ANÁLISIS DE INFORMACIÓN CIENTÍFICA-TECNOLÓGICA RELACIONADOS CON LA PRODUCCIÓN Y TRATAMIENTO DE VINAZA SUCRO ALCOHOLERA.

ESTUDIO DE VIGILANCIA TECNOLÓGICA E INTELIGENCIA ESTRATÉGICA.

Ministerio de Ambiente y Desarrollo Sustentable

Ministerio de Ciencia, Tecnología e Innovación Productiva

Presidencia de la Nación

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PRÓLOGO

La planificación es un instrumento clave para el desarrollo del sector científico tecnológico en la búsqueda de respuestas a problemas sectoriales y sociales. Con el fin de contribuir al crecimiento sostenido del país, el Ministerio de Ciencia, Tecnología e Innovación Productiva de la Nación (MINCyT) tiene como misión formular políticas científicas orientadas a incrementar la competitividad del sector productivo a partir de la investigación y la innovación tecnológica.

Para ello, es indispensable reconocer el valor que hoy tiene la información en articulación con la gestión del conocimiento si la meta es trazar estrategias que permitan la innovación productiva en el territorio. En este sentido, el Programa Nacional de Vigilancia Tecnológica e Inteligencia Competitiva (VINTEC) dependiente de la Subsecretaría de Estudios y Prospectiva detecta y analiza información relevante sobre avances científicos, tendencias, tecnologías emergentes, ventanas de oportunidades, invenciones, alianzas estratégicas, clientes y competidores.

Junto al Ministerio de Ambiente y Desarrollo Sustentable de la Nación (MAyDS), el MINCyT ha realizado acciones de vigilancia tecnológica e inteligencia estratégica que, en este caso, se refieren a la producción y el tratamiento de vinaza sucro-alcoholera. El estudio que aquí se presenta tiene por objetivo dar cuenta de las tendencias y los movimientos locales e internacionales sobre la gestión sustentable de la vinaza sucro-alcoholera, para establecer las potencialidades competitivas de Argentina al identificar los avances científicos-tecnológicos que existen en la actualidad en este sector.

La Secretaría de Planeamiento y Políticas en Ciencia, Tecnología e Innovación Productiva (MINCyT) pone este trabajo a disposición de todos aquellos actores vinculados con la investigación, el desarrollo y la aplicación de las tecnologías para la producción de bioenergía y la gestión de la vinaza sucro-alcoholera, como instituciones gubernamentales, científicas y tecnológicas, con el objetivo de contribuir al crecimiento productivo de nuestro país promoviendo el desarrollo sustentable.

Ing. Jorge Aguado
Secretario de Planeamiento y Políticas
del Ministerio de Ciencia, Tecnología e
Innovación Productiva

RESUMEN EJECUTIVO

El objetivo del presente trabajo, es realizar un estudio sobre el estado del arte de las tendencias y los movimientos locales e internacionales sobre la *Gestión Sustentable de la Vinaza Sucro-Alcoholera*, en las cuales Argentina presenta o podría presentar potencialidades competitivas; identificando los avances científicos, tecnológicos y de proyectos de investigación, desarrollo e innovacion (I+D+i) que existen en la actualidad a nivel mundial referidos al tema. El foco del trabajo fue puesto en aquellas tecnologías nuevas o mejoradas sobre el eje del estudio seleccionado, teniendo en cuenta, también aquellas tecnologías incipientes y/o emergentes que permitan un mejoramiento de los procesos actuales, identificando su matriz tecnológica.

A partir del objeto de estudio, y a través del apoyo de expertos en la temática, se definieron 3 (tres) ejes sobre los cuáles se puntualizó en el informe: procesos, tratamientos y disposición, y aplicaciones.

El trabajo se estructuró en 8 (ocho) capítulos que se resumen a continuación:

En el *Capítulo I* se realiza una descripción del marco institucional de los organismos que han articulado de manera conjunta el desarrollo del presente trabajo. Por un lado, se presenta al Ministerio de Ciencia, Tecnología e Innovación productiva (MINCyT) y en segundo lugar, al Ministerio de Ambiente y Desarrollo Sustentable (MAyDS). El esfuerzo conjunto entre ambas instituciones genera un fortalecimiento en campos estratégicos relacionados con la *vigilancia tecnológica e inteligencia estratégica (VTeIE) y la gestión sustentable de la vinaza sucro-alcoholera.*

En el *Capítulo II*, se describe en el marco conceptual el origen de la elaboración del presente estudio solicitado por los integrantes de la Mesa Nacional para la Gestión Sustentable de la Vinaza Sucro-Alcoholera, presidida por el Ministerio de Ambiente y Desarrollo Sustentable de la Nación. En dicho estudio, se manifiesta la importancia de la temática para la Argentina, con realación a las potencialidades competitivas. Por otra parte, se detalla el alcance de la disciplina de vigilancia tecnológica e inteligencia estratégica (VTeIE).

En el *Capítulo III,* se explican los aspectos metodológicos que sustentan el desarrollo del trabajo, especificando las herramientas informáticas y las bases de datos que se utilizaron para la recolección y análisis de información estratégica relacionada con el campo científico–tecnológico, el conjunto de palabras clave utilizado y modelos conceptuales elaborados en forma conjunta con el grupo de expertos en el tema.

En el *Capítulo IV y V*, se muestran los resultados del proceso de vigilancia tecnológica aplicado a los distintos ejes del estudio, a partir de la búsqueda y recolección en bases de datos de publicaciones científicas y artículos técnicos, y de patentes de invención, generando como resultados una serie de indicadores que permiten ver el estado actual y la evolución de la producción científica y tecnológica en los últimos 10 (diez) años en cuanto al tema abordado.

En el *Capítulo VI*, se muestra por un lado una breve descripción de los perfiles que presentan algunas de las organizaciones a nivel mundial, como institutos de investigación y empresas que cuentan con patentes, relacionadas con la producción y tratamiento de vinaza sucro-alcoholera, donde en cada perfil se puede observar información sobre el país de la organización, área de trabajo y un resumen a lo que se dedica. Por otro lado, se enumeran un conjunto de proyectos de I+D+i relacionados con el foco del presente estudio, donde este tipo de información, puede generar nuevas oportunidades de alianzas estratégicas.

En el *Capítulo VII*, se ha realizado un abordaje sobre el tema con un alcance a nivel nacional. Se realizó un monitoreo a nivel nacional sobre los avances científicos y tecnológicos en los campos en los que se focalizó el estudio, permitiendo conocer e identificar la producción científica tecnológica que vienen desarrollando instituciones y organizaciones en vinaza sucro-alcoholera.

Por último en el *Capítulo VIII,* se realiza un descripción sobre las principales conclusiones planteadas por el grupo de expertos, a partir de los resultados obtenidos en dicho estudio.

1. MARCO INSTITUCIONAL

La competencia en el mercado actual es una realidad que amenaza permanentemente la estabilidad y bienestar de diferentes organizaciones (universidades, centros de investigación, empresas, cámaras empresariales e instituciones gubernamentales), por ello es necesario generar nuevas estrategias de innovación para superar creativamente los obstáculos que el mercado nos presenta diariamente.

La utilización de las tecnologías de información y comunicación (TICs) a nivel mundial, han surgido y adquirido un rol central, dando lugar a la aparición de nuevas temáticas tales como la *vigilancia tecnológica e inteligencia estratégica (VTeIE).*

La ***vigilancia tecnológica*** puede definirse como la búsqueda y detección de informaciones, orientadas a la toma de decisiones competitivas, sobre amenazas y oportunidades externas, maximizando la utilidad de las fortalezas propias y disminuyendo el impacto de las debilidades.

La ***inteligencia estratégica*** se ocupa del análisis, el tratamiento de la información, la evaluación y la gestión de los procesos de decisiones estratégicas dentro de las organizaciones, integrando los sistemas de vigilancia tecnológica, así como de vigilancia comercial, vigilancia competitiva, vigilancia del entorno, entre otras.

Estas actividades estratégicas, resultan ser entonces herramientas claves en los procesos de innovación y en el fortalecimiento de un Sistema Nacional de Ciencia, Tecnología e Innovación (SNCTI), por lo cual existe la necesidad de posicionar y lograr un alto nivel de penetración de estas áreas temáticas en los distintos actores nacionales, logrando la concreción de una práctica generalizada y sistemática por parte de los mismos.

A partir de la realización de un relevamiento de necesidades, a nivel nacional y para resolver esta insipiencia sobre el tema, estudió el Ministerio de Ciencia, Tecnología e Innovación Productiva (MINCYT) de la República Argentina https://www.argentina.gob.ar/ciencia, consiente de su importancia, como llevar a cabo acciones o políticas de gestión de la VTeIE, en cualquier ámbito de ciencia y tecnología, analizando sí es necesario implementar algo nuevo incrementando nuevos servicios.

Dentro de la infraestructura gubernamental de ciencia, tecnología e innovación productiva, se ha diseñado un programa nacional para la realización de estudios y servicios en materia de vigilancia tecnológica e inteligencia estratégica, incluyendo así un conjunto de actividades que

desde un ángulo más aplicado e instrumental, pretende fortalecer las capacidades de los actores del Sistema Nacional de Innovación (SNI).

Para dar respuesta a las necesidades del mercado, en cuanto a formación y asesoramiento sobre estas temáticas en las cuales varios países vienen trabajando activamente, desde hace más de 15 años, como Japón, Francia, España, EE.UU., Suecia, Alemania, Gran Bretaña, Rusia e Israel, en mayo de 2010 el MINCYT, a través de la Secretaría de Planeamiento y Políticas, creó el Programa Nacional Vigilancia Tecnológica e Inteligencia Competitiva (VINTEC).

El VINTEC es la primera y única iniciativa de su tipo en la Argentina y apunta a la promoción, sensibilización, ejecución y gestión de actividades de Vigilancia Tecnológica e Inteligencia Estratégica (VTeIE) en grandes empresas, PyME, asociaciones empresariales, entidades gubernamentales, universidades y organismos públicos y privados de investigación.

Dicho programa, está conformado por expertos interdisciplinarios, que cuentan con formación de grado y/o postgrado en la temática y en otras disciplinas relacionadas, con experiencia informática y/o en el campo de la investigación, la innovación, la prospectiva y el planeamiento estratégico, la gestión tecnológica y en formulación de estudios de mercado.

VINTEC es el punto de partida para la implementación de un Sistema Nacional de Gestión de Vigilancia e Inteligencia Estratégica con el objetivo de hacer realidad la inclusión de todo el territorio en la era del conocimiento, la ciencia, tecnología e innovación (CTI) como política de estado plasmada en la federalización del conocimiento. Para darle continuidad y consistencia a ese objetivo, se planifican y ejecutan otras acciones convergentes de corto y mediano plazo, como por ejemplo los *Estudios VeIE*, documentos elaborados en conjunto con otras instituciones y expertos sectoriales, donde se monitorean y analizan información confiable, estratégica, gratuita y de calidad, permitiendo visualizar las trayectorias y tendencias de distintos sectores estratégicos y áreas tecnológicas.

Por su parte, el Ministerio de Ambiente y Desarrollo Sustentable de la Nación (MAyDS) creado en el 2015, permitió su jerarquización a rango de Ministerio otorgar mayor autonomía al ejercicio de competencias para la tutela del ambiente. Así se buscó priorizar y ampliar las políticas destinadas al ambiente y al desarrollo sustentable como un objetivo estratégico del desarrollo nacional y su asociación con la calidad de vida de los habitantes de la Argentina. Su misión es la de promover la protección de los recursos naturales renovables y no renovables, el desarrollo sustentable y el derecho de todos los ciudadanos a gozar de un entorno saludable.

Asimismo en el año 2016[1], se crea la *¨Mesa Nacional para la Gestión Sustentable de la Vinaza sucro-alcoholera (MNGSVISA)¨* presidida por el MAyDS, cuyos objetivos se basan en la identificación y análisis de las diferentes tecnologías existentes para promover una gestión integral y sustentable de la vinaza sucro-alcoholera. Dicha mesa se encuentra integrada en la actualidad por el MINCYT, el Ministerio de Energía y Minería (MINEM), el Ministerio de Agroindustria (MINAGRO), el Ministerio de Producción, la Unidad Plan Belgrano, el Instituto Nacional de Tecnología Agropecuaria (INTA), el Instituto Nacional de Tecnología Industrial (INTI), y los Gobiernos provinciales de Tucumán, Santiago del Estero, Salta y Jujuy.

De acuerdo a lo desarrollado anteriormente y en concordancia a los objetivos de la MNGSVISA, ésta propone la realización de un Estudio de VTeIE sobre Vinaza con la finalidad de obtener información acerca de las tendencias y los movimientos locales e internacionales relativos a la Gestión Sustentable de la Vinaza Sucro-Alcoholera, en las cuales Argentina presenta o podría presentar potencialidades competitivas.

En el 2017 el MINCYT, a través del Programa Nacional VINTEC y el MAyDS, se han unido técnicamente para realizar un e*studio de vigilancia tecnológica e inteligencia estratégica, llamado "Análisis de información científica – tecnológica relacionados con la producción y tratamiento de vinaza sucro alcoholera*" *.*

En conclusión, evidentemente este esfuerzo conjunto entre MINCyT y MAyDS, beneficia a ambas partes en 2 (dos) campos importantes a desarrollarse, como son la vigilancia tecnológica e inteligencia estratégica y la vinaza sucro-alcoholera.

[1] Resolución 2016-3-E-APN-SECPACCYDS#M. Creación Mesa Nacional para la Gestión Sustentable de la Vinaza Sucro-Alcoholera. 2016.

2. MARCO TEÓRICO CONCEPTUAL

2.1 INTRODUCCIÓN A LA VINAZA SUCRO ALCOHOLERA

Generación de la vinaza:

La producción tradicional de azúcar en Argentina, se concentra en las provincias de Tucumán, Jujuy y Salta, representando estas 3 (tres) provincias cerca del 98% de la producción nacional de azúcar. Tucumán entrega su cosecha a 15 (quince) ingenios[2] y además existen en el país otros 3 (tres) ingenios en Jujuy, 2 (dos) en Salta, 2 (dos) en Santa Fe y 1 (uno) en Misiones, totalizando 23 (veintitrés) ingenios (Valeiro y Portocarrero, 2017).

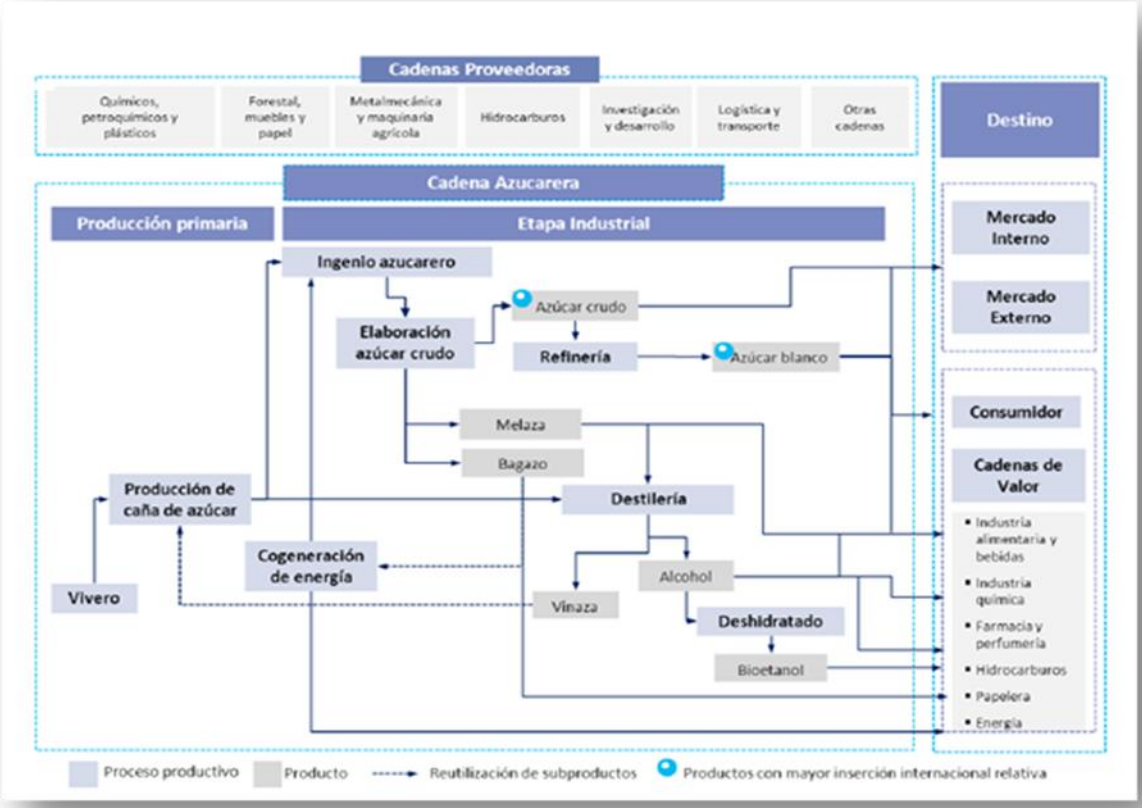
Asimismo, a nivel nacional existen 16 (dieciséis) destilerías de alcohol en su mayoría integradas con los ingenios, 9 (nueve) plantas de deshidratado en funcionamiento (Valeiro et al., 2017) y en octubre de 2017 se ha iniciado la construcción de dos nuevas destilerías y ampliación para la producción de bioetanol en la Provincia de Tucumán (fuente: http://www.ucar.gob.ar). Estas últimas extraen el 4% de agua que queda en el alcohol, transformándolo en bioetanol que se utiliza para la mezcla con naftas en el mercado nacional desde 2010.

Existen 2 (dos) alternativas para la producción de etanol o alcohol etílico. Una de ellas es a partir de la fermentación por microorganismos (levaduras o bacterias) directamente de los azúcares del jugo de la caña y la otra es a partir de la melaza. En Argentina, en líneas generales, las destilerías se sitúan anexas a los ingenios. Luego de la fermentación de los jugos, la melaza y/o las mieles, se alcanza una concentración de alcohol de aproximadamente un 10-12%. Este producto, llamado mosto fermentado, es centrifugado y convertido en un líquido conocido como vino, el cual es sometido a destilación, obteniéndose el alcohol hidratado, con un contenido aproximado del 4-5% de agua, que tras ser deshidratado se utiliza como combustible *(Los residuos de la industria sucro-alcoholera argentina, Valeiro y Portocarrero, pg.4, 2017*).

En el proceso de destilación se produce un residuo líquido del alto contenido orgánico denominado *Vinaza.* Por cada litro de etanol producido se generan aproximadamente en promedio, 13 litros de vinaza con una alta carga contaminante *(Los residuos de la industria sucro-alcoholera argentina, Valeiro y Portocarrero, pg.2, 2017*).

[2] Ingenio azucarero: es la planta industrial donde se lleva a cabo el proceso de producción de azúcar.

Figura 1. Cadena de valor del sector azucarero.



Fuente: Ministerio de Hacienda y Finanzas Públicas de la República Argentina.

Caracterización:

La vinaza es de todas las aguas residuales provenientes de los complejos azucareros-alcoholeros, la que mayor impacto ambiental genera, contiene impurezas procedentes del proceso de extracción de los jugos y de la fermentación, caracterizada por su alta carga orgánica, acidez, corrosividad, altas concentraciones de potasio y sulfatos, elevadas temperaturas de descarga (80 a 100°C) y olor pestilente. Algunas de estas características convierten a la vinaza en un material altamente contaminante frente a una descarga no controlada, particularmente en el caso que pueda producirse un vertido en forma directa a cuerpos de agua, lo que podría causar una alteración irreversible de los ecosistemas acuáticos impactados[3].

[3] Documento preliminar de discusión para la gestión sustentable de la vinaza producido por Ministerio de Ambiente y Desarrollo Sustentable de la Nación.

Alternativas:

Pese a existir diferentes procesos primarios para el manejo de la vinaza, la solución definitiva requiere de tecnologías capaces de convertirla en subproductos útiles mediante una gestión integral y sustentable. Actualmente en Argentina, se han adoptado alternativas para su aplicación en suelos, productivos o salinos, en compostaje y/o uso para su recuperación energética entre los principales, vislumbrándose potenciales perspectivas productivas vinculadas a los biocombustibles. En particular, la obtención de bioetanol por medio de la fermentación de los azúcares y a partir del procesamiento de la caña de azúcar tiene un impacto positivo en el ambiente en virtud de considerarse un cultivo de alta energía y uno de los más eficientes en la generación de energías renovables.

En este sentido cabe señalar que según lo informado por la Secretaría de Energía de la Nación, durante el 2017, se han producido un total de 1.105.107 m^3 de bioetanol. El 49,95% (551.964 m^3) corresponde a bioetanol en base a maíz y el 50,05 % (553.143 m^3) a bioetanol en base a caña de azúcar. Dichas cantidades, comparadas con el año 2016, representan un crecimiento de aproximadamente el 24 % en la producción total de bioetanol, significando un aumento del casi 13% de la producción de bioetanol a base de maíz y un incremento del 38,25% de la producción de bioetanol a base de caña de azúcar[4].

La solución integral para el uso sustentable de este material constituye el desafío ambiental para la producción de bioetanol a partir de caña de azúcar.

2.2 VIGILANCIA TECNOLÓGICA E INTELIGENCIA ESTRATÉGICA

Se entiende por *vigilancia tecnológica* al proceso sistemático y organizado que permite buscar, recolectar y analizar información relacionada con conocimientos científicos y tecnológicos, e información sobre aspectos legislativos, normativos, sociales, económicos y de mercado, entre otros. Permite identificar a tiempo cambios y novedades que suceden en el entorno de las organizaciones, con el fin de tomar decisiones más acertadas frente a oportunidades y amenazas identificadas con el menor riesgo posible en el desarrollo de un nuevo producto, servicio, política o estrategia.

La *inteligencia estratégica* comprende, en un nivel más detallado, el análisis, interpretación y comunicación de información de valor estratégico acerca de aspectos científicos, tecnológicos, normativos, legislativos, mercado, que se transmite a los responsables de la toma de decisiones

[4] Ver las normas nacionales que regulan la producción de biocombustibles en Argentina: Ley Nº 26.093, Decreto Nº 109, Ley Nº 26.334 y Decreto Nº 543.

como elemento de apoyo para ajustar el rumbo y marcar posibles caminos de evolución, de interés para las organizaciones[5].

En este contexto la *vigilancia tecnológica y la inteligencia estratégica* juegan un rol estratégico, como disciplina que conecta las lecturas sistemáticas de los entornos con el diseño de las estrategias internas para el fortalecimiento y formación de capacidades endógenas.

De acuerdo con la norma UNE 166006:2011[6], la *Vigilancia Tecnológica* es una herramienta fundamental en el marco de los sistemas de gestión de I+D+i y se define como "el proceso organizado, selectivo y sistemático, para captar información del exterior y de la propia organización sobre ciencia y tecnología, seleccionarla, analizarla, difundirla y comunicarla, para convertirla en conocimiento con el fin de tomar decisiones con menor riesgo y poder anticiparse a los cambios".

Las fases de un proceso de VTeIE son la que se aprecian en la siguiente figura:

Figura 2. Etapas del proceso de VTeIE.

Fuente: VINTEC, MINCYT 2015.

a) Obtención o captura de la información pertinente sobre un tema, problema o proyecto.
b) Procesamiento, análisis e interpretación de la misma, lo que a veces exige la búsqueda de información adicional.
c) Comunicación del análisis efectuado a la dirección de la empresa o entidad.

[5] Ver Guía Nacional de Vigilancia e Inteligencia Estratégica (2015).
[6] Veáse Asociación Española de Normalización y Certificación AENOR (2011). Gestión de la I+D+i: Sistema de vigilancia tecnológica e inteligencia competitiva. UNE 166006. Madrid, España.

d) Toma de decisiones sobre la cuestión examinada por parte de la dirección.

La información capturada debe referirse, a temas de interés estratégico para la entidad. Para algunas organizaciones la prioridad puede consistir en detectar a tiempo las tecnologías emergentes, que pueden representar amenazas u oportunidades. Para otras puede interesar conocer a fondo las actividades de un competidor. O bien, los requisitos de un mercado potencial o las condiciones de implantación en un país extranjero. Otras necesitan saber todas las normas de los países que importan sus productos o bien las reglamentaciones sobre el medio ambiente. Cada entidad debe determinar, de acuerdo con su estrategia, las áreas en las que quiere estar bien informada (Escorsa y Lazaro, 2007).

3. METODOLOGÍA DE TRABAJO

Para este estudio, se partió de la premisa de considerar a la vinaza como un subproducto de la destilación del alcohol etílico proveniente de los complejos sucro-alcholeros, que se convierte en un elemento o compuesto orgánico o material altamente contaminante sólo cuando se gestiona inadecuadamente.

En Argentina, existe amplia experiencia e información referente a riego de vinaza en suelos productivos y no productivos - denominada fertiriego[7] (Dantur et al., 1996), elaborada por reconocidas instituciones como lo son el Instituto Nacional de Tecnología Agropecuaria (INTA), la Estación Experimental Agroindustrial Obispo Colombres (EEAOC), la Universidad Nacional de Tucumán (UNT), la Planta Piloto de Procesos Industriales Microbiológicos (PROIMI) pertenciente al Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), entre los principales. En este sentido, el objeto de la búsqueda y análisis priorizó nuevas instancias a nivel internacional como variantes al fertiriego. En un apartado especial, se mencionan las tecnologías y combinación de las mismas, utilizadas en Argentina para la gestión de la vinaza sucro-alcoholera.

Los ejes de trabajo seleccionado, tienen en cuenta las consideraciones que se detallan a continuación:

Procesos: en la selección de documentos, tanto de publicaciones científicas como de patentes, se orientó la búsqueda a aquellos procesos en los que se genera vinaza y a aquellos donde la vinaza es utilizada para otros procesos.

Tratamientos y disposición: hace referencia a aquellos procesos biológicos y físicos con el objetivo de disminuir el potencial contaminante de la vinaza, de manera que sus características se encuadren dentro de las normas establecidas por la autoridad competente (Finguerut et al., 2008).

Respecto a los tratamientos biológicos, las transformaciones aeróbica y anaeróbica se consideran como las principales, y se mostró interés en realizar búsquedas específicas que involucren transformaciones con utilización de microalgas, compostaje y disposición en suelos como enmienda orgánica.

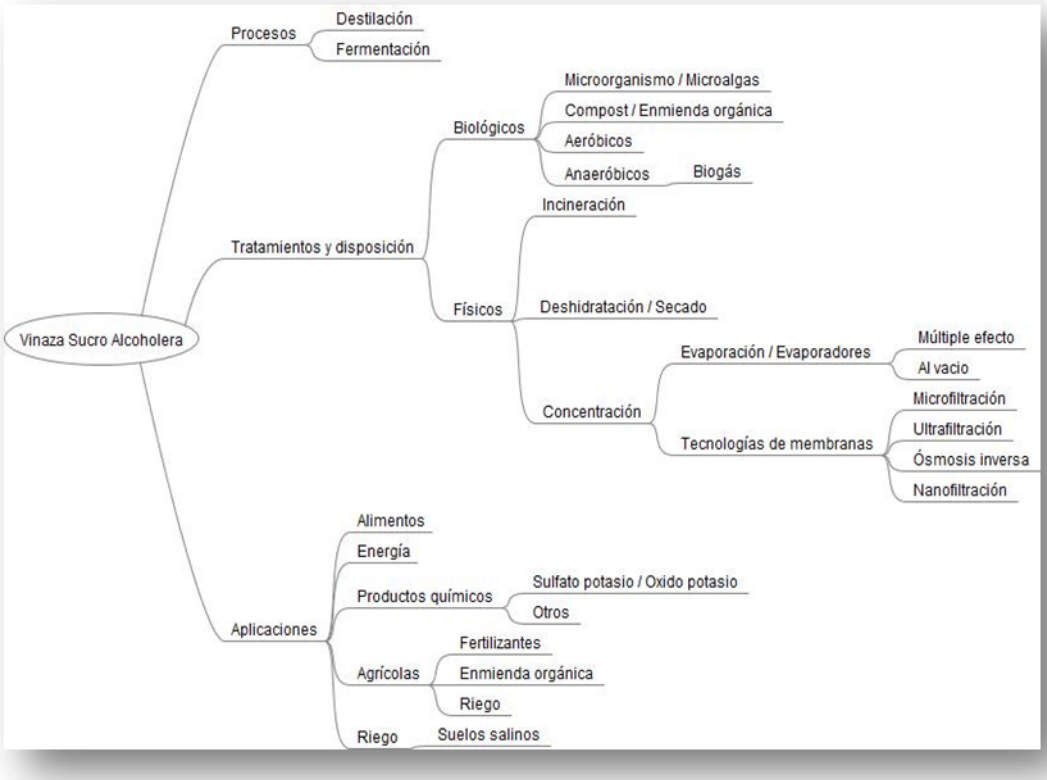
[7] Fertirrigación: existe una discusión técnica alrededor de esta denominación en Argentina. Se dice que si la vinaza se aplica pura hablamos de fertilización; en cambio, si se usara diluida en agua entonces se denominaría fertirrigación. En ambos casos, podríamos hablarse de enmienda orgánica (Morandini, 2010).

En referencia a los tratamientos físicos, las búsquedas se centraron en aquellos basados en concentración de vinaza (evaporación, deshidratación, secado), separación (microfiltración, ultrafiltración, etc.) y transformaciones como la incineración, abarcando en este sentido las 3 (tres) operaciones básicas de tratamiento.

Aplicaciones: hace referencia a los potenciales usos y procesos de generación de subproductos a partir de la vinaza. Involucra alternativas de transformación de la vinaza para valorizar a los subproductos, con la finalidad de su eliminación efectiva e inocua y realizar aportes para una mayor rentabilidad al proceso industrial de partida. Se realizaron búsquedas orientadas a aplicaciones en la industria alimenticia, energética, química y agrícola.

A continuación se presenta el modelo conceptual construído por el VINTEC, con la colaboración del grupo de expertos, a partir de los ejes identificados, siendo la base para el armado de las sentencias de búsquedas utilizadas en las distintas bases de datos a las que se accedieron:

Figura 3. Modelo conceptual Vinaza sucro-alcoholera.



Fuente: VINTEC, MINCYT (2017).

El presente estudio de vigilancia tecnológica e inteligencia estratégica se realizó trabajando principalmente con 2 (dos) tipos de fuentes de información: fuentes primarias, que comprenden la información surgida de la experiencia y el conocimiento de los expertos, y de las fuentes secundarias, conformadas específicamente por las bases de datos de documentos científicos y de patentes de invención.

Las bases de datos utilizadas fueron las disponibles en la plataforma de vigilancia e inteligencia Thomson Reuters, denominada Thomson Innovation (TI), a través de la cual se accedió a más de 95 (noventa y cinco) millones de patentes, de más de 90 (noventa) países del mundo, contando además con información de su propia base de datos de patentes Derwent, y acerca de 50 (cinquenta) millones de publicaciones científicas de Web of Science, Conference Proceedings y Current Contents.

Por otra parte, toda la primera etapa de búsqueda realizada con el TI, se complementó con la utilización de otra de las herramientas de Thomson Routers, Thomson Data Analyzer (TDA), que permitió realizar una gran variedad de análisis a partir de un corpus determinado, aplicando técnicas de data mining y text mining.

Para llevar adelante dicho estudio, se conformó por parte del MAyDS, un comité de expertos en función del área de investigación correspondiente, que procedió a definir las palabras clave, los códigos de clasificación de patentes y los países con estudios relevantes en la materia. A partir de estos parámetros, el equipo técnico del VINTEC, construyó las sentencias de búsqueda utilizadas en las bases de datos de publicaciones científicas y de patentes de invención, a fin de permitir recuperar documentos relevantes.

A partir de los resultados obtenidos de bases de datos de publicaciones científicas y artículos técnicos, y de patentes de invención, los expertos seleccionaron los más relevantes relacionados con los ejes del trabajo, lo que permitió generar una serie de indicadores que muestran el estado actual y la evolución de la producción científica y tecnológica en los últimos 10 (diez) años y que se pone a disposición de los actores involucrados en la gestión de la vinaza sucro-alcoholera.

Para la búsqueda de información a partir de documentos de artículos científicos y patentes de invención, se definieron las palabras clave y sentencias de búsqueda[8] que se observan en la siguiente tabla:

[8] Los resultados obtenidos de documentos de patentes fueron filtrados por familias de patentes.

Tabla 1: Ecuaciones de búsqueda.

FOCO DE TRABAJO	PALABRAS CLAVE	ECUACIÓN	CAMPOS DE BÚSQUEDA	RESULTADOS
PUBLICACIONES CIENTÍFICAS				
Procesos	Sugarcane, vinasse, stillage, process, distillation, fermentation	(PY>=(2007) AND PY<=(2017)) AND ALL=((sugarcane and (vinasse or stillage)) and (distillat* or fermentat*));	All Text	40
Tratamientos y Disposición	Sugarcane, vinasse, stillage, treatment*, process*, disposal, biologic*, microorganism, microalgae*, compost, fertilizer, green waste, aerobic, anaerobic, biogas	(PY>=(2007) AND PY<=(2017)) AND ALL=((sugarcane and (vinasse or stillage)) and ((treatment* or process* or disposal) and (biologic* or microorganism or microalgae* or compost or aerobic or anaerobic or biogas)));	All Text	85
	Sugarcane, vinasse, stillage, treatment*, process*, disposal, physic*, incinerator, calcination, boiler, burn, energy, potassium sulfat, potassium oxide	(PY>=(2007) AND PY<=(2017)) AND ALL=((sugarcane and (vinasse or stillage)) and ((treatment* or process* or disposal) and (physic* or ((incinerat* or calcinat* or boiler or burn) and (energy or (potassium and sulfat*) or (potassium and oxide)))));	All Text	
	Sugarcane, vinasse, treatment*, process*, disposal, physic*, concentration, evaporator, multi-jet, vacuum, membrane, technology, membrane filtration, microfiltration, ultrafiltration, reverse osmosis, nanofiltration	(PY>=(2007) AND PY<=(2017)) AND ALL=((sugarcane and (vinasse or stillage)) and ((treatment* or process* or disposal) and (physic* or concentrat* or evaporat* or (multi near jet) or vacuum or (membrane near technolog*) or (membrane near filtrat*) or microfiltrat* or ultrafiltrat* or (reverse near osmosis) or nanofiltrat*)));	All Text	
Aplicaciones	Sugarcane, vinasse, food, feed, energy, chemical products, potassium sulfate, potassium oxide	(PY>=(2007) AND PY<=(2017)) AND ALL=((sugarcane and (vinasse or stillage)) and (food or feed or (energ* and recovery) or (chemical and product*) or farm* or fertiliz* or (green and waste) or (recovery and (saline near soil)) or (irrigat* and (asper* or sprinkling))));	All Text	96

DOCUMENTOS DE PATENTES				
Procesos	Vinasse, vinhaça, vinaza, incineration, dehydration, anaerobic biodigestion, anaerobic digestion, organic amendment, compost, drying, concentration, evaporators.	TAB=(((vinaza or vinhaca or vinasse* or vinhoto OR stillage) and (sugarcane or "cana near açécar" or "cana near açúcar")) and ((destillation or fermentat*) or (process near2 (destillation or fermentat*)))) AND DP>=(20070101) AND DP<=(20170822);	Title, Abstract	56 documentos
Tratamientos y Disposición	Process, treatment, vinasse, vinhaça, vinaza, incineration, dehydration, anaerobic biodigestion, anaerobic digestion, organic amendment, compost, drying, concentration, evaporators.	TAB=(((vinaza or vinhaca or vinasse* or vinhoto or stillage) and (sugarcane or "cana near açécar" or "cana near açúcar")) and (((treatment* or process* or disposal) and (biologic or biological)) or ((treatment* or process* or disposal) and (microorganism or microalgae or compost or aerobic or anaerobic or biogas)))) AND DP>=(20070101) AND DP<=(20170822);	Title, Abstract	51 documentos
Tratamientos y Disposición	Vinasse, vinhaça, vinaza, sugar cane, destilation, fermentation.	TAB=((vinaza or vinhaca or vinasse* or vinhoto or stillage) and (sugarcane or "cana near açécar" or "cana near açúcar")) AND TAB=(((treatment* or processing or disposal) and (physical or physics)) or ((incinerat* or boiler or burn or calcination) and ((energy) or ((potassium near sulfate) or (potassium near oxide)))) or concentration or (concentration near2 (evaporator or "multi near jet" or vacuum)) or ("membrane technol*" or "membrane filtration") or (microfiltration or ultrafiltration or "reverse osmosis" or nanofiltration)) AND DP>=(20070101) AND DP<=(20170823);	Title, Abstract	
Aplicaciones	Vinasse, vinhaça, vinaza, food, energy, energy generation, potassium, biofertilizer, organic	TAB=(((vinaza or vinhaca or vinasse* or vinhoto or stillage) and (sugarcane or "cana near açécar" or "cana near	Title, Abstract	10 documentos

	amendment, compost, fertigation, biogas.	açúcar")) and (food or (energynear ADJ recovery) or feed or (chemical near3 products) or ((agricultural or farming) and (Fertilizer or "Green near waste")) or (recovery near2 "saline soil") or ((irrigation) and (asper* or sprinklers)))) AND DP>=(20070101) AND DP<=(20170719);

Fuente: elaboración propia a partir de Thomson Innovation – VINTEC.

Este trabajo explora el estado del arte de nuevas tecnologías referidas a la gestión de la vinaza sucro-alcoholera, en países como Argentina, Brasil, Colombia, Estados Unidos e India, identificando los avances científicos, tecnológicos y de patentes, que existen en la actualidad referidos al tema. El foco del trabajo fue puesto en aquellas tecnologías nuevas o mejoradas en relación a la gestión de la vinaza sucro-alcoholera, teniendo en cuenta aquellas tecnologías incipientes y/o emergentes que permitan un mejoramiento de los procesos actuales, identificando su matriz tecnológica.

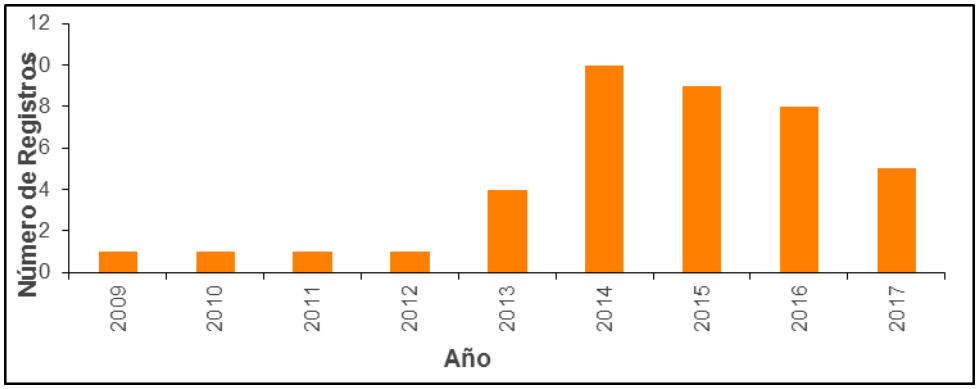
4. BÚSQUEDA Y ANÁLISIS DE INFORMACIÓN CIENTÍFICA

4.1 PROCESOS

4.1.1 Cantidad de registros por año

En la figura 4 se observa como la tendencia en materia de investigaciones relacionadas con el tema objeto de estudio, no presenta una en crecimiento destacable, siendo el año con mayor cantidad de registros el 2014 (10 documentos).

Figura 4. Evolución de publicaciones científicas por año.

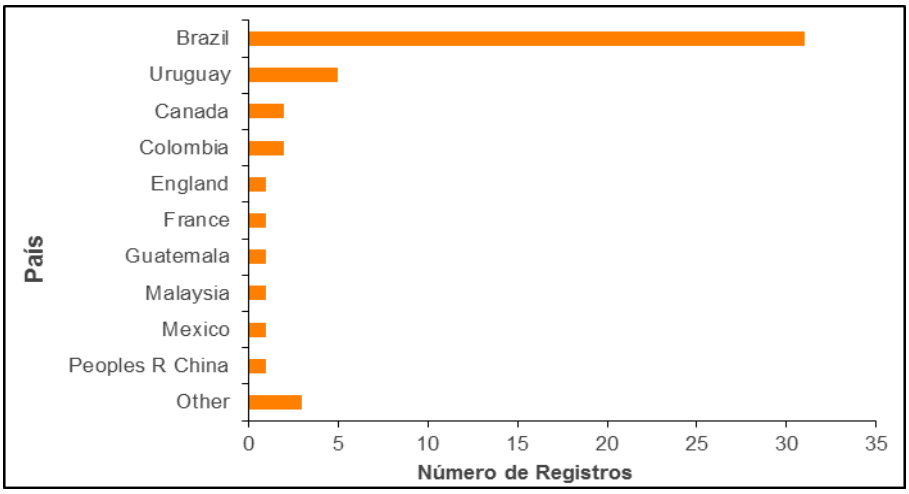


Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.1.2 Países líderes en la producción científica

Entre los 5 (cinco) países líderes en materia de publicaciones científicas se destacan: Brasil (31 documentos), Uruguay (5 documentos), Canadá (2 documentos), Colombia (2 documentos) e Inglaterra (1 documento).

Figura 5. Países líderes en publicaciones científicas.



Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.1.3 Perfil tecnológico por país

Se puede observar con mayor detalle en la tabla que se presenta a continuación, la cantidad de publicaciones científicas por organizaciones en cada país y las disciplinas presentes en estas publicaciones.

Tabla 2: Perfil tecnológico por país.

Número de Registros	País	Top Organizaciones	Top Disciplinas
31	Brasil	Univ. Sao Paulo [14]; Univ. Fed Sao Carlos [10]; Inst. Invest. Biol Clemente Estable [3]	Energy & Fuels [14]; Chemistry, Physical [8]; Electrochemistry [8]
5	Uruguay	Univ. Sao Paulo [4]; Inst. Invest. Biol Clemente Estable [3]; Univ. República [2]; CTBE Brazilian Bioethanol Sci & Technol Lab CNPEM [2]	Energy & Fuels [3]; Chemistry, Physical [2]; Electrochemistry [2]
2	Canadá	Ctr Eau Terre Environm [1]; Univ. Fed Párana [1]; Univ. Clermont Ferrand [1]	Energy & Fuels [2]; Chemistry, Physical [1]; Electrochemistry [1]
2	Colombia	Colombian Sugarcane Res Ctr CE NICANA [1]; Colombian Sugarcane Res Ctr Cenicana [1]; Santiago Cali Univ. [1]	Biotechnology & Applied Microbiology [1]; Microbiology [1]; Food Science & Technology [1]
1	Inglaterra	Empresa Brasileira Pesquisa Agropecuaria Embrapa [1]; Univ. Brasaia [1]; Univ. Cambridge [1]	Environmental Sciences [1]; Agriculture, Multidisciplinary [1]; Ecology [1]
1	Francia	Ctr Eau Terre Environm [1]; Univ. Fed Parana [1]; Univ. Clermont Ferrand [1]	Biotechnology & Applied Microbiology [1]; Energy & Fuels [1]; Agricultural Engineering [1]

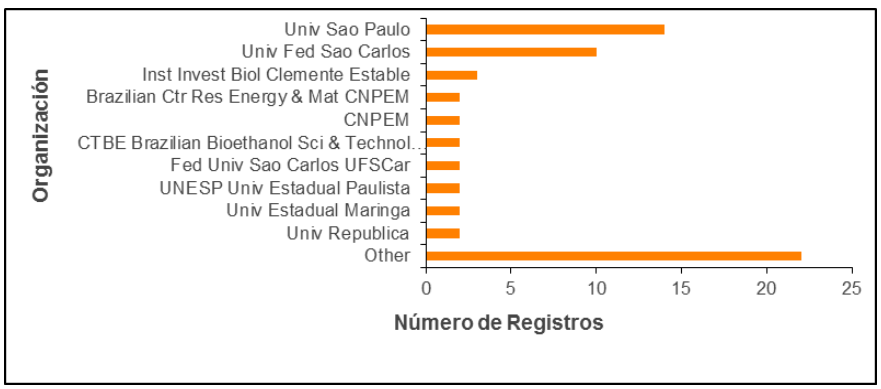
1	Guatemala	Asoc. Azucareros Guatemala Mag Alcoholes SA [1]; Univ. Fed Parana [0]; Univ. Clermont Ferrand [0]	Food Science & Technology [1]; Biotechnology & Applied Microbiology [0]; Energy & Fuels [0]
1	Malaysia	Sudan Univ. Sci & Technol [1]; Univ. Malaya [1]; Univ. Clermont Ferrand [0]	Environmental Sciences [1]; Food Science & Technology [0]; Biotechnology & Applied Microbiology [0]
1	México	CINVESTAV [1]; Ctr Invest & Asistencia Tecnol & Diseno Estado Ja [1]; Univ. Clermont Ferrand [0]	Multidisciplinary Sciences [1]; Environmental Sciences [0]; Food Science & Technology [0]
1	China	Guangxi Univ Nationalities [1]; Guangxi Acad Agr Sci [1]; Guangxi Guitang Grp Co Ltd [1]	Biotechnology & Applied Microbiology [1]; Energy & Fuels [1]; Agricultural Engineering [1]

Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.1.4 Organizaciones líderes en la producción científica

Las instituciones que se han identificado con mayor cantidad de documentos científicos son la Universidad de Sao Paulo (14 documentos), Universidad Federal Sao Carlos (10 documentos), el Instituto de Investigaciones Biológicas Clemente Estable (3 documentos) y el Centro Nacional de Investigación en Energía y Materiales (4 documentos).

Figura 6. Instituciones principales con mayor cantidad de documentos de publicaciones científicas.



Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.1.5 Perfil tecnológico por organización

Tabla 3: Perfil tecnológico por organización.

Número de Registros	Organizaciones	Top Paises	Top Investigadores	Top Disciplinas
14	Univ. Sao Paulo	Brasil [14]; Uruguay [4]; Canadá [0]	Silva, E L [5]; Zaiat, M [5]; Varesche, M B A [5]	Energy & Fuels [10]; Chemistry, Physical [7]; Electrochemistry [7]
10	Univ. Fed Sao Carlos	Brasil [10]; Uruguay [1]; Canadá [0]	Silva, E L [6]; Varesche, M B A [5]; Sakamoto, I K [3]	Energy & Fuels [5]; Chemistry, Physical [4]; Electrochemistry [4]
3	Inst. Invest. Biol Clemente Estable	Brasil [3]; Uruguay [3]; Canadá [0]	Etchebehere, C [3]; Zaiat, M [3]; Ferraz, A D N [3]	Energy & Fuels [2]; Chemistry, Physical [1]; Electrochemistry [1]
2	Brazilian Ctr Res Energy & Mat CNPEM	Brasil [2]; Uruguay [0]; Canadá [0]	Zaiat, M [2]; Moraes, B S [1]; Bonomi, A [1]	Energy & Fuels [2]; Chemistry, Physical [1]; Electrochemistry [1]
2	CNPEM	Brasil [2]; Uruguay [1]; Canadá [0]	Zaiat, M [1]; Etchebehere, C [1]; Nolasco, J [1]	Energy & Fuels [1]; Biotechnology & Applied Microbiology [1]; Agricultural Engineering [1]
2	CTBE Brazilian Bioethanol Sci & Technol Lab CNPEM	Brasil [2]; Uruguay [2]; Canadá [0]	Zaiat, M [2]; Etchebehere, C [2]; Ferraz, A D N [2]	Energy & Fuels [1]; Chemistry, Physical [1]; Electrochemistry [1]
2	Fed. Univ. Sao Carlos UFSCar	Brasil [2]; Uruguay [0]; Canadá [0]	Bastos, R G [2]; Matos, V D [1]; Morais, D V [1]	Engineering, Chemical [1]; Agronomy [1]; Agriculture, Multidisciplinary [1]
2	Univ. Estadual Paulista	Brasil [2]; Uruguay [0]; Canadá [0]	Fuess, L T [2]; Garcia, M L [2]; Zaiat, M [1]	Energy & Fuels [1]; Chemistry, Physical [1]; Electrochemistry [1]

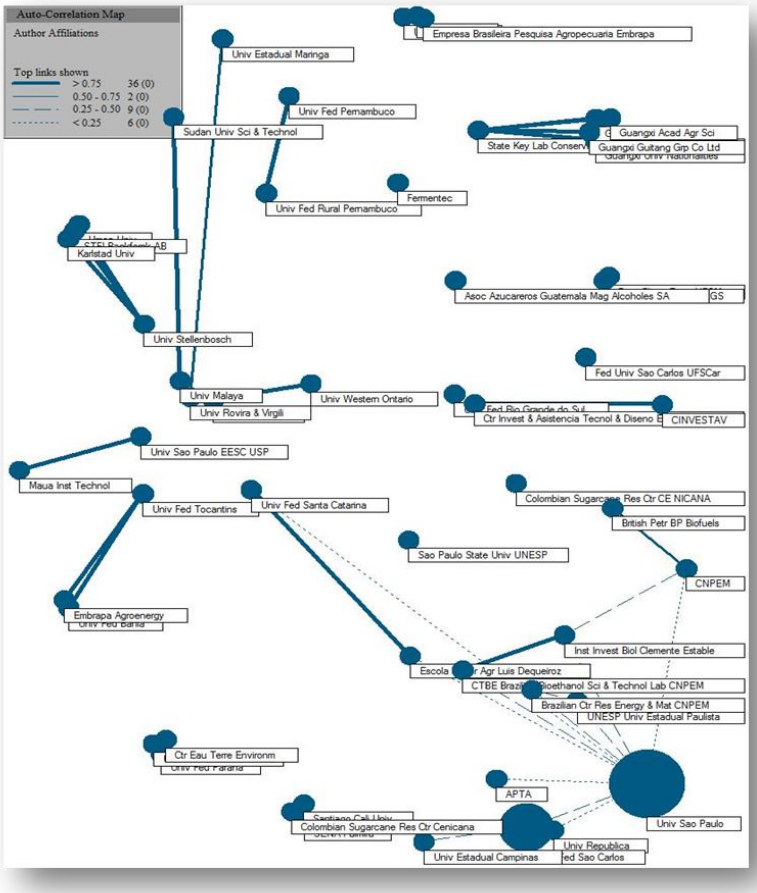
2	Univ. Estadual Maringa	Brasil [2]; España [1]; Uruguay [0]	Gimenes, M L [1]; de Souza, R P [1]; Defendi, R O [1]	Multidisciplinary Sciences [1]; Energy & Fuels [0]; Chemistry, Physical [0]
2	Univ. República	Uruguay [2]; Brasil [1]; España [0]	Perna, V [1]; Borzacconi, L [1]; Lazaro, C Z [1]	Energy & Fuels [1]; Chemistry, Physical [1]; Electrochemistry [1]

Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.1.6 Redes de colaboraciones entre instituciones

Entre las instituciones líderes, la que presenta mayor nivel de colaboración conjunta con otras es la Universidad de Sao Paulo (USP). El resto de las instituciones también muestran algunos lazos de articulación con otras instituciones, pero con menor grado.

Figura 7. Redes de colaboración entre instituciones.

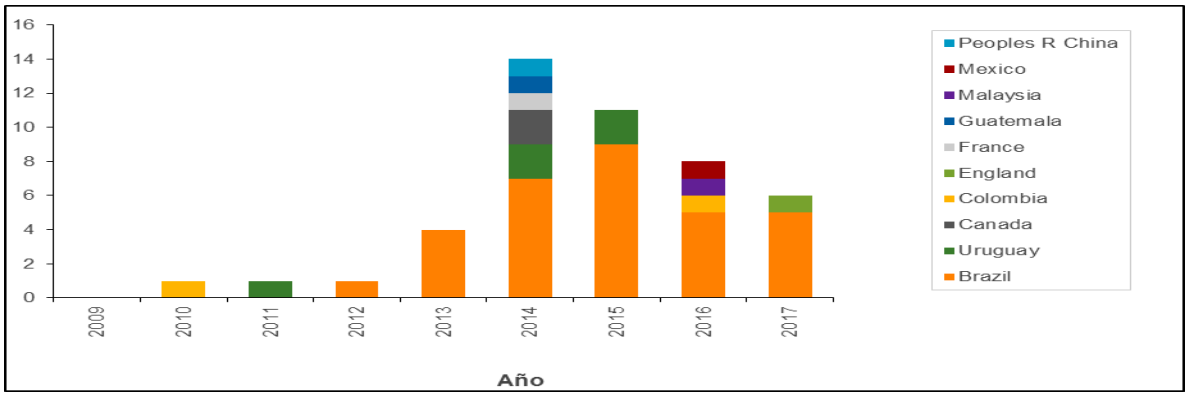


Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.1.7 Evolución anual de publicaciones científicas en los últimos años por país

En la figura 8 se puede apreciar como en los últimos 5 (cinco) años, el país que aparece con mayor cantidad de investigaciones es Brasil, destacándose el año 2014 donde aparecen otros países que presentan registros de investigaciones como Inglaterra, Canadá, Fancia, Guatemala y China.

Figura 8. Cantidad de publicaciones científicas por países y por año.

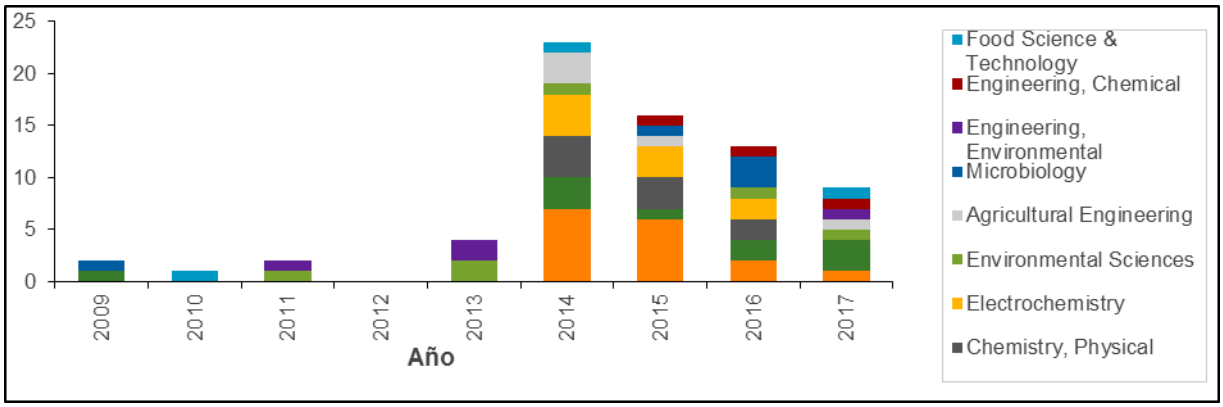


Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.1.8 Evolución anual de publicaciones científicas en los últimos años por disciplina

En la figura siguiente se puede ver como en los últimos 3 (tres) años, las disciplinas que poseen mayor nivel de investigaciones científicas son electroquímica, biotecnología y microbiología aplicada, química y física. A su vez, cabe resaltar como las investigaciones en el área de electroquímica ha venido decreciendo notablemente en los últimos años.

Figura 9. Cantidad de investigaciones por disciplina y por año.

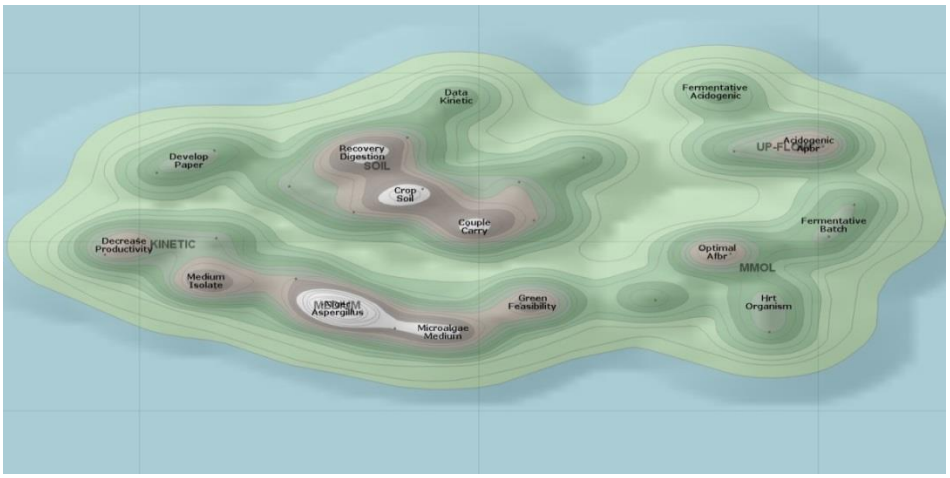


Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.1.9 Mapa Temático por áreas de investigación

El siguiente mapa temático[9] presenta los conceptos que aparecen con mayor frecuencia dentro del corpus de información obtenido. Los relieves y la intensidad de los verdes indican proporcionalmente los niveles de aparición. "Recovery Digestion", "Crop Soil", "Couple Carry", "Microalgae Medium" y "Niger Aspergillus" son los conceptos que se presentan con mayor frecuencia.

Figura 10. Mapa temáticos de las principales áreas de investigación.



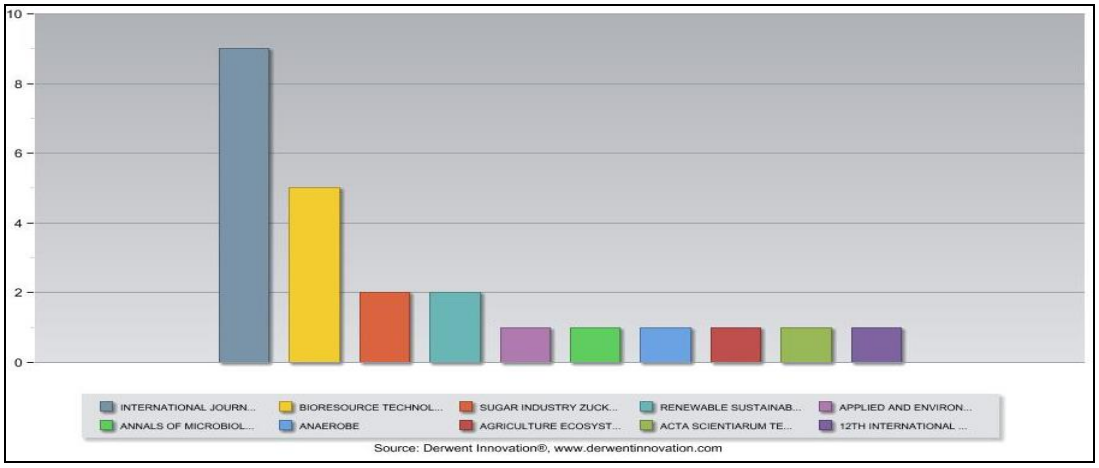
Fuente: elaboración propia a partir de Thomson Innovation – VINTEC.

4.1.10 Revistas con mayor número de publicaciones para la temática procesos

En la figura siguiente se pueden observar las revistas que han aparecido con mayor cantidad de documentos de investigación: Bioresource Technology (9 registros), International Journal of Hydrogen Energy (5 registros), Sugar Industry-Zuckerindustrie (2 registros), Renewable Energy (2 registros) y Applied And Environmental Microbiology (1 registro).

[9] Se entiende por mapa temático, al gráfico que presenta los temas involucrados con el análisis de las palabras de cada documento. Mediante algoritmos de minería de datos, se ubica a cada documento en un "cluster" especifico. El gráfico permite observar los nombres de todos los "clusters" de términos. En los picos se puede visualizar las concentraciones de documentos relacionados a los conceptos más relevantes. De existir muchos documentos que forman parte del "cluster", se crea una zona blanca. En el mapa se presentan los nombres de los clusters que el algoritmo conformó a partir de las relaciones de las palabras claves presentes en los documentos.

Figura 11. Revistas con mayor cantidad de publicaciones científicas.



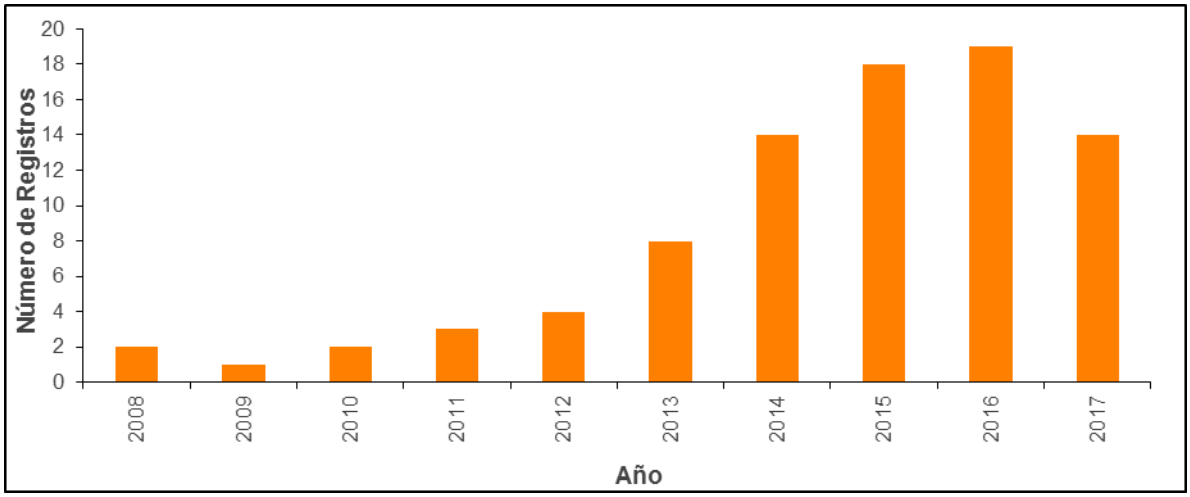
Fuente: elaboración propia a partir de Thomson Innovation – VINTEC.

4.2 TRATAMIENTOS Y DISPOSICIÓN

4.2.1 Cantidad de registros por año

En la figura 12 se observa como la tendencia en materia de investigaciones relacionadas con el tema objeto de estudio, presenta una tendencia en crecimiento positiva, siendo el año con mayor cantidad de registros el 2016 (19 documentos).

Figura 12. Evolución de publicaciones científicas por año.

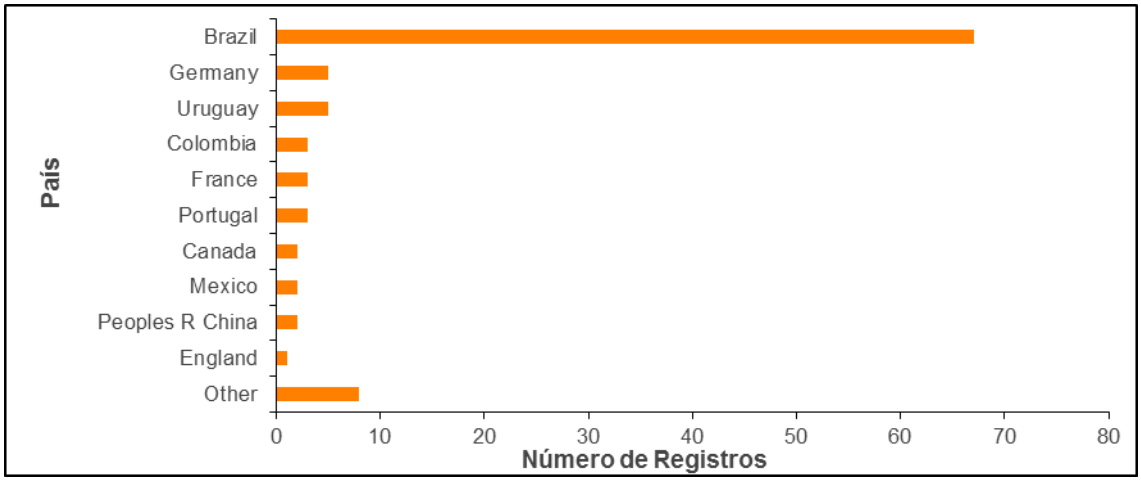


Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.2.2 Países líderes en la producción científica

Los 5 (cinco) países líderes con mayor cantidad de publicaciones científicas se destacan Brasil (67 documentos), Alemania (5 documentos), Uruguay (5 documentos), Colombia (3 documentos) y Francia (3 documentos).

Figura 13. Países líderes en publicaciones científicas.



Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.2.3 Perfil tecnológico por país

Se puede observar con mayor detalle en la tabla que se presenta a continuación, la cantidad de publicaciones científicas por organizaciones en cada país y las disciplinas que representan respectivamente.

Tabla 4: Perfil tecnológico por país.

Número de Registros	País	Top Organizaciones	Top Disciplinas
67	Brasil	Univ. Sao Paulo [28]; Univ. Fed Sao Carlos [11]; Univ. Estadual Paulista [5]	Energy & Fuels [28]; Biotechnology & Applied Microbiology [15]; Environmental Sciences [13]
5	Alemania	UFZ Helmholtz Ctr Environm Res [4]; Univ. Rostock [3]; Deutsch Biomasseforschungszentrum Gemeinnutzige [2]	Energy & Fuels [2]; Biotechnology & Applied Microbiology [1]; Agricultural Engineering [1]
5	Uruguay	Univ. Sao Paulo [4]; Inst. Invest. Biol Clemente Estable [3]; Univ. República [2];	Energy & Fuels [3]; Chemistry, Physical [2]; Electrochemistry [2]

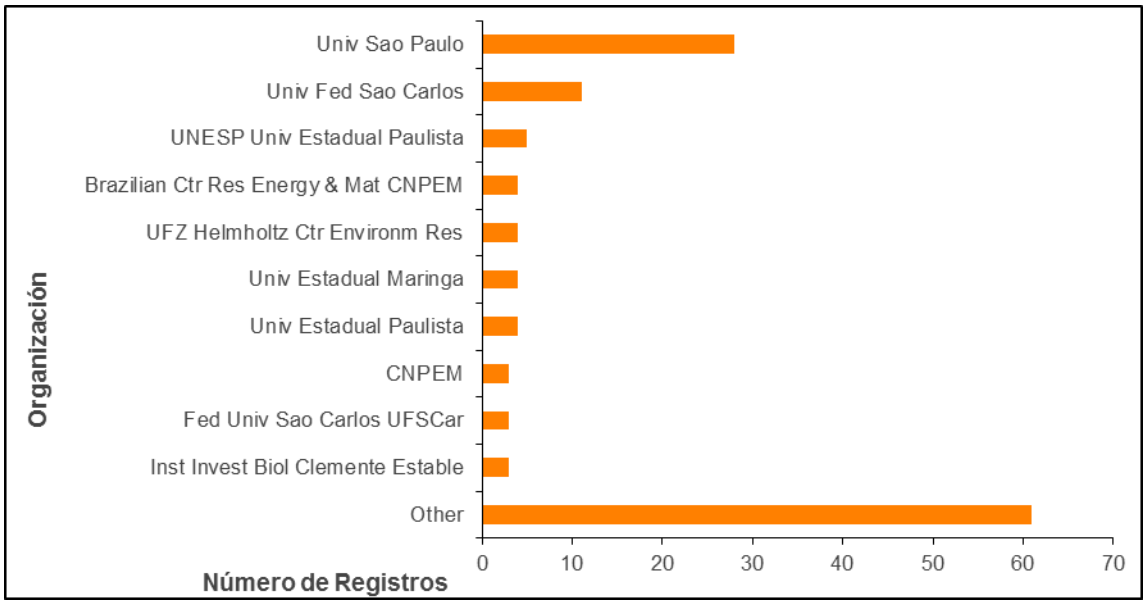
		CTBE Brazilian Bioethanol Sci & Technol Lab CNPEM [2]	
3	Colombia	Univ. Bonn [1]; Ctr Invest Cana Azucar Colombia [1]; Ingn Providencia SA [1]	Biotechnology & Applied Microbiology [1]; Microbiology [1]; Food Science & Technology [1]
3	Francia	Imperial Coll Sci Technol & Med [1]; Ctr Eau Terre Environm [1]; Univ. Fed Parana [1]	Biotechnology & Applied Microbiology [2]; Energy & Fuels [2]; Agricultural Engineering [2]
3	Portugal	Fac Tecnol Jaboticabal [2]; Univ. Porto [2]; Univ. Estadual Paulista [2]	Environmental Sciences [3]; Engineering, Environmental [1]; GREEN & SUSTAINABLE SCIENCE & TECHNOLOGY [1]
2	Canadá	Univ. Fed Parana [1]; Univ. Clermont Ferrand [1]; Univ. Fed Mato Grosso [1]	Environmental Sciences [1]; Biotechnology & Applied Microbiology [1]; Energy & Fuels [1]
2	México	COLPOS [1]; Inst. Natl Agron Paris Grignon [1]; Inst. Natl Polytecn [1]	Environmental Sciences [1]; Ecology [1]; Water Resources [1]
2	China	Guangxi Acad Agr Sci [2]; Guangxi Univ [2]; Chinese Acad Agr Sci [1]	Biotechnology & Applied Microbiology [1]; Energy & Fuels [1]; Agricultural Engineering [1]
1	Inlgaterra	COLPOS [1]; Inst Natl Agron Paris Grignon [1]; Inst Natl Polytecn [1]	Ecology [1]; Biotechnology & Applied Microbiology [0]; Energy & Fuels [0]

Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.2.4 Organizaciones líderes en la producción científica

Las instituciones que se han identificado con mayor cantidad de documentos científicos son la Universidad de Sao Paulo (28 documentos), Universidad Federal Sao Carlos (11 documentos),la Universidad Estadual Paulista (5 documentos), el Centro Nacional de investigación en Energía y materiales CNPEM (4 documentos) y el Centro Helmholtz de investigación ambiental (4 documentos).

Figura 14. Instituciones principales con mayor cantidad de documentos de publicaciones.



Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.2.5 Perfil tecnológico por organización

Tabla 5: Perfil tecnológico por organización.

Número de Registros	Organizaciones	Top Paises	Top Investigadores	Top Disciplinas
28	Univ. Sao Paulo	Brasil [28]; Uruguay [4]; Irlanda [1]	Zaiat, M [12]; Fuess, L T [8]; Ferraz, A D N [6]; Garcia, M L [6]	Energy & Fuels [16]; Chemistry, Physical [7]; Electrochemistry [7]
11	Univ. Fed Sao Carlos	Brasil [11]; Uruguay [1]; Irlanda [0]	Silva, E L [6]; Varesche, M B A [5]; Sakamoto, I K [3]	Energy & Fuels [5]; Chemistry, Physical [4]; Electrochemistry [4]; Biotechnology & Applied Microbiology [4]
5	.Univ. Estadual Paulista	Brasil [5]; Uruguay [0]; Irlanda [0]	Fuess, L T [5]; Garcia, M L [5]; Zaiat, M [2]	Engineering, Chemical [2]; Environmental Sciences [2]; Energy & Fuels [1]

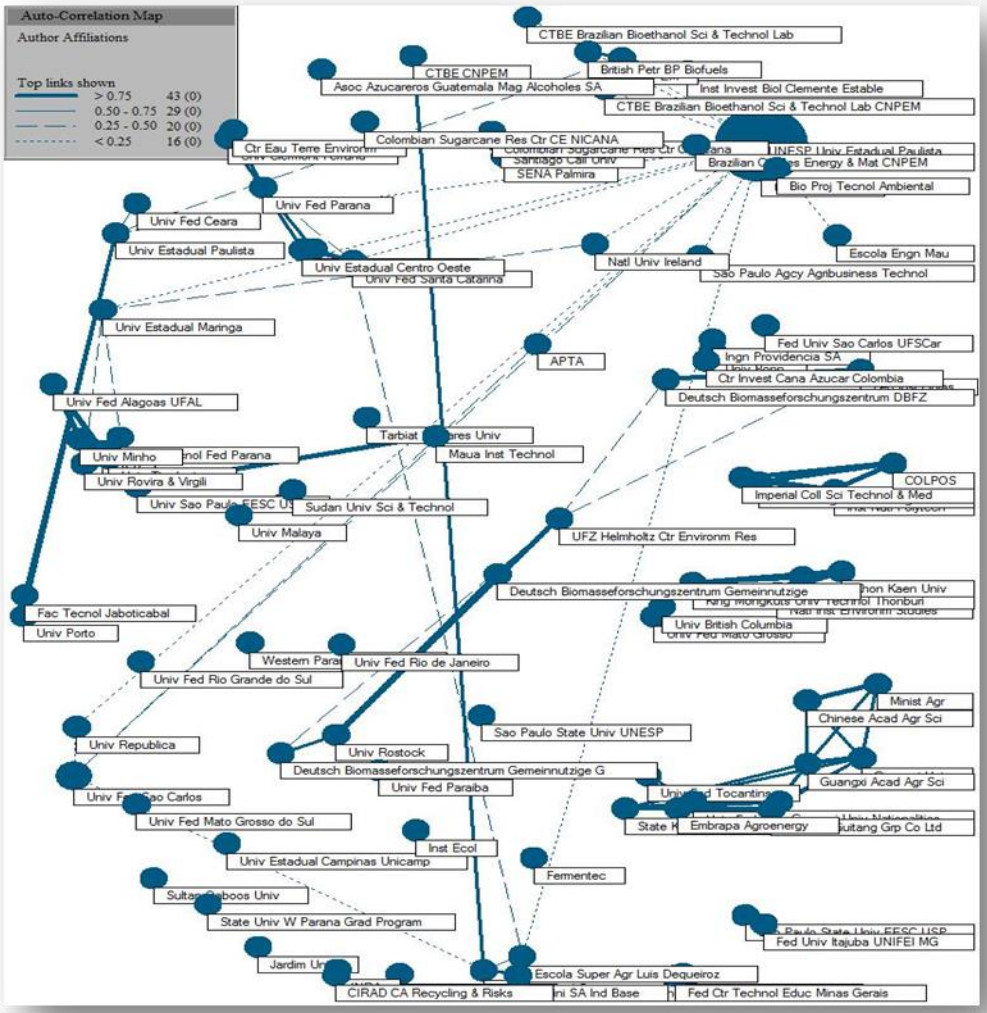
4	Brazilian Ctr Res Energy & Mat CNPEM	Brasil [4]; Uruguay [0]; Irlanda [0]	Zaiat, M [4]; Fuess, L T [2]; Bonomi, A [2]; Kiyuna, L S M [2]; Moraes, B S [2]	Energy & Fuels [4]; Engineering, Chemical [1]; Chemistry, Physical [1]
4	UFZ Helmholtz Ctr Environm Res	Alemania [4]; Brasil [1]; Uruguay [0]	Janke, L [4]; Nikolausz, M [4]; Stinner, W [4]	Energy & Fuels [2]; Engineering, Chemical [1]; Biotechnology & Applied Microbiology [1]
4	Univ. Estadual Maringa	Brasil [4]; Irlanda [1]; España [1]	Fernandes-Machado, N R C [2]; Gimenes, M L [2]; Foresti, E [1]	Chemistry, Multidisciplinary [1]; Biology [1]; Multidisciplinary Sciences [1]
4	Univ. Estadual Paulista	Brasil [4]; Portugal [2]; Irlanda [0]	Rodrigues, C S D [2]; Madeira, L M [2]; Boaventura, R A R [2]; de Oliveira, R A [2]; Duda, R M [2]	Environmental Sciences [3]; Energy & Fuels [1]; Engineering, Chemical [1]
3	CNPEM	Brasil [3]; Uruguay [1]; Portugal [0]	Ferraz, A D N [2]; Zaiat, M [2]; Fuess, L T [1]	Energy & Fuels [2]; Engineering, Chemical [1]; Biotechnology & Applied Microbiology [1]
3	Fed Univ. Sao Carlos UFSCar	Brasil [3]; Uruguay [0]; Portugal [0]	Bastos, R G [2]; Costa, C B B [1]; Cruz, A J G [1]	Energy & Fuels [1]; Engineering, Chemical [1]; GREEN & SUSTAINABLE SCIENCE & TECHNOLOGY [1]
3	Inst. Invest. Biol Clemente Estable	Brasil [3]; Uruguay [3]; Portugal [0]	Etchebehere, C [3]; Ferraz, A D N [3]; Zaiat, M [3]	Energy & Fuels [2]; Biotechnology & Applied Microbiology [1]; Agricultural Engineering [1]

Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.2.6 Redes de colaboraciones entre instituciones

Entre las instituciones líderes, la que presenta mayor nivel de colaboración conjunta con otras es la Universidad Estadual Paulista. El resto de las instituciones presentan menos nivel de articulación con otras instituciones.

Figura 15. Redes de colaboración entre instituciones.

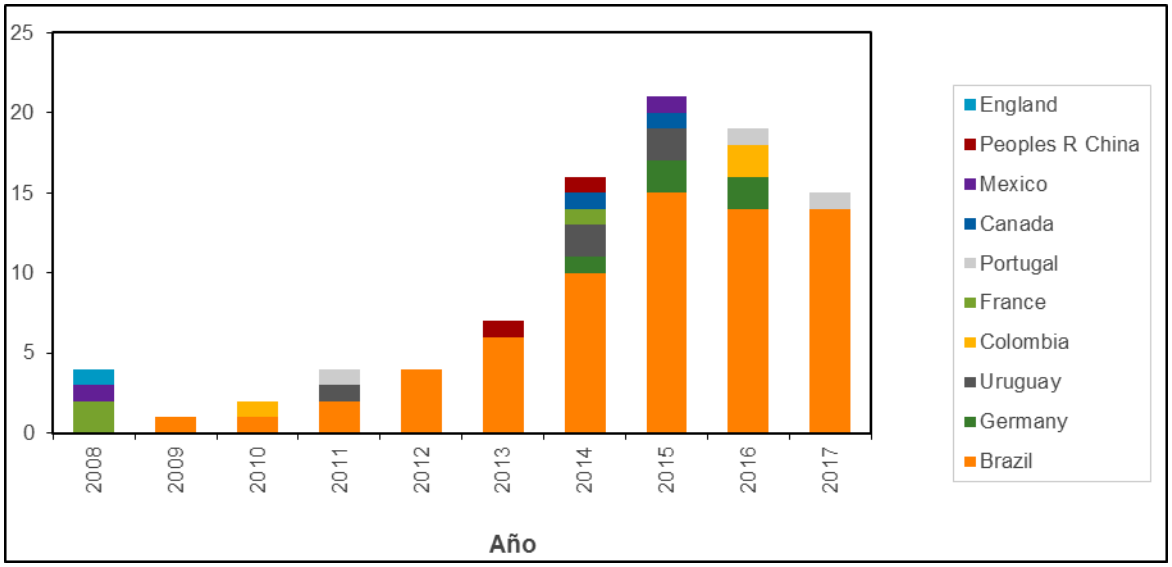


Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.2.7 Evolución anual de publicaciones científicas en los últimos años por país

En la figura siguiente se puede apreciar como en los últimos cinco años, el país que aparece con mayor cantidad de investigaciones es Brasil con una tendencia en crecimiento año tras año, destacándose los años 2014 y 2015 donde aparecen otros países que presentan registros de investigaciones como Francia, Uruguay y Canadá.

Figura 16. Cantidad de publicaciones científicas por países y por año.

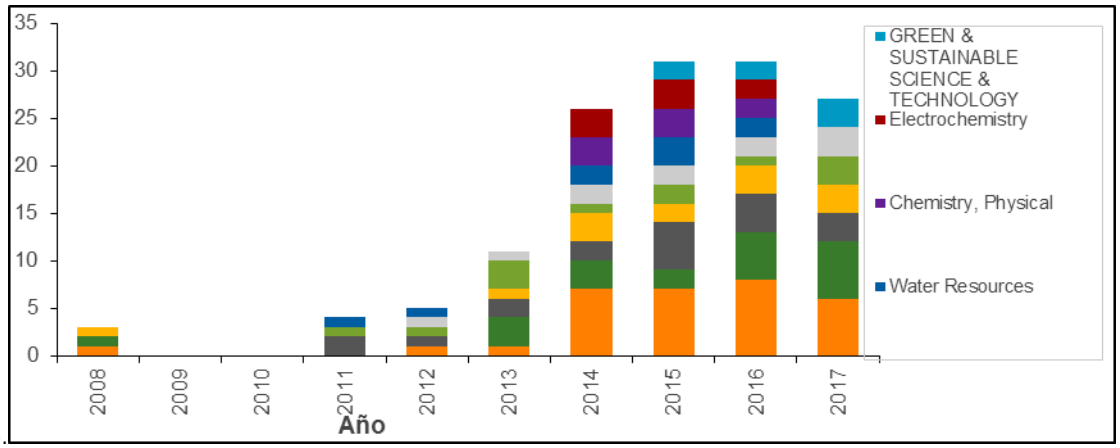


Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.2.8 Evolución anual de publicaciones científicas en los últimos años por disciplina

En la figura siguiente se puede ver como en los últimos 3 (tres) años, las disciplinas que poseen mayor nivel de investigaciones científicas son ingeniería agrícola, biotecnología y microbiología aplicada, ciencias ambientales, energía y combustibles, ingeniería ambiental e ingeniería y química.

Figura 17. Cantidad de investigaciones por disciplina y por año.



Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.2.9 Mapa Temático por áreas de Investigación

El siguiente mapa topográfico presenta los conceptos que aparecen con mayor frecuencia dentro del corpus de información obtenido. Los relieves y la intensidad de los verdes indican proporcionalmente los niveles de aparición. "Fluidized Mmol", "Evaporation Soil" y "Filter Cake" son los conceptos que se presentan con mayor frecuencia.

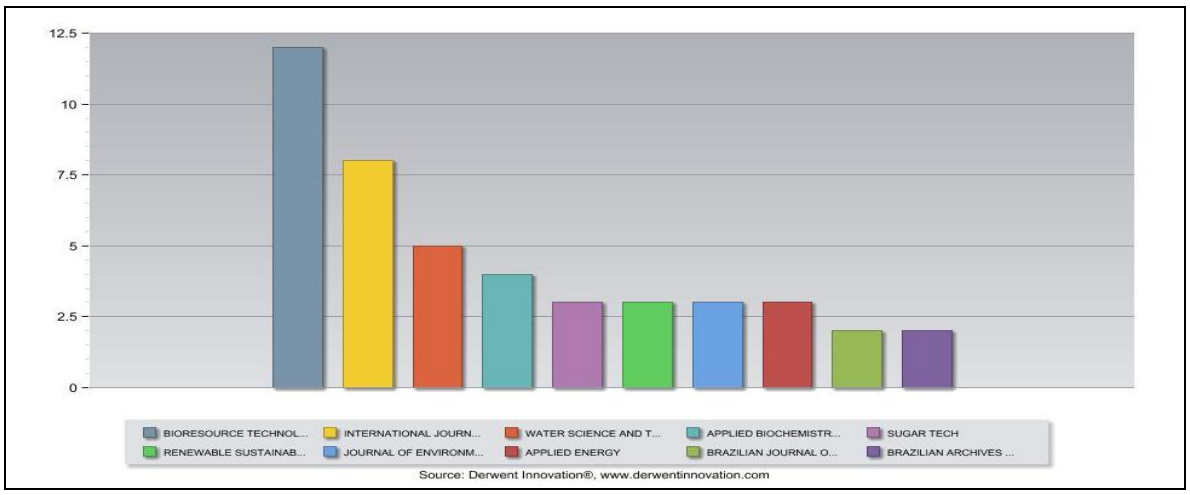
Figura 18. Mapa temáticos de las principales áreas de investigación.

Fuente: elaboración propia a partir de Thomson Innovation – VINTEC:

4.2.10 Revistas con mayor número de publicaciones para la temática tratamiento y disposición

En la figura siguiente se pueden observar las revistas que han aparecido con mayor cantidad de documentos de investigación: Bioresource Technology (12 registros), International Journal of Hydrogen Energy (8 registros), Water Science and Technology (5 registros), Applied biochemistry and Biotechnology (4 registros) y Sugar Tech (3 registros).

Figura 19. Revistas con mayor cantidad de publicaciones científicas.



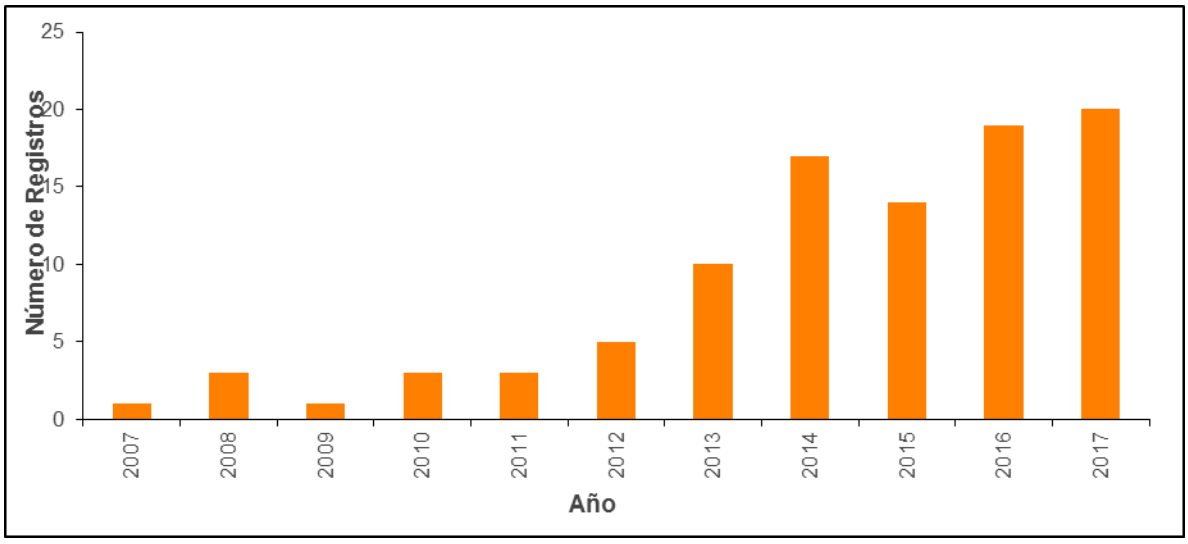
Fuente: elaboración propia con Thomson Innovation – VINTEC.

4.3 APLICACIONES

4.3.1 Cantidad de registros por año

En la figura siguiente se observa como la tendencia en materia de investigaciones relacionadas con el tema objeto de estudio, presenta un crecimiento a lo largo de los años. A la fecha, el año con mayor cantidad de registros es el 2017 (20 documentos).

Figura 20. Evolución de publicaciones científicas por año.

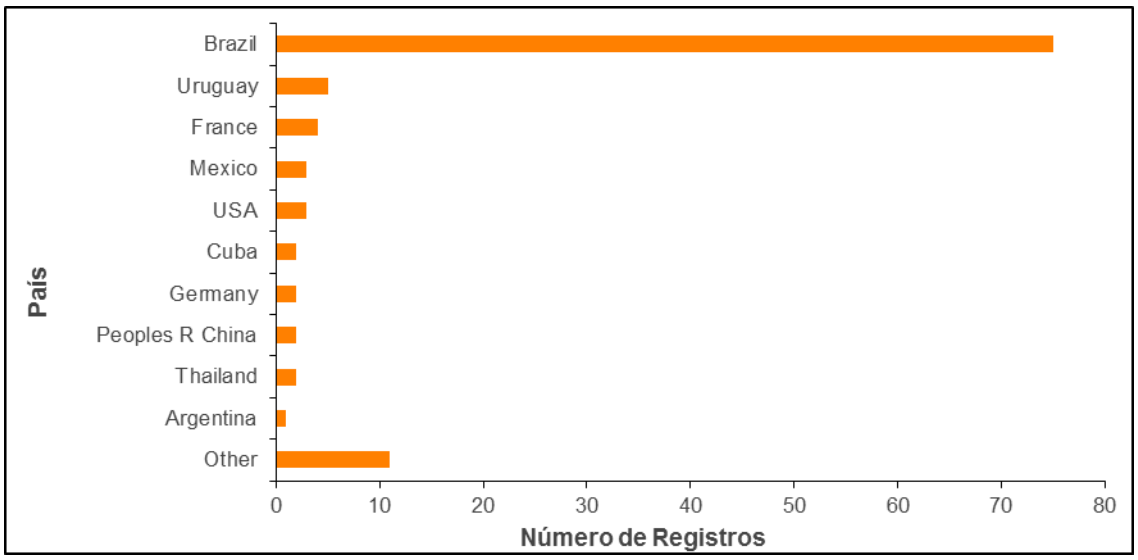


Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.3.2 Países líderes en la producción científica

Entre los 5 (cinco) países líderes en materia de publicaciones científicas se destacan Brasil (75 documentos), Uruguay (5 documentos), Francia (4 documentos), México (3 documentos) y EEUU (3 documentos).

Figura 21. Países líderes en publicaciones científicas.



Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.3.3 Perfil tecnológico por país

Se puede observar con mayor detalle en la tabla que se presenta a continuación, la cantidad de publicaciones científicas por organizaciones en cada país y las disciplinas que representan.

Tabla 6: Perfil tecnológico por país.

Número de Registros	País	Top Organizaciones	Top Disciplinas
75	Brasil	Univ. Sao Paulo [30]; Univ. Fed Sao Carlos [10]; Univ. Estadual Campinas [5]; Univ. Estadual Maringa [5]; Univ. Estadual Paulista [5]	Energy & Fuels [25]; Biotechnology & Applied Microbiology [17]; Environmental Sciences [15]
5	Uruguay	Univ. Sao Paulo [4]; Inst. Invest. Biol Clemente Estable [3]; Univ. Republica [2]; CTBE Brazilian Bioethanol Sci & Technol Lab CNPEM [2]	Energy & Fuels [3]; Chemistry, Physical [2]; Electrochemistry [2]

4	Francia	INRA [2]; Univ. Utrecht [1]; Univ. Estadual Campinas [1]	Energy & Fuels [2]; Biotechnology & Applied Microbiology [2]; Agricultural Engineering [2]
3	México	Inst Ecol [2]; Univ. Veracruzana [1]; Univ. Estadual Campinas [0]	Environmental Sciences [2]; Water Resources [2]; Engineering, Environmental [1]
3	USA	Univ. Maryland [1]; Univ. Sao Paulo [1]; Univ. Florida [1]	Environmental Sciences [1]; Engineering, Environmental [1]; Biotechnology & Applied Microbiology [1]
2	Cuba	ICIDCA Cuban Res Inst Sugarcane Coprod [2]; Univ Fed Itajuba [2]; Univ Maryland [0]	Food Science & Technology [2]; Environmental Sciences [0]; Engineering, Environmental [0]
2	Alemania	UFZ Helmholtz Ctr Environm Res [2]; Deutsch Biomasseforschungszentrum Gemeinnutzige [2]; Univ Rostock [2]	Biotechnology & Applied Microbiology [1]; Chemistry, Multidisciplinary [1]; Energy & Fuels [1]
2	China	Guangxi Acad Agr Sci [1]; Guangxi Guitang Grp Co Ltd [1]; Guangxi Univ [1]	Biotechnology & Applied Microbiology [2]; Energy & Fuels [2]; Agricultural Engineering [2]
2	Tailandia	Khon Kaen Univ [1]; Kasetsart Univ [1]; MITR PHOL Grp [1]	Environmental Sciences [1]; Engineering, Environmental [1]; Agronomy [1]
1	Argentina	CONICET [1]; Univ. Nacl San Luis [1]; Univ. Nacl Tucuman [1]	Environmental Sciences [1]; Engineering, Environmental [0]; Agronomy [0]

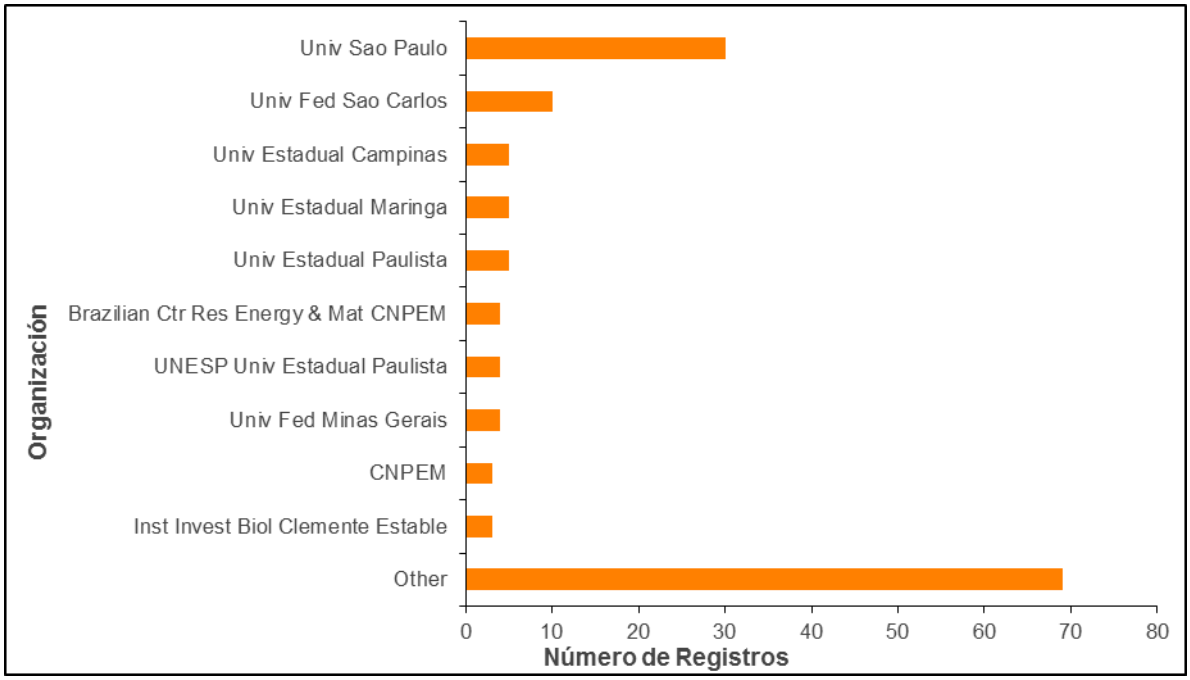
Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.3.4 Organizaciones líderes en la producción científica

Las instituciones que se han identificado con mayor cantidad de documentos científicos son la Universidad de Sao Paulo (30 documentos), Universidad Federal Sao Carlos (10 documentos), la

Universidad Estadual de Campinas (5 documentos), la Universidad Estadual Maringa (5 documentos) y la Universidad Estadual Paulista (5 documentos).

Figura 22. Instituciones principales con mayor cantidad de documentos de publicaciones.



Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.3.5 Perfil tecnológico por organización

Tabla 7: Perfil tecnológico por organización.

Número de Registros	Organizaciones	Top Paises	Top Investigadores	Top Disciplinas
30	Univ. Sao Paulo	Brasil [30]; Uruguay [4]; USA [1]	Zaiat, M [12]; Fuess, L T [7]; Ferraz, A D N [6]	Energy & Fuels [15]; Environmental Sciences [7]; Chemistry, Physical [6]; Electrochemistry [6]
10	Univ. Fed Sao Carlos	Brasil [10]; Uruguay [1]; USA [0]	Silva, E L [5]; Varesche, M B A [4]; Rosa, P R F [2]; Santos, S C [2]; Lazaro, C Z [2]; Sakamoto, I K [2]; Bastos, R G [2]; de Mattos, L F A [2]	Energy & Fuels [4]; Biotechnology & Applied Microbiology [4]; Chemistry, Physical [3]; Electrochemistry [3]

5	Univ. Estadual Campinas	Brasil [5]; Francia [1]; Netherlands [1]	Junqueira, T L [1]; Pires, R C M [1]; Correa, S T R [1]	Engineering, Environmental [2]; Engineering, Chemical [2]; Agricultural Engineering [2]
5	Univ. Estadual Maringa	Brasil [5]; Irlanda [1]; Francia [0]	Fernandes-Machado, N R C [3]; Gimenes, M L [3]; Santana, V S [2]; de Souza, R P [2]	Multidisciplinary Sciences [2]; Agricultural Engineering [1]; Chemistry, Multidisciplinary [1]
5	Univ. Estadual Paulista	Brasil [5]; Portugal [1]; Irlanda [0]	Soares, F H [2]; Bisinoti, M C [2]; Ferreira, O P [2]; Melo, C A [2]; Moreira, A B [2]	Energy & Fuels [3]; Engineering, Chemical [2]; Environmental Sciences [2]
4	Brazilian Ctr Res Energy & Mat CNPEM	Brasil [4]; Portugal [0]; Irlanda [0]	Zaiat, M [4]; Bonomi, A [2]; Moraes, B S [2]; Fuess, L T [2]; Kiyuna, L S M [2]	Energy & Fuels [4]; Engineering, Chemical [1]; Agricultural Engineering [1]
4	Univ. Estadual Paulista	Brasil [4]; Portugal [0]; Irlanda [0]	Garcia, M L [4]; Fuess, L T [4]; Zaiat, M [2]	Environmental Sciences [2]; Energy & Fuels [1]; Engineering, Chemical [1]
4	Univ. Fed Minas Gerais	Brasil [4]; Portugal [0]; Irlanda [0]	Amaral, M C S [3]; Santos, F S [2]; Mota, V T [2]	Biotechnology & Applied Microbiology [2]; Environmental Sciences [1]; Energy & Fuels [1]
3	CNPEM	Brasil [3]; Uruguay [1]; Portugal [0]	Ferraz, A D N [2]; Zaiat, M [2]; Rossell, C E V [1]	Energy & Fuels [2]; Biotechnology & Applied Microbiology [1]; Agricultural Engineering [1]
3	Inst. Invest. Biol Clemente Estable	Brasil [3]; Uruguay [3]; Portugal [0]	Ferraz, A D N [3]; Zaiat, M [3]; Etchebehere, C [3]	Energy & Fuels [2]; Biotechnology & Applied Microbiology [1]; Agricultural Engineering [1]

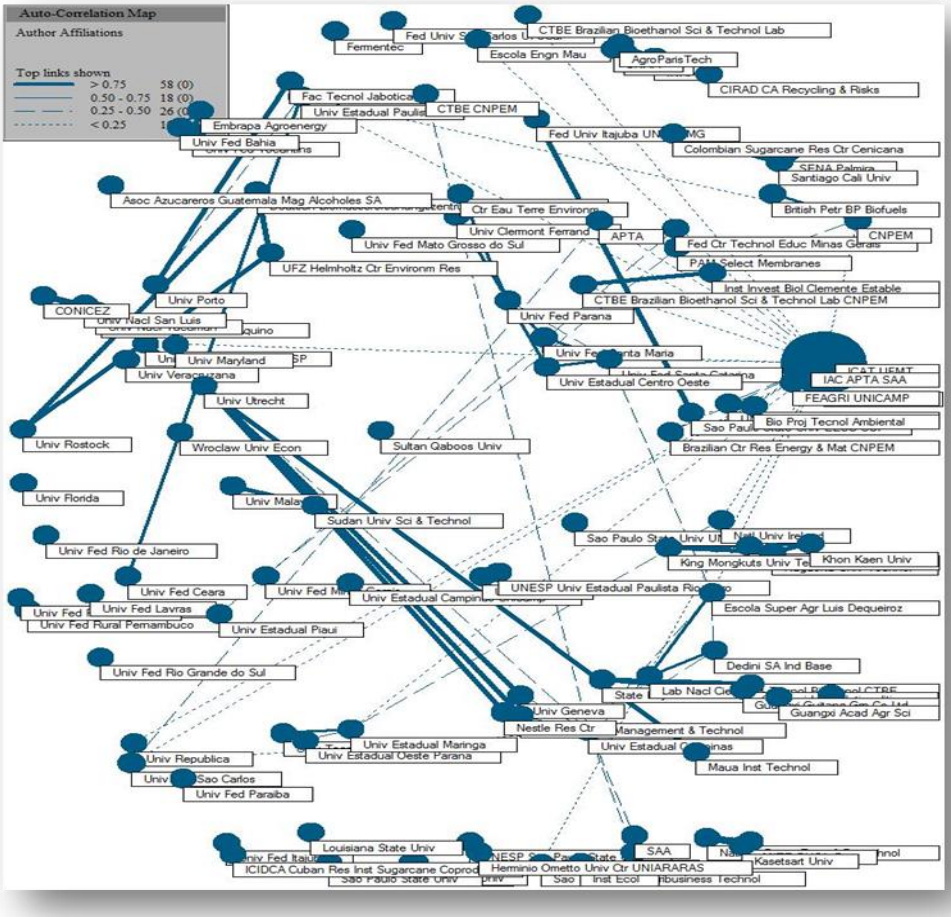
Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.3.6 Redes de colaboraciones entre instituciones

Entre las instituciones líderes, las que presentan mayor nivel de colaboración conjunta con otras instituciones es la Universidad Federal de Mato Grosso (UFMT). El resto de las instituciones

también muestran algunos lazos de articulación con otras instituciones, pero con menor grado que la UFMT.

Figura 23. Redes de colaboración entre instituciones.

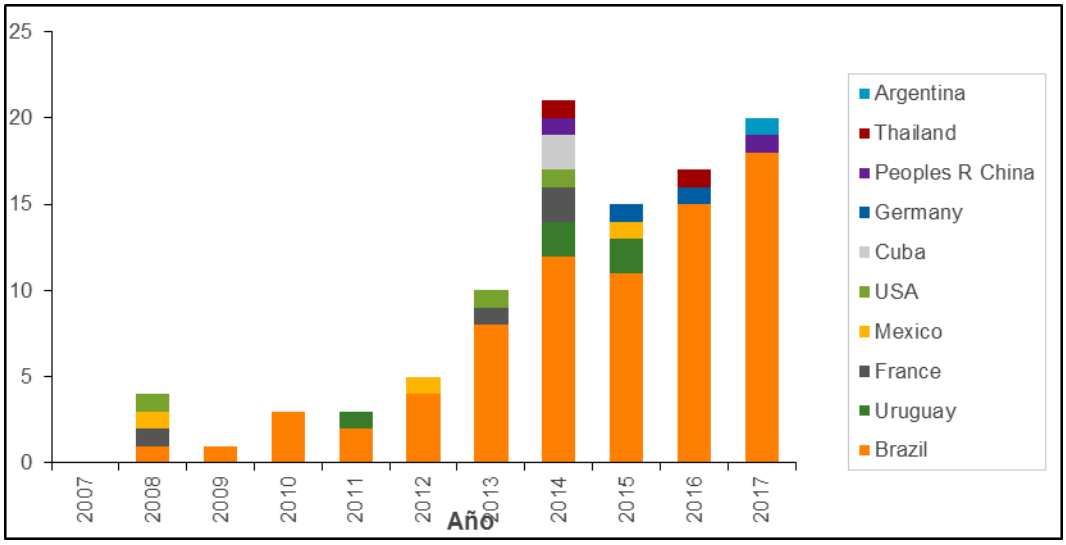


Fuente: elaboración propia con Thomson Data Analyzer - VINTEC.

4.3.7 Evolución anual de publicaciones científicas en los últimos años por país

En la figura 24 se puede apreciar como en los últimos 5 (cinco) años, el país que aparece con mayor cantidad de investigaciones es Brasil, destacándose el año 2014 donde aparecen otros países que presentan registros de investigaciones como Uruguay, Estados Unidos, Cuba, china y Tailandia.

Figura 24. Cantidad de publicaciones científicas por países y por año.

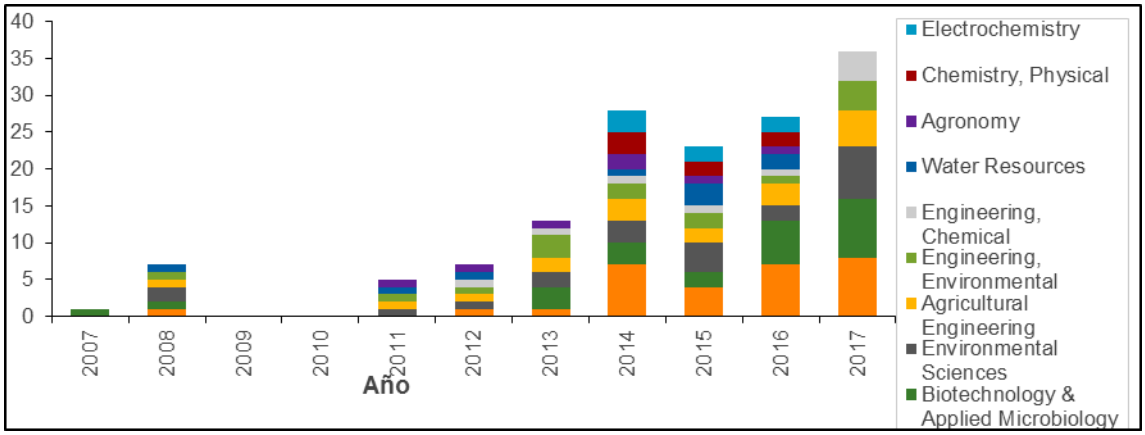


Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.3.8 Evolución anual de publicaciones científicas en los últimos años por disciplina

En la figura siguiente se puede ver como en los últimos 3 (tres) años, las diciplinas que poseen mayor nivel de investigaciones científicas son energía y combustibles, biotecnología y microbiología aplicada, ciencias ambientales e ingeniería agrícola.

Figura 25. Cantidad de investigaciones por disciplina y por año.



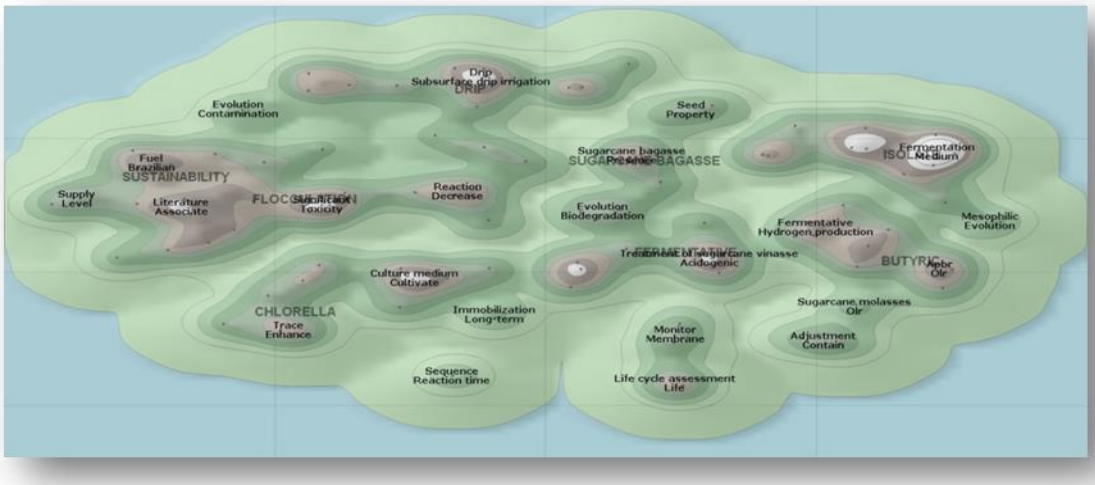
Fuente: elaboración propia con Thomson Data Analyzer – VINTEC.

4.3.9 Mapa Temático por áreas de Investigación

El siguiente mapa topográfico presenta los conceptos que aparecen con mayor frecuencia dentro del corpus de información obtenido. Los relieves y la intensidad de los verdes indican proporcionalmente los niveles de aparición. “Drip”, “Subsurface drip irrigation”, “Fermentation”,

"Culture médium Cultivate", "Literature associate" y "Significaot toxicity" son los conceptos que se presentan con mayor frecuencia.

Figura 26. Mapa temáticos de las principales áreas de investigación.

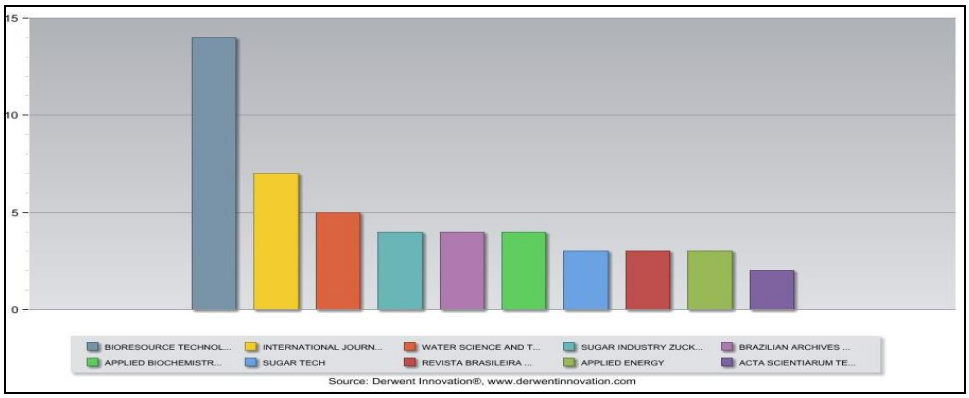


Fuente: elaboración propia a partir de Thomson Innovation – VINTEC.

4.3.10 Revistas con mayor número de publicaciones para la temática aplicaciones

En la figura siguiente se pueden observar las revistas que han aparecido con mayor cantidad de documentos de investigación: Bioresource Technology (14 registros), International Journal of Hydrogen Energy (7 registros), Water Science and Technology (5 registros), Sugar Industry - Zuckerindustrie (4 registros) y Brasilian Archives or Biology and Technology (4 registros).

Figura 27. Revistas con mayor cantidad de publicaciones científicas.



Fuente: elaboración propia con Thomson Innovation – VINTEC.

5. BÚSQUEDA Y ANÁLISIS DE INFORMACIÓN TECNOLÓGICA EN VINAZA

A partir de los documentos de patentes encontrados en función a las distintas sentencias de búsquedas formuladas, y teniendo en cuenta los documentos que los expertos han considerado pertinentes para cada eje del trabajo, se llevó a cabo el proceso de vigilancia e inteligencia en cada uno de los corpus obtenidos, generando los siguientes indicadores sobre el nivel de avance y desarrollo en el campo tecnológico sobre la gestión sustentable de la vinaza.

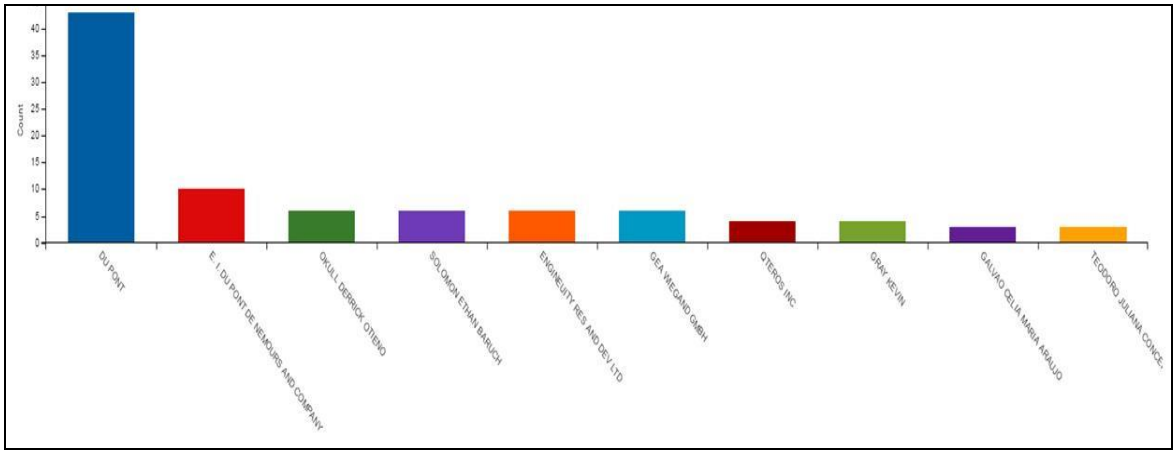
5.1 PROCESOS

5.1.1 Organizaciones líderes

En la figura 28 se puede observar las empresas que tienen mayor cantidad de registros de documentos de patentes: Du Pont con más de 40 (cuarenta) documentos (entre ambas subsidiaria de la misma compañía), Engineuity Res And Dev Ltd. (6 documentos) y Gea Wegand Gmbh (6 documentos).

Cabe resaltar que los solicitantes OKULL, D. y SOLOMON, E. que son los que también aparecen en la gráfica con 6 documentos de patentes, pertenecen a la compañía Du Pont.

Figura 28. Organizaciones con mayor cantidad de documentos de patentes – Procesos.

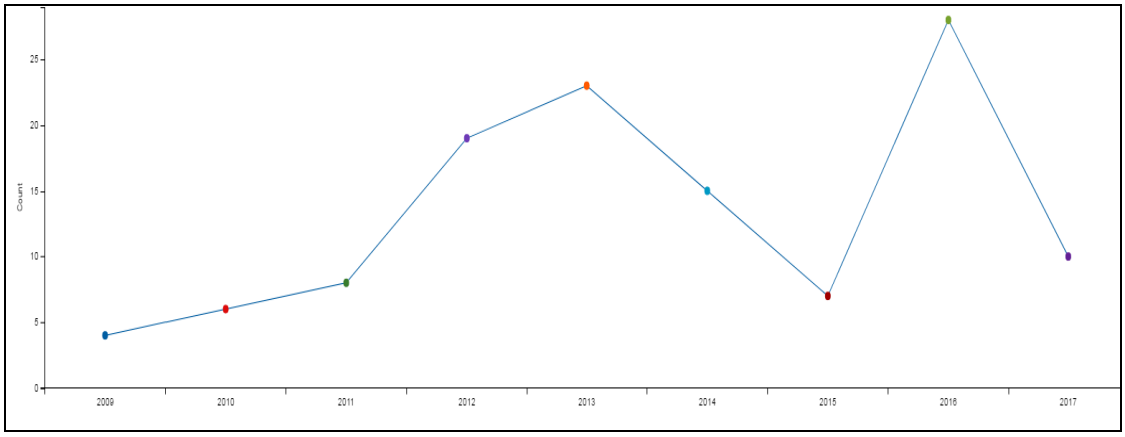


Fuente: elaboración propia con Thomson Innovation – VINTEC.

5.1.2 Crecimiento anual de patentabilidad

A lo que hace a la evolución de patentabilidad por años, se puede ver que dentro del tema del trabajo hubo un crecimiento constante entre el periodo comprendido entre el año 2009 y 2013, marcando un importante decrecimiento durante los dos años siguientes, llegando al nivel de siete documentos en el año 2015 (Figura 29). El año con mayor cantidad de documentos fue el 2016 (28 documentos).

Figura 29. Evolución de patentabilidad por año – Procesos.

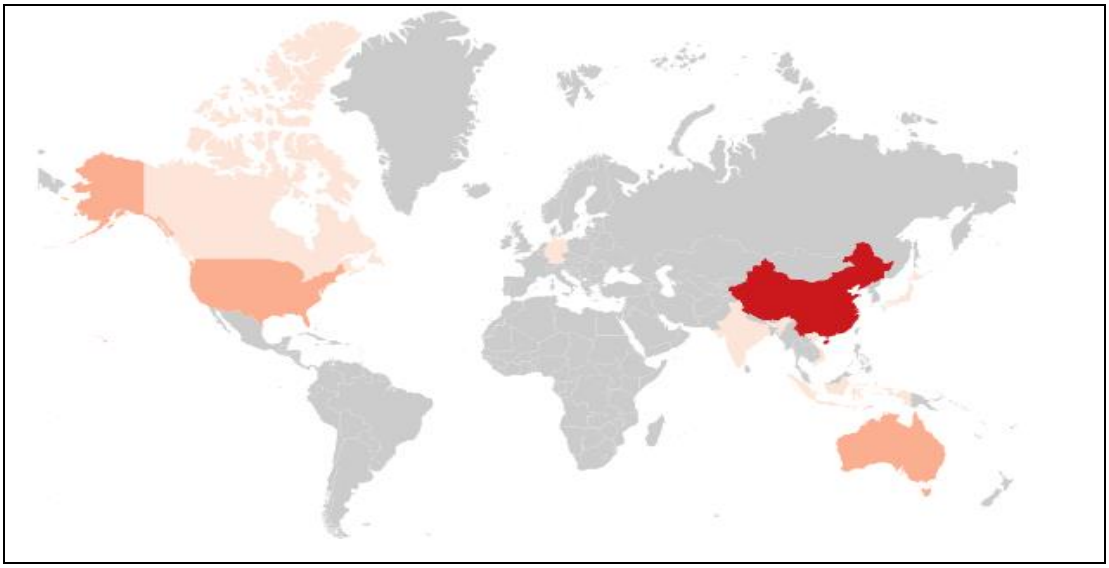


Fuente: elaboración propia con Thomson Innovation – VINTEC.

5.1.3 Países líderes

En la figura siguiente se pueden ver los países donde se han registrado mayor nivel de actividad sobre patentabilidad relacionada al tema foco del trabajo, donde los principales que aparecen son China (38 documentos), Australia (12 documentos) y Estados Unidos (11 documentos). Con menor cantidad aparecen India, Canadá, Indonesia, Japón, Vietnam y Germany, donde la suma total de este grupo representa un total de 23 (veintitrés) documentos (Figura 30).

Figura 30. Países principales – Procesos.

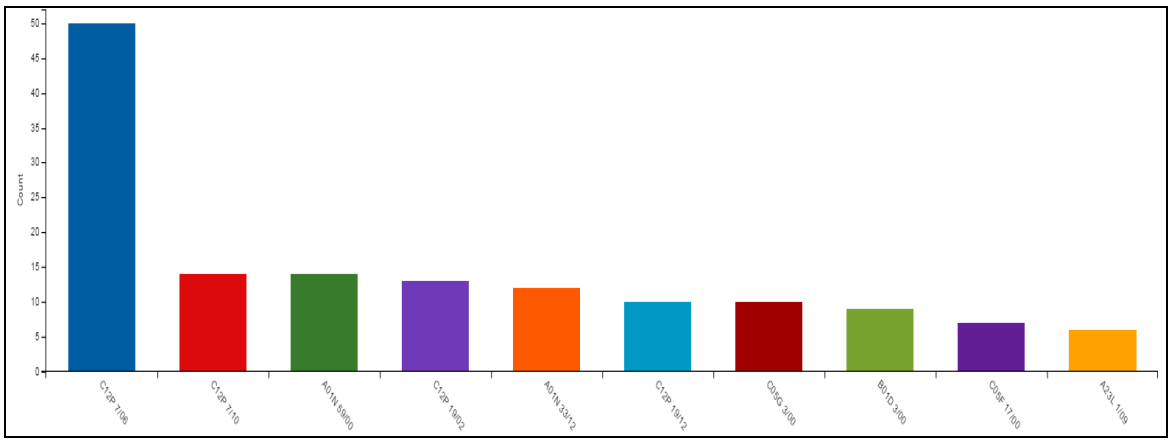


Fuente: elaboración propia con Thomson Innovation – VINTEC.

5.1.4 Áreas Tecnológicas principales

En la figura que se ve a continuación, se muestran las áreas tecnológicas[10] con las que se relacionan el mayor porcentaje de los documentos de patentes analizado. A partir de los documentos de patentes relacionados con el eje de "Procesos", las áreas tecnológicas con las que se relacionan la mayoría de estos tienen que ver con los siguientes IPC: C12P 7/06, C12P 7/10, A01N 59/00, C12P 19/02 y A01N 33/12.

Figura 31. Principales áreas tecnológicas – Procesos.



Fuente: elaboración propia con Thomson Innovation – VINTEC.

En la tabla 8 se describen las referencias de los cinco principales IPC que han sido identificados del análisis de los distintos documentos de patentes procesados:

Tabla 8. Principales áreas tecnológicas con mayor cantidad registros de patentes.

ÁREA TECNOLÓGICA - IPC	REFERENCIA
C12P 7/06	Preparación de compuestos orgánicos que contienen oxígeno. Etanol como producto químico y no como bebida alcohólica.
C12P 7/10	Preparación de compuestos orgánicos que contienen oxígeno. De un sustrato constituido por materias celulósicas.
A01N 59/00	BIOCIDAS QUE CONTIENEN ELEMENTOS O COMPUESTOS INORGÁNICOS.
C12P 19/02	Preparación de compuestos que contienen radicales sacárido. Monosacáridos.
A01N 33/12	Compuestos de amonio cuaternario.

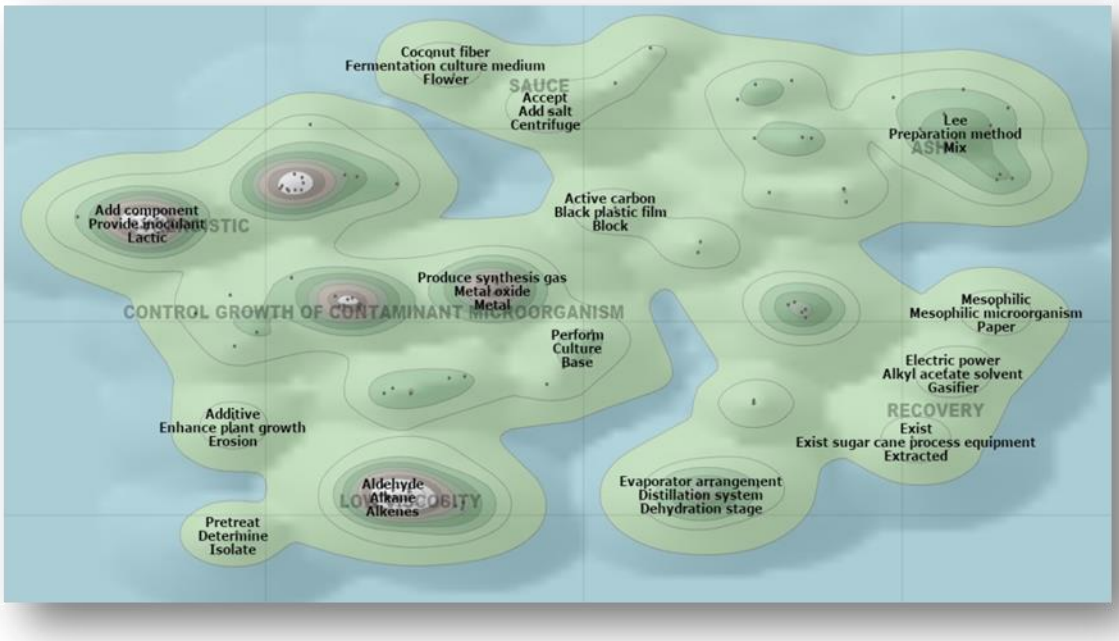
Fuente: VINTEC.

[10] En materia de patentes, los distintos sectores de la tecnología a los que pertenecen las patentes y los modelos de utilidad, se definen a través de los códigos denominados IPC (International Patents Clasification).

5.1.5 Mapa Temático

En la figura siguiente se pueden observar los conceptos mas relavantes que han aparecido entre los documentos de patentes analizados, generándose un conjunto de clusters temáticos.

Figura 32. Principales temas en documentos de patentes – Procesos.



Fuente: elaboración propia con Thomson Innovation – VINTEC.

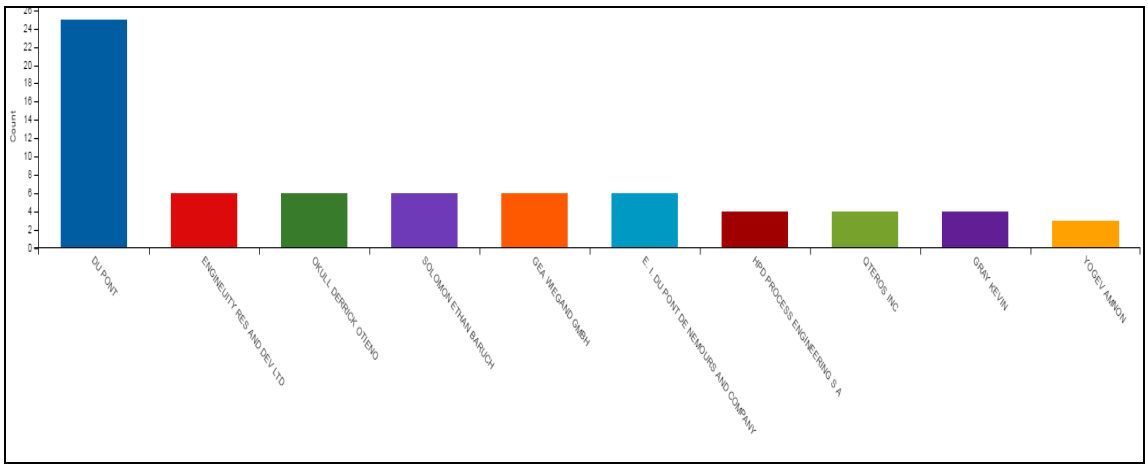
5.2 TRATAMIENTOS Y DISPOSICIÓN

5.2.1 Organizaciones líderes

En la figura siguiente se pueden ver las principales empresas que tienen mayor cantidad de registros de documentos de patentes. En la misma aparecen como líderes Du Pont (25 documentos) y Engineuity Res And Dev. Ltd (6 documentos).

Cabe resaltar que los solicitantes OKULL, D. y SOLOMON, E. que son los que aparecen en la gráfica con 6 (sesis) documentos de patentes, pertenecen a la compañía Du Pont.

Figura 33. Organizaciones con mayor cantidad de documentos de patentes – Tratamientos y disposición.

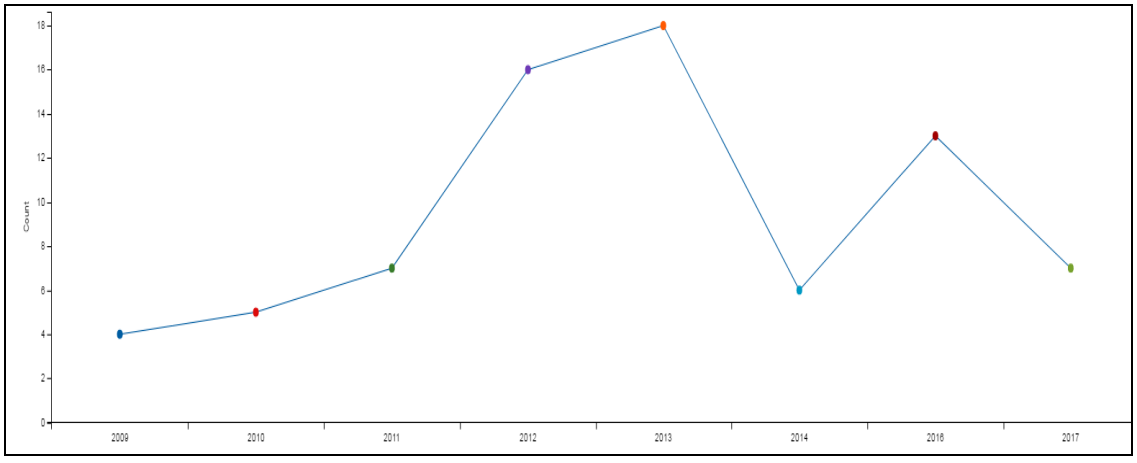


Fuente: elaboración propia con Thomson Innovation – VINTEC.

5.2.2 Crecimiento anual de patentabilidad

A lo que respecta a la evolución de patentabilidad por años, se observa que en el eje de trabajo, tratamientos y disposición de vinaza sucro-alcoholera, hay un crecimiento positivo desde el año 2009 hasta el 2013, encontrándose un pico en decrecimiento en el año 2014 con 6 (seis) documentos.

Figura 34. Evolución de patentabilidad por año – Tratamientos y disposición.

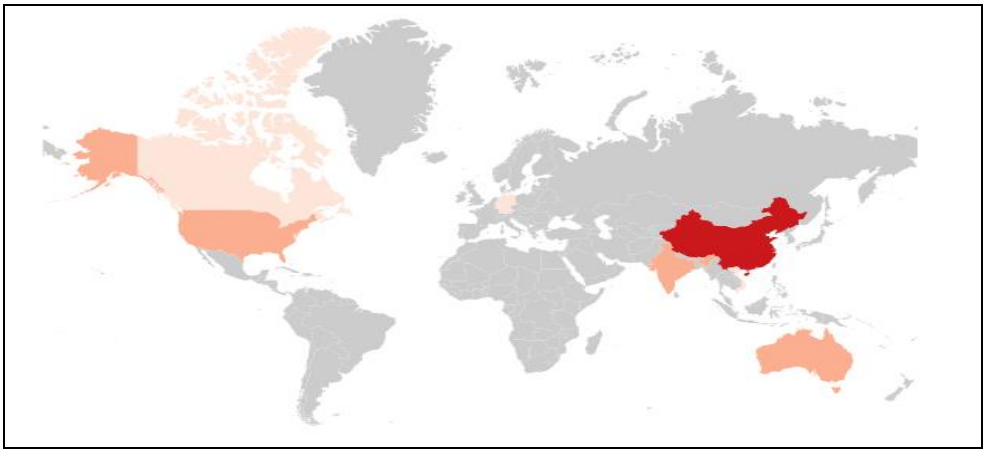


Fuente: elaboración propia con Thomson Innovation – VINTEC.

5.2.3 Países líderes

En la figura siguiente se pueden ver los países donde se han registrado mayor nivel de actividad sobre patentabilidad relacionada al tema foco del trabajo, donde los principales que aparecen son China (19 documentos), Australia (documentos), Estados Unidos (7 documentos), India (5 documentos), Canada (4 documentos), Vietnam (3 documentos) y Alemania (1 documento) (figura 35).

Figura 35. Países principales – Tratamientos y disposición.

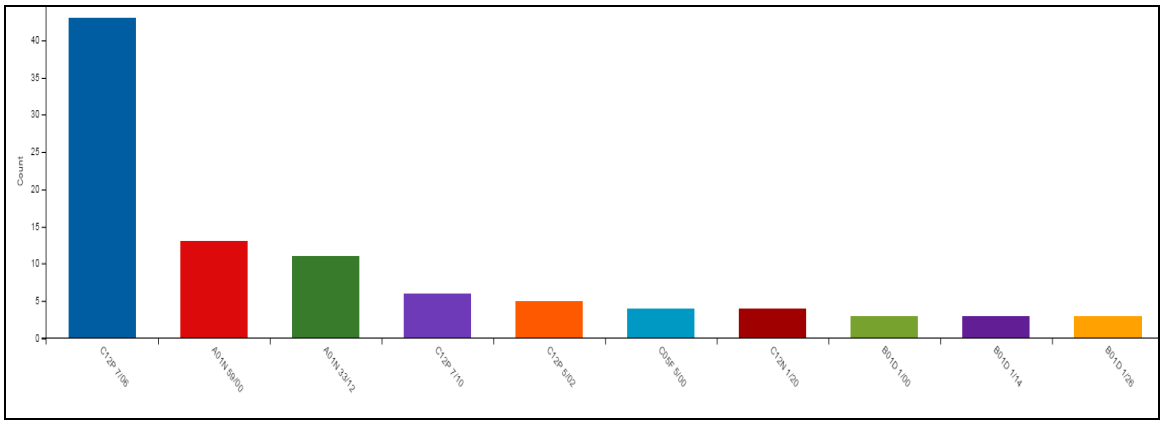


Fuente: elaboración propia con Thomson Innovation – VINTEC.

5.2.4 Áreas Tecnológicas principales

En la figura 36 se muestran las áreas tecnológicas con las que se relacionan el mayor porcentaje de los documentos de patentes analizado. A partir de los documentos de patentes relacionados con el eje de "Tratamientos y Disposición", las áreas tecnológicas con las que se relacionan la mayoría de estos tienen que ver con los siguientes IPC: C12P 7/06, A01N 59/00, A01N 33/12, C12P 7/10 y C12P 5/02.

Figura 36. Principales áreas tecnológicas – Tratamientos y disposición.



Fuente: elaboración propia con Thomson Innovation – VINTEC.

En la tabla 9 se describen las referencias de los cinco principales IPC que han sido identificados del análisis de los distintos documentos de patentes procesados:

Tabla 9. Principales áreas tecnológicas con mayor cantidad de patentes.

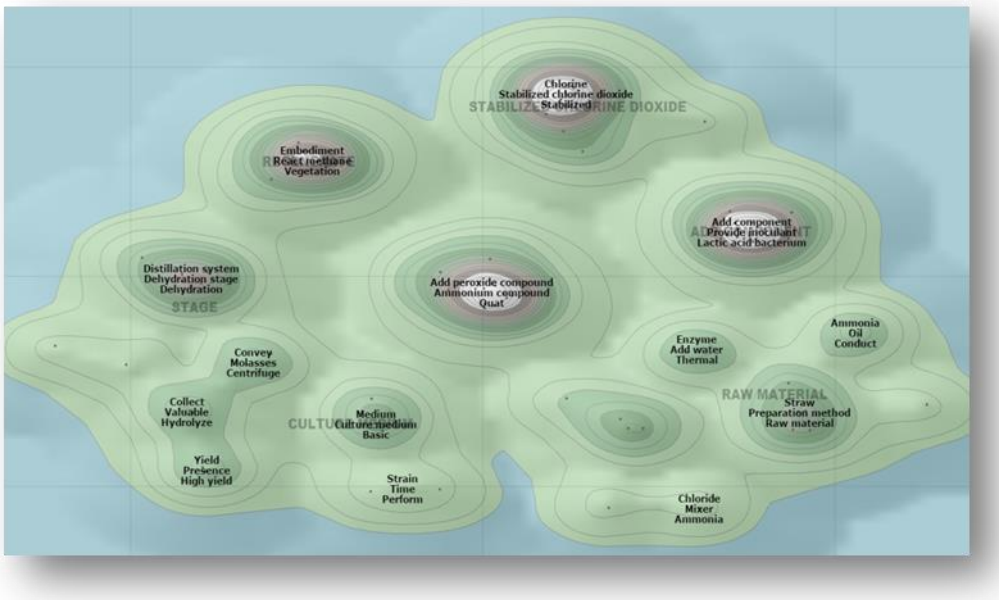
ÁREA TECNOLÓGICA - IPC	REFERENCIA
C12P 7/06	Preparación de compuestos orgánicos que contienen oxígeno. Etanol como producto químico y no como bebida alcohólica.
A01N 59/00	BIOCIDAS QUE CONTIENEN ELEMENTOS O COMPUESTOS INORGÁNICOS.
A01N 33/12	Compuestos de amonio cuaternario.
C12P 7/10	Preparación de compuestos orgánicos que contienen oxígeno. De un sustrato constituido por materias celulósicas.
C12P 5/02	Preparación de hidrocarburos. Acíclicos.

Fuente: VINTEC.

5.2.5 MapaTemático

En la figura siguiente se pueden observar los conceptos mas relavantes que han aparecido entre los documentos de patentes analizados, generándose un conjunto de clusters temáticos.

Figura 37. Principales temas en documentos de patentes – Tratamientos y disposición.



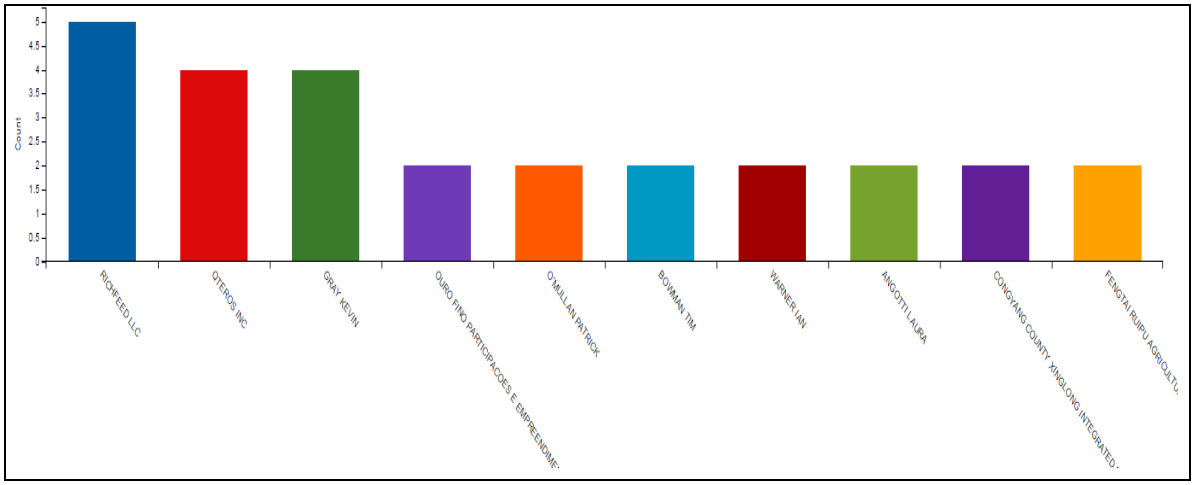
Fuente: elaboración propia con Thomson Innovation - VINTEC.

5.3 APLICACIONES

5.3.1 Organizaciones líderes

En la figura siguiente se ven las empresas que tienen mayor cantidad de registros de documentos de patentes. En la misma aparecen con mayor cantidad liderando Richfeed Llc. (5 documentos) y Qteros Inc. (4 documentos).

Figura 38. Organizaciones con mayor cantidad de documentos de patentes – Aplicaciones.

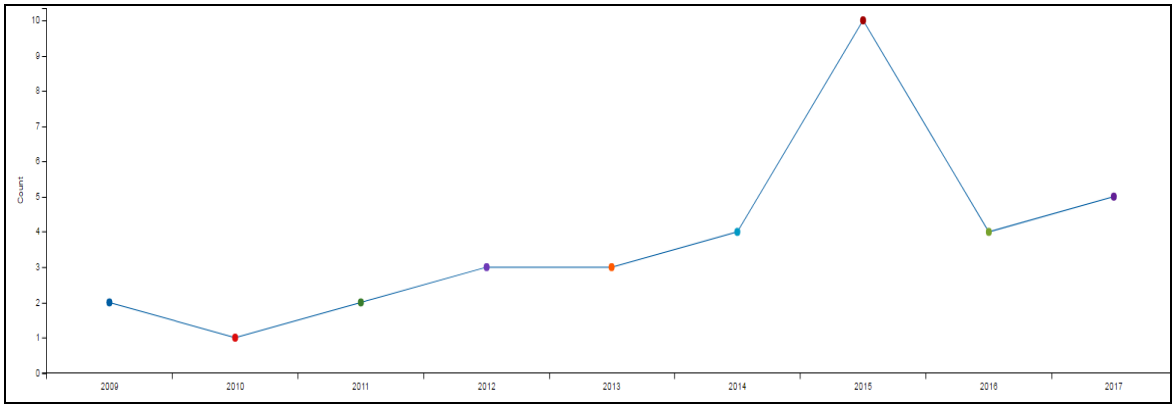


Fuente: elaboración propia con Thomson Innovation – VINTEC.

5.3.2 Crecimiento anual de patentabilidad

En términos de evolución de patentabilidad por año, se observa en la siguiente figura una tendencia en crecimiento en los últimos 7 (siete) años, donde el año con mayor cantidad de registros ha sido el 2015 (10 documentos).

Figura 39. Evolución de patentabilidad por año – Aplicaciones.



Fuente: elaboración propia con Thomson Innovation – VINTEC.

5.3.3 Países líderes

En la figura siguiente se pueden ver los países donde se han registrado mayor nivel de actividad sobre patentabilidad relacionada al tema foco del trabajo. Entre los principales países están China (20 documentos), Estados Unidos (2 documentos) y luego aparecen Canadá y Japón (1 documento ambos).

Figura 40. Países principales – Aplicaciones.

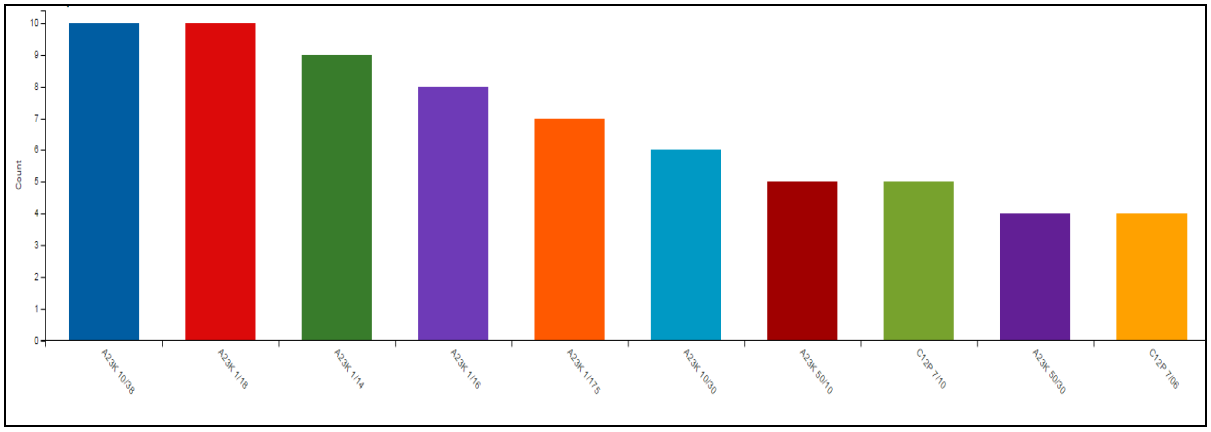
Fuente: elaboración propia con Thomson Innovation – VINTEC.

5.3.4 Áreas Tecnológicas principales

En la figura 41 se muestran las áreas tecnológicas[11] con las que se relacionan el mayor porcentaje de los documentos de patentes analizado. A partir de los documentos de patentes relacionados con el eje de "Aplicaciones", las áreas tecnológicas con las que se relacionan la mayoría de estos tienen que ver con los siguientes IPC: A23K 10/38, A23K 1/18, A23K 1/14, A23K 1/16 y A23K 1/175.

[11] En materia de patentes, los distintos sectores de la tecnología a los que pertenecen las patentes y los modelos de utilidad, se definen a través de los códigos denominados IPC (International Patents Clasification).

Figura 41. Principales áreas tecnológicas – Aplicaciones.



Fuente: elaboración propia con Thomson Innovation – VINTEC.

En la tabla 10 se describen las referencias de los 5 (cinco) principales IPC que han sido identificados del análisis de los distintos documentos de patentes procesados:

Tabla 10. Principales áreas tecnológicas con mayor cantidad de patentes.

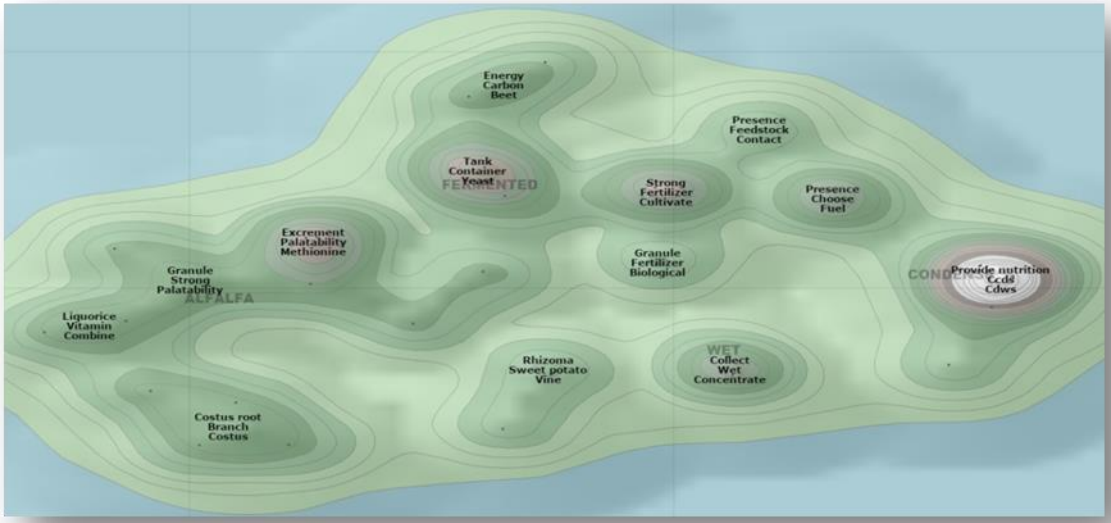
ÁREA TECNOLÓGICA - IPC	REFERENCIA
A23K 10/38	Productos alimenticios para animales a partir de residuos de destilerías o fermentadores de cerveza.
A23K 1/18	ALIMENTOS Especialmente adaptados para animales particulares.
A23K 1/14	ALIMENTOS PARA ANIMALES A partir de materias vegetales.
A23K 1/16	ALIMENTOS PARA ANIMALES Suplementado con factores alimenticios accesorios.
A23K 1/175	ALIMENTOS PARA ANIMALES Suplementado con factores alimenticios accesorios, con sustancias inorgánicas.

Fuente: VINTEC.

5.3.5 Mapa tecnológico

En la figura siguiente se pueden observar los conceptos relavantes en los documentos de patentes analizados, generándose un conjunto de clusters temáticos.

Figura 42. Principales temas en documentos de patentes – Aplicaciones.



Fuente: elaboración propia con Thomson Innovation – VINTEC.

6. PERFILES DE ORGANIZACIONES RELACIONADAS CON LA GESTIÓN DE LA VINAZA, POSIBLES ALIANZAS ESTRATÉGICAS

6.1 PERFILES DE PRINCIPALES ORGANIZACIONES

En el presente apartado se ha realizado una descripción de los perfiles que presentan algunas de las organizaciones a nivel mundial, como institutos de investigación y empresas, relacionadas con la producción y tratamiento de vinaza sucro-alcoholera, donde en cada perfil se puede ver información sobre el país de la organización, área de trabajo y un resumen a lo que se dedica.

Asimismo, dicha información puede resultar de interés para identificar potenciales oportunidades de formar alianzas estratégicas con socios aliados o partners. Las alianzas estratégicas verdaderamente exitosas son aquellas que se basan en nutrir las relaciones entre organizaciones, por lo que la confianza representa un elemento clave.

A continuación describiremos potenciales socios aliados o partners estratégicos en la temática:

EMPRESAS

	ENGINEUITY RESEARCH AND DEVELOPMENT LTD La empresa desarrolla tecnología para la producción de hidrógeno a bordo de vehículos. País: **Israel** Área de Trabajo: **Empresa** Para más información: http://engineuitycoil.nationprotect.net/index.htm
	GEA WIEGAND GMBH GEA Wiegand GmbH fabrica equipos de producción. La compañía produce una variedad de sistemas tales como evaporación y destilación, filtración de membrana, vacío y sistemas de lavado utilizados para aplicaciones químicas, farmacéuticas, alimentarias y medioambientales. GEA Wiegand atiende a clientes de todo el mundo. País: **Alemania** Área de Trabajo: **Empresa** Para más información: www.gea-wiegand.com

	HPD PROCESS ENGINEERING S.A. Una nueva marca española que busca impulsar la moda sostenible al máximo posible con los materiales más curiosos. El reciclaje podría ser la solución si somos capaces de crear una nueva generación de productos realizados con materiales reciclados con la misma calidad, diseño y propiedades técnicas que los mejores productos no reciclados. País: España Área de Trabajo: **Empresa** Para más información: http://www.hpdsystems.com

UNIVERSIDADES E INSTITUTOS DE INVESTIGACIÓN

	UNIVERSIDADE SAO PAULO La Universidad de São Paulo es una de las tres universidades públicas del estado de São Paulo, junto con la Universidad Estatal de Campinas y la Universidad Estatal Paulista. País: **Brasil** Área de Trabajo: **Universitario** Para más información: http://www5.usp.br/
	UNIVERSIDADE FEDERAL SAO PAULO (UFSCar) La UFSCar fue fundada en 1968 y fue la primera institución federal de Enseñanza Superior instalada en el interior del Estado de São Paulo. La Universidad se destaca por el alto nivel de cualificación de su cuerpo docente: el 96,1% son doctores o maestros y el 95,81% de los profesores desarrollan actividades de enseñanza, investigación y extensión en régimen de dedicación exclusiva. País: **Brasil** Área de Trabajo: **Universitario** Para más información: http://www2.ufscar.br/

	UNIVERSIDADE ESTADUAL DE CAMPINAS (UNICAMP) La UNICAMP es una de las universidades públicas del estado de São Paulo, Brasil. Su campus principal se localiza en el barrio de Barão Geraldo, a 10km del centro de Campinas, con campus adicional en Limeira y Piracicaba. Fundada en 1962 e instalada en 1966, la UNICAMP tuvo como misión inicial promover la ciencia y tecnología en el polo industrial en la proviencia del estado de São Paulo. En el 2004, tenía 14.000 estudiantes de licenciatura, 10.000 estudiantes de posgrado y 1.800 académicos. En Campinas de más de 14 universidades / institutos superiores públicos y privados. País: **Brasil** Área de Trabajo: **Universitario** Para más información: http://www.unicamp.br/unicamp/
	UNIVERSIDADE ESTADUAL MARINGA (UEM) La UEM es una institución pública de enseñanza superior, mantenida por el Estado de Paraná. Con sede en la ciudad de Maringá, posee campus en las ciudades de Cianorte, Ciudad Gaúcha, Goioerê, Ivaiporã y Umuarama, y extensiones en los distritos de Floriano (Maringá) (Centro de Piscicultura) e Iguatemi (Maringá) (Hacienda Experimental) y en la ciudad de. Puerto Rico (Centro de Investigación en Puerto Rico - Nupelia). La institución ofrece 63 cursos de Graduación, 85 cursos de Especialización, 30 cursos de Maestría, 17 cursos de Doctorado y 2 cursos de Post-Doctorado. Considerada una de las mejores universidades de Brasil, la UEM posee cursos de destaque en todo el ámbito nacional, los cuales atraen a estudiantes del país entero. País: **Brasil** Área de Trabajo: **Universitario** Para más información: http://www.uem.br/

	UNIVERSIDADE ESTADUAL PAULISTA (UNESP) La UNESP es una universidad pública brasileña, con experiencia en la docencia, investigación y extensión de servicios a la comunidad. La institución es una de las tres universidades subvencionadas por el gobierno del Estado de São Paulo junto con la Universidad de São Paulo (USP) y la Universidad Estatal de Campinas (Unicamp). La UNESP fue creada en 1976, a partir institutos aislados de enseñanza superior que existían en diversas regiones del estado. Tiene actualmente 32 facultades e institutos que ofrecen 168 cursos de pregrado, 114 cursos de posgrado, y 64 profesiones de nivel superior. Forma aproximadamente 6 mil nuevos profesionales cada año, y son responsables de 2,200 postgraduados. País: **Brasil** Área de Trabajo: **Universitario** Para más información: http://www.unesp.br/
	INSTITUTO DE INVESTIGACIONES BIOLÓGICAS CLEMENTE ESTABLE (IIBCE) El IIBCE es una institución pública sin fines de lucro dependiente del Ministerio de Educación y Cultura (MEC), que reúne un importante número de grupos dedicados a la investigación en diferentes campos de las ciencias biológicas. Su misión es diseñar y conducir proyectos de investigación científica para obtener nuevos conocimientos en el campo de las ciencias de la vida y áreas afines. País: **Brasil** Área de Trabajo: **Entidad Científica** Para más información: http://www.iibce.edu.uy/

	Centro Nacional de Pesquisa em Energia e Materiais (CNPEM) El CNPEM es una organización social calificada del Ministerio de Ciencia, Tecnología, Innovación y Comunicación (MCTIC). Situado en Campinas-SP, constituido por cuatro laboratorios y aperturas de referencia globales para la comunidad científica y empresarial. El National Synchrotron Laboratory light (LNLS) opera sólo fuente de luz de Synchrotron Latin America y es, en ese momento, Construyendo Sirius, o nuevo acelerador Brasileño de Generación Cuarta, para analizar diferentes tipos de materiales, MÁS inorgánicos y orgánicos; el National Bioscience Laboratorio (LNBio) desarrolla investigaciones en áreas de la frontera de la Biociencia, con foco en biotecnología y drogas; el Laboratorio Nacional de Ciencia y Tecnología de Bioetanol (CTBE) investiga nuevas tecnologías para la producción de etanol celulósico; El National Nanotechnology Laboratorio (LNNano) realiza investigaciones avanzadas, con gran potencial económico para el país. País: **Brasil** Área de Trabajo: **Entidad Científica** Para más información: http://cnpem.br/
	CENTRO COLOMBIANO DE INVESTIGACIÓN DE CAÑA DE AZÚCAR (CENICAÑA) El Centro Colombiano de Investigación de Caña de Azúcar (Cenicaña) es una corporación privada, sin fines de lucro, fundada en 1977 por la Asociación de Cultivadores de Caña de Azúcar (Asocaña) en representación de la agroindustria azucarera ubicada en el Valle del Río Cauca. Cenicaña lleva a cabo programas de investigación en Variedades, Agronomía y Procesos de Fábrica, y cuenta con servicios de apoyo en Análisis Económico y Estadístico, Información y Documentación, Tecnología Informática, Cooperación Técnica y Transferencia de Tecnología. Proporciona servicios de análisis de laboratorio,

	administra las estaciones de Automated Weather Network (AWN) y actualiza continuamente la cartografía digital del área cultivada. País: **Colombia** Área de Trabajo: **Entidad Científica** Para más información: http://www.cenicana.org
	UNIVERSIDAD SANTIAGO DE CALI (USC) La USC es una corporación de carácter civil, privada, de utilidad común, sin ánimo de lucro, fundada en el año de 1958. La USC es una de las primeras universidades de docencia e investigación de Colombia, reconocida y referente por la alta calidad en sus funciones misionales, la pertinencia y relevancia de sus programas, el impacto social y el aporte al desarrollo con equidad de la región suroccidental, con un modelo educativo incluyente, centrado en valores humanistas, con perspectivas pedagógicas y curriculares de carácter global, fortalecida en sus procesos de internacionalización, con valiosas relaciones de cooperación y una administración basada en principios de buen gobierno. País: **Colombia** Área de Trabajo: **Universitario** Para más información: http://www.usc.edu.co/
	UNIVERSIDAD DE LA REPUBLICA URUGUAY (UDELAR) La UDELAR es la principal institución de educación superior y de investigación del Uruguay. En colaboración con una amplia gama de actores institucionales y sociales, realiza también múltiples actividades orientadas al uso socialmente valioso del conocimiento y a la difusión de la cultura. Es una institución pública, autónoma y cogobernada por sus docentes, estudiantes y egresados. País: **Uruguay** Área de Trabajo: **Universitario** Para más información: http://www.universidad.edu.uy/

	**INSTITUTO CUBANO DE INVESTIGACIONES DE LOS DERIVADOS DE LA CAÑA DE AZÚCAR (ICIDCA)** El ICIDCA fue creado el 23 de mayo de 1963 por el Comandante Ernesto Che Guevara, con el objetivo de brindar el soporte científico al desarrollo de las tecnologías que permitieran el aprovechamiento integral y diversificado de la caña de azúcar. El ICIDCA cuenta con una estructura que responde a las actividades fundamentales desarrolladas por el instituto como centro de I+D+I y servicios técnicos especializados, organizados a través de proyectos dirigidos a la industria azucarera y sus derivados. El ICIDCA pertenece al Grupo Azucarero (AZCUBA). Difunde las experiencias alcanzadas y los resultados obtenidos en el marco de la investigación a través de su principal publicación: la revista ICIDCA sobre los derivados de la caña de azúcar, que fue creada en 1967. El instituto cuenta con 172 graduados universitarios, de ellos 83 poseen categoría científica, 19 son doctores y 44 masters; y las actividades investigativas son apoyadas por 186 técnicos. De 55 laboratorios cubanos acreditados, 3 son del ICIDCA, estos laboratorios emiten informes y certificados que serán reconocidos fuera de nuestras fronteras. País: **Cuba** Área de Trabajo: **Entidad Científica** Para más información: http://www.icidca.azcuba.cu/
	**UNIVERSITY MARYLAND** La Universidad de Maryland es la universidad más representativa del sistema público universitario de Maryland. Está ubicada en la localidad de College Park, en el condado de Prince George, cerca de Washington D. C., en los Estados Unidos. Fundada en 1856, la universidad es la institución académica más importante del estado de Maryland, y según los autores de las Greene's Guides (2001) es una de las más destacadas del país. Su situación la convierte en

	un lugar privilegiado, ya que por hallarse tan cerca de la capital federal, se han establecido equipos conjuntos de la universidad y el gobierno federal. Algunos miembros de la universidad han participado en la fundación de agencias como la Fundación Nacional de la Ciencia, los National Institutes of Health, la NASA, el Departamento de Defensa y la Agencia de Seguridad Nacional, entre otras. Es miembro de la Association of American Universities. País: USA Área de Trabajo: **Universitario** Para más información: https://www.umd.edu/
	UNIVERSIDAD DE KHON KAEN La Universidad de Khon Kaen es una universidad con reconocimiento internacional en Asia. Está localizada en la región de Tailandia del Nordeste, comúnmente conocida como Isaán. La universidad es el centro educativo más importante de esta región. Diversas facultades como las de ciencias agrarias, tecnología, ciencia, medicina o humanidades y ciencias sociales han ayudado a que sea calificada por la Comisión de Tailandia sobre la Educación Superior como una de las universidades con mejor enseñanza e investigación en el país. País: **Tailandia - Asia** Área de Trabajo: **Universitario** Para más información: http://www.ic.kku.ac.th/
	Asociación de Técnicos Azucareros de Guatemala (ATAGUA) ATAGUA es la Asociación de Técnicos Azucareros de Guatemala, autónoma, no lucrativa, cuyo objetivo es proveer los medios necesarios para el desarrollo de los técnicos azucareros contribuyendo así a la agroindustria azucarera de Guatemala, así como organización de actividades culturales y deportivas para la recreación de los socios y sus familias. Tiene su sede en el Km. 92.5 carretera al Pacífico, Santa Lucía Cotzumalguapa, Escuintla, Guatemala (interior de CENGICAÑA). Actualmente cuenta con 400 socios

	activos entre técnicos de los ingenios y técnicos de empresas afines. Funciona gracias al apoyo de la Asociación de Azucareros de Guatemala, a los ingenios azucareros de Guatemala y empresas que patrocinan los eventos que se realizan. País: **Guatemala** Área de Trabajo: **Asociación Empresarial** Para más información: https://www.atagua.org/
	UNIVERSIDADE FEDERAL DO PARANÁ (UFPR) La UFPR es la universidad brasileña más antigua, fundada el 19 de diciembre de 1912, inicialmente con el nombre de Universidade do Paraná. La UFPR funcionó como facultades aisladas hasta 1946 y fue federalizada en 1951, pasando a ser una institución pública y a ofrecer enseñanza gratuita. Actualmente las instalaciones de la universidad están ubicadas en varios puntos de Curitiba y en otras ciudades de Paraná, en esta institución hay 60 opciones de cursos de graduación, 124 de especialización, 41 de maestría y 26 de doctorado. País: **Brasil** Área de Trabajo: **Universitario** Para más información: http://www.ufpr.br
	UNIVERSITY OF MALAYA (UM) La Universidad de Malaya es una universidad pública de investigación ubicada en Kuala Lumpur, Malasia. Es la universidad más antigua y estimada de Malasia. El nombre de la universidad se abrevió como Malaya durante el período anterior a la independencia. La Universidad de Malaya tiene sus raíces en Singapur con el establecimiento de la Facultad de Medicina King Edward VII el 28 de septiembre de 1905. La Universidad Malaya se estableció en Singapur en 1949 con la fusión de la Facultad de Medicina King Edward VII y Raffles College (fundada en 1929) . El crecimiento de la Universidad fue muy rápido durante la primera década de su fundación y esto dio lugar a la creación

	de dos Divisiones autónomas el 15 de enero de 1959, una ubicada en Singapur y la otra en Kuala Lumpur. En 1960, el gobierno de los dos indicó que las dos divisiones de la Universidad de Malaya deberían convertirse en universidades nacionales autónomas separadas, una ubicada en Singapur (más tarde se convertiría en la Universidad Nacional de Singapur) y la otra en Kuala Lumpur (conservando el nombre de Universidad de Malaya). La legislación se aprobó en 1961 y la Universidad de Malaya se estableció el 1 de enero de 1962. País: **Malasia** Área de Trabajo: **Universitario** Para más información: https://www.um.edu.my/

6.2 PROYECTOS I+D+i

A la hora de mantenerse informado en términos de vigilancia del entorno, es aconsejable avanzar por sobre las tradicionales búsquedas de patentes, publicaciones científicas y artículos técnicos que habitualmente han sido útiles en pos de la innovación.

Además de lo mencionado, surge la necesidad de contar con cierta información estratégica sobre proyectos de investigación, desarrollo e innovación (I+D+i), con el fin de respaldar el trabajo con información válida, confiable y útil.

A continuación se detallan algunas novedades informativas sobre proyectos de investigación financiados por la Unión Europea, respecto de la temática de este estudio, con el objetivo de contextualizar y mostrar la evolución de la temática.

PAÍS / ORGANIZACIÓN	BREVE DESCRIPCIÓN	ENLACE
REINO UNIDO UNIVERSITY OF YORK	**TITULO: SUSTAINABLE LIQUID BIOFUELS FROM BIOMASS BIOREFINING** Compared with fossil fuels, biofuels (such as bioethanol) offer considerable potential benefits in terms of greenhouse gas emissions and sustainability. However, so-called 'First Generation' bioethanol is produced from sugar..	http://cordis.europa.eu/result/rcn/168223_en.html

PORTUGAL LABORATORIO NACIONAL DE ENERGIA E GEOLOGIA I.P.	TITULO: PROETHANOL2G (INTEGRATION OF BIOLOGY AND ENGINEERING INTO AN ECONOMICAL AND ENERGY-EFFICIENT 2G BIOETHANOL BIOREFINERY) The European Union has set a 10 % mandatory target for the share of renewables (including biofuels) in transportation sector by 2020 in Europe. To achieve this goal sustainable biofuels from lignocellulosic biomass must deploy in Europe very soon since the...	http://cordis.europa.eu/result/rcn/169193_en.html
FRANCIA CENTRE DE COOPERATION INTERNATIONAL EN RECHERCHE AGRONOMIQUE POUR LE DEVELOPPEMENT	TITULO: SWEET SORGHUM: AN ALTERNATIVE ENERGY CROP) Fossil resources are limited while world energy demand is expected to greatly increase in the next years, especially from China and India. On the other hand, it is tremendously urgent to tackle climate change through mitigation of GHG...	http://cordis.europa.eu/result/rcn/165796_en.html
FRANCIA CENTRE DE COOPERATION INTERNATIONAL EN RECHERCHE AGRONOMIQUE POUR LE DEVELOPPEMENT	TITULO: SPATIAL ECOLOGY OF WHITE GRUBS IN AGRICULTURAL LANDSCAPES DOMINATED BY SUGARCANE: IMPLICATIONS FOR AREAWIDE PEST MANAGEMENT The project examined how the pest uses a variety of landscape elements in relation to their availability. The research studies mainly conducted in sugarcane fields and natural landscape around aimed at (a) Quantify key landcape elements in pilot...	http://cordis.europa.eu/result/rcn/145936_en.html
FRANCIA CENTRE DE COOPERATION INTERNATIONAL EN RECHERCHE AGRONOMIQUE POUR LE DEVELOPPEMENT	TITULO: AGENOMICS (UNRAVELLING PATHOGENICITY OF XANTHOMONAS ALBILINEANS, THE PATHOGEN CAUSING LEAF SCALD DISEASE OF SUGARCANE) Diseases caused by plant pathogens are major threats for crop productivity. Understanding the mechanisms used by these plant pathogens to infect their host and to cause disease symptoms	http://cordis.europa.eu/result/rcn/52322_en.html

DINAMARCA CANEBIOFUEL	TITULO: CONVERSION OF SUGAR CANE BIOMASS INTO ETHANOL Second-generation biofuels may hold one of the keys to boosting Europe's goal of becoming more energy and resource efficient by 2020. The Canebiofuel initiative paved the way for the world's first cost-effective and commercially viable process for converting sugarcane biomass into fermentable sugars.	http://cordis.europa.eu/result/rcn/90463_en.html
ALEMANIA WIRTSCHAFT UND INFRASTRUKTUR GMBH & CO PLANUNGS KG MUENCHEN	TITULO: GLOBAL ASSESSMENT OF BIOMASS AND BIOPRODUCT IMPACTS ON SOCIO-ECONOMICS AND SUSTAINABILITY In response to the call on Topic KBBE-2009-3-4-01 of the Seventh Framework Programme (FP7) for research and technological development of the European Union, the GLOBAL-BIO-PACT, the expected impact was: 'The development of sustainability criteria for biomas...	http://cordis.europa.eu/result/rcn/58862_en.html
DINAMARCA NOVOZYMES A/S, BAGSVAERD	TITULO: CONVERSION OF SUGAR CANE BIOMASS INTO ETHANOL The CANEBIOFUEL project has advanced the current state-of-the-art by creating new fundamental knowledge on the components in sugar cane bagasse and straw. The treatability of both raw materials has been evaluated and it was found that straw was easier to hydrolyse and ferment ...	http://cordis.europa.eu/result/rcn/53336_en.html
IRLANDA UNIVERSITY OF LIMERICK	TITULO: DIBANET (THE PRODUCTION OF SUSTAINABLE DIESEL-MISCIBLE-BIOFUELS FROM THE RESIDUES AND WASTES OF EUROPE AND LATIN AMERICA) The increasing reliance on imported diesel fuels, in addition to annual increases in the quantities of organic wastes are threats to the EU and LA. DIBANET will combat these threats and help to eliminate diesel imports by developing novel technologies that will allow the...	http://cordis.europa.eu/result/rcn/143025_en.html

7. PANORAMA DE LA PRODUCCIÓN CIENTÍFICA Y LA PROPIEDAD INTELECTUAL RELACIONADA CON LA VINAZA EN ARGENTINA

Con el objetivo de reconocer la producción científica tecnológica en Argentina, se realizó el ejercicio de búsqueda de publicaciones científicas y documentos de patentes en las bases de datos de publicaciones Scopus[12], ScienceDirect[13] y Scielo[14] y de documentos de patentes Latipat[15]. A continuación se muestran los registros encontrados al cierre del presente informe:

PUBLICACIONES CIENTÍFICAS			
TITULO	AUTORES	ORGANIZACIÓN	REVISTA
Base de datos: SCOPUS			
Producción de lípidos a partir de levaduras oleaginosas utilizando vinaza como sustrato: Optimización de métodos de ruptura de células y extracción de lípidos	Britos, L. Alfaro, J.M. Baigorí, M, Martearena, M.R.	Universidad Nacional de Salta, CIUNSa, INIQUI (CONICET), - PROIMI	Journal of the Argentine Chemical Society
Base de datos: SCIENCE DIRECT			
Integral use of sugarcane vinasse for biomass production of actinobacteria: Potential application in soil remediation	Juan D. Aparicio, Claudia S. Benimeli, César A. Almeida, Marta A. Polti, Verónica L. Colin	Planta Piloto de Procesos Industriales Microbiologicos (PROIMI), CONICET, Facultad de Bioquímica, Química y Farmacia, Universidad Nacional de Tucumán, Universidad Santo Tomas de Aquino, Instituto de Química de San Luis, INQUISAL (UNSL-CONICET), Facultad de Ciencias Naturales e Instituto Miguel Lillo, Universidad Nacional de Tucumán	Chemosphere

[12] https://www.scopus.com
[13] http://www.sciencedirect.com
[14] http://www.scielo.org
[15] http://lp.espacenet.com

Two amplicon sequencing strategies revealed different facets of the prokaryotic community associated with the anaerobic treatment of vinasses from ethanol distilleries	M.A. Martínez, H. Romero, N.I. Perotti	PROIMI-CONICET, Facultad de Ciencias Exactas y Tecnología, Universidad Nacional de Tucumán, Laboratorio de Organización y Evolución del Genoma, Dpto. Ecología y Evolución, Facultad de Ciencias/CURE, Universidad de la República, Uruguay	Bioresource Technology
The Use of Single and Mixed Cultures for Aerobic Treatment of Cane Sugar Stillage and SCP Production	B. C. Nudel, R. S. Waehner, E. R. Fraile & A. M. Giulietti	Biotecnología y Microbiología Industrial, Facultad de Farmacia y Bioquímica, Universidad de Buenos Aires	Biological Wastes
Bio-concentration of vinasse from the alcoholic fermentation of sugar cane molasses	A.R. Navarro, M. del C. Sepúlveda, M.C. Rubio	Instituto de Biotecnología, Catedra de Microbiología Industrial. Facultad de Bioquímica, Química y Farmacia, Universidad Nacional de Tucumán,	Waste Management

Base de datos: SCIELO			
SICOVIN V.1.0: "software" para el análisis de concentración de vinaza	Gisela F. Diaz, Guillermo De Boeck, M. Carolina Cruz** y Dora Paz	Sección Ingeniería y Proyectos Agroindustriales, EEAOC.	Rev. Ind. y Agríc. de Tucumán
Combustión de vinaza con materiales celulósicos en calderas bagaceras de ingenios de la provincia de Tucumán (R. Argentina)	Federico J. Franck Colombres, Marcos A. Golato, Enrique Feijóo, Walter D.	Sección Ingeniería y Proyectos Agroindustriales, EEAOC, Ingenio Santa Bárbara.	Rev. Ind. y Agríc. de Tucumán

	Morales, Dora Paz* y Mario Octaviano		
Estudios preliminares de la evolución de los lodos de un reactor anaeróbico trabajando con vinaza	César F. Molina, Rebeca D. V. Montoya, José H. Pisa, Walter D. Machado, Eugenio A. Quaia	Sección Ingeniería y Proyectos Agroindustriales, EEAOC., Ingenio La Trinidad.	Rev. Ind. Y Agríc. de Tucumán
Caracterización de lodos como inoculantes para un reactor anaeróbico para el tratamiento de vinaza	Walter D. Machado, Federico Marquetti, Federico Molina, Carlos Gusils y Eugenio A. Quaia	Sección Ingeniería y Proyectos Agroindustriales – EEAOC, Sección Química – EEAOC - CONICET	Rev. Ind. y Agríc. de Tucumán

PATENTES		
TITULO	SOLICITANTES	N° PUBLICACIÓN
Base de datos: LATIPAT		
Procedimiento para el tratamiento de la vinaza, su clarificación, la recuperación de sales ricas en potasio, agua y la incorporación de dióxido de carbono	DURÁN RAÚL ALBERTO [AR]	AR099539 (A1)
Producción de etanol y subproductos de la fermentación, sin la generación de vinaza utilizando filtraciones tangenciales	I&D MUVAD S A	AR098212 (A1)
Extracción de policosanol de la vinaza de caña	DOW GLOBAL TECHNOLOGIES LLC [US]; ROHM & HAAS [US]	AR099361 (A1)
Extracción de componentes valiosos de la vinaza de caña	DOW GLOBAL TECHNOLOGIES LLC [US]; ROHM & HAAS [US]	AR099362 (A1)

Proceso continuo de desalinización de vinazas y obtención de sales de potasio	SOCOLSKY CARLOS OSCAR [AR]	AR097530 (A1)
Procesos para recuperar aceite de procesos de productos de fermentación y procesos para producir productos de fermentación	NOVOZYMES AS [DK]	AR096712 (A1)
Proceso y sistema para la producción de alcohol por destilación de efecto múltiple, alcohol hidratado y proceso para producir alcohol anhidro a partir de este ultimo	DEDINI SA IND DE BASE [BR]; SIEMENS LTDA [BR]	AR059379 (A1)
Método para agotar corrientes de procesamiento de vinaza diluida	NALCO CO [US]	AR054207 (A1)
Proceso para recuperación del agua industrial, desintoxicación y secado de vinaza a través de micronización y formulación de abono orgánico mineral a partir de vinaza	BIOMASSA COM DE RACOES EN E ADUBOS LTDA	AR085011 (A1)
Procedimiento para obtener un producto solido fertilizante y biocombustible a partir de vinazas de caña de azúcar y producto solido fertilizante y biocombustible obtenido mediante dicho procedimiento	HPD PROCESS ENGINEERING S A	AR083939 (A1)
Procedimiento para la obtención de sulfato de potasio a partir de vinaza	CREALAB S R L	AR083340 (A1)
Proceso de tratamiento de los efluentes industriales denominados vinazas y el tándem de filtrado que utiliza dicho proceso	REGINATO DOMINGO MIGUEL ANGEL [AR]	AR082417 (A1)
Proceso para la producción de un fertilizante órgano - mineral	DEDINI SA IND DE BASE	AR071481 (A1)

Existen diferentes combinaciones tecnológicas para valorizar la vinaza. Si bien en Argentina un alto porcentaje de las destilerías han adoptado el riego con vinaza cruda como la estrategia de

aplicación en suelo más difundida, nuevas iniciativas se están explorando para la disposición de la misma.

En este sentido, las búsquedas en publicaciones científicas argentinas, arrojaron como principales temas de investigación los vinculados a tratamientos biológicos de la vinaza, ya sea las relacionadas con el uso de microrganismos en reactores anaeróbicos UASB a escala piloto como en tratamientos aeróbicos utilizando diferentes cultivos bacterianos a escala laboratorio. Respecto a tratamientos físicos, las principales investigaciones se focalizan en procesos de bioconcentración de vinaza (acondicionamiento previo) y el desarrollo de software para análisis y diseño de sistemas de concentración de vinaza por evaporación. En cuanto a aplicaciones de la vinaza, los estudios que se destacan se vinculan al uso de vinaza para la producción de biomasa y potenciales aplicaciones en la remediación de suelos.

Entre los principales grupos de investigación de nuestro país se destacan la Universidad Nacional de Tucumán (UNT), la Universidad Nacional de Salta (UNSa), la Universidad Nacional de San Luis (UNSL), la Universidad Nacional del Norte Santo Tomás de Aquino (UNSTA), la Estación Experimental Agropecuaria Obispo Colombres, el Instituto de Investigaciones para la Industria Química (INIQUI-CONICET), la Planta Piloto de Procesos Industriales Microbiológicos (PROIMI-CONICET) y el Instituto de Química de San Luis (INQUISAL-CONICET). También cabe destacar la participación en algunas publicaciones de los Ingenios como La Trinidad y Santa Bárbara de la provincia de Tucumán.

Respecto a las principales temáticas objeto de solicitudes de patentes se destacan aquellas que comprenden la extracción de componentes valiosos de la vinaza, alcoholes como el inositol, glicerol, policosanol, con potenciales usos en la industria farmacéutica; recuperación de sales de potasio; obtención de productos sólidos a través de procesos de concentración y secado de vinaza, para aplicaciones como fertilizante y como biocombustible. También se destaca una solicitud que desarrolla un proceso que evita la generación de vinaza en la producción de alcohol.

Por otra parte, se identificaron 13 (trece) solicitudes de patentes en Argentina, siendo las empresas solicitantes líderes DOW GLOBAL TECHNOLOGIES [US], ROHM & HAAS [US] y DEDINI SA IND DE BASE [BR].

8. PRINCIPALES HALLAZGOS Y CONCLUSIONES

Uno de los objetivos de la MNGSVISA, desde la dimensión ambiental, es que la vinaza sea considerada un subproducto sustentable proveniente de los procesos de la destilación, siendo esto posible en función de que es valorizable a partir de la recuperación de productos de valor comercial, recuperación energética, o aplicándola en suelos agrícolas para el aprovechamiento de sus constituyentes.

La vinaza, requiere por sus características, una gestión adecuada previo a su uso o tratamiento. El actual manejo de vinaza implementado en los ingenios y destilerías de nuestro país, principalmente en las provincias de Tucumán, Salta y Jujuy, ha tenido avances significativos desde el punto de vista socio-ambiental. Sin embargo, no han alcanzado aún un abordaje integral y sustentable. La solución definitiva requiere de tecnologías capaces de convertirla en subproductos útiles, haciéndose necesaria la combinación de dos o más tecnologías de gestión y/o tratamiento que funcionen articuladamente entre sí, teniendo en cuenta las particularidades de cada región.

Los resultados del presente Estudio de vigilancia tecnológica e inteligencia competitiva pretenden realizar aportes para el trazado de políticas, programas y/o líneas de acción para el manejo sustentable de la vinaza sucro-alcoholera, entregando resultados concretos y mensurables que posibilitan delinear una visión del rumbo de la temática para el mediano y largo plazo; saber qué y cómo se está estudiando en el mundo, para así tomar las mejores decisiones a nivel nacional.

Identificar también el estado del arte de las nuevas tecnologías a través de las patentes generadas y las principales tendencias de las investigaciones científicas, tanto en ciencia básica como aplicada, en los países monitoreados resultan de suma importancia para poder desarrollar prácticas sustentables en el manejo de la vinaza sucro-alcoholera.

Dicho estudio estuvo delimitado a algunos temas específicos constituyendo una primera etapa de trabajo, dejando abierta la posibilidad de trabajar en otros temas relevantes para el sector de generación de bioetanol a partir de caña de azúcar.

De acuerdo a las distintas premisas identificadas en este trabajo de vigilancia tecnológica e inteligencia estratégica, se pueden remarcar algunos de los resultados y hallazgos obtenidos de la búsqueda y análisis de cerca de 700 (setescientos documentos), tanto de publicaciones científicas como patentes de invención y que se mencionan a continuación.

Procesos de generación de vinaza sucro-alcoholera: a partir del análisis de las publicaciones, los términos tecnológicos predominantes son: energía y combustibles, biotecnología aplicada y microbiología, química, electroquímica, ciencias ambientales, agricultura, microbiología, ingeniería ambiental, ingeniería química, ciencia y tecnología de los alimentos.

Principalmente se encontraron documentos vinculados a procesos de producción de biomasa, de producción de energía a partir de material biológico, condiciones de instalaciones para la producción de etanol a partir de caña de azúcar, métodos para producción de fertilizantes orgánicos y para reducción de turbidez de la vinaza sucro-alcoholera. Esto vislumbra las principales inquietudes en la materia en los países como Brasil, Uruguay, Colombia, Canadá, Inglaterra y Guatemala.

Específicamente vinculados a los procesos de destilación de vinaza sucro-alcoholera, se resaltan los títulos de publicaciones vinculadas a implicancias ambientales del uso de la vinaza sucro-alcoholera, digestión anaeróbica de la vinaza sucro-alcoholera, producción de biogás a partir de vinaza como alternativa para el desarrollo de biocombustibles, utilización de vinaza como enmienda de suelos y su potencial como fertilizante de suelos.

Tratamientos y disposición de la vinaza: para este eje, a partir del análisis de las publicaciones, se identificaron entre los principales temas de investigación a destacar, aquellos vinculados a impactos ambientales causados por la aplicación de la vinaza en suelo, su potencial como nutriente y la intervención en procesos de mineralización, tratamientos de digestión anaeróbica en industria de bioetanol y biorreactores anaeróbicos.

Respecto de las patentes analizadas en esta oportunidad, los principales procesos identificados en este foco son aquellos vinculados a procesos biológicos de digestión anaeróbica de vinaza; procesos químicos de coagulación, floculación y físicos de concentración, como la evaporación y microfiltración de vinaza. Todos ellos orientados a mejorar el potencial nutritivo de la vinaza, reducir volúmenes para facilitar su transporte o bien acondicionar la vinaza para intervenir como sustrato en procesos fermentativos.

Aplicaciones: entre las principales aplicaciones que se han identificado para la vinaza sucro-alcoholera se destacan aquellas vinculadas a la producción de alimentos balanceados, producción de energía (mejoras en rendimientos de producción de biogás, usos como combustible en hornos de plantas de bioetanol), digestión anaeróbica en reactores, obtención de fertilizantes sólidos y mejoradores de suelos.

Entre las nuevas iniciativas de tratamiento de la vinaza, la promoción del compostaje para su aplicación en suelos agrícolas se presenta como una buena alternativa para valorizar y gestionar

la vinaza. La digestión anaeróbica y los procesos de producción de biomasa parecen ser una opción favorable para optimizar la explotación energética y reducir los impactos ambientales de los productos de desecho de bioetanol.

La puesta en marcha de cualquiera de las tecnologías señaladas se verá potenciada por la implementación combinada de las mismas, principalmente teniendo en cuenta las condiciones agroecológicas de las áreas próximas a cada destilería. En la medida en que la vinaza se convierta en subproducto y adquiera valor, las amenazas ambientales se transformarán en oportunidades.

Por lo expuesto en el trabajo, en lo que a publicaciones científicas se refiere, y en referencia a procesos que involucran generación, tratamiento y aplicaciones de la vinaza sucro-alcoholera, en Latinoamérica, Brasil lidera la producción con más de tres decenas de publicaciones y en una cantidad inferior a cinco le siguen Colombia y Uruguay. A nivel internacional, en igual cantidad a estos dos últimos lideran Canadá e Inglaterra.

Las instituciones que se han identificado con mayor cantidad de documentos científicos son la Universidad de Sao Paulo, la Universidad Federal Sao Carlos, el Instituto de Investigaciones Biológicas Clemente Estable y el Centro Nacional de Investigación en Energía y Materiales.

En lo que a publicaciones científicas se refiere, y en referencia a la gestión de vinaza en general, llevan un aumento significativo con su pico máximo en el año 2014.

A partir de los hallazgos descriptos en el se pueden identificar y analizar ciertas brechas estratégicas y tecnológicas, a corto y mediano plazo para la Argentina, que se deberán tener en cuenta en futuros estudios focalizados en:

- Adecuación en Argentina, de tecnologías de países referentes en la materia (como Brasil) para lograr la eficiencia en la gestión de la vinaza.
- Ponderación del desarrollo de tecnologías vinculadas a la producción de energía, digestión anaeróbica, obtención de fertilizantes sólidos y mejoradores de suelos, a partir de vinaza.
- Desarrollo de nuevas líneas de investigación en Argentina a partir de grupos de investigación del país.
- Fomento de alianzas estratégicas con instituciones y empresas del extranjero y a nivel regional.
- Diseño de nuevas líneas de acción o de trabajo en CTI sobre la gestión de vinaza en Argentina.

La gestión integral de la vinaza requiere no sólo de obras sino también del fortalecimiento institucional para la implementación de planes estratégicos. A través de este estudio, la "*Mesa Nacional para la Gestión Sustentable de la Vinaza Sucro-Alcoholera (MNGSVISA)"* presidida por el MAyDS, pretende estudiar alternativas realizadas en otros países y en conjunto con las desarrolladas en Argentina, buscar soluciones a corto, mediano y largo plazo de una manera integral y con una visión local que involucre al sector de generación de bioetanol en base a caña de azúcar de nuestro país.

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ANEXO 1. ACRÓNIMOS

INTA: Instituto Nacional de Tecnología Agropecuaria.

EEAOC: Estación Experimental Agroindustrial Obispo Colombres.

UNT: Universidad Nacional de Tucumán.

PROIMI: Planta Piloto de Procesos Industriales Microbiológicos.

OPERADORES DE BÚSQUEDA

*: Su uso permitirá buscar documentos con palabras que comiencen con las letras que anteceden al operador.

NEAR: Su uso devolverá documentos que posean las dos palabras entre las que se encuentra, ubicada primera una ú otra, existiendo un número de palabras entre las mismas que se define por el valor que se encuentra luego del operador. EJ. "A" NEAR2 "B", buscará documentos que contengan A y B, pero solo cuando no estén separados por más de 2 palabras.

ADJ: Su uso devolverá documentos que posean las dos palabras entre las que se encuentra, ubicadas solo en el mismo orden, existiendo un número de palabras entre las mismas definido por el número que se encuentra luego del operador. EJ. "A" NEAR2 "B", buscará documentos que contengan A y B, pero solo cuando no estén separados por más de 2 palabras.

>= Su uso devolverá documentos que contengan un determinado campo de información con valores mayores o iguales al valor que antecede.

<= Su uso devolverá documentos que contengan un determinado un campo de información con valores menores o iguales al valor que antecede.

CAMPOS DE INFORMACIÓN USADOS EN SENTENCIAS DE BÚSQUEDAS

TI: Campo de información referido al título del documento.

TAB: Campo de información referido al título y al resumen del documento.

PY: Campo de información de año de publicación del documento.

ALL: Referido a todos los campos de información del documento.

DP: Campo de información del año de publicación del documento.

ANEXO 2. CUERPOS DE INFORMACIÓN DE PUBLICACIONES CIENTIFICAS Y DOCUMENTOS DE PATENTES

PUBLICACIONES CIENTÍFICAS				
TITULO	RESUMEN	AUTORES	ORGANIZACIÓN	REVISTA
Aerobic biodegradation of vinasse: Effect of temperature, initial pH and pH control		Cibis, E | Ryznar-Luty, A | Krzywonos, M | Miskiewicz, T	Wroclaw Univ Econ | Wroclaw University of Economics | Dept Bioproc Engn | Wroclaw Univ Econ Wroclaw University of Economics Dept Bioproc Engn	JOURNAL OF BIOTECHNOLOGY | 131 (2): S155-S156 Suppl. S SEP 2007
Anaerobic Biological Treatment of Vinasse for Environmental Compliance and Methane Production	The energy crisis resulted in increasing awareness that alternative sources of energy should be considered. During this time, Brazil implemented ethanol production from sugarcane as biofuel. However, during this process, large amounts of residues are generated, such as vinasse. This residue can be treated anaerobically to generate methane as a source of bioenergy with the use of sequencing batch reactors operated with immobilized biomass (AnSBBR). In this work, tests were conducted in an AnSBBR laboratory-scale reactor, and the main results regarding the kinetic model fitting and performance of substrate consumption (83 %), methane content in the biogas (77 %), applied organic load (5.54 g COD L-1 day(-1)), methane productivity (973 N-mL CH4 L-1 day(-1)), and yield (9.47 mol CH4 kg COD-1) show that AnSBBR is a promising technological alternative. After tests conducted in a laboratory-scale reactor, an industrial reactor was scaled and was also operated in a sequencing batch with immobilized biomass (AnSBBR) for the anaerobic treatment of vinasse with the goal of generating methane and environmental suitability to further disposal in soil. The calculations were performed based on data from a sugar and alcohol plant located in So Paulo, Brazil. This study proposes to the operation of the industrial scale reactor was the association of four AnSBBR (each one with a volume of 15849 m(3)) operating in parallel (with a feeding	Albanez, R | Chiaranda, BC | Ferreira, RG | Franca, ALP | Honorio, CD | Rodrigues, JAD | Ratusznei, SM | Zaiat, M	Univ Sao Paulo | Universidade de Sao Paulo | Escola Engn Mau | Escola Engn Sao Carlos | Inst Mau Tecnol | Univ Sao Paulo Universidade de Sao Paulo Escola Engn Sao Carlos Escola Engn Mau Inst Mau Tecnol	APPLIED BIOCHEMISTRY AND BIOTECHNOLOGY | 178 (1): 21-43 JAN 2016

	and discharge time of 4 h and a reaction time of 8 h), with the goal of adapting the treatment system from a discontinuous operation to a continuous operation. In this industrial scenario, the methane production was estimated at 1.65 Au 10(6) mol CH4 day(-1), and the energy was approximately 17 MW, increasing the possible energy recovery contained in sugarcane from 93 to 96 %.			
Anaerobic digestion of stillage to produce bioenergy in the sugarcane-to-ethanol industry	Stillage is the main wastewater from ethanol production, containing a high chemical oxygen demand in addition to acidic and corrosive characteristics. Though stillage may be used as a soil fertilizer, its land application may be considered problematic due its high polluting potential. Anaerobic digestion represents an effective alternative treatment to reduce the pollution load of stillage. In addition, the methane gas produced within the process may be converted to energy, which can be directly applied to the treatment plant. The objective of this paper was to investigate the energetic potential of anaerobic digestion applied to stillage in the sugarcane ethanol industry. An overall analysis of the results indicates energy recovery capacity (ERC) values for methane ranging from 3.5% to 10%, respectively, for sugarcane juice and molasses. The processes employed to obtain the fermentable broth, as well as the distillation step, represent the main limiting factors to the energetic potential feasibility. Considering financial aspects the annual savings could reach up to US$ 30 million due to anaerobic digestion of stillage in relatively large-scale distilleries (365,000 m(3) of ethanol per year). The best scenarios were verified for the association between anaerobic digestion of stillage and combustion of bagasse. In this case, the fossil fuels consumption in distilleries could be fully ceased, such the ERC of methane could reach values ranging from 140% to 890%.	Fuess, LT | Garcia, ML	Univ Sao Paulo | Universidade de Sao Paulo | UNESP Univ Estadual Paulista | Universidade Estadual Paulista | Sao Carlos Sch Engn | Dept Hydraul & Sanitat | Lab Biol Proc | Inst Geosci & Exact Sci | Dept Petrol & Metallogeny | Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn Dept Hydraul & Sanitat Lab Biol Proc UNESP Univ Estadual Paulista Universidade Estadual Paulista Inst Geosci & Exact Sci Dept Petrol & Metallogeny	ENVIRONMENTAL TECHNOLOGY | 35 (3): 333-339 FEB 1 2014
Anaerobic digestion of vinasse from sugarcane biorefineries in Brazil from energy,	The need to improve the sustainability of bioethanol production from sugarcane in Brazil has intensified the search for process energy optimization coupled with the environmental suitability of the generated	Moraes, BS | Junqueira, TL | Pavanello, LG | Cavalett, O | Mantelatto, PE | Bonomi,	Brazilian Ctr Res Energy & Mat CNPEM | Univ Sao Paulo | Universidade de Sao Paulo | Brazilian	APPLIED ENERGY | 113: 825-835 Sp. Iss. SI JAN 2014

environmental, and economic perspectives: Profit or expense?	coproducts and wastes. In this scenario, the anaerobic digestion of vinasse (the most abundant effluent from a sugarcane biorefinery) arises as an interesting altemative because, in addition to promoting the stabilization of organic matter, it also enables energy generation from biogas. In this work, vinasse anaerobic digestion in biorefineries was evaluated in terms of energy, environmental, and economic considerations. The energy potential from vinasse of a single sugarcane biorefinery, which is generally lost due to its application to soil with no treatment, was found to be comparable to the electricity supply demand of a city of approximately 130,000 inhabitants or to the surplus energy from bagasse burning that is exported by some sugarcane mills in Brazil. On a national level, such energy is comparable to the electricity generated by some hydroelectric plants, reaching 7.5% of the electricity generated by the world's largest hydroelectric plant. When burned in boilers, biogas could be used to stimulate second-generation ethanol production because almost 12% of the bagasse could be released from burning and the biogas used to attenuate the process energy demand. As an alternative fuel, biogas could replace up to 40% of the annual diesel supply in the agricultural operations of a sugarcane biorefinery and still provide approximately 14 MW h annually from cogeneration. An environmental assessment demonstrated significant savings in terms of greenhouse gas emissions that could financially benefit the biorefineries due to carbon credit commercialization. Such revenue would be more than enough to cover the operational costs of an anaerobic digestion plant. A global economic analysis revealed that the application of biogas as a diesel replacement would be the most attractive alternative for a sugarcane biorefinery with anaerobic digestion of vinasse. (C) 2013 Elsevier Ltd. All rights reserved.	A | Zaiat, M	Bioethanol Sci & Technol Lab CTBE | Sao Carlos Engn Sch EESC | Ctr Res Dev & Innovat Environm Engn CPDI EA | Biol Proc Lab LPB | Brazilian Ctr Res Energy & Mat CNPEM Brazilian Bioethanol Sci & Technol Lab CTBE Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Engn Sch EESC Ctr Res Dev & Innovat Environm Engn CPDI EA Biol Proc Lab LPB	

Anaerobic digestion of vinasse from sugarcane ethanol production in Brazil: Challenges and perspectives	The replacement of fossil fuels by biofuels has been extremely important worldwide to stimulate the growth of economies based on the sustainability through the use of renewable resources. Anaerobic digestion for biogas production is recognized as a clean technology that allies the suitability of wastes with energy generation, fulfilling the requirements for a sustainable alternative to provide the optimization of the biofuels production. This alternative is especially interesting for the sugarcane ethanol production in Brazil, in which the generation of vinasse, the main liquid waste, is very expressive. Nevertheless, the use of vinasse for anaerobic digestion has been finding some challenges to its establishment in the Brazilian sugarcane biorefineries. This paper reviews the actual context of anaerobic digestion within the sugarcane ethanol production in Brazil, presenting the main obstacles for its full application and, the directions to promote it as well. Alternatives for biogas use are also presented and compared, highlighting the environmental and energy advantages of applying anaerobic digestion in the sugarcane biorefineries. This scenario is envisaged as a suitable way to achieve the future biorefineries model, based on the use and recovery of renewable resources with economic, social, and environmental benefits. (C) 2015 Elsevier Ltd. All rights reserved.	Moraes, BS | Zaiat, M | Bonomi, A	Brazilian Ctr Res Energy & Mat CNPEM | Univ Sao Paulo | Universidade de Sao Paulo | Brazilian Bioethanol Sci & Technol Lab CTBE | Sao Carlos Engn Sch EESC | Ctr Res Dev & Innovat Environm Engn CPDI EA | LPB | Brazilian Ctr Res Energy & Mat CNPEM Brazilian Bioethanol Sci & Technol Lab CTBE Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Engn Sch EESC Ctr Res Dev & Innovat Environm Engn CPDI EA LPB	RENEWABLE & SUSTAINABLE ENERGY REVIEWS | 44: 888-903 APR 2015

Anaerobic digestion of vinasse: energetic application of biogas and acquisition of credits of carbon - a case	The increase of the ethanol production in Brazil leads to growing of vinasse (main by-product of sugar and alcohol industry), worsing the problem related to its destinantion. Vinasse is rich in nutrients and has a high content of organic matter, which justifies its intense ferti-irrigation use in sugar cane crop areas. Thus, the anaerobic digestion of vinasse by UASB (upflow anaerobic sludge blanket digestion) reactor emerges as an alternative treatment for this by-product, showing also an economic factor, the production of methane and its use. This work aimed to implement the system of anaerobic digestion of vinasse in UASB reactor and the use of energy generated by biogas. In this way, the design of UASB was based on organic volumetrical load of vinasse. The estimation of the baseline was based on the mass balance between the carbon present in the vinasse and CO(2) emitted by the aerobic degradation of effluent into the environment. From the compute emissions, it was found that emissions from the baseline and the project implementation would be the same, and additionally it could be occur the production of electricity by biogas. In this way, biogas produced by anaerobic digestion has a competitive energy potential compared to other energy sources and presents additionality; however, carbon credits marked could not be a financial attractive in the development of this type of project.	Szymanski, MSE | Balbinot, R | Schirmer, WN	Univ Estadual Centro Oeste | Universidade Estadual do Centro Oeste | Univ Fed Santa Maria | Universidade Federal de Santa Maria (UFSM) | Univ Fed Parana | Universidade Federal do Parana | Univ Fed Santa Catarina | Universidade Federal de Santa Catarina (UFSC) | UNICENTRO | Dept Engn Florestal | Univ Estadual Centro Oeste Universidade Estadual do Centro Oeste UNICENTRO Univ Fed Santa Maria Universidade Federal de Santa Maria (UFSM) Dept Engn Florestal Univ Fed Parana Universidade Federal do Parana Univ Fed Santa Catarina Universidade Federal de Santa Catarina (UFSC)	SEMINA-CIENCIAS AGRARIAS | 31 (4): 901-911 2010
Application of urea dosing for alkalinity supply during anaerobic digestion of vinasse	Pushed by demand for renewable energy, the ethanol industry in Brazil is expanding. However, production of 1 m(3) of ethanol generates around 13 m(3) of liquid residues (vinasse), so this expansion results in an increasing need for a more adequate destination of these residues. Nowadays the vinasse is dispersed on the sugar cane fields in the practice of fertirrigation, but anaerobic digestion of this residue may be a better solution, additionally offering an alternative source of energy, able to complement hydroelectric power supply in the dry season. However, when trying to digest vinasse at reduced hydraulic retention times,	Boncz, MA | Formagini, EL | Santos, LD | Marques, RD | Paulo, PL	Univ Fed Mato Grosso do Sul | Universidade Federal de Mato Grosso do Sul | Ctr Exact Sci & Technol | Univ Fed Mato Grosso do Sul Universidade Federal de Mato Grosso do Sul Ctr Exact Sci & Technol	WATER SCIENCE AND TECHNOLOGY | 66 (11): 2453-2460 2012

	complications arise from its strong tendency toward acidification, upsetting the fragile balance of transformations normally occurring under anaerobic conditions. For successful operation of an anaerobic treatment process with acceptable hydraulic residence times, increasing alkalinity levels inside the reactor is necessary. In the present work we show that pH regulation by means of urea dosing, in spite of the risk posed by ammonia toxicity towards methanogenic biomass, can be a viable alternative to avoid vinasse acidification. The ammonia formed in urea conversion remains in solution, rather than escaping to the biogas, and so its use as fertiliser can offset its cost of application in the process.			
ASSESSMENT OF OZONE AS A PRETREATMENT TO IMPROVE ANAEROBIC DIGESTION OF VINASSE	This paper presents an assessment of ozone oxidative effects on the biodegradability of sugar cane vinasse, aiming at increasing the methane yield by anaerobic digestion of this effluent. Furthermore, as a new approach, an economic balance of this process was made. Using a bench scale reactor, ozone was applied at 60, 120, 180, 240 mgO(3)center dot gCOD(-1) doses in raw vinasse and at three initial pH values (4.8, 7 and 9). Applying 60 mgO(3)center dot gCOD(-1), the biodegradability of vinasse was increased by 22.7% at the initial pH value of 4.8. The application of the two-way ANOVA test indicated a significant statistical interaction between the pH value and ozone. However, a preliminary energy assessment showed that the amount of electricity consumed in a full-scale ozonation plant would be almost 6 times higher than the energy recovered from the combustion of the additional methane produced (13.6%). These results indicate that ozonation of raw vinasse to increase the methane production in a subsequent anaerobic process is economically unfeasible.	Aquino, S | Pires, EC	Univ Sao Paulo | Universidade de Sao Paulo | Hydraul & Sanit Engn Dept | Sch Engn Sao Carlos | SHS EESC USP | Univ Sao Paulo Universidade de Sao Paulo Hydraul & Sanit Engn Dept Sch Engn Sao Carlos SHS EESC USP	BRAZILIAN JOURNAL OF CHEMICAL ENGINEERING | 33 (2): 279-285 APR-JUN 2016

Assessment of the Variations in Characteristics and Methane Potential of Major Waste Products from the Brazilian Bioethanol Industry along an Operating Season	Anaerobic digestion appears to be a favorable option to optimize the energetic exploitation and reduce the environmental impacts of bioethanol waste products. Some analytical characteristics of these waste products are available in various sources. However, these data are too incomplete and unsystematic to be compared among the bioethanol industries. Design of biogas processes based on such data has to deal with considerable unknowns regarding the technical feasibility and operating costs. Therefore, to better understand and assess the applicability of these bioethanol waste products in anaerobic digestion, the micro- and macro-element concentrations, the physicochemical parameters, and the methane potential were analyzed. In addition to the assessment of seasonal variations, the effect of alkaline and mechanical treatments was also investigated for lignocellulosic bagasse samples. Possible deficiencies of the trace elements Ni, Co, Mo, Se, and W in vinasse as a substrate for anaerobic digestion were recorded. The correlation between the gradual increase in methane yields of vinasse and filter cake along the bioethanol operating season and the dynamic changes in the substrate characteristics was shown. Moreover, the methane yield of raw bagasse increased by 50% after applying both treatments in combination.	Leite, AF | Janke, L | Harms, H | Zang, JW | Fonseca-Zang, WA | Stinner, W | Nikolausz, M	UFZ Helmholtz Ctr Environm Res | Helmholtz Association | Helmholtz Center for Environmental Research (UFZ) | Dept Environm Microbiol | Deutsch Biomasseforschungszentrum DBFZ | Dept Biochem Convers | Fed Inst Goias | Instituto Federal de Goias (IFG) | Master Program Sustainable Proc Technol | UFZ Helmholtz Ctr Environm Res Helmholtz Association Helmholtz Center for Environmental Research (UFZ) Dept Environm Microbiol Deutsch Biomasseforschungszentrum DBFZ Dept Biochem Convers Fed Inst Goias Instituto Federal de Goias (IFG) Master Program Sustainable Proc Technol	ENERGY & FUELS | 29 (7): 4022-4029 JUL 2015
Assessment of VHG (Very High Gravity) ethanol fermentation in continuous multistage with cell recovery, reactivation and recycling using a blend of juice and molasses from sugarcane as raw material	The very high gravity (VHG) process can improve the production through high ethanol titer up to 15 % (v/v), nearly doubling the productivity [9.8 kg/(m(3) center dot h)], reducing vinasse to 5.4 L/L and minimizing the energy demand. The concept of this new process of high productivity and efficiency is based on the yeast kinetic model aimed to preserve cell activity at high ethanol content under high recycling. The process design is for continuous mode in multistage reactors with decreasing fermentation temperature profile in each stage (34 to 28 degrees C), standardization of mash in microbiological and physicochemical terms, feeding	Yamakawa, CK | Atala, DIP | Ambrosio, WB | Nolasco, J | Rossell, CEV	CNPEM | British Petr BP Biofuels | Lab Nacl Ciencia & Tecnol Bioetanol CTBE | Vaz Rossell Consultoria Empresarial Ltda | CNPEM Lab Nacl Ciencia & Tecnol Bioetanol CTBE British Petr BP Biofuels Vaz Rossell Consultoria Empresarial Ltda	SUGAR INDUSTRY-ZUCKERINDUSTRIE | 142 (4): 212-216 APR 2017

	mash distributed between the first and second reactors, and intracellular detoxification through a second centrifugation followed by yeast treatment promoting membrane recovery and enzymatic restoration. The basic parameters were developed at bench scale in fed-batch with cell recycle. An oxidation-reduction potential sensor was successfully used to determine the micro-aeration requirement for final stage of sugar exhaustion, to promote a respiratory environment able to support high ethanol content, and as a tool to monitoring the reactivation stage. The optimized set of parameters obtained in bench scale were used for scaling-up the process to a continuous fermentation pilot unit set to operate uninterruptedly.			
Biochar from Sugarcane Filtercake Reduces Soil CO2 Emissions Relative to Raw Residue and Improves Water Retention and Nutrient Availability in a Highly-Weathered Tropical Soil	In Brazil, the degradation of nutrient-poor Ferralsols limits productivity and drives agricultural expansion into pristine areas. However, returning agricultural residues to the soil in a stabilized form may offer opportunities for maintaining or improving soil quality, even under conditions that typically promote carbon loss. We examined the use of biochar made from filtercake (a byproduct of sugarcane processing) on the physicochemical properties of a cultivated tropical soil. Filtercake was pyrolyzed at 575 degrees C for 3 h yielding a biochar with increased surface area and porosity compared to the raw filtercake. Filtercake biochar was primarily composed of aromatic carbon, with some residual cellulose and hemicellulose. In a three-week laboratory incubation, CO2 effluxes from a highly weathered Ferralsol soil amended with 5% biochar (dry weight, d.w.) were roughly four-fold higher than the soil-only control, but 23-fold lower than CO2 effluxes from soil amended with 5% (d.w.) raw filtercake. We also applied vinasse, a carbon-rich liquid waste from bioethanol production typically utilized as a fertilizer on sugarcane soils, to filtercake- and biochar-amended soils. Total CO2 efflux from the biochar-amended soil in response to vinasse application was only 5% of the efflux when vinasse was applied to soil amended with raw filtercake. Furthermore, mixtures of 5 or 10%	Eykelbosh, AJ | Johnson, MS | de Queiroz, ES | Dalmagro, HJ | Couto, EG	Univ British Columbia | University of British Columbia | Univ Fed Mato Grosso | Universidade Federal de Mato Grosso do Sul | Inst Resources Environm & Sustainabil | Dept Earth Ocean & Atmospher Sci | Fac Agron Med Vet & Zootecnia FAMEV | Inst Fis | Univ British Columbia University of British Columbia Inst Resources Environm & Sustainabil Univ British Columbia University of British Columbia Dept Earth Ocean & Atmospher Sci Univ Fed Mato Grosso Universidade Federal de Mato Grosso do Sul Fac Agron Med Vet & Zootecnia FAMEV Univ Fed Mato Grosso Universidade Federal de Mato	PLOS ONE | 9 (6): - JUN 4 2014

	biochar (d.w.) in this highly weathered tropical soil significantly increased water retention within the plant-available range and also improved nutrient availability. Accordingly, application of sugarcane filtercake as biochar, with or without vinasse application, may better satisfy soil management objectives than filtercake applied to soils in its raw form, and may help to build soil carbon stocks in sugarcane-cultivating regions.		Grosso do Sul Inst Fis	
Biochemical compositions and fatty acid profiles in four species of microalgae cultivated on household sewage and agro-industrial residues	The potential of four regional microalgae species was evaluated in relation to their cell growth and biomass production when cultured in the following alternative media: bio-composts of fruit/horticultural wastes (HB), sugarcane waste and vinasse (VB) chicken excrements (BCE), raw chicken manure (RCM), and municipal domestic sewage (MDS). The cultures were maintained under controlled conditions and their growth responses, productivities, biochemical compositions, and the ester profiles of their biomasses were compared to the results obtained in the synthetic media. The MDS and HB media demonstrated promising results for cultivation, especially of Chlorella sp., Chlamydomonas sp., and Lagerheimia longiseta, which demonstrated productivities superior to those seen when grown on the control media. The highest lipid levels were obtained with the HB medium. The data obtained demonstrated the viability of cultivating microalgae and producing biomass in alternative media prepared from MDS and HB effluents to produce biodiesel. (C) 2016 Elsevier Ltd. All rights reserved.	Calixto, CD | Santana, JKD | de Lira, EB | Sassi, PGP | Rosenhaim, R | Sassi, CFD | da Conceicao, MM | Sassi, R	Univ Fed Paraiba | Universidade Federal da Paraiba | Ctr Ciencias Exatas & Nat | Lab Ambientes Recifais & Biotecnol Com Microalgas | Lab Combustiveis & Mat LACOM | CTDR | Univ Fed Paraiba Universidade Federal da Paraiba Ctr Ciencias Exatas & Nat Lab Ambientes Recifais & Biotecnol Com Microalgas Univ Fed Paraiba Universidade Federal da Paraiba Lab Combustiveis & Mat LACOM Univ Fed Paraiba Universidade Federal da Paraiba CTDR	BIORESOURCE TECHNOLOGY | 221: 438-446 DEC 2016
Bioenergy from Biofuel Residues and Wastes	This review includes works published in the general scientific literature during 2014 on the production of bioenergy and biofuel from waste residues generated during bioethanol and biodiesel production with a brief overview of current and emerging feedstocks. Anothersection of this review summarizes literature on culturing algae for biofuels including bioreactors and open pond cultivation systems with the utilization of inorganic and organic sources of nutrients. New methods applicable to the mass culture of	Choudri, BS | Baawain, M	Sultan Qaboos Univ | Sultan Qaboos University | Ctr Environm Studies & Res | Sultan Qaboos Univ Sultan Qaboos University Ctr Environm Studies & Res	WATER ENVIRONMENT RESEARCH | 87 (10): 1414-1444 2015

	algae are highlighted. Algal cell harvesting and oil extraction techniques tested and developed for algae are also discussed.			
Bioenergy from stillage anaerobic digestion to enhance the energy balance ratio of ethanol production	The challenges associated with the availability of fossil fuels in the past decades intensified the search for alternative energy sources, based on an ever-increasing demand for energy. In this context, the application of anaerobic digestion (AD) as a core treatment technology in industrial plants should be highlighted, since this process combines the pollution control of wastewaters and the generation of bioenergy, based on the conversion of the organic fraction to biogas, a methane-rich gaseous mixture that may supply the energetic demands in industrial plants. In this context, this work aimed at assessing the energetic potential of AD applied to the treatment of stillage, the main wastewater from ethanol production, in an attempt to highlight the improvements in the energy balance ratio of ethanol by inserting the heating value of methane as a bioenergy source. At least 5-15% of the global energy consumption in the ethanol industry could be supplied by the energetic potential of stillage, regardless the feedstock (i.e. sugarcane, corn or cassava). The association between bagasse combustion and stillage anaerobic digestion in sugarcane-based distilleries could provide a bioenergy surplus of at least 130% of the total fossil fuel input into the ethanol plant, considering only the energy from methane. In terms of financial aspects, the economic gains could reach US$ 0.1901 and US$ 0.0512 per liter of produced ethanol, respectively for molasses-(Brazil) and corn-based (EUA) production chains. For large-scale (similar to 1000 m(EtOH)(3) per day) Brazilian molasses-based plants, an annual economic gain of up to US$ 70 million could be observed. Considering the association between anaerobic and aerobic digestion, for the scenarios analyzed, at least 25% of the energetic potential of stillage would be required to supply the energy consumption with aeration, however, more suitable effluents for agricultural application could be produced. The main conclusion from this work indicates that	Fuess, LT | Garcia, ML	Univ Sao Paulo | Universidade de Sao Paulo | UNESP Univ Estadual Paulista | Universidade Estadual Paulista | Sao Carlos Sch Engn EESC | Lab Biol Proc | Inst Geosci & Exact Sci | Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn EESC Lab Biol Proc UNESP Univ Estadual Paulista Universidade Estadual Paulista Inst Geosci & Exact Sci	JOURNAL OF ENVIRONMENTAL MANAGEMENT | 162: 102-114 OCT 1 2015

	anaerobic processes should be considered the core technology to treat stillage, based mainly on the attractive relation energy generation-financial return and on the possibility to keep the advantages inherent to the common fertigation when using the treated effluent in agriculture. (C) 2015 Elsevier Ltd. All rights reserved.			
Biogas Production from Sugarcane Waste: Assessment on Kinetic Challenges for Process Designing	Biogas production from sugarcane waste has large potential for energy generation, however, to enable the optimization of the anaerobic digestion (AD) process each substrate characteristic should be carefully evaluated. In this study, the kinetic challenges for biogas production from different types of sugarcane waste were assessed. Samples of vinasse, filter cake, bagasse, and straw were analyzed in terms of total and volatile solids, chemical oxygen demand, macronutrients, trace elements, and nutritional value. Biochemical methane potential assays were performed to evaluate the energy potential of the substrates according to different types of sugarcane plants. Methane yields varied considerably (5-181 Nm(3)ton(FM)(-1)), mainly due to the different substrate characteristics and sugar and/or ethanol production processes. Therefore, for the optimization of AD on a large-scale, continuous stirred-tank reactor with long hydraulic retention times (>35 days) should be used for biogas production from bagasse and straw, coupled with pre-treatment process to enhance the degradation of the fibrous carbohydrates. Biomass immobilization systems are recommended in case vinasse is used as substrate, due to its low solid content, while filter cake could complement the biogas production from vinasse during the sugarcane offseason, providing a higher utilization of the biogas system during the entire year.	Janke, L | Leite, A | Nikolausz, M | Schmidt, T | Liebetrau, J | Nelles, M | Stinner, W	Deutsch Biomasseforschungszentrum Gemeinnutzige | Univ Rostock | University of Rostock | UFZ Helmholtz Ctr Environm Res | Helmholtz Association | Helmholtz Center for Environmental Research (UFZ) | Dept Biochem Convers | Fac Agr & Environm Sci | Chair Waste Management | Dept Environm Microbiol | Deutsch Biomasseforschungszentrum Gemeinnutzige Dept Biochem Convers Univ Rostock University of Rostock Fac Agr & Environm Sci Chair Waste Management UFZ Helmholtz Ctr Environm Res Helmholtz Association Helmholtz Center for Environmental Research (UFZ) Dept Environm Microbiol	INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES | 16 (9): 20685-20703 SEP 2015
Biogas production from vinasse as an alternative to develop biofuels (Case study:	This paper describes the project for a biogas production unit located at the Mag-Alcoholes S.A. distillery (300,000 L/d) in Guatemala. The ethanol plant is based on sugarcane molasses feedstock. The anaerobic treatment digestion plant 4200 m(3)/day in four biodigesters	Gonzalez, JBM	Asoc Azucareros Guatemala Mag Alcoholes SA	SUGAR INDUSTRY-ZUCKERINDUSTRIE | 139 (10): 617-619 OCT 1 2014

Mag-Alcoholes, SA distillery)	includes both floating membranes to capture methane and are circulation system for sludge to maximise biogas production. The solids are properly separated in the process and the biogas is captured by the reactor roof membranes. Despite the negative pressure, the biogas is sent to the boilers to produce high pressure steam to congestion and low pressure steam for the distillation plant. The result of this process is a balanced treated effluent, with a neutral pH value and rich in minerals and nutrients for use in fertigation.			
Biohydrogen production from pretreated corn cobs	In this study, the co-fermentability of four different pretreated corn cob streams at different mixing ratios was assessed. The four streams, denoted DP, DS, HP, and HS, were: two dilute acid pretreatment comprising one purge and one squeeze and two high pressure autohydrolysis comprising one purge and one squeeze. The "Purge" stream was taken from the steam percolation reactor during cooling and the "Squeeze" stream was recovered from the cooked biomass with a pressing step. In addition, the impact of furfural and 5-hydroxymethylfurfural (HMF) on biohydrogen production potential was evaluated. The DP:DS mix at 50:50 by volume achieved the maximum H-2 yield of 265 (mL/gCOD sugars consumed). Furfural at concentrations of 0.21-1.09 g/L had no impact on H-2 production rates and yields and HMF was below the inhibitory threshold of 0.14 g/L. A positive correlation was observed between the monomeric-to-polymeric sugars ratio and H-2 production rates and yields. Copyright (C) 2014, Hydrogen Energy Publications, LLC. Published by Elsevier Ltd. All rights reserved.	Nasr, N | Gupta, M | Elbeshbishy, E | Hafez, H | El Naggar, MH | Nakhla, G	Univ Western Ontario | Western University (University of Western Ontario) | Univ Waterloo | University of Waterloo | Dept Civil & Environm Engn | Dept Chem & Biochem Engn | Univ Western Ontario Western University (University of Western Ontario) Dept Civil & Environm Engn Univ Western Ontario Western University (University of Western Ontario) Dept Chem & Biochem Engn Univ Waterloo University of Waterloo Dept Civil & Environm Engn	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY | 39 (35): 19921-19927 DEC 3 2014

BIOMETHANE PRODUCTION INTEGRATED TO THE BRAZILIAN SUGARCANE INDUSTRY: THE CASE STUDY OF SAO PAULO STATE	he Brazilian ethanol and sugar production system is intensive in organic wastes generation. The main sugarcane production region (i.e. Sao Paulo State) is committed to increase the share of renewable energy into its matrix, including the promotion of biomethane as alternative fuel to natural gas. The present research assessed the potential biomethane production through the use of the organic wastes generated by the Sugarcane Industry of Sao Paulo State, Brazil. Total sugarcane milled and ethanol production were utilized to estimate the organic wastes generation of the Sugarcane Industry of Sao Paulo State during the 2012/2013 harvesting season, and together with biochemical methane potential (BMP) assays of filter cake, vinasse, bagasse and straw it was possible to simulate different scenarios where the produced biogas was upgraded into biomethane to further substitute the natural gas consumption of Sao Paulo State. The biochemical methane potential assays resulted in a biogas yield of 486, 647, 528 and 395 NmL/gVS, respectively for filter cake, vinasse, bagasse and straw. When these results are utilized to simulate the biomethane production, it was found that, if the entire filter cake generation was converted to biomethane, it could be substituted 10% of the total natural gas consumption in the State. In the same way, if the entire vinasse would be converted to biomethane, 17% of the natural gas consumption could be substituted. Meanwhile, if a fraction of the lignocellulosic organic wastes (1/4 of bagasse and 1/2 straw) would also be used to biomethane production, not only the entire natural gas consumption could be substituted, but also additional energy (equivalent to 54% of the natural gas consumption in the year 2012) could be produced and exported from the State of Sao Paulo.	Janke, L | Leite, A | Wedwitschka, H | Schmidt, T | Nikolausz, M | Stinner, W	Deutsch Biomasseforschungszentrum Gemeinnutzige G | Dept Biochem Convers | Univ Rostock | University of Rostock | Chair Waste Management | Fac Agr & Environm Sci | UFZ Helmholtz Ctr Environm Res | Helmholtz Association | Helmholtz Center for Environmental Research (UFZ) | Dept Bioenergy | Deutsch Biomasseforschungszentrum Gemeinnutzige G Dept Biochem Convers Univ Rostock University of Rostock Chair Waste Management Fac Agr & Environm Sci UFZ Helmholtz Ctr Environm Res Helmholtz Association Helmholtz Center for Environmental Research (UFZ) Dept Bioenergy	PAPERS OF THE 22ND EUROPEAN BIOMASS CONFERENCE: SETTING THE COURSE FOR A BIOBASED ECONOMY | : 1295-1299 2014
Cellulase Production from Spent Lignocellulose Hydrolysates by Recombinant	A recombinant Aspergillus niger strain expressing the Hypocrea jecorina endoglucanase Cel7B was grown on spent hydrolysates (stillage) from sugarcane bagasse and spruce wood. The spent hydrolysates served as excellent growth media for the Cel7B-	Alriksson, B | Rose, SH | van Zyl, WH | Sjode, A | Nilvebrant, NO | Jonsson, LJ	Umea Univ | Umea University | Karlstad Univ | Karlstad University | Univ Stellenbosch | Stellenbosch University | STFI	APPLIED AND ENVIRONMENTAL MICROBIOLOGY | 75 (8): 2366-2374 APR 2009

Aspergillus niger	producing strain, A. niger D15[egl], which displayed higher endoglucanase activities in the spent hydrolysates than in standard medium with a comparable monosaccharide content (e. g., 2,100 nkat/ml in spent bagasse hydrolysate compared to 480 nkat/ml in standard glucose-based medium). In addition, A. niger D15[egl] was also able to consume or convert other lignocellulose-derived compounds, such as acetic acid, furan aldehydes, and phenolic compounds, which are recognized as inhibitors of yeast during ethanolic fermentation. The results indicate that enzymes can be produced from the stillage stream as a high-value coproduct in secondgeneration bioethanol plants in a way that also facilitates recirculation of process water.		Packforsk AB | Dept Chem | Dept Chem & Biomed Sci | Dept Microbiol | Umea Univ Umea University Dept Chem Karlstad Univ Karlstad University Dept Chem & Biomed Sci Univ Stellenbosch Stellenbosch University Dept Microbiol STFI Packforsk AB	
Coagulation-flocculation of anaerobically treated sugarcane stillage	Anaerobic digestion applied to stillage usually results in treatment performances. However, effluents from anaerobic reactors still present a residual polluting load due to the presence of organic recalcitrant compounds. Additional treatment methods, such as coagulation-flocculation, may be utilized to improve the final effluent quality. In this study, we assessed the processes of coagulation and flocculation for sugarcane stillage samples previously submitted to anaerobic digestion, aiming to obtain optimal conditions for the physicochemical treatment. Natural corn starch and ferric chloride were tested as coagulants. While starch was considered as not suitable for the treatment for the tested conditions, ferric chloride assays presented satisfactory results. The investigated parameters included coagulant solution dose, rapid mixing gradient and time, flocculation gradient and time, and sedimentation time. Their adjusted values at which better performances obtained were, respectively, 1.6 g L-1, 325 rpm, 10 s, 65 rpm, 20 and 20 min. The best color, turbidity, and chemical oxygen demand removal efficiencies were 95, 97, and 65%, respectively. Stillage pH variation to alkaline conditions did not result in improved removal efficiencies. Although relatively high removal efficiencies of constituents were obtained, the final effluent	Rodrigues, IJ | Fuess, LT | Biondo, L | Santesso, CA | Garcia, ML	UNESP Univ Estadual Paulista | Universidade Estadual Paulista | Univ Sao Paulo | Universidade de Sao Paulo | Dept Petr & Metallogeny | Inst Geosci & Exact Sci | Sao Carlos Sch Engn | Dept Hydraul & Sanitat | Lab Biol Proc | UNESP Univ Estadual Paulista Universidade Estadual Paulista Dept Petr & Metallogeny Inst Geosci & Exact Sci Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn Dept Hydraul & Sanitat Lab Biol Proc	DESALINATION AND WATER TREATMENT | 52 (22-24): 4111-4121 2014

	characteristics did not fit regulations of water reuse in the agriculture through fertigation. However, stillage can definitely become more easily managed if better final effluent quality control parameters are achieved, enabling for example effluents discharge in water bodies.			
COD and nitrogen removal from sugarcane vinasse by heterotrophic green algae Desmodesmus sp.	Vinasse is the main wastewater from the ethanol fermentation-distillation process, generated in large volumes during industrial sugarcane processing. Desmodesmus is a green algae genus with recognized ability to treat wastewater containing organic matter and to consume nutrients under heterotrophic growth conditions. Thus, the aim of this research was to evaluate Desmodesmus sp. growth in sugarcane vinasse. Results indicated slight elevation of pH, low oxygen, and low carbon dioxide consumption. Nitrogen and chemical oxygen demand (COD) removal were 52.1 and 36.2%, respectively. Specific growth rate of 0.15h(-1) and high yield of COD to biomass at first hour (0.5mgmg(-1)) suggest the feasibility of biomass production of this green algae in sugarcane vinasse.	de Mattos, LFA | Bastos, RG	Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | Ctr Agr Sci | Univ Fed Sao Carlos Universidade Federal de Sao Carlos Ctr Agr Sci	DESALINATION AND WATER TREATMENT | 57 (20): 9465-9473 APR 26 2016
Cogeneration potential in Colombian sugar factories	Nowadays, the Colombian sugar industry is involved in an expansion process, mainly related to the diversification of final products. In this way, since 2005 five ethanol distilleries have been running, covering just 65% of total ethanol demand. The distilleries were designed coupled with a composting plant, based on vinasses and carbonatation sludge from the sugar factory. Both distilleries and composting plants show many features which make them a special case in the ethanol market, so they produce a maximum of 3 L vinasse/L ethanol. Besides, in all cases, the thermal and electrical power requirements in the ethanol plant are supplied by the sugar factory. In this paper, a brief description of technological features of the typical process configuration followed by the Colombian sugar industry is shown. It comprises the steam consumption distribution by sections, the common configuration of the heat exchanger network (HEN) developed for bleed	Castillo, EF | Gomez, AL | Cobo, D | Aguirre, C	Colombian Sugarcane Res Ctr CE NICANA	ZUCKERINDUSTRIE | 135 (9): 561-565 SEP 15 2010

	vapor usage and the role of energy self-sufficiency of the factory played by the bagasse quality. A set of possible scenarios for improving energy efficiency in a selected sugar factory which comprises a modified HEN can be formulated, including a revamping of the existing boiler and finally a new boiler operating at higher pressure. Based on the previous information, the state of the main Colombian cogeneration projects based on sugarcane and its potential impact on the national energy supply is shown. Finally, the paper describes how Colombian governmental requirements for cogeneration plants are flying to establish a legal framework for this novel industrial activity in the country.			
Color Removal from Anaerobically Digested Sugar Cane Stillage by Biomass from Invasive Macrophytes	The ability of untreated and acid-treated biomass from Pistia stratiotes (PL and APL, respectively) and Eichhornia crassipes (ELS and AELS, respectively) to remove color from anaerobically digested sugar cane stillage (ADS) was investigated. The effects of pH (3-8), particle size (<0.75, 0.75-1, 1-4 mm), and biomass concentration (5-15 g/L) on decolorization of ADS were assessed using untreated biomass. After acid modification of biomass (acid-treated), the effects of pH (3-8), biomass concentration (6-10 g/L), time (20480 min), and ADS dilution (non-diluted, 1: 2, 1: 10, 1: 20) on color removal from ADS were evaluated. Scanning electron microscopy and Fourier transform infrared spectroscopy (FTIR) analyses were also performed. A clear effect of particle size on ADS decolorization was found (21.04 +/- 0.75 and 27.87 +/- 0.30 % for 0.75-1 and <0.75 mm, respectively, for ELS; 31.65 +/- 0.23 and 37.82 +/- 0.53 for 1-4 and 0.75-1 mm, respectively, for PL). Decolorization also increased when the untreated biomass concentration was higher (15.41 +/- 0.3 and 27.89 +/- 0.2 % for 5 and 10 g/L, respectively, for ELS; 15.61 +/- 0.11 and 33.06 +/- 1.09 % for 5 and 10 g/L, respectively, for PL). The use of acid-treated biomass enhanced the effect of pH on color removal (48.30 +/- 1.27 and 12.96 +/- 0.27 % for pH of 3 and 7, respectively, for AELS; 47.11 +/- 1.72 and 6.62 +/- 0.21 % for pH of 3 and 7, respectively, for APL). The	Sanchez-Galvan, G | Torres-Quintanilla, E | Sayago, J | Olguin, EJ	Inst Ecol | Instituto Nacional de Ecologia - Mexico | Biotechnol Management Resources Network | Inst Ecol Instituto Nacional de Ecologia - Mexico Biotechnol Management Resources Network	WATER AIR AND SOIL POLLUTION | 226 (4): - APR 2015

	highest rate of color removal obtained using acid-treated biomass was 55.58 +/- 1.82 and 56 +/- 0.77% for AELS and APL, respectively. The FTIR spectra analysis suggested the electrostatic attraction between protonated carboxylic groups on biomass and anionic colored compounds as being one of the adsorption mechanisms for ADS decolorization. The use of dry biomass from invasive macrophytes is an effective alternative for color removal from ADS.			
Combination of chemical coagulation, photo-Fenton oxidation and biodegradation for the treatment of vinasse from sugar cane ethanol distillery	The post-treatment of biodigested sugarcane vinasse was envisaged in the present study following three different approaches: i) coagulation/flocculation - Approach 1; ii) combination of coagulation/flocculation with photo-Fenton reaction Approach 2; iii) coagulation/flocculation followed by biological degradation and photo-Fenton reaction - Approach 3. The coagulation/flocculation per se provided a slight increase in effluent's biodegradability, a decrease in toxicity and turbidity, and provided moderate removals of total organic carbon (TOC), biochemical oxygen demand (BOD5) and chemical oxygen demand (COD). The operating costs associated with chemicals consumption are low (5.7 R$/m(3) approximate to 1.4 (SDC)/m(3)). The second and third treatment approaches allowed to reach a nontoxic effluent, improved the biodegradability and led to similar high global organics removal efficiencies. The combined treatment consisting of coagulation/flocculation plus photo-Fenton oxidation (Approach 2) revealed to be a promising solution for treating this wastewater, in order to be recirculated into the high rate anaerobic reactor. Additionally, this solution provides smaller costs (84.9 R$/m(3) approximate to 20.2 (SIC)/m(3)) associated with chemicals and energy consumption, which are however very high. Nonetheless, this cost can be reduced by about 40% if solar radiation is used in the photo-Fenton process. (C) 2016 Elsevier Ltd. All rights reserved.	Rodrigues, CSD | Neto, AR | Duda, RM | de Oliveira, RA | Boaventura, RAR | Madeira, LM	Univ Porto | Universidade do Porto | Fac Tecnol Jaboticabal | Univ Estadual Paulista | Universidade Estadual Paulista | Fac Engn | Dept Engn Quim | LEPABE | Fac Ciencias Agr & Vet | Dept Engn Rural | Lab Saneamento Ambiental,UNESP | Lab Associado LSRE LCM | LSRE Lab Proc Separacao & Reacao,Dept Engn Quim | Univ Porto Universidade do Porto Fac Engn Dept Engn Quim LEPABE Fac Tecnol Jaboticabal Univ Estadual Paulista Universidade Estadual Paulista Fac Ciencias Agr & Vet Dept Engn Rural Lab Saneamento Ambiental,UNESP Univ Porto Universidade do Porto Fac Engn Lab Associado LSRE LCM LSRE Lab Proc Separacao & Reacao,Dept Engn Quim	JOURNAL OF CLEANER PRODUCTION | 142: 3634-3644 Part 4 JAN 20 2017

Comparison of Aerobic and Anaerobic Biodegradation of Sugarcane Vinasse	Vinasse is the main liquid waste from ethanol production, and it has a considerable pollution potential. Biological treatment is a promising alternative to reduce its organic load. The aim of this study was to analyze the biodegradation of sugarcane juice vinasse in aerobic and anaerobic conditions. The content of carbohydrates, proteins and volatile fatty acids was evaluated. Vinasse samples showed a high biodegradability (> 96.5 %) and low percentage of inert chemical oxygen demand (COD) (< 3.2 %) in both aerobic and anaerobic conditions. The rates of substrate utilization were slightly higher in aerobic reactors, but COD stabilization occurred simultaneously in the anaerobic reactors, confirming its suitability for anaerobic digestion. Inert COD in anaerobic conditions was lower than in aerobic conditions. On the other hand, COD from metabolic products in the anaerobic reactors was higher than in the aerobic ones, indicating an increased release of soluble microbial products (SMPs) by anaerobic microorganisms. The results indicated that carbohydrates were satisfactorily degraded and protein-like substances were the major components remaining after biological degradation of vinasse.	Mota, VT | Araujo, TA | Amaral, MCS	Univ Fed Minas Gerais | Universidade Federal de Minas Gerais | Dept Sanit & Environm Engn | Escola Engn | Univ Fed Minas Gerais Universidade Federal de Minas Gerais Dept Sanit & Environm Engn Escola Engn	APPLIED BIOCHEMISTRY AND BIOTECHNOLOGY | 176 (5): 1402-1412 JUL 2015
Constructed wetland mesocosms for the treatment of diluted sugarcane molasses stillage from ethanol production using Pontederia sagittata	Sugarcane molasses stillage contains a very high concentration of organic matter and toxic/recalcitrant compounds. Its improper disposal has become a global problem and there is very scanty information about its treatment using phytotechnologies. This work aimed at evaluating the performance of subsurface flow constructed wetlands (SSF CWs) mesocosms planted with Pontederia sagittata and operating at two hydraulic retention times (HRTs), compared to an unplanted SSF CWs, for the treatment of diluted stillage subjected to no pre-treatment apart from an adjustment to pH 6.0. CWs were fed with very high surface COD loading rates (i.e. 47.26 and 94.83 g COD/m(2) d). The planted CWs were able to remove COD in the range of 80.24-80.62%, BOD5 in the range of 82.2-0-87.31%, TKN in the range of 73.42-76.07%, nitrates from 56-58.74% and sulfates from 68.58-69.45%,	Olguin, EJ | Sanchez-Galvan, G | Gonzalez-Portela, RE | Lopez-Vela, M	Inst Ecol | Instituto Nacional de Ecologia - Mexico | Unidad Biotecnol Ambiental | Inst Ecol Instituto Nacional de Ecologia - Mexico Unidad Biotecnol Ambiental	WATER RESEARCH | 42 (14): 3659-3666 AUG 2008

	depending on the HRT. Phosphate and potassium were not removed. It was concluded that this type of CWs is a feasible option for the treatment of diluted stillage. (C) 2008 Elsevier Ltd. All rights reserved.			
Continuous Hydrogen Production from Agricultural Wastewaters at Thermophilic and Hyperthermophilic Temperatures	The objective of this study was to investigate the effects of hydraulic retention time (HRT) (8 to 0.5 h) and temperature (55 to 75 degrees C) in two anaerobic fluidized bed reactors (AFBR) using cheese whey (AFBR-CW = 10,000 mg sugars L-1) and vinasse (AFBR-V = 10,000 mg COD L-1) as substrates. Decreasing the HRT to 0.5 h increased the hydrogen production rates in both reactors, with maximum values of 5.36 +/- 0.81 L H-2 h(-1) L-1 in AFBR-CW and 0.71 +/- 0.16 L H-2 h(-1) L-1 in AFBR-V. The optimal conditions for hydrogen production were the HRT of 4 h and temperature of 65 degrees C in AFBR-CW, observing maximum hydrogen yield (HY) of 5.51 +/- 0.37 mmol H-2 g COD-1. Still, the maximum HY in AFBR-V was 1.64 +/- 0.22 mmol H-2 g COD-1 at 4 h and 55 degrees C. However, increasing the temperature to 75 A degrees C reduced the hydrogen production in both reactors. Methanol and butyric, acetic, and lactic acids were the main metabolites at temperatures of 55 and 65 degrees C, favoring the butyric and acetic metabolic pathways of hydrogen production. The increased productions of lactate, propionate, and methanol at 75 degrees C indicate that the hydrogen-producing bacteria in the thermophilic inoculum were inhibited under hyperthermophilic conditions.	Ramos, LR | Silva, EL	Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | Dept Chem Engn | Univ Fed Sao Carlos Universidade Federal de Sao Carlos Dept Chem Engn	APPLIED BIOCHEMISTRY AND BIOTECHNOLOGY | 182 (2): 846-869 JUN 2017
Controllability of runoff and soil loss from small plots treated by vinasse-produced biochar	Many different amendments, stabilizers, and conditioners are usually applied for soil and water conservation. Biochar is a carbon-enriched substance produced by thermal decomposition of organic material in the absence of oxygen with the goal to be used as a soil amendment. Biochar can be produced from a wide range of biomass sources including straw, wood, manure, and other organic	Sadeghi, SH | Hazbavi, Z | Harchegani, MK	Tarbiat Modares Univ | Tarbiat Modares University | Fac Nat Resources | Dept Watershed Management Engn | Watershed Management Engn | Tarbiat Modares Univ	SCIENCE OF THE TOTAL ENVIRONMENT | 541: 483-490 JAN 15 2016

	wastes. Biochar has been demonstrated to restore soil fertility and crop production under many conditions, but less is known about the effects of its application on soil erosion and runoff control. Therefore, a rainfall simulation study, as a pioneer research, was conducted to evaluate the performance of the application of vinasse-produced biochar on the soil erosion control of a sandy clay loam soil packed in small-sized runoff 0.25-m(2) plots with 3 replicates. The treatments were (i) no biochar (control), (ii) biochar (8 t ha(-1)) application at 24 h before the rainfall simulation and (iii) biochar (8 t ha(-1)) application at 48 h before the rainfall simulation. Rainfall was applied at 50mmh(-1) for 15min. The mean change of effectiveness in time to runoff could be found in biochar application at 24 and 48 h before simulation treatment with rate of +55.10% and +71.73%, respectively. In addition, the mean runoff volume 24 and 48 h before simulation treatments decreased by 98.46% and 46.39%, respectively. The least soil loss (1.12 +/- 0.57 g) and sediment concentration (1.44 +/- 0.48 g l(-1)) occurred in the biochar-amended soil treated 48 h before the rainfall simulation. In conclusion, the application of vinasse-produced biochar could effectively control runoff and soil loss. This study provided a new insight into the effects of biochar on runoff, soil loss, and sediment control due to water erosion in sandy clay loam soils. (C) 2015 Elsevier B.V. All rights reserved.		Tarbiat Modares University Fac Nat Resources Dept Watershed Management Engn Tarbiat Modares Univ Tarbiat Modares University Fac Nat Resources Watershed Management Engn	
CULTIVATION OF Aspergillus niger ON SUGARCANE BAGASSE WITH VINASSE	Solid-state cultivation (SSC) involves growth of microorganism in absence or near-absence of free water, employing a natural or inert support. Ethanol production in Brazil from molasses or sugarcane juice generates large volumes of vinasse and sugarcane bagasse, a liquid nutrient medium and a potential carry for SSC, respectively. Consecutively to use the wastes, experiments were set up on packed bed column-reactor with sugarcane bagasse impregnated suspension of Aspergillus niger and vinasse with 80% moisture, 25 degrees C, aeration flow-rate of 0.4L/min of water-saturated air, for 6 days. The results hint the efficiency of the	Oliveira, AF | Matos, VD | Bastos, RG	Fed Univ Sao Carlos UFSCar | Universidade Federal de Sao Carlos | Ctr Agr Sci CCA Araras | Fed Univ Sao Carlos UFSCar Universidade Federal de Sao Carlos Ctr Agr Sci CCA Araras	BIOSCIENCE JOURNAL | 28 (6): 889-894 NOV-DEC 2012

	SSC in this situation, with 1.45g of total acid per g of dry bagasse per day. The purpose is an alternative to right the major residues from sugarcane processing.			
Cultivation of Spirulina maxima in medium supplemented with sugarcane vinasse	The feasibility of sugarcane vinasse as supplement in growth medium of Spirulina maxima was investigated. The cell was cultivated under autotrophic (no vinasse, 70 mu mol photons m(-2) s(-1)), heterotrophic (no light, culture medium supplemented with vinasse at 0.1% v/v and 1.0% v/v) and mixotrophic conditions (70 mu mol photons m(-2) s(-1), vinasse at 0.1% v/v and 1.0% v/v). These preliminary results suggested a cyclic two-stage cultivation - CTSC, with autotrophic condition during light phase of the photoperiod (12 h, 70-200 mu mol photons m(-2) s(-1)) and heterotrophic condition during dark phase (12 h, 3.0% v/v vinasse). The adopted CTSC strategy consisted in three cycles with 75% withdrawal of suspension and reposition of medium containing 3.0% v/v vinasse, separated by autotrophic rest periods of few days between cycles. Results show an increase of biomass concentration between 0.495 g L-1 and 0.609 g L-1 at the 7th day of each cycle and high protein content (between 74.3% and 77.3% w/w). (C) 2016 Elsevier Ltd. All rights reserved.	dos Santos, RR | Araujo, ODF | de Medeiros, JL | Chaloub, RM	Univ Fed Rio de Janeiro | Universidade Federal do Rio de Janeiro | Escola Quim | Ctr Tecnol | Inst Quim | Univ Fed Rio de Janeiro Universidade Federal do Rio de Janeiro Escola Quim Ctr Tecnol Univ Fed Rio de Janeiro Universidade Federal do Rio de Janeiro Inst Quim Ctr Tecnol	BIORESOURCE TECHNOLOGY | 204: 38-48 MAR 2016
Designing full-scale biodigestion plants for the treatment of vinasse in sugarcane biorefineries: How phase separation and alkalinization impact biogas and electricity production costs?	Anaerobic digestion (AD) is the most suitable approach for the management of vinasse in sugarcane distilleries because both environmental adequacy and bioenergy recovery could be achieved through biogas production. Because the literature lacks data on the implementation and operation of full-scale AD plants for enhanced energy recovery from vinasse, this study presents different designs for AD plants applied to vinasse in large-scale distilleries, considering both single- and two-phase schemes and different alkalizing strategies. Investment and operating costs and biogas and electricity production costs were obtained for each case. The results indicate that phase separation is economically feasible when scaling up AD plants in	Fuess, LT | de Araujo, MM | Garcia, ML | Zaiat, M	Univ Sao Paulo | Universidade de Sao Paulo | Bio Proj Tecnol Ambiental | UNESP Univ Estadual Paulista | Universidade Estadual Paulista | Sao Carlos Sch Engn EESC | Biol Proc Lab LPB | Inst Geosci & Exact Sci | Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn EESC Biol Proc Lab LPB Bio Proj Tecnol Ambiental	CHEMICAL ENGINEERING RESEARCH & DESIGN | 119: 209-220 MAR 2017

	biorefineries. Despite the higher capital and operating costs in such schemes, the estimated biogas and electricity production costs reached equivalent or lower values compared with those of single-phase AD layouts, depending on the alkalizing strategy used. With respect to the alkalizing strategy, the best results were associated with sodium hydroxide dosing and/or effluent recirculation, with electricity costs reaching values 1.8- to 2.3-fold lower than grid electricity. In contrast, the competitive use of sodium bicarbonate in AD plants for treating vinasse requires further dosing optimization. (C) 2017 Institution of Chemical Engineers. Published by Elsevier B.V. All rights reserved.		UNESP Univ Estadual Paulista Universidade Estadual Paulista Inst Geosci & Exact Sci	
Determination of Electroactive Organic Acids in Sugarcane Vinasse by High Performance Anion-Exchange Chromatography with Pulsed Amperometric Detection Using a Nickel Nanoparticle Modified Boron-Doped Diamond	Ethanol production process generates a huge quantity of vinasse. A suitable destination for this byproduct may be its utilization as source of chemical substances, by recovery within the biorefinery process. Vinasse is rich in organic acids, which present value-added due to their many industrial applications. In this context, the present work aimed the development of an anion-exchange chromatographic method with pulsed amperometric detection, using oxidized nickel nanoparticle modified boron-doped diamond electrode, to determine industrially interesting electroactive organic acids, such as lactic acid, malic acid, and tartaric acid, in sugarcane vinasse. The chromatographic separation was carried out in a CarboPac PA 1 column under gradient elution employing different proportions of 0.10 mol L-1 NaOH in 0.25 mol L-1 CH3COONa and deionized water. Under these conditions, lactic acid, malic acid, and tartaric acid were separated in 27 min. The limits of detection were 1.2 x 10(-4) mol L-1 for lactic acid, 6.1 X 10(-5) mol L-1 for malic acid, and 2.8 x 10(-5) mol L-1 for tartaric acid. The concentration of each organic acid in sugarcane vinasse was determined to be (1.2 +/- 0.3) x 10(-1) mol L-1 lactic acid, (2.7 +/- 0.6) x 10(-3) mol L-1 malic acid, and (9.9 +/- 1.0) X 10(-4) mol L-1 tartaric acid. The values of recovery between 97.4 and 107.6% indicated the method has excellent accuracy.	Sedenho, GC | da Silva, JL | Beluomini, MA | de Sa, AC | Stradiotto, NR	Univ Estadual Paulista | Universidade Estadual Paulista | UNESP | Inst Chem Araraquara | Dept Analyt Chem | Univ Estadual Paulista Universidade Estadual Paulista UNESP Inst Chem Araraquara Dept Analyt Chem	ENERGY & FUELS | 31 (3): 2865-2870 MAR 2017

	Our results showed the present method is attractive for routine analysis during the ethanol production process because of the not costly and not time-consuming sample preparation, no need for organic solvent, rapid run time, and satisfactory separation. Thus, it can contribute to the process of utilization of sugarcane vinasse as a source of value-added chemical substances.			
Diplopods as Soil Bioindicators of Toxicity After Application of Residues From Sewage Treatment Plants and Ethanol Industry	Residues like sewage sludge and vinasse have been reused as agricultural fertilizers, but they also present a potential to contaminate soils. Diplopods have been considered excellent bioindicators of soil contamination. In the present study, Rhinocricus padbergi were used to assess toxicity in samples of sewage sludge, biosolids, and sugarcane vinasse. The behavioral analysis, mortality rate, and histological, histochemical, and ultrastructural analyses of the midgut of diplopods were the parameters evaluated. Behaviorally, some diplopods avoided burying themselves after 30 days in soil with biosolid or vinasse. Besides, certain residue combinations were able to cause death of all individuals between 60 and 90 days of exposure. The main tissue responses were significant brush border thickening, induction of epithelial renovation, clustering of hemocytes, accumulation of cytoplasmic granules in hepatic cells, hepatic cells with heteropycnotic nuclei, and cytoplasmic degradation. Alterations were observed at various levels among treatments with different samples and exposure times. Ultrastructural analysis revealed elongation of microvilli coated with a layer of an amorphous substance, resulting in a thicker brush border as observed in the histological analysis. After 30 days of exposure, animals showed an accumulation of spherocrystals in hepatic cells and high absorption of substances, based on the elongation of microvilli. Results obtained in the chemical analysis and the behaviors observed in diplopods suggest that animals processed the residues. Therefore, caution should be exercised in the disposal of these residues in agriculture.	Christofoletti, CA | Francisco, A | Pedro-Escher, J | Gastaldi, VD | Fontanetti, CS	UNESP Sao Paulo State Univ | Universidade Estadual Paulista | Herminio Ometto Univ Ctr UNIARARAS | Centro Universitario Herminio Ometto | Inst Biosci | Dept Biol | Struct Biol Lab | UNESP Sao Paulo State Univ Universidade Estadual Paulista Inst Biosci Dept Biol Herminio Ometto Univ Ctr UNIARARAS Centro Universitario Herminio Ometto Struct Biol Lab	MICROSCOPY AND MICROANALYSIS | 22 (5): 1098-1110 OCT 2016

Distribution of Dekkera bruxellensis in a sugarcane-based fuel ethanol fermentation plant	We investigated the presence of the yeast Dekkera bruxellensis in samples collected at three points surrounding the industrial alcoholic fermentation plants of two distilleries where there are often cases of contamination caused by this yeast: this involved sugar cane wash water, feeding sugar cane juice and vinasse from the treatment pond. Total yeast was isolated in WLN medium with bromocresol green and cycloheximide and further selected on the basis of its ability to grow in synthetic medium containing nitrate. Following this, colonies were selected from the distribution on nitrate plates and identified by amplification with species-specific primers and DNA sequencing of the 26S-D1/D2 locus. The results showed that D.bruxellensis is introduced through the feeding substrate, which suggests that its cells originated with the harvested cane. Subsequently, its population circulates as a result of the reuse of water for washing the cane, in a continuous re-inoculation of the plant with yeasts. Furthermore, the yeast population is formed in the vinasse by the addition of wash water into the treatment ponds and then reintroduced to the culture fields by fertigation, so that the process can be renewed in the following season. It is now possible to adopt sanitation procedures that can prevent the entry of the contamination to the fermentation process. Significance and Impact of the StudyThe presence of the yeast Dekkera bruxellensis is sometimes attributed to a decline in the industrial productivity of ethanol since it has a more limited fermentation capacity than Saccharomyces cerevisiae. Although its adaptability to the industrial environment has been noted, so far, there has been no evidence to determine the source of this contamination. In this study, we provide evidence to show that D.bruxellensis comes from the fields together with the harvested cane and is then accumulated and recirculated. It might be possible to prevent the accumulation of this yeast by carrying out sanitation controls during the harvesting season. Significance and Impact of the Study: The presence of the	da Silva, TCD | Leite, FCB | De Morais, MA	Univ Fed Pernambuco | Universidade Federal de Pernambuco | Univ Fed Rural Pernambuco | Universidade Federal Rural de Pernambuco (UFRPE) | Interdept Res Grp Metab Engn | Dept Biol | Dept Genet | Univ Fed Pernambuco Universidade Federal de Pernambuco Interdept Res Grp Metab Engn Univ Fed Rural Pernambuco Universidade Federal Rural de Pernambuco (UFRPE) Dept Biol Univ Fed Pernambuco Universidade Federal de Pernambuco Dept Genet	LETTERS IN APPLIED MICROBIOLOGY | 62 (4): 354-358 APR 2016

	yeast Dekkera bruxellensis is sometimes attributed to a decline in the industrial productivity of ethanol since it has a more limited fermentation capacity than Saccharomyces cerevisiae. Although its adaptability to the industrial environment has been noted, so far, there has been no evidence to determine the source of this contamination. In this study, we provide evidence to show that D.bruxellensis comes from the fields together with the harvested cane and is then accumulated and recirculated. It might be possible to prevent the accumulation of this yeast by carrying out sanitation controls during the harvesting season.			
Down-flow fixed-structured bed reactor: An innovative reactor configuration applied to acid mine drainage treatment and metal recovery	A down-flow fixed-structured bed reactor (DFSBR) was operated for 277 days treating a mixture of synthetic substrates simulating an iron-rich acid mine drainage (AMD) and the soluble fraction of a sugarcane vinasse. The synthetic sugarcane vinasse was used as electron donor for biological sulfate reduction, resulting in influent chemical oxygen demand (COD) close to 4000 mg L-1 and volumetric organic loading rate of 4.8 g L(-1)d(-1). The influent sulfate concentration was kept close to 2000 mg L-1 (volumetric sulfate loading rate of 2.5 g L(-1)d(-1)) while a gradual increase of iron concentration (2-400 mg L-1) was applied. COD removal efficiencies were higher than 93% and the sulfate removal efficiencies were close to 100%. With the highest iron concentration (400 mg L-1) applied, the DFSBR achieved 95% of iron removal efficiency. The precipitate collected at the reactor bottom showed increasing concentrations of fixed suspended solids (FSS), as well as an increasing proportion of iron, indicating the possibility of metal recovery from the system. The association between sulfidogenic and methanogenic processes also enables energy recovery from the methane-rich biogas produced. (C) 2017 Elsevier Ltd. All rights reserved.	de Godoi, LAG | Foresti, E | Damianovic, MHRZ	Univ Sao Paulo | Universidade de Sao Paulo | LPB | Sao Carlos Sch Engn EESC | Univ Sao Paulo Universidade de Sao Paulo LPB Sao Carlos Sch Engn EESC	JOURNAL OF ENVIRONMENTAL MANAGEMENT | 197: 597-604 JUL 15 2017
Economic evaluation of the replacement of sugar cane	Sugarcane had its participation in the Brazilian energy sector boosted when PROALCOOL was enacted, a program that encourages the production of ethanol fuel made	Pazuch, FA | Nogueira, CEC | Souza, SNM | Micuanski, VC	Jardim Univ | UNIOESTE PPGEA | Jardim Univ UNIOESTE PPGEA	RENEWABLE & SUSTAINABLE ENERGY REVIEWS | 76: 34-42 SEP 2017

bagasse by vinasse, as a source of energy in a power plant in the state of Parana, Brazil	from sugarcane. The ethanol production process generates a residue in large proportions, called vinasse. This study aimed to assess the economic feasibility of using vinasse to produce electricity in an ethanol plant located in the northwestern region of the state of Parana, Brazil. The electricity generated will be consumed by the plant itself, and the sugarcane bagasse, which was used to be burned in a boiler to generate that electricity, will now be sold to other consumers. The study was conducted considering two operating modes. For each operation, it was considered five scenarios, ranging from the most optimistic (highest salesprice per ton of sugarcane bagasse) to the most pessimistic (lowest sales price per ton of sugarcane bagasse). It was calculated the feasibility of the project by using the Internal Rate of Return (IRR), Net Present Value (NPV) and the discounted payback period. All indexes indicated great economic feasibility to project development. It was conducted an NPV sensitivity analysis considering the variation of the sales price of sugarcane bagasse, the quantity sold and the fixed costs involved. It was also carried out a Probability Analysis, using 1000 NPV simulations, considering that the change in the selling price of the bagasse has a normal distribution. The energy production cost for the expected scenario in Operations 1 and 2 were, respectively, US$51.98MWH(-1) and US$ 86.64MWh(-1).	| Friedrich, L | Lenz, AM		
Economic process to produce biohydrogen and volatile fatty acids by a mixed culture using vinasse from sugarcane ethanol industry as nutrient source	This work evaluates the potential of vinasse (a waste obtained at the bottom of sugarcane ethanol distillation columns) as nutrient source for biohydrogen and volatile fatty acids production by means of anaerobic consortia. Two different media were proposed, using sugarcane juice or molasses as carbon source. The consortium LPBAH1 was selected for fermentation of vinasse supplemented with sugarcane juice, resulting in a higher H-2 yield of 7.14 molH(2) molsucrose (1) and hydrogen content in biogas of approx. 31%, while consortium LPBAH2 resulted in 3.66 molH(2)/molsucrose and 32.7%	Sydney, EB | Larroche, C | Novak, AC | Nouaille, R | Sarma, SJ | Brar, SK | Letti, LAJ | Soccol, VT | Soccol, CR	Univ Fed Parana | Universidade Federal do Parana | Univ Clermont Ferrand | Blaise Pascal University | Ctr Eau Terre Environm | University of Quebec | Bioproc Engn & Biotechnol Dept | Ctr Politecn | Clermont Univ | Labex IMobS3 | Inst Pascal,Polytech Clermont	BIORESOURCE TECHNOLOGY | 159: 380-386 MAY 2014

	hydrogen content in biogas. The proposed process showed a rational and economical use for vinasse, a mandatory byproduct of the renewable Brazilian energy matrix. (C) 2014 Elsevier Ltd. All rights reserved.		Ferrand | Inst Natl Rech Sci | Univ Fed Parana Universidade Federal do Parana Bioproc Engn & Biotechnol Dept Ctr Politecn Univ Clermont Ferrand Blaise Pascal University Clermont Univ Labex IMobS3 Inst Pascal,Polytech Clermont Ferrand Ctr Eau Terre Environm University of Quebec Inst Natl Rech Sci	
Effect of anaerobic digestion on sequential pyrolysis kinetics of organic solid wastes using thermogravi metric analysis and distributed activation energy model	Thermogravimetric analysis, Gaussian-fit-peak model (GFPM), and distributed activation energy model (DAEM) were firstly used to explore the effect of anaerobic digestion on sequential pyrolysis kinetic of four organic solid wastes (OSW). Results showed that the OSW weight loss mainly occurred in the second pyrolysis stage relating to organic matter decomposition. Compared with raw substrate, the weight loss of corresponding digestate was lower in the range of 180-550 degrees C, but was higher in 550-900 degrees C. GFPM analysis revealed that organic components volatized at peak temperatures of 188-263, 373-401 and 420-462 degrees C had a faster degradation rate than those at 274-327 degrees C during anaerobic digestion. DAEM analysis showed that anaerobic digestion had discrepant effects on activation energy for four OSW pyrolysis, possibly because of their different organic composition. It requires further investigation for the special organic matter, i.e., protein-like and carbohydrate-like groups, to confirm the assumption. (C) 2016 Elsevier Ltd. All rights reserved.	Li, XW | Mei, QQ | Dai, XH | Ding, GJ	Shanghai Univ | Shanghai University | Tongji Univ | Tongji University | Sch Environm & Chem Engn | Coll Environm Sci & Engn | Natl Engn Res Ctr Urban Pollut Control | State Key Lab Pollut Control & Resources Reuse | Shanghai Univ Shanghai University Sch Environm & Chem Engn Tongji Univ Tongji University Coll Environm Sci & Engn Natl Engn Res Ctr Urban Pollut Control State Key Lab Pollut Control & Resources Reuse	BIORESOURCE TECHNOLOGY | 227: 297-307 MAR 2017

Effect of dietary inclusion of dried or autoclaved sugarcane bagasse and vinasse on live performance and in vitro evaluations on growing rabbits	The current study was conducted to evaluate the potential use of dried or autoclaved sugarcane bagasse, enriched or non-enriched with vinasse, in diets for growing rabbits, by assessing the growth and slaughtering performance, in vitro digestibility, degradability and fermentation parameters. A total of 110 rabbits were used, distributed in five groups with 22 animals each in a completely randomized design and fed diets containing: 100 g/kg of dried sugarcane bagasse (DB); 100 g/kg of dried sugarcane bagasse enriched with vinasse (DBV); 100 g/kg of autoclaved sugarcane bagasse (AB); 100 g/kg of autoclaved sugarcane bagasse enriched with vinasse (ABV); and a control diet, without bagasse or vinasse. The in vitro assays were conducted employing cecum inoculum on the same aforementioned dietary treatments. The results showed that all bagasses show high amounts of aNDF (742-900 g/kg DM), ADF (493-616 g/kg DM) and lignins (88.1-136 g/kg DM), and low CP (22.6-30.3 g/kg DM). The inclusion of vinasse increased the in vitro DM digestibility and in vitro DM degradability of the diets (0.72 and 0.67, respectively). The control diet presented higher in vitro DM degradability (0.68) when compared to DB (0.65) and AB (0.65), but was no significantly different to the DBV (0.67) and ABV (0.66) diets. For diets with autoclaved bagasse, vinasse inclusion increased the specific gas production rate from 4.33 to 4.74. Maximum fermentation rate was higher for ABV than for DBV diet (6.09 vs. 5.54 mL/h, respectively), and the autoclaving of bagasse and inclusion of vinasse increased the lag time. Bagasse autoclaving increased FCR from 30 to 51 days (2.26 vs. 2.44), and FCR from 51 to 72 days was reduced by inclusion of vinasse (4.84 and 5.28). There were no significant differences to live weight, ADG, ADFI and slaughter weight among the groups. Autoclaving bagasse reduced the relative liver weight and increased caecal N NH3 content. Moreover, the N NH3 of the control group (3.71 mmol/L) was lower than DBV (4.64 mmol/L), AB (5.01 mmol/L) and ABV (5.11	Ferreira, FNA | Ferreira, WM | Neta, CSS | Inacio, DFD | Mota, KCD | da Costa, MB | da Rocha, LF | Lara, LB | Fontes, DD	Univ Fed Minas Gerais | Universidade Federal de Minas Gerais | Dept Anim Sci | Univ Fed Minas Gerais Universidade Federal de Minas Gerais Dept Anim Sci	ANIMAL FEED SCIENCE AND TECHNOLOGY | 230: 87-95 AUG 2017

	mmol/L), but similar to the DB group (4.05 mmol/L). The results of this study revealed that 100 g/kg of sugarcane bagasse can be included in the diet of growing rabbits without adverse effects on growth performance. Additionally, autoclaving and vinasse inclusion promote higher rate and extent of in vitro digestion, which is reflected on the caecal activity.			
Effect of organic loading rate on hydrogen production from sugarcane vinasse in thermophilic acidogenic packed bed reactors	This study evaluated the effect of organic loading rate (OLR) on hydrogen production in up-flow anaerobic packed bed reactors (APBR) continuously fed with sugarcane vinasse. Four thermophilic up-flow APBR were operated in parallel at different ORL. Continuous hydrogen production was detected. The optimum OLR of 84.2 kg-COD m(-3) d(-1) was assessed by polynomial adjustment, which predicted a maximum Volumetric Hydrogen Production (VHP) and hydrogen yield (Y-H2) of 1117.2 mL-H-2 d(-1) L-reactor(-1) and 2.4 mol-H-2 mol(total carbohydrates)(-1), respectively. The microbial composition was monitored using 16S rRNA gene by Terminal Restriction Fragment Length Polymorphism (T-RFLP) analysis and quantification of Fe-hydrogenase gene by real-time PCR which was affected by the OLR. The number of the Fe-hydrogenase genes was proportional to the monitored hydrogen production and yield. Hydrogen-producing strains were isolated, and the 16S rRNA gene sequences were highly homologous to those of Thermoanaerobacterium thermosaccarolyticum. The ability of vinasse as substrate for hydrogen production was confirmed for both strains.	Ferraz, ADN | Wenzel, J | Etchebehere, C | Zaiat, M	CTBE Brazilian Bioethanol Sci & Technol Lab CNPEM | Inst Invest Biol Clemente Estable | Instituto de Investigaciones Biologicas Clemente Estable Uruguay | Univ Sao Paulo | Universidade de Sao Paulo | Lab Ecol Microbiana | Dept Bioquim & Genom Microbiana | Sao Carlos Sch Engn EESC | Ctr Res Dev & Innovat Environm Engn | Biol Proc Lab | CTBE Brazilian Bioethanol Sci & Technol Lab CNPEM Inst Invest Biol Clemente Estable Instituto de Investigaciones Biologicas Clemente Estable Uruguay Lab Ecol Microbiana Dept Bioquim & Genom Microbiana Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn EESC Ctr Res Dev & Innovat Environm Engn Biol Proc Lab	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY | 39 (30): 16852-16862 OCT 13 2014

Effect of the reaction medium on the immobilization of nutrients in hydrochars obtained using sugarcane industry residues	In this study, nutrients were immobilized on the hydrochars obtained by hydrothermal carbonization (HTC) of a vinasse and sugarcane bagasse mixture, in the presence of acid, base and salt additives at temperatures of 150, 190 and 230 degrees C. The increase in temperature caused higher immobilization of Ca, Mg, K, N, Cu, Mn, Zn, B, P and Fe in all hydrochars produced. H3PO4 and NaOH immobilized higher amounts of P, Mg and Mn, while Ca was immobilized in higher quantities in the presence of H3PO4 and (NH4)(2)SO4. The addition of H2SO4, H3PO4 and (NH4)(2)SO4 was responsible for an increased immobilization of P, N, Ca, Mg and K. The immobilization of B, not present in the starting raw material, was possible with the addition of H3BO3. The results showed that it is possible to alter the reaction medium to immobilize nutrients on hydrochars produced from vinasse and sugarcane bagasse, for agricultural applications. (C) 2017 Elsevier Ltd. All rights reserved.	Silva, CC | Melo, CA | Soares, FH | Moreira, AB | Ferreira, OP | Bisinoti, MC	Univ Estadual Paulista | Universidade Estadual Paulista | Univ Fed Ceara | Universidade Federal do Ceara | UNESP | Inst Biociencias Letras & Ciencias Exatas | Dept Quim & Ciencias Ambientais,Lab Estudos Cienc | Dept Fis | LaMFA | Univ Estadual Paulista Universidade Estadual Paulista UNESP Inst Biociencias Letras & Ciencias Exatas Dept Quim & Ciencias Ambientais,Lab Estudos Cienc Univ Fed Ceara Universidade Federal do Ceara Dept Fis LaMFA	BIORESOURCE TECHNOLOGY | 237: 213-221 Sp. Iss. SI AUG 2017
Effects of Vinasse and Press Mud Application on the Biological Properties of Soils and Productivity of Sugarcane	The present study has been conducted to investigate the effects of vinasse and press mud (PM) (sugar industry by-products) applications on sugarcane soil microbial population, its enzyme activities and biomass carbon and nitrogen in order to work out its potential to be used as bio-friendly fertilizer. The treatments were compared with traditional chemical fertilizer (CF) applications. Vinasse and PM amended soils were found to have slightly lower pH and higher total N and C content, however, the difference was insignificant with CF amended soils. Both the treatments increased sugarcane yield compared to chemical fertilizer, but this increase was not significant in PM amended soils. The populations of fungi, bacteria and actinomycetes increased in vinasse and PM amended soils. This increase in former one was significant in PM amended soils only, and that of the latter in vinasse amended soil. The biomass C and N contents were also higher in both the treatments, however, only the former one had significant difference with CF. Amongst the soil enzymes, the activities of cellulase, phosphatase and	Yang, SD | Liu, JX | Wu, J | Tan, HW | Li, YR	Minist Agr | Chinese Acad Agr Sci | Chinese Academy of Agricultural Sciences | Guangxi Acad Agr Sci | Guangxi Univ | Guangxi University | Guangxi Crop Genet Improvement & Biotechnol Lab | Key Lab Sugarcane Biotechnol & Genet Improvement | Sugarcane Res Ctr | Guangxi Key Lab Sugarcane Genet Improvement | Coll Agr | State Key Lab Conservat & Utilizat Subtrop Agrobi | Minist Agr Guangxi Crop Genet Improvement &	SUGAR TECH | 15 (2): 152-158 JUN 2013

	aminopeptidase were significantly higher in PM treatment while these were at par in vinasse and CF treatments. These results showed a potential possibility of substituting chemical fertilizers with vinasse and press mud which besides improving soil health and enhancing sugarcane productivity, can also solve the problem of their disposal in free environment.		Biotechnol Lab Key Lab Sugarcane Biotechnol & Genet Improvement Chinese Acad Agr Sci Chinese Academy of Agricultural Sciences Sugarcane Res Ctr Guangxi Key Lab Sugarcane Genet Improvement Guangxi Acad Agr Sci Guangxi Univ Guangxi University Coll Agr State Key Lab Conservat & Utilizat Subtrop Agrobi	
Enhancing biogas production from vinasse in sugarcane biorefineries: Effects of urea and trace elements supplementation on process performance and stability	In this study, the effects of nitrogen, phosphate and trace elements supplementation were investigated in a semi-continuously operated upflow anaerobic sludge blanket system to enhance process stability and biogas production from sugarcane vinasse. Phosphate in form of KH2PO4 induced volatile fatty acids accumulation possibly due to potassium inhibition of the methanogenesis. Although nitrogen in form of urea increased the reactor's alkalinity, the process was overloaded with an organic loading rate of 6.1 g COD L-1 d(-1) and a hydraulic retention time of 3.6 days. However, by supplementing urea and trace elements a stable operation even at an organic loading rate of 9.6 g COD L-1 d(-1) and a hydraulic retention time of 2.5 days was possible, resulting in 79% higher methane production rate with a stable specific methane production of 239 mL g COD-1. (C) 2016 Elsevier Ltd. All rights reserved.	Janke, L | Leite, AF | Batista, K | Silva, W | Nikolausz, M | Nelles, M | Stinner, W	Deutsch Biomasseforschungszentrum Gemeinnutzige | Dept Biochem Convers | Univ Rostock | Justus Liebig University Giessen | University of Rostock | Chair Waste Management | Fac Agr & Environm Sci | UFZ Helmholtz Ctr Environm Res | Helmholtz Association | Helmholtz Center for Environmental Research (UFZ) | Dept Environm Microbiol | Deutsch Biomasseforschungszentrum Gemeinnutzige Dept Biochem Convers Univ Rostock Justus Liebig University Giessen University of Rostock Chair Waste Management Fac Agr & Environm Sci	BIORESOURCE TECHNOLOGY | 217: 10-20 Sp. Iss. SI OCT 2016

			UFZ Helmholtz Ctr Environm Res Helmholtz Association Helmholtz Center for Environmental Research (UFZ) Dept Environm Microbiol	
Environmental and energy assessment of the substitution of chemical fertilizers for industrial wastes of ethanol production in sugarcane cultivation in Brazil	Purpose Vinasse and filter cake are residues of bioethanol processing that are used to be recycled as fertilizers in sugarcane plantation. Studies related to the environmental dimension on this practice are concerned only with the effects on water and soil. The present study examines the systemic effects of replacing chemical fertilizers with vinasse and filter cake on the environmental performance of ethanol, via life cycle assessment (LCA). Methods The analysis was carried out by comparing various scenarios structured from two control variables: crop management techniques (manual and mechanized harvesting) and source of nutrients (for supplying the nutritional needs of sugarcane crops): chemical fertilizers, chemical fertilizers + vinasse, and chemical fertilizer + vinasse + filter cake. Impact assessment was carried out in terms of primary energy demand, climate change, terrestrial acidification, freshwater eutrophication, human toxicity, and terrestrial ecotoxicity. LCA has been applied according to both attributional and consequential perspectives. Moreover, a sensitivity analysis was performed in order to verify the effects of the varying amounts of nitrogen (N), phosphorus (P), and potassium (K) in the composition of vinasse on the results obtained for the impact profile. Results and discussion From the attributional LCA perspective, the most expressive contributions regarding primary energy demand occurred in terms of depletion of non-renewable fossils. Replacing chemical fertilizers with vinasse and filter	Moore, CCS | Nogueira, AR | Kulay, L	Univ Sao Paulo | Universidade de Sao Paulo | Chem Engn Dept | Polytech Sch | Univ Sao Paulo Universidade de Sao Paulo Chem Engn Dept Polytech Sch	INTERNATIONAL JOURNAL OF LIFE CYCLE ASSESSMENT | 22 (4): 628-643 APR 2017

	cake was beneficial for the environmental performance of ethanol as it reduces climate change, terrestrial acidification, and human toxicity impacts and sustains freshwater eutrophication and terrestrial ecotoxicity unaltered in relation to scenarios using only fertilizers. In terms of consequential LCA, ethanol's environmental performance is influenced by the inclusion of the production of calcium fluorite to compensate the hexafluorosilicic acid deficit occurring in conjunction to the decrease of phosphate fertilizer and is compensated by the benefits provided by the general reduced consumption of chemical fertilizers for most of the impact categories. The exception occurred for primary energy demand. Conclusions The reuse of residues from bioethanol production-vinasse and filter cake-as primary nutrient suppliers for the cultivation of sugarcane instead of chemical fertilizers is a valid practice that improves the environmental performance of ethanol, even if it is analyzed under a consequential LCA perspective. The transport of these inputs to the field must be managed, however, in order to minimize primary energy demand and climate change impacts.			
Ethanol production in Brazil: a bridge between science and industry	In the last 40 years, several scientific and technological advances in microbiology of the fermentation have greatly contributed to evolution of the ethanol industry in Brazil. These contributions have increased our view and comprehension about fermentations in the first and, more recently, second-generation ethanol. Nowadays, new technologies are available to produce ethanol from sugarcane, corn and other feedstocks, reducing the off-season period. Better control of fermentation conditions can reduce the stress conditions for yeast cells and contamination by bacteria and wild yeasts. There are great research opportunities in production processes of the first-generation ethanol regarding high-value added products, cost reduction and selection of new industrial yeast strains that are more robust and customized for each distillery. New technologies have also focused on	Lopes, ML | Paulillo, SCD | Godoy, A | Cherubin, RA | Lorenzi, MS | Giometti, FHC | Bernardino, CD | Neto, HBA | de Amorim, HV	Fermentec	BRAZILIAN JOURNAL OF MICROBIOLOGY | 47: 64-76 Suppl. 1 DEC 2016

	the reduction of vinasse volumes by increasing the ethanol concentrations in wine during fermentation. Moreover, conversion of sugarcane biomass into fermentable sugars for second-generation ethanol production is a promising alternative to meet future demands of biofuel production in the country. However, building a bridge between science and industry requires investments in research, development and transfer of new technologies to the industry as well as specialized personnel to deal with new technological challenges. (C) 2016 Sociedade Brasileira de Microbiologia. Published by Elsevier Editora Ltda.			
Evaluation of hydrogen and methane production from sugarcane vinasse in an anaerobic fluidized bed reactor	This study evaluated the hydrogen and methane production from sugarcane vinasse in an anaerobic fluidized bed reactor. Two reactors were operated with two different substrate concentrations: R5 (5 g COD L-1) and R10 (10 g COD L-1). During the first stage, glucose was used as the primary carbon source; vinasse was then added from 0% to 100% of the organic source in hydraulic retention time (HRT) of 6 h. Later, HRT was changed to 4, 2 and 1 h. The best hydrogen production rate was 0.57 L h(-1) L-1 (R5, HRT = 1 h, 100% vinasse). The best hydrogen yield was 3.07 mmol H-2 g(-1) CODadded (R5, HRT = 6h, vinasse:glucose = 1:3). Main metabolites were ethanol, butyric acid, propionic acid and methanol. Denaturing gradient gel electrophoresis analysis identified Prevotella sp. and Megasphaera sp. belonging to the Bacteria domain and Methanobacterium sp. and Methanosphaera sp. belonging to the Archaea domain. Copyright (C) 2015, Hydrogen Energy Publications, LLC. Published by Elsevier Ltd. All rights reserved.	dos Reis, CM | Carosia, MF | Sakamoto, IK | Varesche, MBA | Silva, EL	Univ Fed Sao Carlos | Univ Sao Paulo | Dept Chem Engn | Sch Engn Sao Carlos | Dept Hydraul & Sanitat | Univ Fed Sao Carlos Dept Chem Engn Univ Sao Paulo Sch Engn Sao Carlos Dept Hydraul & Sanitat	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY | 40 (27): 8498-8509 JUL 20 2015
Evaluation of sugar-cane vinasse treated with Pleurotus sajor-caju utilizing aquatic organisms as toxicological indicators	Toxicity tests with aquatic organisms constitute an effective tool in the evaluation, prediction and detection of the potential effect of pollutants from environmental samples in living organisms. Vinasse, a highly colored effluent, is a sub-product rich in nutrients, mainly organic matter, with high pollutant potential when disposed in the environment. Assays for vinasse decolorization were performed using the fungus Pleurotus sajor-caju CCB020 in	Ferreira, LFR | Aguiar, MM | Messias, TG | Pompeu, GB | Lopez, AMQ | Silva, DP | Monteiro, RT	USP | Universidade de Sao Paulo | Univ Fed Alagoas UFAL | Universidade Federal de Alagoas | Univ Tiradentes | Universidade Tiradentes | Univ Minho | Universidade do Minho | Ctr	ECOTOXICOLOGY AND ENVIRONMENTAL SAFETY | 74 (1): 132-137 JAN 2011

	vinasse biodegradation study, were occurred reductions of 82.8% in COD, 75.3% in BOD, 99.2% in the coloration and 99.7% in turbidity. The vinasse toxicity reduction was determined by the exposition to the following organisms: Pseudokirchneriella subcapitata, Daphnia magna, Daphnia similis and Hydra attenuata. This work concluded that the systematic combination of P. sajor-caju and vinasse can be applied in the bioprocess of color reduction and degradation of complex vinasse compounds, with reduction in the toxicity and improving its physical-chemical properties. (C) 2010 Elsevier Inc. All rights reserved.		Energia Nucl Agr | Inst Quim & Biotecnol IQB | Lab Bioquim Parasitismo & Microbiol Ambiental | Inst Tecnol & Pesquisa | Ctr Biol Engn | IBB Inst Biotechnol & Bioengn | USP Universidade de Sao Paulo Ctr Energia Nucl Agr Univ Fed Alagoas UFAL Universidade Federal de Alagoas Inst Quim & Biotecnol IQB Lab Bioquim Parasitismo & Microbiol Ambiental Univ Tiradentes Universidade Tiradentes Inst Tecnol & Pesquisa Univ Minho Universidade do Minho Ctr Biol Engn IBB Inst Biotechnol & Bioengn	
Expansion of sugarcane ethanol production in Brazil: Environmental and social challenges	Several geopolitical factors, aggravated by worries of global warming, have been fueling the search for and production of renewable energy worldwide for the past few years. Such demand for renewable energy is likely to benefit the sugarcane ethanol industry in Brazil, not only because sugarcane ethanol has a positive energetic balance and relatively low production costs, but also because Brazilian ethanol has been successfully produced and used as biofuel in the country since the 1970s. However, environmental and social impacts associated with ethanol production in Brazil can become important obstacles to sustainable biofuel production worldwide. Atmospheric pollution from burning of sugarcane for harvesting, degradation of soils and aquatic systems, and the exploitation of cane cutters are among the issues that deserve immediate attention from the	Martinelli, LA | Filoso, S	Univ Sao Paulo | Universidade de Sao Paulo | Univ Maryland | University System of Maryland | University of Maryland Center for Environmental Science | CENA | Ctr Environm Sci | Chesapeake Biol Lab | Univ Sao Paulo Universidade de Sao Paulo CENA Univ Maryland University System of Maryland University of Maryland Center for Environmental	ECOLOGICAL APPLICATIONS | 18 (4): 885-898 JUN 2008

	Brazilian government and international societies. The expansion of sugarcane crops to the areas presently cultivated for soybeans also represent an environmental threat, because it may increase deforestation pressure from soybean crops in the Amazon region. In this paper, we discuss environmental and social issues linked to the expansion of sugarcane in Brazil for ethanol production, and we provide recommendations to help policy makers and the Brazilian government establish new initiatives to produce a code for ethanol production that is environmentally sustainable and economically fair. Recommendations include proper planning and environmental risk assessments for the expansion of sugarcane to new regions such as Central Brazil, improvement of land use practices to reduce soil erosion and nitrogen pollution, proper protection of streams and riparian ecosystems, banning of sugarcane burning practices, and fair working conditions for sugarcane cutters. We also support the creation of a more constructive approach for international stakeholders and trade organizations to promote sustainable development for biofuel production in developing countries such as Brazil. Finally, we support the inclusion of environmental values in the price of biofuels in order to discourage excessive replacement of natural ecosystems such as forests, wetlands, and pasture by bioenergy crops.		Science Ctr Environm Sci Chesapeake Biol Lab	
Exploratory study of the stillage use along the time. I. Characteristics of the soil	The aim of this study was to accomplish an exploratory study of the stillage in the areas with sugarcane, through a comparative and systematic analysis. The present work was conducted in the company USACIGA - Sugar, Alcohol and Electric Power S. A. located at Gaucha, northwest Parana state. Treatments constituted of areas cultivated with sugarcane and submitted to different times of stillage application, respectively 1, 2, 3, 4, 12 and 20 years, and a reference area, without application. In all the studied areas trenches of 1 m(3) were opened, geo referenced in 340 m of altitude for accomplishment of the soil classification and sample collection.	Zolin, CA | Paulino, J | Bertonha, A | de Freitas, PSL | Folegatti, MV	Univ Sao Paulo | Universidade de Sao Paulo | Univ Estadual Maringa | Universidade Estadual de Maringa | ESALQ | DAG | Univ Sao Paulo Universidade de Sao Paulo ESALQ Univ Estadual Maringa Universidade Estadual de Maringa DAG	REVISTA BRASILEIRA DE ENGENHARIA AGRICOLA E AMBIENTAL | 15 (1): 22-28 JAN 2011

	The evaluations were performed of the density, soil particle density, organic carbon, cation exchange capacity (CEC), total porosity, soil water moisture for the sugarcane, besides the relationships among K, Ca, Mg and V%. The results indicated that the stillage application contributed to the organic carbon and potassium increase in the soil and that the sugarcane productivity presented a direct relationship with the ratio of potassium adsorption increase in the soil.			
Exploring possibilities of energy insertion from vinasse biogas in the energy matrix of Parana State, Brazil	The growth in the sugar and alcohol sector in Brazil has led to a significant increase in vinasse production, what aggravates the issue of its destination. Anaerobic biodigestion is an alternative for the treatment of this byproduct, presenting a relevant economic factor: its use as a source of energy. This work presents a technical-economic assessment of the electric energy production from vinasse biogas, obtained from an alcohol plant located in the state of Parana, Brazil, under three different operations. For each operation, it was considered five scenarios, varying from the most optimistic (best energy selling price) to the most pessimistic (worst energy selling price). The viability of the proposed project was calculated by using the Internal Rate of Return (IRR), Net Present Value (NPV) and Discounted Payback Period (DPP), showing that the plant is feasible for almost all scenarios. The energy production costs for the expected scenario for Operations 1, 2 and 3, were US$ 38.91 MW h1, US$ 5632 MW h(-1) and US$ 46.93 MW h(-1), respectively. (C) 2015 Elsevier Ltd. All rights reserved.	Nogueira, CEC | de Souza, SNM | Micuanski, VC | Azevedo, RL	Western Parana State Univ | Centro Universitario La Salle | Universidade Estadual do Oeste do Parana | UNIOESTE | Postgrad Program Energy Agr | Coll Agr Engn | Western Parana State Univ Centro Universitario La Salle Universidade Estadual do Oeste do Parana UNIOESTE Postgrad Program Energy Agr Coll Agr Engn	RENEWABLE & SUSTAINABLE ENERGY REVIEWS | 48: 300-305 AUG 2015
Growth of Chlorella vulgaris in treated conventional and biodigested vinasses	Vinasse is a residue of the sugarcane industry. It can be biodigested or not, in this case referred as conventional. The conventional or biodigested vinasses have high content of organic matter and mineral elements, leading to their common use as soil fertilizer for the sugarcane crop. However, vinasses are toxic residues and they can salinize the soil if used too much. On the other hand, the production of photosynthetic microalgae is costly and using a residue to support its growth may contribute	Candido, C | Lombardi, AT	Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | Lab Biotecnol Algas | PPGERN | Univ Fed Sao Carlos Universidade Federal de Sao Carlos Lab Biotecnol Algas PPGERN	JOURNAL OF APPLIED PHYCOLOGY | 29 (1): 45-53 FEB 2017

	to cost reduction. However, because of the vinasse dark color and toxicity, high dilution is necessary to accomplish microalgal growth. Here we present results on the growth and biomass yield of Chlorella vulgaris in conventional and in biodigested vinasses that have been treated by filtration or centrifugation before their use as microalgae culture medium. A concentration range of 10 to 100 % was tested and microalgal growth occurred in vinasse concentration as high as 80 %, with no nutrient addition. We evaluated pH, electrical conductivity, absorbance at 570 nm, and cell density every 24 h in a 6-day incubation experiment. Specific growth rates were calculated and the results showed that in 60 % filtered conventional and 80 % biodigested vinasses, C. vulgaris performed as well as the controls in nutrient rich synthetic culture media, with growth rates of up to 1.2 day(-1). Thus, we propose the use of treated vinasse as culture medium for lowering the costs of microalgae production, with the advantage of increasing the residue value.			
Growth of Chlorella vulgaris on Sugarcane Vinasse: The Effect of Anaerobic Digestion Pretreatment	Microalgae farming has been identified as the most eco-sustainable solution for producing biodiesel. However, the operation of full-scale plants is still limited by costs and the utilization of industrial and/or domestic wastes can significantly improve economic profits. Several waste effluents are valuable sources of nutrients for the cultivation of microalgae. Ethanol production from sugarcane, for instance, generates significant amounts of organically rich effluent, the vinasse. After anaerobic digestion treatment, nutrient remaining in such an effluent can be used to grow microalgae. This research aimed to testing the potential of the anaerobic treated vinasse as an alternative source of nutrients for culturing microalgae with the goal of supplying the biodiesel industrial chain with algal biomass and oil. The anaerobic process treating vinasse reached a steady state at about 17 batch cycles of 24 h producing about 0.116 m(3)CH(4) kgCOD(vinasse) (-1). The highest productivity of Chlorella vulgaris biomass (70 mg l(-1) day(-1)) was observed when	Marques, SSI | Nascimento, I | de Almeida, PF | Chinalia, FA	Univ Fed Bahia | Universidade Federal da Bahia | IB | Biol Marine Lab | ICS | Lab Biotecnol & Ecol Microorganismos | Univ Fed Bahia Universidade Federal da Bahia IB Biol Marine Lab Univ Fed Bahia Universidade Federal da Bahia ICS Lab Biotecnol & Ecol Microorganismos	APPLIED BIOCHEMISTRY AND BIOTECHNOLOGY | 171 (8): 1933-1943 DEC 2013

	using medium prepared with the anaerobic digester effluent. Lipid productivity varied from 0.5 to 17 mg l(-1) day(-1). Thus, the results show that it is possible to integrate the culturing of microalgae with the sugarcane industry by means of anaerobic digestion of the vinasse. There is also the advantageous possibility of using by-products of the anaerobic digestion such as methane and CO2 for sustaining the system with energy and carbon source, respectively.			
Growth of Microalgae Scenedesmus sp in Ethanol Vinasse	This study evaluated the feasibility of using vinasse as a nutrient source for microalgae cultivation. The Scenedesmus sp was grown in a medium supplemented with vinasse and process variables were optimized using a factorial design and a Central Composite Design (CCD). The factorial design results showed that it was possible to cultivate microalgae at concentrations of up to 40% of vinasse in the culture medium. The CCD results showed that the light intensity and vinasse concentration influenced the amount of biomass produced.	Ramirez, NNV | Farenzena, M | Trierweiler, JO	Univ Fed Rio Grande do Sul | Instituto Federal do Rio Grande do Sul (IFRS) | Universidade Federal do Rio Grande do Sul | Dept Engn Quim | Univ Fed Rio Grande do Sul Instituto Federal do Rio Grande do Sul (IFRS) Universidade Federal do Rio Grande do Sul Dept Engn Quim	BRAZILIAN ARCHIVES OF BIOLOGY AND TECHNOLOGY | 57 (5): 630-635 SEP-OCT 2014
Heterotrophic growth of green microalgae Desmodesmus subspicatus in ethanol distillation wastewater (vinasse) and lipid extraction with supercritical CO2	BACKGROUND: Single-cell lipids are obtained frommicroorganisms, including some species of microalgae, which under specific growth conditions are able to accumulate lipids in their biomass. Some species of Desmodesmus, a chlorophyceae microalgae, are considered potential sources of lipids and different cultivation systems, including heterotrophic growth inwastewater, have been proposed. This study evaluated the effect of temperature on heterotrophic growth and lipid productivity of Desmodesmus subspicatus in sugarcane processing wastewater and lipid extraction by supercritical carbon dioxide (SC-CO2). RESULTS: Results indicated lipid production by Desmodesmus subspicatus in the temperature range 15 and 40 degrees C, with the highest lipid productivity (similar to 1100 mg L-1 day(-1)) at 20 degrees C. Lipid extraction yield with SC-CO2 increased from 23 to 45% by increasing pressure from 20 to 30 MPa at 60 degrees C A cell disruption pretreatment (sonication) increased the lipid extraction yield	da Silva, MA | Barbosa, GH | Codato, CB | de Mattos, LFA | Bastos, RG | Kieckbusch, TG	Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | Univ Estadual Campinas | Universidade Estadual de Campinas | Ctr Agr Sci | Sch Chem Engn | Univ Fed Sao Carlos Universidade Federal de Sao Carlos Ctr Agr Sci Univ Estadual Campinas Universidade Estadual de Campinas Sch Chem Engn	JOURNAL OF CHEMICAL TECHNOLOGY AND BIOTECHNOLOGY | 92 (3): 563-569 MAR 2017

	by approximately 17%. Fatty acids profiles of the extracted lipids indicated major fractions of palmitic acid (16:0), stearic acid (18:0), oleic acid (18:1), linoleic acid (18:2), arachidic acid (20:0) and arachidonic acid (20:4). These characteristics are interesting from the viewpoint of biodiesel production. CONCLUSION: Results suggest the feasibility of the heterotrophic production of Desmodesmus subspicatus biomass intended for lipid accumulation using vinasse, followed by SC-CO2 lipid extraction. (C) 2016 Society of Chemical Industry			
High organic loading rate on thermophilic hydrogen production and metagenomic study at an anaerobic packed-bed reactor treating a residual liquid stream of a Brazilian biorefinery	This study evaluated the influence of a high organic loading rate (OLR) on thermophilic hydrogen production at an up-flow anaerobic packed-bed reactor (APBR) treating a residual liquid stream of a Brazilian biorefinery. The APBR, filled with low-density polyethylene, was operated at an OLR of 84.2 kg-COD m(-3) d(-1). This value was determined in a previous study. The maximum values of hydrogen production and yield were 5,252.6 mL-H-2 d(-1) and 3.7 mol-H-2 mol(total carbohydrates)(-1), respectively. However, whereas the OLR remained constant, the specific organic load rate (sOLR) decreased throughout operation from 1.38 to 0.72 g-Total carbohydrates g-VS-1 h(-1), this decrease negatively affected hydrogen production. A sOLR of 0.98 g-Total carbohydrates g-VS-1 h(-1) was optimal for hydrogen production. The microbial community was studied using 454-pyrosequencing analysis. Organisms belonging to the genera Caloramator, Clostridium, Megasphaera, Oxobacter, Thermoanaerobacterium, and Thermohydrogenium were detected in samples taken from the reactor at operation days 30 and 60, suggesting that these organisms contribute to hydrogen production. (C) 2015 Elsevier Ltd. All rights reserved.	Ferraz, ADN | Etchebehere, C | Zaiat, M	CNPEM | Inst Invest Biol Clemente Estable | Instituto de Investigaciones Biologicas Clemente Estable Uruguay | Univ Sao Paulo | Universidade de Sao Paulo | CTBE Brazilian Bioethanol Sci & Technol Lab | Lab Ecol Microbiana | Sao Carlos Sch Engn EESC | Ctr Res Dev & Innovat Environm Engn | Biol Proc Lab | CNPEM CTBE Brazilian Bioethanol Sci & Technol Lab Inst Invest Biol Clemente Estable Instituto de Investigaciones Biologicas Clemente Estable Uruguay Lab Ecol Microbiana Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn EESC Ctr Res Dev & Innovat Environm Engn Biol Proc Lab	BIORESOURCE TECHNOLOGY | 186: 81-88 JUN 2015

Hydrogen production from diluted and raw sugarcane vinasse under thermophilic anaerobic conditions	Two continuous anaerobic fluidized bed reactors (AFBRs) were operated under thermophilic (55 degrees C) temperature for 150 days to investigate the effect of dark H-2 fermentation of diluted and raw sugarcane vinasse on H-2 production using mixed seed sludge. Although effective H-2 production (52.8% of H-2; 0.80 L H-2 h(-1) L-1; 0.79 mmol gCOD(added)(-1) was observed using an elevated substrate concentration (30,000 mg COD L-1), the optimal operational conditions were found for the AFBR(1) (10,000 mg COD L-1) fed with diluted sugarcane vinasse (HRT 6 h; OLR 40 kg COD m(-3) d(-1)), achieving a H-2 yield of 2.86 mmol H-2 g CODadded-1. H-2 production was inhibited by elevated volatile fatty acid (VFA) concentrations (butyric and acetic acids = 3.7 and 3.0 g L-1, respectively) in the raw feedstock. Denaturing gradient gel electrophoresis (DGGE) analyses revealed changes in the bacterial population of the expanded clay biofilm as a function of the substrate concentration. Copyright (C) 2014, Hydrogen Energy Publications, LLC. Published by Elsevier Ltd. All rights reserved.	Santos, SC | Rosa, PRF | Sakamoto, IK | Varesche, MBA | Silva, EL	Univ Sao Paulo | Universidade de Sao Paulo | Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | Sch Engn Sao Carlos | Dept Hydraul & Sanitat | Dept Chem Engn | Univ Sao Paulo Universidade de Sao Paulo Sch Engn Sao Carlos Dept Hydraul & Sanitat Univ Fed Sao Carlos Universidade Federal de Sao Carlos Dept Chem Engn	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY | 39 (18): 9599-9610 JUN 15 2014
Improving bioethanol production - Comparison between extractive and low temperature fermentation	One of the key issues that must be addressed in the biofuel production based on sugarcane industry is the energy consumption of the process. Process energy demand has direct impact on the amount of lignocellulosic material available for use as feedstock for second generation ethanol production. A significant fraction of the energy consumption in bioethanol production occurs in the purification step, since conventional fermentation systems employed in the industry require low substrate concentration and, consequently, produce wine of low (around 8.5 degrees GL) ethanol content that must be distilled in order to meet product specifications. In this study alternatives to the conventional fermentation processes employed in the industry (low temperature fermentation and vacuum extractive fermentation) were assessed, in the context of a large scale sugarcane autonomous distillery, through computer simulation. Electricity consumption and lignocellulosic material surplus on each case were	Dias, MOS | Junqueira, TL | Jesus, CDF | Rossell, CEV | Maciel, R | Bonomi, A	CTBE CNPEM | Univ Estadual Campinas | Universidade Estadual de Campinas | Lab Nacl Ciencia & Tecnol Bioetanol | Fac Engn Quim | UNICAMP | CTBE CNPEM Lab Nacl Ciencia & Tecnol Bioetanol Univ Estadual Campinas Universidade Estadual de Campinas Fac Engn Quim UNICAMP	APPLIED ENERGY | 98: 548-555 OCT 2012

	evaluated. It is shown that the alternative fermentation processes allow a significant reduction on vinasse generation and increases ethanol production when compared with conventional fermentation, but increases electricity consumption (for the extractive fermentation) or steam consumption (for low temperature fermentation); when vinasse concentration is considered in the conventional process, steam consumption in the extractive fermentation is also significantly smaller. (c) 2012 Elsevier Ltd. All rights reserved.			
Influence of organic loading rate on the anaerobic treatment of sugarcane vinasse and biogas production in fluidized bed reactor	This study evaluated an anaerobic fluidized bed reactor (AFBR) that contained polystyrene particles as a support material for the treatment of vinasse that resulted from the alcoholic fermentation of sugarcane molasses. The AFBR was inoculated with sludge from an upflow anaerobic sludge blanket reactor that treated poultry slaughterhouse wastewater. The AFBR was operated with a hydraulic retention time of 24h at a temperature of 30 degrees C with influent vinasse concentrations that ranged from 2273 to 20,073mg COD L-1. The reactor was subjected to increased organic loading rates (OLR) that ranged from 3.33 to 26.19kg COD m(-3) d(-1), with COD removal efficiencies that ranged from 51% to 70% and maximum removal at an OLR of 13.93 +/- 2.18kg COD m(-3) d(-1). The maximum biogas productivity was 5.37m(3) CH4 m(-3) d(-1) for an OLR of 25.32kg COD m(-3) d(-1) (average removal of 51%).,	Siqueira, LM | Damiano, ESG | Silva, EL	Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | Univ Sao Paulo | Universidade de Sao Paulo | Dept Chem Engn | Dept Hydraul & Sanitat | Univ Fed Sao Carlos Universidade Federal de Sao Carlos Dept Chem Engn Univ Sao Paulo Universidade de Sao Paulo Dept Hydraul & Sanitat	JOURNAL OF ENVIRONMENTAL SCIENCE AND HEALTH PART A-TOXIC/HAZARDOUS SUBSTANCES & ENVIRONMENTAL ENGINEERING | 48 (13): 1707-1716 NOV 10 2013
INFLUENCE OF SOLID MOISTURE AND BED HEIGHT ON CULTIVATION OF Aspergillus niger FROM SUGARCANE BAGASSE WITH VINASSE	Solid-state cultivation (SSC) may be defined as growth of microorganisms on a solid support impregnated or not with a nutrient solution in near absence of free-water conditions. The use of sugarcane bagasse as a support for SSC usually demands that the particles are impregnated and moistened with nutrient solution. Vinasse is the main wastewater of ethanol fermentation-distillation. As there are no reports of the use of wastewater for moistening solid supports in SSC, the proposal is the development of an innovative process, with valuation of these by-products. Thus, the aim of this research was to evaluate SSC of Aspergillus niger using sugarcane	Bastos, RG | Morais, DV | Volpi, MPC	Fed Univ Sao Carlos UFSCar | Ctr Agr Sci CCA | Fed Univ Sao Carlos UFSCar Ctr Agr Sci CCA	BRAZILIAN JOURNAL OF CHEMICAL ENGINEERING | 32 (2): 377-384 APR-JUN 2015

	bagasse and vinasse for citric acid production. The results indicate that citric acid production and glucose consumption are dependent on oxygen availability, which can be modulated by selection of bed height and air-flow in packed-bed bioreactors.			
Integral use of sugarcane vinasse for biomass production of actinobacteria: Potential application in soil remediation	The use of living actinobacteria biomass to clean up contaminated soils is an attractive biotechnology approach. However, biomass generation from cheap feedstock is the first step to ensure process sustainability. The present work reports the ability of four actinobacteria, Streptomyces sp. M7, MC1, A5, and Amycolatopsis tucumanensis, to generate biomass from sugarcane vinasse. Optimal vinasse concentration to obtain the required biomass (more than 0.4 g L-1) was 20% for all strains, either grown individually or as mixed cultures. However, the biomass fraction recovered from first vinasse was discarded as it retained trace metals present in the effluent. Fractions recovered from three consecutive cycles of vinasse re-use obtained by mixing equal amounts of biomass from single cultures or produced as a mixed culture were evaluated to clean up contaminated soil with lindane and chromium. In all cases, the decrease in pesticide was about 50% after 14 d of incubation. However, chromium removal was statistically different depending on the preparation methodology of the inoculum. While the combined actinobacteria biomass recovered from their respective single cultures removed about 85% of the chromium, the mixed culture biomass removed more than 95%. At the end of the reused vinasse cycle, the mixed culture removed more than 70% of the biological oxygen demand suggesting a proportional reduction in the effluent toxicity. These results represent the first integral approach to address a problematic of multiple contaminations, concerning pesticides, heavy metals and a regionally important effluent like vinasse. (C) 2017 Elsevier Ltd. All rights reserved.	Aparicio, JD | Benimeli, CS | Almeida, CA | Polti, MA | Colin, VL	CONICEZ | Univ Nacl Tucuman | Univ Santo Tomas de Aquino | Univ Nacl San Luis | Consejo Nacional de Investigaciones Cientificas y Tecnicas (CONICET) | Universidad Nacional de San Luis | Miguel Lillo Foundation | Planta Piloto Proc Ind Microbiol PROIMI | Fac Bioquim Quim & Farm | CONICET | INQUISAL | Inst Quim San Luis | Fac Ciencias Nat | Inst Miguel Lillo | CONICEZ Planta Piloto Proc Ind Microbiol PROIMI Univ Nacl Tucuman Fac Bioquim Quim & Farm Univ Santo Tomas de Aquino Univ Nacl San Luis Consejo Nacional de Investigaciones Cientificas y Tecnicas (CONICET) Universidad Nacional de San Luis CONICET INQUISAL Inst Quim San Luis Univ Nacl Tucuman Fac Ciencias Nat Univ Nacl Tucuman Miguel Lillo Foundation Inst Miguel Lillo	CHEMOSPHERE | 181: 478-484 AUG 2017

Integrated Analysis of an Evaporation and Distillation Bioethanol Industrial System Using Direct and Indirect Heating	In this work we simulate and integrate the systems of evaporation, fermentation and distillation with direct heating. In addition, we propose a new scenario using indirect heating in order to decrease the quantity of stillage, and consequently, minimize environmental and economic impacts associated. In this sense, a reboiler using the steam produced in the evaporators is included in the distillation column to analyse the effect of such revamping. Sensitivity analyses were performed to detect some key operational variables with effect on the process. Results show that the replacement of direct steam injection by use of reboilers decreases significantly the quantity of stillage, consequently, minimizing the problems generated by it. Moreover, once there are no changes in flegma and ethanol mass flows, and the bleeding heat flow is suitable to exchange heat with reboilers, it means the replacement may be done without modify the industrial productivity.	Silva, RO | Tiski, VC | Defendi, RO | Rocha, LB | Lima, OCM | Jimenez, L | Jorge, LMM	Univ Estadual Maringa | Universidade Estadual de Maringa | Dept Chem Engn | Univ Rovira & Virgili | Universitat Rovira i Virgili | Univ Estadual Maringa Universidade Estadual de Maringa Dept Chem Engn Univ Rovira & Virgili Universitat Rovira i Virgili Dept Chem Engn	12TH INTERNATIONAL SYMPOSIUM ON PROCESS SYSTEMS ENGINEERING (PSE) AND 25TH EUROPEAN SYMPOSIUM ON COMPUTER AIDED PROCESS ENGINEERING (ESCAPE), PT A | 37: 443-448 Part A 2015
Integrated Production of Organomineral Biofertiliser (BIOFOM (R)) Using By-products from the Sugar and Ethanol Agro-industry, Associated with the Cogeneration of Energy	Brazilian bioethanol and sugar production generates large amounts of vinasse, filter cake and boiler ashes (originated from biomass combustion). On the other hand, the distribution of these by-products in the field is usually inadequate, considering the environmental aspects and the best use of nutrients and organic material present in these by-products. This work presents a study for reprocessing of these by-products into a solid and granular organomineral biofertiliser developed by Dedini S/A Ind. Base (BIOFOM (R)), which can be formulated according to the soil and sugarcane specific needs. This article shows the process of an integrated BIOFOM, ethanol and electricity from biomass production system for an industrial unit of large capacity. The results of BIOFOM preliminary agronomic greenhouse tests and analysis of process profitability are also shown. These results indicate an excellent internal rate of return (IRR) and attractive payback time as well, resulting from surplus power sales, reduction of chemical fertiliser and fuel consumption, reduction of by-products distribution infrastructure,	Oliverio, JL | Boscariol, FC | Mantelatto, PE | Cesar, ARP | Ciambelli, JRP | Gurgel, MND | De Souza, RTG	DEDINI SA Ind Base	SUGAR TECH | 13 (1): 17-22 MAR 2011

	and decrease (elimination) of the mill's water withdrawal. Moreover, BIOFOM gave a good agronomic performance in greenhouse experiments, and it will provide an appropriate reuse of the by-products, in accordance with green technologies (environmentally sustainable technologies). Therefore, the studies show that BIOFOM will lead to the existence of a more profitable and sustainable agro-industry that adopts rational and friendly practices for the environment.			
Isolation and characterization of native microorganisms with hydrolytic enzyme activity from sugarcane compost, for bioaugmented processes	The production of sugar, ethanol and electricity from sugarcane generates by-products such as leaves, bagasse, muds, ash and vinasse that are transformed through composting processes, where the enzymatic activity of microorganisms, promotes the mineralization of organic materials. These microorganisms can be enhanced for their biotechnological use in biodegradation processes of organic matter. The present research aimed to isolate and select microorganisms with enzymatic activity from compost piles and to produce a bio-inoculant with hydrolytic activity. By enzymatic activity tests, six bacterial strains were isolated, and characterized using BIOLOG (R). Amylolytic, cellulolytic and proteolytic enzymatic activities were evaluated in chemically defined media, incubated at 150 rpm and 37 and 55 degrees C for 48 h. Activity was quantified by 3,5-dinitrosalicylic acid (DNS) and trichloroacetic acid (TCA) techniques. Finally, for the production test of microbial culture, a non-commercial medium with vinasse and molasses was used in a BioFlo (R) 110 bioreactor. The results showed that microorganisms produced amylases, cellulases, lipases and proteases as hydrolytic enzymes both at mesophilic temperatures and under thermophilic conditions with higher expression at 24 h of incubation (p=0.025). Strain P1C, identified as Bacillus racemilacticus, presented significantly higher enzyme activities, with 457.20 amylolytic units, 135 cellulolytic units and 298 proteolytic units min(-1) L-1 (alpha=0.05). In mixed culture, the microbial growth followed a	Daza, ZT | Gallo, A | Rincon, LM | Parrado, DS | Santander, MC | Oviedo, A | Chica, H | Martinez, SMM	Ctr Invest Cana Azucar Colombia | Univ Bonn | University of Bonn | Trop Agr | TROPEN | Ctr Invest Cana Azucar Colombia Univ Bonn University of Bonn Trop Agr TROPEN	III International Symposium on Organic Matter Management and Compost Use in Horticulture | 1146: 175-182 2016

	Gaussian model, where the higher amylolytic activity was expressed at 15 h with 365 amylolytic units min-1 and maximum biomass of 1x10(10) CFU mL(-1).			
Kinetics of thermophilic acidogenesis of typical Brazilian sugarcane vinasse	The kinetics of the acidogenic phase during anaerobic digestion of sugarcane vinasse in differential reactors containing immobilized cells was investigated. The maximum substrate conversion rate (r(max)), substrate saturation constant (K-s) and constant of inhibition by excess substrate (K-is) were determined using vinasse with and without pH adjustment. Simulation and scaling-up of a thermophilic-hydrogen production system were performed. The r(max), values obtained at different pH were similar and near 0.9 mg-Total carbohydrates g-VS-1 h(-1). The K-s obtained from the system without pH adjustment was 10,762.3 mg-Total carbohydrates L-1 (i.e., 2.5 times higher than the system with pH adjustment). No inhibition by excess substrate was achieved in the system without pH adjustment, indicating that sugarcane vinasse can be used to produce hydrogen without input costs. The simulation revealed that hydrogen production is a sensitive process that requires careful balancing of various operational parameters. The payback for the investment in system implementation is 4.4 years. (C) 2016 Elsevier Ltd. All rights reserved.	Koyama, MH | Araujo, MM | Zaiat, M | Ferraz, ADN	Univ Sao Paulo | Universidade de Sao Paulo | CTBE Brazilian Bioethanol Sci & Technol Lab | Sao Carlos Sch Engn EESC | Biol Proc Lab | Ctr Res Dev & Innovat Environm Engn | Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn EESC Biol Proc Lab Ctr Res Dev & Innovat Environm Engn CTBE Brazilian Bioethanol Sci & Technol Lab	ENERGY | 116: 1097-1103 Part 1 DEC 1 2016
Life cycle assessment of sugarcane ethanol production in India in comparison to Brazil	India's biofuel programme relies on ethanol production from sugarcane molasses. However, there is limited insight on environmental impacts across the Indian ethanol production chain. This study closes this gap by assessing the environmental impacts of ethanol production from sugarcane molasses in Uttar Pradesh, India. A comparative analysis with south-central Brazilian sugarcane ethanol is also presented to compare the	Tsiropoulos, I | Faaij, APC | Seabra, JEA | Lundquist, L | Schenker, U | Briois, JF | Patel, MK	Univ Utrecht | University of Utrecht | Univ Estadual Campinas | Universidade Estadual de Campinas | Nestle Res Ctr | Nestle SA | Nestle Waters Management & Technol | Univ	INTERNATIONAL JOURNAL OF LIFE CYCLE ASSESSMENT | 19 (5): 1049-1067 MAY 2014

	performance of sugarcane molasses-based ethanol with sugarcane juice-based ethanol. The production process is assessed by a cradle-to-gate life cycle assessment. The multifunctionality problem is solved by applying two variants of system expansion and economic allocation. Environmental impacts are assessed with Impact 2002+ and results are presented at the midpoint level for greenhouse gas emissions, non-renewable energy use, freshwater eutrophication and water use. Furthermore, results include impacts on human health and ecosystem quality at the damage level. Sensitivity analysis is also performed on key contributing parameters such as pesticides, stillage treatment and irrigation water use. It is found that, compared to Brazilian ethanol, Indian ethanol causes lower or comparable greenhouse gas emissions (0.09-0.64 kgCO(2eq)/kg(ethanolIN), 0.46-0.63 kgCO(2eq)/kg(ethanolBR)), non-renewable energy use (-0.3-6.3 MJ/kg(ethanolIN), 1-4 MJ/kg(ethanolBR)), human health impacts (3.6 center dot 10(-6) DALY/kg(ethanolIN), 4 center dot 10(-6) DALY/kg(ethanolBR)) and ecosystem impairment (2.5 PDF center dot m(2) center dot year/kg(ethanolIN), 3.3 PDF center dot m(2) center dot year/kg(ethanolBR)). One reason is that Indian ethanol is exclusively produced from molasses, a co-product of sugar production, resulting in allocation of the environmental burden. Additionally, Indian sugar mills and distilleries produce surplus electricity for which they receive credits for displacing grid electricity of relatively high CO2 emission intensity. When economic allocation is applied, the greenhouse gas emissions for Indian and Brazilian ethanol are comparable. Non-renewable energy use is higher for Indian ethanol, primarily due to energy requirements for irrigation. For water use and related impacts, Indian ethanol scores worse due groundwater irrigation, despite the dampening effect of allocation. The variation on greenhouse gas emissions and non-renewable		Geneva | University of Geneva | Copernicus Inst Sustainable Dev | Fac Mech Energy | Dept Energy | Nestle LTC | PTC Water | Inst Environm Sci | Energy Grp | Forel Inst | Univ Utrecht University of Utrecht Copernicus Inst Sustainable Dev Univ Estadual Campinas Universidade Estadual de Campinas Fac Mech Energy Dept Energy Nestle Res Ctr Nestle SA Nestle LTC Nestle Waters Management & Technol PTC Water Univ Geneva University of Geneva Inst Environm Sci Energy Grp Univ Geneva University of Geneva Forel Inst	

	energy use of Indian mills is much larger for high and low performance than the respective systems in Brazil. Important measures can be taken across the production chain to improve the environmental performance of Indian ethanol production (e.g. avoiding the use of specific pesticides, avoiding the disposal of untreated stillage, transition to water efficient crops). However, to meet the targets of the Indian ethanol blending programme, displacement effects are likely to occur in countries which export ethanol. To assess such effects, a consequential study needs to be prepared.			
Long-term effect of acid and heat pretreatment of sludge from a sugarcane vinasse treatment plant on the microbial community and on thermophilic biohydrogen production	This work investigated how heat and acid pretreatment affected thermophilic biohydrogen production by a mixed culture present in the sludge of a sugarcane vinasse treatment plant. Heat- (80 degrees C for 15 min) or acid- (pH 3 for 24h) treated sludge samples were employed to seed batch bioreactors along 36 days. The heat- and acid-treated sludge samples afforded H-2 production rates (HPRs) of 8.4 and 9.5 mmo/L.d, respectively. The lactic acid concentration increased in the bioreactor seeded with heat-treated sludge, whilst the lactic acid concentration diminished in the bioreactor inoculated with the acid-treated sludge. Identification of the microbial community revealed that Clostridiaceae predominated in all the sludge samples. The most abundant Clostridiaceae in the heat- and acid-treated sludge samples were Clostridium and Thermoanaerobacterium, respectively. Acid pretreatment modified the microbial community and enhanced consumption of lactic acid, a metabolite that is normally associated with decreased H2 production. Copyright (C) 2015, Hydrogen Energy Publications, LLC. Published by Elsevier Ltd. All rights reserved.	Lamaison, FD | de Andrade, PAM | Bigaton, AD | Andreote, FD | Antonio, RV | Reginatto, V	Univ Fed Santa Catarina | Universidade Federal de Santa Catarina (UFSC) | Escola Super Agr Luis Dequeiroz | Universidade de Sao Paulo | Univ Sao Paulo | Dept Engn Quim & Engn Alimentos | Dept Ciencia Solo | Dept Quim | Fac Filosofia Ciencias & Letras Ribeirao Preto | Univ Fed Santa Catarina Universidade Federal de Santa Catarina (UFSC) Dept Engn Quim & Engn Alimentos Escola Super Agr Luis Dequeiroz Universidade de Sao Paulo Dept Ciencia Solo Univ Fed Santa Catarina Universidade Federal de Santa Catarina (UFSC) Univ Sao Paulo Universidade de Sao Paulo Dept Quim Fac Filosofia Ciencias & Letras Ribeirao Preto	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY | 40 (41): 14124-14133 NOV 2 2015
Media arrangement	This study reports on the application of an innovative	de Aquino, S | Fuess, LT |	Univ Sao Paulo | Universidade de	BIORESOURCE TECHNOLOGY

impacts cell growth in anaerobic fixed-bed reactors treating sugarcane vinasse: Structured vs. randomic biomass immobilizatio n	structured-bed reactor (FVR) as an alternative to conventional packed-bed reactors (PBRs) to treat high-strength solid-rich wastewaters. Using the FVR prevents solids from accumulating within the fixed-bed, while maintaining the advantages of the biomass immobilization. The long-term operation (330 days) of a FVR and a PBR applied to sugarcane vinasse under increasing organic loads (2.4-18.0 kg COD m(3) day (1)) was assessed, focusing on the impacts of the different media arrangements over the production and retention of biomass. Much higher organic matter degradation rates, as well as long-term operational stability and high conversion efficiencies (>80%) confirmed that the FVR performed better than the PBR. Despite the equivalent operating conditions, the biomass growth yield was different in both reactors, i.e., 0.095 gVSS g(-1)COD (FVR) and 0.066 gVSS g(-1)COD (PBR), indicating a clear control of the media arrangement over the biomass production in fixed-bed reactors. (C) 2017 Elsevier Ltd. All rights reserved.	Pires, EC	Sao Paulo | LPB | EESC | SHS | Dept Hidraul & Saneamento | Univ Sao Paulo Universidade de Sao Paulo LPB EESC Univ Sao Paulo Universidade de Sao Paulo SHS EESC Dept Hidraul & Saneamento	| 235: 219-228 JUL 2017
Mesophilic hydrogen production in acidogenic packed-bed reactors (APBR) using raw sugarcane vinasse as substrate: Influence of support materials	Bio-hydrogen production from sugarcane vinasse in anaerobic up-flow packed-bed reactors (APBR) was evaluated. Four types of support materials, expanded clay (EC), charcoal (Ch), porous ceramic (PC), and low-density polyethylene (LDP) were tested as support for biomass attachment. APBR (working volume -2.3 L) were operated in parallel at a hydraulic retention time of 24 h, an organic loading rate of 36.2 kg-COD m(-3) d(-1), at 25 degrees C. Maximum volumetric hydrogen production values of 509.5, 404, 81.4 and 10.3 mL-H-2 d(-1) L-reactor(-1) and maximum yields of 3.2, 2.6, 0.4 and 0.05 mol-H-2 mol(-1) carbohydrates total, were observed during the monitoring of the reactors filled with LDP, EC, Ch and PC, respectively. Thus, indicating the strong influence of the support material on H-2 production. LDP was the most appropriate material for hydrogen production among the materials evaluated. 16S rRNA gene by Terminal Restriction Fragment Length Polymorphism (T-RFLP) analysis and scanning electron microscopy confirmed the selection of different microbial populations.	Ferraz, ADN | Etchebehere, C | Zaiat, M	CTBE Brazilian Bioethanol Sci & Technol Lab CNPEM | Inst Invest Biol Clemente Estable | Instituto de Investigaciones Biologicas Clemente Estable Uruguay | Univ Sao Paulo | Universidade de Sao Paulo | Lab Ecol Microbiana | Sao Carlos Sch Engn EESC | Ctr Res Dev & Innovat Environm Engn | Biol Proc Lab | CTBE Brazilian Bioethanol Sci & Technol Lab CNPEM Inst Invest Biol Clemente Estable Instituto de Investigaciones Biologicas Clemente	ANAEROBE | 34: 94-105 AUG 2015

	454-pyrosequencing performed on samples from APBR filled with LDP revealed the presence of hydrogen-producing organisms (Clostridium and Pectinatus), lactic acid bacteria and non-fermentative organisms. (C) 2015 Elsevier Ltd. All rights reserved.		Estable Uruguay Lab Ecol Microbiana Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn EESC Ctr Res Dev & Innovat Environm Engn Biol Proc Lab	
Mexican sugarcane agroindustry diversfication paradigm	Special attention in the diversification strategy must be given to the efficient use of the potential of sugar cane with the objective of increasing the value added using chemicals and biotechnologies as complements for sugar production. From cane harvest and processing, it is possible to obtain eight products and byproducts (sucrose, ethanol, trash, bagasse, molasses, filter mud, vinasse, and ashes) and a significant number of production processes could be developed. However, industrial production of byproducts and sugarcane derivatives has not shown a constant development and in Mexican sugar industry there has not been a significant change in the diversification pattern in the past few decades. The objective of this paper is to analyze the trends and patterns of diversification and related development in the Mexican sugar industry based on secondary and primary data. It was also found that the absence of a national model of diversification, lack of knowledge and information were the major constraints towards sugarcane agriculture (crop sector), biofabric (industrial sector) efficient and sustainable production.	Aguilar-Rivera, N	Univ Veracruzana	CONVERGENCIA-REVISTA DE CIENCIAS SOCIALES | 19 (59): 187-213 MAY-AUG 2012
Microalgae cultivation in sugarcane vinasse: Selection, growth and biochemical characterization	Sugarcane ethanol is produced at large scale generating wastes that could be used for microalgae biomass production in a biorefinery strategy. In this study, forty microalgae strains were screened for growth in sugarcane vinasse at different concentrations. Two microalgae strains, Micractinium sp. Embrapa| LBA32 and C. biconvexa Embrapa| LBA40, presented vigorous growth in a light-dependent manner even in undiluted vinasse under non-axenic conditions. Microalgae strains presented higher biomass productivity in vinasse-based media compared to standard Bold's Basal	Santana, H | Cereijo, CR | Teles, VC | Nascimento, RC | Fernandes, MS | Brunale, P | Campanha, RC | Soares, IP | Silva, FCP | Sabaini, PS | Siqueira, FG | Brasil, BSAF	Embrapa Agroenergy | Empresa Brasileira de Pesquisa Agropecuaria (Embrapa) | Univ Fed Bahia | Universidade Federal da Bahia | Univ Fed Tocantins | Universidade Federal do Tocantins (UFT) | Embrapa Agroenergy Empresa	BIORESOURCE TECHNOLOGY | 228: 133-140 MAR 2017

	Medium in cultures performed using 15 L airlift flat plate photobioreactors. Chemical composition analyses showed that proteins and carbohydrates comprise the major fractions of algal biomass. Glucose was the main monosaccharide detected, ranging from 46% to 76% of the total carbohydrates content according to the strain and culture media used. This research highlights the potential of using residues derived from ethanol plants to cultivate microalgae for the production of energy and bioproducts. (C) 2016 Elsevier Ltd. All rights reserved.		Brasileira de Pesquisa Agropecuaria (Embrapa) Univ Fed Bahia Universidade Federal da Bahia Univ Fed Tocantins Universidade Federal do Tocantins (UFT)	
Microbial Succession Within an Anaerobic Sequencing Batch Biofilm Reactor (ASBBR) Treating Cane Vinasse at 55 degrees C	The aim of this work was to investigate the anaerobic biomass formation capable of treating vinasse from the production of sugar cane alcohol, which was evolved within an anaerobic sequencing batch biofilm reactor (ASBBR) as immobilized biomass oil cubes of polyurethane foam at the temperature of 55 degrees C. The reactor was inoculated with mesophilic granular sludge originally treating poultry slaughterhouse wastewater. The evolution of the biofilm in the polyurethane foam matrices was assessed during seven experimental phases which were thus characterized by the changes in the organic matter concentrations as COD (1.0 to 20.0 g/L). Biomass characterization proceeded with the examination of sludge samples under optical and scanning electron microscopy. The reactor showed high microbial morphological diversity along the trial. The predominance of Methanosaeta-like cells was observed lip to the organic load of 2.5 gCOD/L.d. Oil the other hand, Methanosarcina-like microorganisms were the predominant archaeal population within the foam matrices at high organic loading ratios above 3.3 gCOD/L.d. This was suggested to be associated to a higher specific rate of acetate consumption by the later organisms.	Ribas, MMF | Chinalia, FA | Pozzi, E | Foresti, E	Univ Estadual Maringa | Universidade Estadual de Maringa | Natl Univ Ireland | National University of Ireland (NUI) Galway | Univ Sao Paulo | Universidade de Sao Paulo | Escola Engn Sao Carlos | Univ Estadual Maringa Universidade Estadual de Maringa Natl Univ Ireland National University of Ireland (NUI) Galway Univ Sao Paulo Universidade de Sao Paulo Escola Engn Sao Carlos	BRAZILIAN ARCHIVES OF BIOLOGY AND TECHNOLOGY | 52 (4): 1027-1036 JUL-AUG 2009
Microfiltration of vinasse: sustainable strategy to improve its nutritive	The purpose of this article was to evaluate and establish microfiltration (MF) operating conditions for vinasse (ethanol industries wastewater also known as stillage, slop, distillery effluent or	Amaral, MCS | Andrade, LH | Neta, LSF | Magalhaes, NC | Santos, FS | Mota,	Univ Fed Minas Gerais | Universidade Federal de Minas Gerais | Fed Ctr Technol Educ	WATER SCIENCE AND TECHNOLOGY | 73 (6): 1434-1441 MAR 2016

potential	dunder) concentration aiming to improve the use of its nutritive potential. The operating conditions influence permeate flux that has been evaluated by monitoring the flow rate profile during the operation on bench scale in different conditions (feed pH, aeration condition and recovery rate). From the results found, the process scale up was then effected. The bench scale findings showed that the vinasse microfiltration under air flow of 0.5 m(3).h(-1) between membrane fibers, with no pH adjustment, and recovery rate of 93% produced two flows, one of permeate that may be used to wash the sugarcane during the ethanol production processing, and the other of concentrate that contains a high organic compounds and nutrients concentration. This concentrate has additional potentiality of being used as organic compound supplement in contaminated soil bioremediation, and as a supplier of microbial biomass or substrate for biosurfactant production.	GE | Carvalho, RB	Minas Gerais | PAM Select Membranes | Dept Sanit & Environm Engn | Dept Chem | Univ Fed Minas Gerais Universidade Federal de Minas Gerais Dept Sanit & Environm Engn Fed Ctr Technol Educ Minas Gerais Dept Chem PAM Select Membranes	
Mineralization of organic matter from vinasse using physicochemical treatment coupled with Fe2+-activated persulfate and peroxymonosulfate oxidation	Application of advanced oxidation process for wastewater treatment has gained more attention recently. In this study, the efficiency of coagulation-flocculation pretreatment coupled with sulfate radical-based advanced oxidation process (SR-AOP) in the removal and mineralization of organic matter of sugarcane vinasse was evaluated. For coagulation-flocculation, jar-test experiment was carried out with ferric chloride as coagulant and the removal of TOC, color and UV254 was determined. The results revealed that by using 15 g/L of coagulant, 70 % of TOC removal and nearly 100 % of UV254 and color removal were achieved. The pretreated vinasse was then subjected to SR-AOP. In this study, sulfate radical was generated using persulfate (PS) and peroxymonosulfate (PMS) activated by Fe(II). The effect of reaction time, oxidants to Fe(II) ratio and pH on the TOC removal efficiency were investigated. For the effect of reaction time, the TOC removal was found to increase significantly for the first 5 min. TOC removal was found to increase with increasing concentration of Fe(II) for PMS. However, for Fe(II)/PS, the	Fagier, MA | Ali, EA | Tay, KS | Abas, MRB	Sudan Univ Sci & Technol | Univ Malaya | Universiti Malaya | Dept Chem | Fac Sci | Environm Res Grp | Sudan Univ Sci & Technol Dept Chem Fac Sci Univ Malaya Universiti Malaya Dept Chem Environm Res Grp Fac Sci	INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY | 13 (4): 1189-1194 APR 2016

	TOC removal efficiency was decreased with increasing Fe(II) concentration. Both Fe(II)/PMS and Fe(II)/PS showed the highest TOC removal efficiency when the oxidation was carried out at pH 7. By using the selected optimum condition, nearly 70 and 49 % of TOC removal were achieved for PMS/Fe(II) and PS/Fe(II), respectively. Therefore, it can be concluded that SR-AOP can be a promising alternative method for TOC removal from sugarcane vinasse.			
Modelling of an EGSB treating sugarcane vinasse using first-order variable kinetics	An expanded granular sludge bed (EGSB) anaerobic reactor treating sugar cane vinasse was modelled using a simple model with two steps (acidogenesis and methanogenesis), two populations, two substrates and completely mixed conditions. A first-order kinetic equation for both steps with time-variant kinetic coefficients was used. An observer system was used to estimate the evolution of kinetic constants over time. The model was validated by comparing methane flow predictions with experimental values. An estimation of evolution of populations of microorganisms was also performed. This approach allows calculation of specific kinetic constants that reflect biological activity of microorganisms. Variation of specific kinetic constants reflects the influence of the fraction of raw vinasse in the feed. High salt concentrations in the reactor may have inhibited the process.	Lopez, I | Borzacconi, L	Univ Republica | University of the Republic - Uruguay | Fac Ingn | Univ Republica University of the Republic - Uruguay Fac Ingn	WATER SCIENCE AND TECHNOLOGY | 64 (10): 2080-2088 2011
Multiobjective optimization of a sugarcane biorefinery involving process and environmental aspects	Process modeling and simulation are essential to predict process energetic demands, and determine possible throughputs and process emissions in biorefineries. In this paper non-linear multiobjective optimization studies with conflicting process and environmental objectives are performed in a sugarcane biorefinery. The process produces bioethanol (first and second generation), bioelectricity and concentrates vinasse in multiple-effect evaporators. Objective functions, concerning process and environmental issues, are defined and studied in five optimization problems. Decision variables are fraction of bagasse diverted to E2G production (Var1),	Costa, CBB | Potrich, E | Cruz, AJG	Fed Univ Sao Carlos UFSCar | Universidade Federal de Sao Carlos | Chem Engn Grad Program | Chem Eng Dept | UFSCar | Dept Chem Engn | Fed Univ Sao Carlos UFSCar Universidade Federal de Sao Carlos Chem Engn Grad Program Chem Eng Dept UFSCar Fed Univ Sao Carlos	RENEWABLE ENERGY | 96: 1142-1152 Part B Sp. Iss. SI OCT 2016

	and the fraction of vinasse that is concentrated up to 7.0 degrees Bx in multiple-effect evaporator (Var2). The results show that Varl cannot assume values greater than circa 0.5, due to thermal demands of the integrated process, while Var2 cannot be lower than 0.15, due to process demands for vegetal steam. Flows of concentrated vinasse are generally higher when maximization of bioethanol throughputs is imposed. When electric power generation and bioethanol throughput maximization are the objectives, the former varies 45.6%, while the latter varies 16.6%, among non-dominated solutions. The adopted approach can be used as a decision-making tool that may help to choose suitable operating conditions, in order to obtain a trade-off between greater profits and a more sustainable process. (C) 2015 Elsevier Ltd. All rights reserved.		UFSCar Universidade Federal de Sao Carlos Dept Chem Engn UFSCar	
Net and Potential Nitrogen Mineralizatio n in Soil with Sugarcane Vinasse	The increasing ethanol production brings many advantages to Brazil. However, it generates high quantities of vinasse from 10 to 15 l per liter of alcohol produced. This residue is applied as a fertilizer in sugarcane crops but, it presents a potential risk to soil quality when high doses of vinasse are applied in the same area over years. So, one solution would be to transport it to distant locations, but this would mean an increase in costs. Thus, concentrated vinasse, wherein the volume is reduced by evaporation process, becomes a viable alternative and is being increasingly used by sugarcane mills in Brazil. The aim of this study was to evaluate the net nitrogen mineralization and potential nitrogen mineralization of soil that received three doses of concentrated and not concentrated vinasse. The not concentrated vinasse is a good alternative to be applied, but higher doses promote N losses by denitrification due to the high water content. The highest values of potential nitrogen mineralization and, lowest values of constant of mineralization in the treatments with concentrated vinasse indicate that this residue releases N at a slower speed than in treatments with not concentrated vinasse, suggesting that there will be N availability in the subsequent	da Silva, A | Rossetto, R | Bonnecine, J | Piemonte, M | Muraoka, T	Univ Sao Paulo | Universidade de Sao Paulo | APTA | Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | CENA | Polo Reg Ctr Sul | Univ Sao Paulo Universidade de Sao Paulo CENA APTA Polo Reg Ctr Sul Univ Fed Sao Carlos Universidade Federal de Sao Carlos	SUGAR TECH | 15 (2): 159-164 JUN 2013

	crops.			
New applications, through drip systems enable environmentally-friendly sugarcane growing techniques	Subsurface drip irrigation has been in use in sugarcane for more than twenty years. The first generation was for irrigation only, the second generation started soon after with the application of fertilisers through the drip system. This work presents the third generation of subsurface drip used for delivering a wide range of materials directly to the root system's environment. The aim of this work was to evaluate new environmentally safe application methods for various agricultural practices utilising the drip irrigation system. Among the new applications is the use of drip as a delivery system for pest control; a trial conducted in Alagoas State, Brazil, evaluated the efficiency of controlling the population of the Giant Borer, Telchin licus, with the application of bio insecticides, Beauveria bassiana. The bio insecticide control efficiency, based on B. bassiana, resulted in up to 81.8% reduction of the Giant Borer population and, as a result, increased sugarcane yield. Another potential application through drip irrigation is the dissemination of inoculation units of a symbiotic fungus, Arbuscular Mycorrhiza (AM). AM fungi form a beneficial association with a variety of crops, including sugarcane. Trials conducted to find the most uniform method for dispersal of AM inoculation units through the drip irrigation system define a mineral based carrier as an efficient distribution method. An additional use for drip is the application of the sugar mill effluent from ethanol production called vinasse. A trial conducted in Sao Paulo State, Brazil, evaluated the constant application of vinasse at a rate of 5%, replacing the application of chemical fertiliser. The effect of vinasse application on the soil was an increase in soil K levels, with no effect on drip system performance or on yield. The results of the trials show that the success in the use of drip as a delivery system depends on meeting such factors as timing of application (e.g. applying B. bassiana when the adults lay their eggs in the soil); The properties of the product to be delivered; It may	Krontal, Y		INTERNATIONAL SUGAR JOURNAL | 116 (1386): 430-437 JUN 2014

	be necessary to develop special carriers (as in the case of mycorrhiza) or to take special measures to ensure environmental safety (such as dilution of vinasse over an extended period to reduce leaching and salinisation risks).			
New sources and methods to isolate vinasse-tolerant wild yeasts efficient in ethanol production	In most Colombian distilleries, fuel alcohol is produced by a continuous operation mode, recycling vinasse to dilute B molasses, which is the main byproduct of the sugar refining process and, more recently, the main feedstock for ethanol production. Commercial yeasts are used as catalysts during the fermentation stage; however, their yield is significantly affected by hyperosmolarity-induced stress and high organic acid concentration, both of which gradually reduce the performance of these microorganisms after a 3-month period of vinasse recycling. In this study, a methodology for isolating wild yeasts obtained from molasses storage tanks and sugarcane buds and leaves was standardized. These yeasts exhibited natural tolerance to vinasse and 85 % of the isolates were characterized as Saccharomyces cerevisiae by biochemical testing. Based on intraspecific characterization by interdelta markers 12-21 and subsequent confirmation by the AFLP method, isolates were classified into five groups of strains with genetic distances ranging between 15 and 30 %. A culture medium containing 50 % vinasse and around 16 % (w/v) reducing sugars was used to determine their fermentation capacity; ethanol yield (Yp/s) ranged from 5.69 to 6.82 % (w/v), volumetric productivity (Qp) from 2.37 to 2.84 g L-1 h(-1), and efficiency was 71.22-85.09 % after 24 h.	Castillo, JAV | Laguado, JA | Lopez, J | Gil, NJ	Colombian Sugarcane Res Ctr Cenicana | Santiago Cali Univ | SENA Palmira | Factory Proc Program | Electrochem & Environm Res Grp GIEMA | Ind Biotechnol Ctr | Biotechnol & Innovat Res Grp | Varietal Program | Colombian Sugarcane Res Ctr Cenicana Factory Proc Program Santiago Cali Univ Electrochem & Environm Res Grp GIEMA SENA Palmira Ind Biotechnol Ctr Biotechnol & Innovat Res Grp Colombian Sugarcane Res Ctr Cenicana Varietal Program	ANNALS OF MICROBIOLOGY | 66 (1): 187-195 MAR 2016
NITROGEN MINERALIZATION FROM SUGARCANE VINASSE	Vinasse is a liquid residue applied as a fertilizer in sugarcane crops. However, in areas far away from sugarcane mills the cost of the distribution can be very high due, the large volume of water. So, one solution is to concentrate the vinasse by the evaporation process to reduce transport costs. Considering that the nitrogen mineralization kinetics is not known in concentrated vinasse, the objective of this study was to evaluate the net and potential nitrogen mineralization in soil that	da Silva, A | Rossetto, R | Bombecini, J | Piemonte, M | Muraoka, T	Univ Sao Paulo | Universidade de Sao Paulo | Sao Paulo Agcy Agribusiness Technol | Ctr Nucl Energy Agr | Univ Sao Paulo Universidade de Sao Paulo Ctr Nucl Energy Agr Sao Paulo Agcy Agribusiness Technol	JOURNAL OF PLANT NUTRITION | 37 (8): 1227-1236 2014

	received vinasse concentrated and not concentrated. The treatments with concentrated vinasse provided the highest values of net mineralization and total nitrogen, which presented significant correlation each other, the same way as the potential mineralization values had a positive correlation with the doses and the amounts of total nitrogen. The total nitrogen values can be used as an index of nitrogen availability in soils that received concentrated vinasse.			
NUTRITIONAL EVALUATION OF SUGARCANE BAGASSE ENRICHED WITH VINASSE IN DIETS FOR GROWING RABBITS	Aiming to evaluate the digestive use and performance of growing rabbits fed with diets containing sugarcane bagasse enriched with vinasse, 118 New Zealand white rabbits was used in a digestibility, caecotrophy and performance trials. The experimental design was completely randomized, being applied in the digestibility and caecotrophy three treatments (a reference diet, a diet containing sugarcane bagasse and a diet containing sugarcane bagasse enriched with vinasse) and in performance trial, four treatments (0, 50, 100 and 150 g kg(-1) of bagasse enriched with vinasse). The data were subjected to variance analysis and subsequently carried out comparisons between the averages of the treatments. The bagasse enriched or not with vinasse changes consumption, excretion and the digestibility coefficients of dry matter, mineral matter, organic matter, crude protein, ether extract and gross energy. The inclusion of vinasse promotes the improvement of the values of digestible energy and digestible protein of bagasse. There was no change in the dry matter of the cecotrophes, while there wasn't on the crude protein of cecotrophes by the inclusion of the bagasse enriched or not with vinasse. There was a reduction of the nutritional contribution in dry matter, from the inclusion of test feeds. This did not affect nutritional contribution in crude protein. The use of bagasse enriched with vinasse in diets for growing rabbits proved viable, so that the inclusion did not alter the average daily weight gain of animals and therefore, the time required to reach slaughter weight.	Ferreira, FNA | Ferreira, WM | Mota, KCD | Neta, CSS | Lara, LB | dos Santos, EA	Univ Fed Minas Gerais | Universidade Federal de Minas Gerais | Univ Estadual Piaui | Universidade Estadual do Piaui (UESPI) | Escola Vet | Dept Zootecnia | Zootecnia | UESPI | Univ Fed Minas Gerais Universidade Federal de Minas Gerais Escola Vet Dept Zootecnia Zootecnia Univ Fed Minas Gerais Universidade Federal de Minas Gerais Escola Vet Dept Zootecnia Univ Estadual Piaui Universidade Estadual do Piaui (UESPI) UESPI Dept Zootecnia	REVISTA CAATINGA | 28 (4): 217-226 2015

Operational strategies for long-term biohydrogen production from sugarcane stillage in a continuous acidogenic packed-bed reactor	The use of packed-bed reactors for biohydrogen production often results in performance losses in the short term because of the negative effects of operational factors, such as biomass accumulation and inadequate pH conditions. Because packed -bed systems constitute a promising technology for biohydrogen production, studies on continuous hydrogen production over the long term must be carefully conducted by applying proper operational strategies. Therefore, this study assessed continuous biohydrogen production in a packed -bed reactor operated under thermophilic conditions (55 degrees C) using sugarcane stillage as the substrate. The results indicated that the acidogenic reactor presented a capacity for recovering from performance losses, regardless of their cause, and maintaining continuous hydrogen production rates under long-term operation (240 days). pH proved to be a key factor for obtaining continuous hydrogen production, and the optimal results were observed in a pH range from 5.1 to 5.2. Furthermore, an optimal specific organic loading rate of 6.3-6.4 g carbohydrates g(-1) volatile suspended solids d(-1) was observed, and this value is consistent with the results of previous studies focused on hydrogen production from fermentative systems. (C) 2015 Hydrogen Energy Publications LLC. Published by Elsevier Ltd. All rights reserved.	Fuess, LT | Kiyuna, LSM | Garcia, ML | Zaiat, M	Univ Sao Paulo | Universidade de Sao Paulo | Sao Carlos Sch Engn EESC | Biol Proc Lab LPB | UNESP Univ Estadual Paulista | Universidade Estadual Paulista | Inst Geosci & Exact Sci | Brazilian Ctr Res Energy & Mat CNPEM | Brazilian Bioethanol Sci & Technol Lab CTBE | Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn EESC Biol Proc Lab LPB UNESP Univ Estadual Paulista Universidade Estadual Paulista Inst Geosci & Exact Sci Brazilian Ctr Res Energy & Mat CNPEM Brazilian Bioethanol Sci & Technol Lab CTBE	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY | 41 (19): 8132-8145 Sp. Iss. SI MAY 25 2016
Optimization, metabolic pathways modeling and scale-up estimative of an AnSBBR applied to biohydrogen production by co-digestion of vinasse and molasses	This study investigated the application of an AnSBBR in biohydrogen production process from the co-digestion of vinasse and molasses. Process performance indicators were evaluated using the organic matter removal efficiency, molar hydrogen yield, productivity and composition of the biogas. The influence of influent composition and concentration, feeding mode (batch/fed batch), need for micronutrient supplementation and inoculum pretreatment were evaluated. Kinetic modeling of the metabolic pathways of the conditions with the highest hydrogen productivity was performed. The results showed that the system was stable under all	Albanez, R | Louato, G | Zaiat, M | Ratusznei, SM | Rodrigues, JAD	Maua Inst Technol | Instituto Maua de Tecnologia | Univ Sao Paulo EESC USP | Maua Sch Engn | Sao Carlos Sch Engn | Maua Inst Technol Instituto Maua de Tecnologia Maua Sch Engn Univ Sao Paulo EESC USP Sao Carlos Sch Engn	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY | 41 (45): 20473-20484 DEC 7 2016

	conditions. The best results were obtained with an influent concentration of 6000 mgCOD L-1, composition of 67-33% vinasse-molasses, without micronutrient supplementation, with inoculum heat shock pretreatment, and batch mode (13.5 molH(2) m(-3) d(-1) with 39% H-2). Increasing the percentage of the vinasse in the influent was unfavorable, but increasing the influent concentration, refraining from micronutrient supplementation and performing the inoculum heat shock pretreatment favored the performance indicators. The fitted kinetic model aided the understanding of the metabolic pathways: hydrogen is produced via acetic, butyric and valeric acids routes. Scale up estimation (performed with data of best condition) resulted in a system with 6 discontinuous reactors configured in parallel, each one with a volume of 27,297 m(3). (C) 2016 Hydrogen Energy Publications LLC. Published by Elsevier Ltd. All rights reserved.			
Organic loading rate impact on biohydrogen production and microbial communities at anaerobic fluidized thermophilic bed reactors treating sugarcane stillage	This study aimed to evaluate the effect of high organic loading rates (OLR) (60.0-480.00 kg COD m (3) d (1)) on biohydrogen production at 55 degrees C, from sugarcane stillage for 15,000 and 20,000 mg COD L (1), in two anaerobic fluidized bed reactors (AFBR(1) and AFBR(2)). It was obtained, for H-2 yield and content, a decreasing trend by increasing the OLR. The maximum H-2 yield was observed in AFBR(1) (2.23 mmol g CODadded1). The volumetric H-2 production was proportionally related to the applied hydraulic retention time (HRT) of 6, 4, 2 and 1 h and verified in AFBR1 the highest value (1.49 L H-2 h (1) L (1)). Among the organic acids obtained, there was a predominance of lactic acid (7.5-22.5%) and butyric acid (9.4-23.8%). The microbial population was set with hydrogen-producing fermenters (Megasphaera sp.) and other organisms (Lactobacillus sp.). (C) 2014 Elsevier Ltd. All rights reserved.	Santos, SC | Rosa, PRF | Sakamoto, IK | Varesche, MBA | Silva, EL	Univ Sao Paulo | Universidade de Sao Paulo | Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | Dept Hydraul & Sanitat | Dept Chem Engn | Univ Sao Paulo Universidade de Sao Paulo Dept Hydraul & Sanitat Univ Fed Sao Carlos Universidade Federal de Sao Carlos Dept Chem Engn	BIORESOURCE TECHNOLOGY | 159: 55-63 MAY 2014
Photodegradation of sugarcane vinasse: evaluation of the effect of vinasse pre-	In this work, the effect of vinasse pre-treatment and anatase content in the photocatalytic degradation of sugarcane vinasse was evaluated. The in nature vinasse was pretreated by coagulation/flocculation using	de Souza, RP | Ferrari-Lima, AM | Pezoti, O | Santana, VS | Gimenes, ML | Fernandes-	Univ Tecnol Fed Parana | Universidade Tecnologica Federal do Parana | Pontificia	ACTA SCIENTIARUM-TECHNOLOGY | 38 (2): 217-226 APR-JUN 2016

treatment and the crystalline phase of TiO2	vegetal tannin as coagulant and diluted 1: 2 with deionized water. The photocatalytic tests with in nature, pretreated and diluted vinasse were performed for 48 hours under UV radiation using 1 g of catalyst: TiO2 Kronos calcined at 300 degrees C (100% anatase) and 1000 degrees C (34% anatase) and TiO2 P25 (87% anatase). The process of coagulation/flocculation removed about 50, 85 and 97% of COD, color and turbidity of in nature vinasse, respectively. The results showed that despite the slight COD decrease of in nature vinasse, its toxicity was significantly reduced after photocatalytic treatment, especially when TiO2-34 and TiO2-87 were used. This behavior shows that the mixture of anatase and rutile phases showed a positive synergistic effect. Regarding pre-treatment of vinasse, the coagulation/flocculation process was more efficient, promoting the greatest reductions of COD (67%) and toxicity (up to 10 times).	Machado, NRC	Universidade Catolica do Parana | Univ Estadual Maringa | Universidade Estadual de Maringa | Univ Estadual Oeste Parana | Universidade Estadual do Oeste do Parana | Coordenacao Bioproc & Biotecnol | Coordenacao Tecnol Proc Quim | Dept Quim | Dept Engn Quim | Univ Tecnol Fed Parana Universidade Tecnologica Federal do Parana Coordenacao Bioproc & Biotecnol Univ Tecnol Fed Parana Pontificia Universidade Catolica do Parana Universidade Tecnologica Federal do Parana Coordenacao Tecnol Proc Quim Univ Estadual Maringa Universidade Estadual de Maringa Dept Quim Univ Estadual Oeste Parana Universidade Estadual do Oeste do Parana Dept Engn Quim Univ Estadual Maringa Universidade Estadual de Maringa Dept Engn Quim	

Physico-Chemical and Sensorial Evaluation of Sugarcane Spirits Produced Using Distillation Residue	The objective of the present study was to analyze the use of vinasse from cachaca as an ingredient of the fermentation medium for the spirit production. The fermentations were conducted out in three successive batches using a Saccharomyces cerevisiae isolate. In the first batch, the sugarcane broth was only diluted with distilled water. In the second and third batches, the fermentations were carried out using the cane broth diluted with vinasse from the distillation of the sugarcane wines of the first and second batches, respectively at a concentration of 10% (v/v). The spirits were submitted to the physicochemical and sensorial analyses. The results showed that vinasse addition did not affect the fermentation, distillation and chemical-sensorial quality of the beverage. Therefore, the vinasse addition could be an alternative use for that residue.	Menezes, EGT | Alves, JGLF | Valeriano, C | Guimaraes, IC	Univ Fed Lavras | Universidade Federal de Lavras | Dept Ciencia Alimentos | Univ Fed Lavras Universidade Federal de Lavras Dept Ciencia Alimentos	BRAZILIAN ARCHIVES OF BIOLOGY AND TECHNOLOGY | 56 (1): 121-126 JAN-FEB 2013
Production potential of biogas in sugar and ethanol plants for use in urban buses in Brazil	Brazil is one of the major producers of ethanol and sugar in the world. Ethanol has been used as a renewable fuel in passenger vehicles, decreasing the levels of pollution in big cities like Sao Paulo and Rio de Janeiro. On the other hand, sugarcane ethanol plants produce a waste of vinasse, which is used as organic fertilizer in cane plantations which causes soil and water contamination. The anaerobic digestion treatment can be used to reduce the pollution vinasse and, concomitantly, to increase the production of biogas. This essay intended to reflect/discuss about the potential of biogas production from the anaerobic digestion of vinasse in Brazil, and the availability of its use in urban buses as gas fuel. Brazilian urban buses are using natural gas as fuel in big cities like Rio de Janeiro, but diesel prevails in most of the cities, and biogas can be important to reduce the dependence of a nonrenewable fuel in the country. The national potential for biogas production from vinasse could replace 50% of the urban bus fleet in Brazil. A big ethanol production plant has autonomy to supply 788 buses per day.	de Souza, SNM | Borsoi, A | Santos, RF | Secco, D | Frigo, EP | da Silva, MJ	State Univ W Parana Grad Program | Bairro Fac | State Univ W Parana Grad Program Bairro Fac	JOURNAL OF FOOD AGRICULTURE & ENVIRONMENT | 10 (1): 908-910 Part 2 JAN 2012

Reduction of BOD values of sugarcane vinasse through bioremediation by water hyacinth (Eichhornia crassipes)		Marcato, ACC | Souza, CP | Fontanetti, CS	Sao Paulo State Univ | Universidade Estadual Paulista | Dept Biol | UNESP | Sao Paulo State Univ Universidade Estadual Paulista Dept Biol UNESP	TOXICOLOGY LETTERS | 259: S98-S99 Suppl. S OCT 2016
Sequential fermentative and phototrophic system for hydrogen production: An approach for Brazilian alcohol distillery wastewater	This study evaluated the possibility of using sugarcane vinasse for biological hydrogen production under non-sterile conditions via sequential two-stage fermentative and phototrophic processes, which simultaneously allows bioenergy production and chemical oxygen demand (COD) removal. The fermentative process was performed in an anaerobic fluidized bed reactor (AFBR) fed with a mixture of sucrose and sugarcane vinasse (5:10 g COD L-1). The phototrophic process was performed using a microbial consortium (Rhodopseudomonas related microorganisms) as inoculum and batch reactors fed with different concentrations of the AFBR effluent (10, 20, 40, 70 and 80%, v/v). The hydrogen yield (HY) (0.34 mol H-2 g(-1) CODinfluent) observed in the fermentative step was justified by the establishment of microbial community composed predominantly by Lactobacillus related microorganisms. The highest HY observed in the phototrophic stage (5.5 mmol H-2 g(-1) CODremoved) was observed for the lowest AFBR concentration. Increasing the AFBR effluent concentration as the substrate for the phototrophic reactors had a negative impact on cell growth, hydrogen production and COD removal mostly due to the occurrence of sulfate reduction. Hydrogen production was not observed in batch reactors fed with 70 and 80% of AFBR effluent; however, under those conditions, the sulfate removal rate was 86.5 and 86.9%, respectively. Copyright (C) 2015, Hydrogen Energy Publications, LLC. Published by Elsevier Ltd. All rights reserved.	Lazaro, CZ | Varesche, MBA | Silva, EL	Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | Univ Sao Paulo | Universidade de Sao Paulo | Dept Chem Engn | Sch Engn Sao Carlos | Dept Hydraul & Sanitat | Univ Fed Sao Carlos Universidade Federal de Sao Carlos Dept Chem Engn Univ Sao Paulo Universidade de Sao Paulo Sch Engn Sao Carlos Dept Hydraul & Sanitat	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY | 40 (31): 9642-9655 AUG 17 2015

Sugar Cane Stillage: A Potential Source of Natural Antioxidants	Biorefinery of sugar cane is the first economic activity of Reunion Island. Some sugar cane manufactured products (juice, syrup, molasses) have antioxidant activities and are sources of both phenolic compounds and Maillard Reaction Products (MRP). The study aimed to highlight the global antioxidant activity of sugar cane stillage and understand its identity. Chromatographic fractionation on Sephadex LH-20 resin allowed the recovery of a MRP-rich fraction, responsible for 58 to 66% of the global antioxidant activity according to the nature of the sugar cane stillage (DPPH test), and a phenolic compounds-rich fraction for 37 to 59% of the activity. A good correlation was recorded between the antioxidant activity of the sugar cane stillage and its content in total reducing compounds amount (Folin-Ciocalteu assay), among them 2.8 to 3.9 g/L of phenolic compounds (in 5-caffeoylquinic acid equivalent). Preliminary experiments by HPLC-DAD-MS allowed to identify several free phenolic acids and gave clues to identify esters of quinic acids.	Caderby, E | Baumberger, S | Hoareau, W | Fargues, C | Decloux, M | Maillard, MN	eRcane | AgroParisTech | Universite Paris Saclay (ComUE) | INRA | Institut National de la Recherche Agronomique (INRA) | CNAM | Conservatoire National Arts & Metiers | Ingn Proc Aliments UMR1145 | IJPB UMR1318 | eRcane AgroParisTech AgroParisTech Universite Paris Saclay (ComUE) Ingn Proc Aliments UMR1145 INRA Institut National de la Recherche Agronomique (INRA) Ingn Proc Aliments UMR1145 CNAM Conservatoire National Arts & Metiers Ingn Proc Aliments UMR1145 AgroParisTech AgroParisTech Universite Paris Saclay (ComUE) IJPB UMR1318 INRA Institut National de la Recherche Agronomique (INRA) IJPB UMR1318	JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY | 61 (47): 11494-11501 NOV 27 2013
Sugarcane fertigated with stillage and mineral fertilizers under subsurface drip irrigation: Cycle of cane-plant	This study aimed to evaluate the effect of subsurface drip irrigation and the application of stillage and nutrients in some agronomic parameters, stem yield, technological characteristics of sugarcane and yield of theoretical recoverable sugar. The experiment was carried out in completely randomized block design with four treatments and five replications. The treatments were: mineral fertilizers without irrigation; irrigation and fertigation with NPK using mineral fertilizers; irrigation and fertigation with stillage supplying the K and complementation of N and P with mineral fertilizers; and irrigation and	Barbosa, EAA | Arruda, FB | Pires, RCM | da Silva, TJA | Sakai, E	FEAGRI UNICAMP | Universidade Estadual de Campinas | IAC APTA SAA | Instituto Agronomico de Campinas (IAC) | ICAT UFMT | Universidade Federal de Mato Grosso do Sul | FEAGRI UNICAMP Universidade Estadual de Campinas IAC APTA SAA	REVISTA BRASILEIRA DE ENGENHARIA AGRICOLA E AMBIENTAL | 16 (9): 952-958 SEP 2012

	fertigation with stillage supplying the NK and complementation of P with mineral fertilizer. The system of irrigation adopted was the subsurface drip irrigation. The irrigated treatments showed higher number of tillers and leaf area index, when compared to rainfed cultivation. The fertigation with stillage supplying the K promoted higher Brix and stem yield when compared to non-irrigated cultivation. The irrigation and fertigation with stillage supplying the NK promoted higher yield of theoretical recoverable sugar, when compared the cultivation without irrigation.		Instituto Agronomico de Campinas (IAC) ICAT UFMT Universidade Federal de Mato Grosso do Sul	
Sugarcane fertigated with vinasse under subsurface drip irrigation in three cycles of cane-ratoon	The objective of this study was evaluate the effect of irrigation and fertigation with mineral fertilizer and vinasse applied by subsurface drip irrigation, in the number of tiller, stem yield, technological quality of sugarcane and yield of recoverable sugar in first three cycles of ratoon cane. The treatments were: T1NI - cultivation without irrigation with mineral fertilization; T2I - cultivation fertigated with mineral fertilizers; T3Iv - cultivation fertigated with the vinasse supplying K and complementation of NP with mineral fertilizer; T4IV - cultivation fertigated with the vinasse supplying NPK. In the cycle of the first ratoon cane, there was no effect of treatments on the variables, already in the subsequent cycles, the T2I and T3Iv showed higher numbers of tillers, 17.4 and 17.2 tiller m(-1), in the second ratoon cane and 16.6 and 16.0 tiller m(-1) in the third ratoon cane, respectively. The stem yield was amended with the T4IV obtaining the higher yield, 179.6 Mg ha(-1), in the second ratoon cane, and the T2I and T3Iv in the third ratoon cane, 151.5 and 151.0 Mg ha(-1), respectively. There was no treatment effect on the technological quality and in the second ratoon cane the T3Iv and T4IV showed higher yield of sugar, 25 and 25.9 Mg ha(-1), respectively.	Barbosa, EAA | Arruda, FB | Pires, RCM | da Silva, TJA | Sakai, E	Univ Estadual Campinas | Universidade Estadual de Campinas | SAA | Instituto Agronomico de Campinas (IAC) | UFMT | Universidade Federal de Mato Grosso do Sul | FEAGRI | APTA | IAC | ICAT | Univ Estadual Campinas Universidade Estadual de Campinas FEAGRI SAA Instituto Agronomico de Campinas (IAC) APTA IAC UFMT Universidade Federal de Mato Grosso do Sul ICAT	REVISTA BRASILEIRA DE ENGENHARIA AGRICOLA E AMBIENTAL | 17 (6): 588-594 JUN 2013
Sugarcane molasses-based bio-ethanol wastewater treatment by two-phase multi-staged	This study was designed to evaluate a treatment system for high strength wastewater (vinasse) from a sugarcane molasses-based bio-ethanol plant in Thailand. A laboratory-scale two-phase treatment system composed of a sulfate reducing (SR) tank and	Choeisai, P | Jitkam, N | Silapanoraset, K | Yubolsai, C | Yoochatchaval, W | Yamaguchi, T	Khon Kaen Univ | Khon Kaen University | King Mongkuts Univ Technol Thonburi | King Mongkuts University of	WATER SCIENCE AND TECHNOLOGY | 69 (6): 1174-1180 2014

up-flow anaerobic sludge blanket (UASB) combination with up-flow UASB and down-flow hanging sponge	multi-staged up-flow anaerobic sludge blanket (MS-UASB) reactor was used as the pre-treatment unit. Conventional UASB and down-flow hanging sponge (DHS) reactors were used as the post-treatment unit. The treatment system was operated for 300 days under ambient temperature conditions (24.6-29.6 degrees C). The hydraulic retention time (HRT) in each unit was kept at 25 h for the two-phase system and 23 h for the UASB&DHS. The influent concentration was allowed to reach up to 15,000 mg chemical oxygen demand (COD)/L. COD removal efficiency (based on influent COD) of the two-phase MS-UASB and the UASB&DHS was 54.9 and 18.7%, respectively. Due to the effective removal of sulfide in the SR tank, the MS-UASB achieved a high methane conversion ratio of up to 97%. In DHS, nitrification occurred at the outside portion of the sponge media while denitrification occurred at the inside. Consequently, 27% of the total nitrogen (TN) was removed. An amount of 32% of residual nitrogen (28 mgN/L) was in the form of nitrate, a better nitrogen state for fertilizer.	| Onodera, T | Syutsubo, K	Technology | King Mongkuts University of Technology Thonburi | Nagaoka Univ Technol | Nagaoka University of Technology | Natl Inst Environm Studies | National Institute for Environmental Studies - Japan | Fac Engn | Dept Environm Engn | Dept Environm Syst Engn | Ctr Reg Environm Res | Khon Kaen Univ Khon Kaen University Fac Engn Dept Environm Engn King Mongkuts Univ Technol Thonburi King Mongkuts University of Technology King Mongkuts University of Technology Thonburi Fac Engn Dept Environm Engn Nagaoka Univ Technol Nagaoka University of Technology Dept Environm Syst Engn Natl Inst Environm Studies National Institute for Environmental Studies - Japan Ctr Reg Environm Res	
Sugarcane vinasse as substrate for fermentative hydrogen production: The effects of temperature and substrate concentration	The present study aimed to evaluate the hydrogen production of a microbial consortium using different concentrations of sugarcane vinasse (2-12 g COD L-1) at 37 degrees C and 55 degrees C. In mesophilic tests, the increase in vinasse concentration did not significantly impact the hydrogen yield (HY) (from 1.72 to 2.23 mmol H-2 g(-1) CODinfluent) but had a positive effect on the hydrogen	Lazaro, CZ | Perna, V | Etchebehere, C | Varesche, MBA	Univ Sao Paulo | Universidade de Sao Paulo | Univ Fed Sao Carlos | Universidade Federal de Sao Carlos | Univ Republica | Instituto de Investigaciones Biologicas Clemente	INTERNATIONAL JOURNAL OF HYDROGEN ENERGY | 39 (12): 6407-6418 APR 15 2014

	production potential (P) and hydrogen production rate (R-m). On the other hand, the increase in the substrate concentration caused a drop in HY from 2.31 to 0.44 mmol H-2 g(-1) CODinfluent in the tests performed at 55 degrees C with vinasse concentrations from 2 to 12 g COD L-1. The mesophilic community was composed of different species within the Clostridium genus, and the thermophilic community was dominated by organisms affiliated with the Thermoanaerobacter genus. Not all isolates affiliated with the Clostridium genus contributed to a high HY, as the homoacetogenic pathway can occur. Copyright (C) 2014, Hydrogen Energy Publications, LLC. Published by Elsevier Ltd. All rights reserved.		Estable Uruguay | University of the Republic - Uruguay | Escola Engn Sao Carlos | Dept Hidraul & Saneamento | Lab Proc Biol | Lab Controle Ambiental 2 | Fac Quim | Lab Ecol Microbiana | Inst Invest Biol Clemente Estable | Fac Ciencias | Univ Sao Paulo Universidade de Sao Paulo Escola Engn Sao Carlos Dept Hidraul & Saneamento Lab Proc Biol Univ Fed Sao Carlos Universidade Federal de Sao Carlos Lab Controle Ambiental 2 Univ Republica Instituto de Investigaciones Biologicas Clemente Estable Uruguay University of the Republic - Uruguay Fac Quim Lab Ecol Microbiana Inst Invest Biol Clemente Estable Univ Republica University of the Republic - Uruguay Fac Ciencias	

Sugarcane vinasse: Environmental implications of its use	The inadequate and indiscriminate disposal of sugarcane vinasse in soils and water bodies has received much attention since decades ago, due to environmental problems associated to this practice. Vinasse is the final by-product of the biomass distillation, mainly for the production of ethanol, from sugar crops (beet and sugarcane), starch crops (corn, wheat, rice, and cassava), or cellulosic material (harvesting crop residues, sugarcane bagasse, and wood). Because of the large quantities of vinasse produced, alternative treatments and uses have been developed, such as recycling of vinasse in fermentation, fertirrigation, concentration by evaporation, and yeast and energy production. This review was aimed at examining the available data on the subject as a contribution to update the information on sugarcane vinasse, from its characteristics and chemical composition to alternatives uses in Brazil: fertirrigation, concentration by evaporation, energy production; the effects on soil physical, chemical and biological properties; its influence on seed germination, its use as biostimulant and environmental contaminant. The low pH, electric conductivity, and chemical elements present in sugarcane vinasse may cause changes in the chemical and physical-chemical properties of soils, rivers, and lakes with frequent discharges over a long period of time, and also have adverse effects on agricultural soils and biota in general. Thus, new studies and green methods need to be developed aiming at sugarcane vinasse recycling and disposal. (C) 2013 Elsevier Ltd. All rights reserved.	Christofoletti, CA | Escher, JP | Correia, JE | Marinho, JFU | Fontanetti, CS	Sao Paulo State Univ UNESP | Universidade Estadual Paulista | Sao Paulo State Univ UNESP Universidade Estadual Paulista	WASTE MANAGEMENT | 33 (12): 2752-2761 DEC 2013
Sulfidogenesis interference on methane production from carbohydrate-rich wastewater	Two anaerobic fixed-structured bed reactors were fed with synthetic wastewater simulating the soluble fraction of sugarcane vinasse to evaluate the interference of sulfidogenesis on methanogenesis. The reactors running in parallel were subjected to the same operating conditions. The influent organic matter concentration (in term of chemical oxygen demand (COD)) remained close to 4,000 mgCOD L-1 and the hydraulic retention time was 24 hours. One	Godoi, LAG | Damianovic, HRZ | Foresti, E	Univ Sao Paulo | Universidade de Sao Paulo | Univ Sao Paulo Universidade de Sao Paulo	WATER SCIENCE AND TECHNOLOGY | 72 (9): 1644-1652 NOV 2015

	reactor, the methanogenic (control reactor), received sulfate only to provide the sulfur required as a nutrient to the methanogenic biomass. The other one, the sulfidogenic/methanogenic reactor (SMR), received sulfate concentration corresponding to COD/sulfate ratios of 4, 5 and 3. In the last phase, the COD removal efficiencies were higher than 96% in both reactors and the SMR achieved 97% of sulfate removal efficiency (COD/sulfate ratio of 3 and influent sulfate concentration close to 1,300 mgSO(4)(2-) L-1). Both reactors also had similar methane yields in this phase, close to 350 mLCH(4) gCOD(removed)(-1) at standard temperature and pressure. These results indicated no significant inhibition of methanogenic activity under the sulfidogenic conditions assessed.			
Technical-economic assessment of different biogas upgrading routes from vinasse anaerobic digestion in the Brazilian bioethanol industry	This paper presents a technical-economic assessment of biomethane production from vinasse in the Brazilian bioethanol industry, considering five technological routes of biogas upgrading. The technologies assessed were pressure water scrubbing, organic-physical scrubbing, amine scrubbing, membrane separation and pressure swing adsorption. The biomethane costs of the five technological routes overlapped in the range between R$30/GJ(HHv) (US$13/GJ(HHv)) and R$34/GJ(HHv) (US$14/GJ(HHv)), which indicates a certain equivalence of the options. Those costs were comparable to the prices of potential alternative fuels at 2014 prices, such as the Bolivian natural gas, priced at R$20/GJ (US$8/GJ); imported LNG, at R$31/ GJ (US$13/GJ); and diesel, at R$42/GJ (US$18/GJ). The effects of scale on biomethane cost were also assessed and pointed out that the likely minimum scale for vinasse-to-biomethane projects aiming at diesel substitution would be at sugarcane mills with a minimum capacity of producing 87 million liters of ethanol per season, whereas if the aim were to target natural gas markets, 174 million liters of ethanol per season would likely be the minimum capacity for competitive prices. (C) 2016 Elsevier Ltd. All rights reserved.	Leme, RM | Seabra, JEA	Univ Estadual Campinas Unicamp | Universidade Estadual de Campinas | Face Engn Mecan | Univ Estadual Campinas Unicamp Universidade Estadual de Campinas Face Engn Mecan	ENERGY | 119: 754-766 JAN 15 2017

TECHNOLOGY FOR SUGARCANE AGROINDUSTRY WASTE REUSE AS GRANULATED ORGANOMINERAL FERTILIZER	Aiming to evaluate the use of sugarcane industry waste such as byproducts from vinasse concentration process, it was assessed the organomineral fertilizer BIOFOM (concentrated vinasse, filter cake, boiler ash, soot from chimneys and supplemented with mineral fertilizers). The study included characterization and agronomic potential analysis of a test plant (corn), by noting the differences between mineral fertilizers and BIOFOM fertilization until 45 days after sowing. The technology traditionally used to produce BIOFOM was based on vinasse evaporation with high heat transfer coefficients. It was observed that the technology, which can be formulated according to the needs of any crop, could be used in many cases as mineral fertilizer. Therefore, the use of this organomineral fertilizer reduces waste generation of sugarcane industry.	Gurgel, MND | Correa, STR | Neto, DD | De Paula, DR	Dedini SA Ind Base | Lab Nacl Ciencia & Tecnol Bioetanol CTBE | Escola Super Agr Luis Dequeiroz | Universidade de Sao Paulo | Univ Estadual Campinas | Universidade Estadual de Campinas | Engn Desenvolvimento | Programa Sustentabilidade | Dept Prod Vegetal | Fac Agr Engn | Dept Agua & Solo | Dedini SA Ind Base Engn Desenvolvimento Lab Nacl Ciencia & Tecnol Bioetanol CTBE Programa Sustentabilidade Escola Super Agr Luis Dequeiroz Universidade de Sao Paulo Dept Prod Vegetal Univ Estadual Campinas Universidade Estadual de Campinas Fac Agr Engn Dept Agua & Solo	ENGENHARIA AGRICOLA | 35 (1): 63-75 JAN-FEB 2015
The Current Status of Sugar Industry and By-products in Thailand	Sugarcane is one of the major agricultural crop of Thailand that covers 1.762 million hectares of area across the 47 provinces of the country. A current sugarcane production of 94.05 million tons is being utilized for varieties of applications, such as production of ethanol, sugar for consumption, fuel blending, pulp paper products, use of vinasse and filter cake for fertilization. To ensure crop sustainability, multiple policies and plans are implemented. Crop zoning and breeding improvement program significantly influences an increase in crop production and yield. With upgraded equipment of co-generation system in combination with optimizing operating conditions, it is possible to achieve surplus electricity to export to national grid at 123 kWh	Sriroth, K | Vanichsriratana, W | Sunthornvarabhas, J	MITR PHOL Grp | Kasetsart Univ | Kasetsart University | Natl Ctr Genet Engn & Biotechnol | National Science & Technology Development Agency - Thailand | Dept Biotechnol | MITR PHOL Grp Kasetsart Univ Kasetsart University Dept Biotechnol Natl Ctr Genet Engn & Biotechnol National Science & Technology Development Agency -	SUGAR TECH | 18 (6): 576-582 Sp. Iss. SI DEC 2016

	per ton cane from sugar processing factory. Multiple collaboration were established to create a centre for communication and negotiation between grower, miller, and government. These factors are the key to success of Thailand's sugar industry.		Thailand	
The nutritive value of modified dried vinasse (Pro Mass) and its effects on growth performance, carcass characteristics and some blood biochemical parameters in steers	This study was conducted to determine the chemical composition and rumen degradability characteristics of modified dried vinasse (ProMass) originating from bakers yeast production and to investigate its effects on steer performance, carcass characteristics and some blood parameters. This additive compound with an elevated metabolizable energy (2 800 kcal/g) contained a marked proportion of crude proteins which were remarkably rich in glutamic acid. The degradation of dry matter and organic matter measured in rumens from 4 crossed sheep was very high (about 900 g/kg) during the first 4 hours and the ProMass crude protein was markedly soluble. Forty-five steers were randomly allotted in 3 equal groups according to the mixed diet regimen (concentrates plus forage): concentrates supplemented with 40 g/kg or 80 g/kg ProMass were distributed to assay groups for 24 weeks whereas one group was not supplemented and served as negative control. Growth performance and food efficiency was slightly increased but not significantly in supplemented steers and faecal moisture and serum biochemical profiles (urea, protein and cholesterol concentrations and AST, ALT and ALP activities) were unchanged compared to controls. ProMass supplementation has induced significant reductions of the heart and pelvic fat weights whereas the dressing percentages and the other carcass characteristics remained unaffected. These results showed that ProMass supplies highly soluble proteins, can be included in the steer ration up to 80 g/kg without adverse effects and would promote fat utilization.	Yalcin, S | Eltan, O | Karsli, MA	Ankara Univ | Ankara University | Integro Food & Feed Mfg Co | Yuzuncu Yil Univ | Yuzuncu Yil University | Selcuk Univ | Selcuk University | Fac Vet Med | Dept Anim Nutr | Dept Food Hyg & Technol | Ankara Univ Ankara University Fac Vet Med Dept Anim Nutr Integro Food & Feed Mfg Co Yuzuncu Yil Univ Yuzuncu Yil University Fac Vet Med Dept Anim Nutr Selcuk Univ Selcuk University Fac Vet Med Dept Food Hyg & Technol	REVUE DE MEDECINE VETERINAIRE | 161 (5): 245-252 MAY 2010

The recovery of polymerization grade aconitic acid from sugarcane molasses	BACKGROUNDAconitic acid (propene-1, 2, 3- tricarboxylic acid) is the most prevalent organic acid found in sugar cane. It is used in the food processing industry as an acidulant and can be used in the synthesis of plasticizers. It can also be used to synthesize biodegradable polyesters for tissue engineering applications. In this study, aconitic acid was isolated from sugarcane molasses via liquid-liquid extraction with ethyl acetate. Six combinations of time and temperature (1-6 h at either 30 or 40 degrees C) were tested. In order to conserve solvent, ethyl acetate was recovered and reused for subsequent extractions. The recovery of aconitic acid from vinasse was also evaluated. RESULTSUnder the most efficient set of conditions, 69% of the aconitic acid was recovered as free acid. The purity (HPLC) of the extracted acid was found to be 99.9%. Ethanol was an additional stream that was generated by fermentation of molasses and yields of 12.4% (g per 100 g of molasses) were obtained. CONCLUSIONThe yield of aconitic acid from molasses varied from 34-69%, depending on the extraction conditions, with purity of the extracted acid being 99.9%. The aconitic acid is of a quality sufficient to synthesize polymers that could realize high-value in biomedical applications. (c) 2013 Society of Chemical Industry	Kanitkar, A | Aita, G | Madsen, L	Louisiana State Univ | Louisiana State University | Louisiana State University System | Ctr Agr | Audubon Sugar Inst | Dept Biol & Agr Engn | Louisiana State Univ Louisiana State University Louisiana State University System Ctr Agr Audubon Sugar Inst Louisiana State Univ Louisiana State University Louisiana State University System Ctr Agr Dept Biol & Agr Engn	JOURNAL OF CHEMICAL TECHNOLOGY AND BIOTECHNOLOGY | 88 (12): 2188-2192 DEC 2013
The Success and Sustainability of the Brazilian Sugarcane-Fuel Ethanol Industry	Currently, Brazil has 410 sugar and ethanol plants that crush about 660 million tons of cane per crop, producing about 28.5 billion liters of ethanol and 38.7 million tons of sugar. New sugarcane varieties launched in the last two years are less demanding in water, have high sugar concentration, and are more adaptable to mechanical harvesting. Regarding the sustainability of ethanol production from sugarcane, it is essential to consider the use of the land, reduction of greenhouse gases (GHG), bioelectricity production from bagasse, energy balance of ethanol produced from sugarcane and reduction of vinasse. No other technology available to date has been able to transform the sun's energy and to reduce carbon emissions as efficiently and economically as the production of	Amorim, HV | Gryschek, M | Lopes, ML	Fermentec	SUSTAINABILITY OF THE SUGAR AND SUGAR-ETHANOL INDUSTRIES | 1058: 73-82 2010

	ethanol from sugarcane and its use as biofuel. This amazing combination of the sun's energy, fixation of CO(2) by sugarcane, and the transformation of sugars into a high quality, clean, liquid fuel has made the ethanol industry in Brazil a success as well as an example of sustainability.			
The sugar and alcohol industry in the biofuels and cogeneration era: a paradigm change (part I)	The aim of this paper is to discuss the major technological changes related to the implementation of large-scale cogeneration and biofuel production in the sugar and alcohol industry. The reduction of the process steam consumption, implementation of new alternatives in driving mills, the widespread practice of high steam parameters use in cogeneration facilities, the insertion of new technologies for biofuels production (hydrolysis and gasification), the energy conversion of sugarcane trash and vinasse, animal feed production, process integration and implementation of the biorefinery concept are considered. Another new paradigm consists in the wide spreading of sustainability studies of products and processes using the Life Cycle Assessment (LCA) and the implementation of sustainability indexes. Every approach to this issue has as an objective to increase the economic efficiency and the possibilities of the sugarcane as a main source of two basic raw materials: fibres and sugar. The paper briefly presents the concepts, indicators, state-of-the-art and perspectives of each of the referred issues.	Lora, EES | Rocha, MH | Palacio, JCE | Venturini, OJ | Reno, MLG | del Olmo, OA	Univ Fed Itajuba | Universidade Federal de Itajuba | ICIDCA Cuban Res Inst Sugarcane Coprod | Mech Engn Inst IEM | NEST Excellence Grp Thermal Power & Distributed G | Univ Fed Itajuba Universidade Federal de Itajuba Mech Engn Inst IEM NEST Excellence Grp Thermal Power & Distributed G ICIDCA Cuban Res Inst Sugarcane Coprod	SUGAR INDUSTRY-ZUCKERINDUSTRIE | 139 (1): 28-36 JAN 5 2014
Thermophilic anaerobic digestion of raw sugarcane vinasse	The application of thermophilic anaerobic digestion is a logical choice for the treatment of sugarcane vinasse (industrial wastewater from ethanol production) because this process enables the recovery of energy as hydrogen and methane without requiring energy for heat or interfering in its quality as a bio-fertilizer. Thus, this study evaluated the performance of thermophilic methanogenic up-flow sludge blanket reactors (UASB) operating continuously in single-stage (UASB I) and two-stage (UASB II) systems vinasse during the sugarcane harvesting season (180 days). The maximum methane yields were	Ferraz, ADN | Koyama, MH | de Araujo, MM | Zaiat, M	CTBE Brazilian Bioethanol Sci & Technol Lab | Univ Sao Paulo | Universidade de Sao Paulo | CNPEM | Ctr Res Dev & Innovat Environm Engn | Sao Carlos Sch Engn EESC | Biol Proc Lab | CTBE Brazilian Bioethanol Sci & Technol Lab CNPEM Univ Sao Paulo Universidade de	RENEWABLE ENERGY | 89: 245-252 APR 2016

	250.9 NmL-CH4.g(-1)COD(removed) and 316.0 NmL-CH4.g(-1)COD(removed) for UASB I and II, respectively, corresponding to 71.7% and 90.3% of the maximum theoretical methane yield (350 NmL-CH4.g(-1)COD(removed)()). Furthermore, the energy production from the two-stage system was 25.7% higher than the single-stage system, indicating the need for an acidogenic phase to improve both the removal of organic matter and energy extraction from sugarcane vinasse. (C) 2015 Elsevier Ltd. All rights reserved.		Sao Paulo Ctr Res Dev & Innovat Environm Engn Sao Carlos Sch Engn EESC Biol Proc Lab	
Thermophilic two-phase anaerobic digestion using an innovative fixed-bed reactor for enhanced organic matter removal and bioenergy recovery from sugarcane vinasse	This study considered the application of anaerobic digestion (AD) with phase separation combined with the use of an anaerobic structured-bed reactor (ASTBR) as the methanogenic phase for the treatment of sugarcane vinasse, a high-strength wastewater resulting from ethanol production. Two combined thermophilic acidogenic-methanogenic systems formed by one single acidogenic reactor followed by two methanogenic reactors operated in parallel were compared, namely, a conventional UASB reactor and an upflow ASTBR reactor. Increasing organic loading rate (OLR) conditions (15-30 kg COD m(-3) d(-1)) were applied to the methanogenic reactors. The results highlighted the feasibility of applying the ASTBR to vinasse, indicating a global COD removal higher than 80%. The ASTBR exhibited a stable long-term operation (240 days), even for OLR values as high as 30 kg COD m(-3) d(-1). The application of similar conditions to the UASB reactor indicated severe performance losses, leading to the accumulation of acids for every increase in the OLR. An energetic potential of 181.5 MJ for each cubic meter of vinasse was estimated from both hydrogen and methane. The provision of bicarbonate alkalinity proved to be a key factor in obtaining stable performance, offsetting the limitations of relatively low hydraulic retention times (<24 h). (C) 2016 Elsevier Ltd. All rights reserved.	Fuess, LT | Kiyuna, LSM | Ferraz, ADN | Persinoti, GF | Squina, FM | Garcia, ML | Zaiat, M	Univ Sao Paulo | Universidade de Sao Paulo | CNPEM | Univ Estadual Paulista | Universidade Estadual Paulista | Sao Carlos Sch Engn EESC | Biol Proc Lab LPB | Lab Nacl Ciencia & Tecnol Bioetanol CTBE | Inst Geosci & Exact Sci | Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn EESC Biol Proc Lab LPB CNPEM Lab Nacl Ciencia & Tecnol Bioetanol CTBE Univ Estadual Paulista Universidade Estadual Paulista Inst Geosci & Exact Sci	APPLIED ENERGY | 189: 480-491 MAR 1 2017

Transforming Sugarcane Bagasse and Vinasse Wastes into Hydrochar in the Presence of Phosphoric Acid: An Evaluation of Nutrient Contents and Structural Properties	Purpose Sugarcane bagasse and vinasse are wastes generated at large scales by the Brazilian sugarcane industry. Therefore, new waste treatment and management practices are essential for a sustainable industrial growth and here we purpose the hydrothermal carbonization (HTC) to converts wet biomass into carbon-based solids. Methods HTC of a mixture of sugarcane bagasse and vinasse was conducted at different temperatures, reaction times and phosphoric acid percentages. The chemical, structural and morphological properties of the hydrochars were evaluated by elemental analysis (CHNS), nutrient quantification (P, Ca, Mg, K), Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD) and scanning electron microscopy (SEM). Results In the presence of phosphoric acid, the hydrochar yield increased as the ash content increased due to phosphate precipitates, as observed by XRD. The yield of the hydrochar decreased and the carbon and nitrogen content increased when the temperature increased from 180 to 230 A degrees C. Hydrochars are amorphous and compositionally similar to lignites. The FTIR spectra showed bands at approximately 1700 and 1600 cm(-1) in the hydrochar due to carboxylation and aromatization of the products, respectively. The presence of carboxylic acids is important due to their ability to interact with cations and hydrophilic molecules. Additionally, nutrients such as P, N, K, Ca, and Mg were concentrated in the hydrochar as inorganic phases. Conclusion HTC applied to sugarcane bagasse and vinasse wastes produces hydrochars primarily containing carbon, nitrogen, and other nutrients as inorganic phases. Hydrochars could potentially be used as an agricultural fertilizer.	Melo, CA | Soares, FH | Bisinoti, MC | Moreira, AB | Ferreira, OP	Univ Estadual Paulista | Universidade Estadual Paulista | Univ Fed Ceara | Universidade Federal do Ceara | Lab Estudos Ciencias Ambientais | Dept Quim & Ciencias Ambientais | Inst Biociencias Letras & Ciencias Exatas,UNESP | Dept Fis | Lab Mat Funcionais Avancados LaMFA | Univ Estadual Paulista Universidade Estadual Paulista Lab Estudos Ciencias Ambientais Dept Quim & Ciencias Ambientais Inst Biociencias Letras & Ciencias Exatas,UNESP Univ Fed Ceara Universidade Federal do Ceara Dept Fis Lab Mat Funcionais Avancados LaMFA	WASTE AND BIOMASS VALORIZATION | 8 (4): 1139-1151 JUN 2017
Treatment of sugarcane vinasse by combination of coagulation/flocculation and Fenton's oxidation	The efficiency of individual and integrated processes applied to organic matter reduction and biodegradability improvement of a biodigested sugarcane vinasse wastewater was assessed. Strategies considered were Fenton's oxidation (Strategy 1), coagulation/flocculation (Strategy 2) and the combination of both	Guerreiro, LF | Rodrigues, CSD | Duda, RM | de Oliveira, RA | Boaventura, RAR | Madeira, LM	Univ Porto | Universidade do Porto | Fac Tecnol Jaboticabal | Univ Estadual Paulista | Universidade Estadual Paulista | Fac Engn |	JOURNAL OF ENVIRONMENTAL MANAGEMENT | 181: 237-248 OCT 1 2016

	processes (coagulation/flocculation followed by Fenton's reaction) - Strategy 3. It was found that Fenton's oxidation per se allowed reducing the organic matter, increasing the wastewater biodegradability and a non-toxic effluent was generated; however the cost of treatment was very high (86.6 R$/m(3) 21.2(sic)/m(3)). Under optimized conditions, coagulation/flocculation provided a slight increase in effluent's biodegradability, toxicity towards Vibrio fischeri was also eliminated and moderate removals of total organic carbon - TOC - (30.5%), biological oxygen demand - BOD5 - (27.9%) and chemical oxygen demand - COD - (43.6%) were achieved; however, the operating costs are much smaller. The use of dissolved iron resulting from coagulation/flocculation (270 mg/L) as catalyst in the second stage Fenton's oxidation was shown to be an innovative and economically attractive strategy. Under optimal conditions overall removals of 51.6% for TOC, 45.7% for BOD5 and 69.2% for COD were achieved, and a biodegradable (BOD5:COD ratio = 0.54) and non-toxic effluent was obtained. In order to increase the efficiency of the process but using less hydrogen peroxide, the Fenton's oxidation was performed by gradually adding the oxidant. This procedure allowed to obtain the highest organic matter removal efficiency (as compared with the addition of all hydrogen peroxide at the beginning of the reaction). This way it was possible to minimize the reagent consumption and, consequently, reduce the treatment cost. (C) 2016 Elsevier Ltd. All rights reserved.		Dept Engn Quim | LEPABE | UNESP | Fac Ciencias Agr & Vet | Dept Engn Rural,Lab Saneamento Ambiental | LSRE Lab Proc Separacao & Reacao | Lab Assoc LSRE LCM | Dept Engn Quim,Fac Engn | Univ Porto Universidade do Porto Fac Engn Dept Engn Quim LEPABE Fac Tecnol Jaboticabal Univ Estadual Paulista Universidade Estadual Paulista UNESP Fac Ciencias Agr & Vet Dept Engn Rural,Lab Saneamento Ambiental Univ Porto Universidade do Porto LSRE Lab Proc Separacao & Reacao Lab Assoc LSRE LCM Dept Engn Quim,Fac Engn	
TREATMENT OF VINASSE BY ADSORPTION ON CARBON FROM SUGAR CANE BAGASSE	The aim of this study was to develop an effective and economically viable technology for the treatment of vinasse, prior to its disposal in the soil for fertirrigation, aiming this way at reducing the environmental impacts generated by inadequately discarding this effluent. The primary treatment of vinasse by adsorption was evaluated. Adsorbents were prepared from sugar cane bagasse and their efficiency evaluated in relation to the treatment of vinasse. The process of preparation of activated carbon consisted of	Seixas, FL | Gimenes, ML | Fernandes-Machado, NRC	Univ Estadual Maringa | Universidade Estadual de Maringa | Univ Tecnol Fed Parana | Universidade Tecnologica Federal do Parana | Dept Engn Quim | Coordenacao Curso Super Tecnol Proc Quim | Univ	QUIMICA NOVA | 39 (2): 172-179 FEB 2016

	carbonizing bagasse at different temperatures followed by chemical activation with NaOH. The carbon samples obtained by solely carbonizing sugar cane bagasse were more efficient for removing turbidity of vinasse than samples activated with NaOH. The sample carbonized at 800 degrees C was the most efficient for removing turbidity of wastewater (83%). During a process of adsorption of vinasse in two stages, it was possible to obtain color removal, turbidity and COD of approximately 76, 85 and 69%, respectively. After the adsorption step of vinasse, the solid waste generated in the second stage of adsorption can be burned in the boilers of the power plant itself, affording an energy of 4606 cal g(-1).		Estadual Maringa Universidade Estadual de Maringa Dept Engn Quim Univ Tecnol Fed Parana Universidade Tecnologica Federal do Parana Coordenacao Curso Super Tecnol Proc Quim	
Two-stage anaerobic membrane bioreactor for the treatment of sugarcane vinasse: Assessment on biological activity and filtration performance	A two-stage submerged anaerobic membrane bioreactor (2-SAnMBR) was designed for the treatment of sugarcane vinasse. For start-up, the flow rate was reduced whenever VFA levels reached critical levels in the methanogenic reactor. After acclimation, the system was operated under a continuous flow. Separation of the stages was observed during the entire period of operation. VFA, COD and DOC levels of raw effluent, acidified effluent and permeate averaged 2141, 3525 and 61 mg VFA L-1 (as acetic acid), 15727, 11512 and 488 mg COD L-1, and, 3544, 3533 and 178 mg DOC L-1, respectively. Overall COD and DOC removal efficiencies of 96.9 +/- 0.7% and 95.0 +/- 1.1%, respectively, were reached. Methane content of the biogas from the acidogenic and methanogenic reactors ranged 0.1-4.6% and 60.1-70.1%, respectively. Removable fouling strongly affected filtration performance and cake layer formation accounted for most of filtration resistance. Membrane resistance was related to presence of protein-like substances and carbohydrates. (c) 2013 Elsevier Ltd. All rights reserved.	Mota, VT | Santos, FS | Amaral, MCS	Univ Fed Minas Gerais | Universidade Federal de Minas Gerais | Dept Sanit & Environm Engn | Univ Fed Minas Gerais Universidade Federal de Minas Gerais Dept Sanit & Environm Engn	BIORESOURCE TECHNOLOGY | 146: 494-503 OCT 2013
Unraveling the influence of the COD/sulfate ratio on organic matter removal and	Throughout the sugarcane harvest, it is common for sulfate to accumulate in the vinasse of sugar and ethanol plants. However, little is known regarding the influence of sulfate on the anaerobic digestion (AD) of vinasse, which may lead to severe performance losses. This	Kiyuna, LSM | Fuess, LT | Zaiat, M	Univ Sao Paulo | Universidade de Sao Paulo | Brazilian Ctr Res Energy & Mat CNPEM | Sao Carlos Sch Engn | Biol Proc Lab |	BIORESOURCE TECHNOLOGY | 232: 103-112 MAY 2017

methane production from the biodigestion of sugarcane vinasse	study assessed the influence of various COD/sulfate ratios (12.0, 10.0 and 7.5) on both COD removal and methane (CH4) production from sugarcane vinasse AD. Batch assays were conducted in thermophilic conditions. At a COD/sulfate ratio of 7.5, CH4 production was 35% lower compared with a ratio of 12.0, considering a diversion of approximately 13.6% of the electron flow to sulfidogenesis. The diversion of electrons to sulfidogenesis was negligible at COD/sulfate ratios higher than 25, considering the exponential increase in CH4 production. Organic matter degradation was not greatly affected by sulfidogenesis, with COD removal levels higher than 80%, regardless of the initial COD/sulfate ratio. (C) 2017 Elsevier Ltd. All rights reserved.		Brazilian Bioethanol Sci & Technol Lab CTBE | Univ Sao Paulo Universidade de Sao Paulo Sao Carlos Sch Engn Biol Proc Lab Brazilian Ctr Res Energy & Mat CNPEM Brazilian Bioethanol Sci & Technol Lab CTBE	
Use of Vinasse and Sugarcane Bagasse for the Production of Enzymes by Lignocelluloly tic Fungi	In this present work, three strains of Pleurotus and Trichoderma reesei were cultivated in media with pre-treated bagasse and vinasse. Cellulolytic and lignolytic activities and biomass production were analyzed. The treatment of the bagasse with 2% H(2)O(2) + 1.5% NaOH + autoclave resulted in a greater fiber breakage increasing the cellulose level up to 1.2 times and decreasing 8.5 times the hemicellulose content. This treatment also resulted in a high lignolytic activity for all cultures utilized. T. reesei produced laccase, peroxidase and manganese-peroxidase in all the treatments, having its manganese-peroxidase activity raging from 1.9 to 4.8 times higher than the basidiomycetes.	Aguiar, MM | Ferreira, LFR | Monteiro, RTR	Univ Sao Paulo | Universidade de Sao Paulo | Lab Ecol Aplicada | Ctr Energia Nucl Agr | Univ Sao Paulo Universidade de Sao Paulo Lab Ecol Aplicada Ctr Energia Nucl Agr	BRAZILIAN ARCHIVES OF BIOLOGY AND TECHNOLOGY | 53 (5): 1245-1254 SEP-OCT 2010
Using pig manure to promote fermentation of sugarcane molasses alcohol wastewater and its effects on microbial community structure	Molasses alcohol wastewater (MAW) is difficult to be bio-treated and converted into biogas. In this study, MAW mixed with pig manure (PM) in different ratios was co-digested. Biogas production, chemical oxygen demand (COD) removal and the structure of microbial communities were monitored in the process. Our results showed that under the optimal COD ratio of PM:MAW (1.0:1.5), CODremoval and biogas yield were the highest. And in fermentation tanks with different PM to MAW ratios, the structure and composition of bacterial communities varied in the early and	Shen, PH | Han, F | Su, SQ | Zhang, JY | Chen, ZN | Li, JF | Gan, JY | Feng, B | Wu, B	Guangxi Univ | Guangxi University | State Key Lab Conservat & Utilizat Agr Bioresourc | Guangxi Acad Agr Sci | Guangxi Guitang Grp Co Ltd | Guangxi Univ Nationalities | Guangxi University of Nationalities | Coll Life Sci & Technol | Coll	BIORESOURCE TECHNOLOGY | 155: 323-329 MAR 2014

	late stage. Furthermore, the type of main bacterial operational taxonomic units (OTUs) have no differences, yet the relative abundance of OTUs varied. The current research showed that there was a good potential to the use of PM as a co-digested material to anaerobic treatment of MAW and provided references for further improving bio-treatment of MAW. (C) 2014 Elsevier Ltd. All rights reserved.		Chem & Ecol Engn | Guangxi Univ Guangxi University Coll Life Sci & Technol State Key Lab Conservat & Utilizat Agr Bioresourc Guangxi Acad Agr Sci Guangxi Guitang Grp Co Ltd Guangxi Univ Nationalities Guangxi University of Nationalities Coll Chem & Ecol Engn	
Utilization of vinasses as soil amendment: consequences and perspectives	Vinasses are a residual liquid generated after the production of beverages, such as mezcal and tequila, from agave (Agave L.), sugarcane (Saccharum officinarum L.) or sugar beet (Beta vulgaris L.). These effluents have specific characteristics such as an acidic pH (from 3.9 to 5.1), a high chemical oxygen demand (50,000-95,000 mg L-1) and biological oxygen demand content (18,900-78,300 mg L-1), a high total solids content (79,000 and 37,500 mg L-1), high total volatile solids 79,000 and 82,222 mg L-1, and K+ (10-345 g L-1) content. Vinasses are most commonly discarded onto soil. Irrigation of soil with vinasses, however, may induce physical, chemical and biochemical changes and affect crop yields. Emission of greenhouse gases (GHG), such as carbon dioxide, nitrous oxide and methane, might increase from soils irrigated with vinasses. An estimation of GHG emission from soil irrigated with vinasses is given and discussed in this review.	Moran-Salazar, RG | Sanchez-Lizarraga, AL | Rodriguez-Campos, J | Davila-Vazquez, G | Marino-Marmolejo, EN | Dendooven, L | Contreras-Ramos, SM	Ctr Invest & Asistencia Tecnol & Diseno Estado Ja | CINVESTAV | Unidad Tecnol Ambiental | Unidad Serv Analit & Metrol | Unidad Biotecnol Med & Farmaceut | ABACUS | Lab Ecol Suelos | Ctr Invest & Asistencia Tecnol & Diseno Estado Ja Unidad Tecnol Ambiental Ctr Invest & Asistencia Tecnol & Diseno Estado Ja Unidad Serv Analit & Metrol Ctr Invest & Asistencia Tecnol & Diseno Estado Ja Unidad Biotecnol Med & Farmaceut CINVESTAV ABACUS Lab Ecol Suelos	SPRINGERPLUS | 5: - JUL 7 2016
VINASSE AND FILTER CAKE COMPOST AS NUTRIENT SOURCE FOR	The effects of vinasse and filter coke compost were evaluated on the chemical properties of the soil, culture nutrition, sugarcane yield and juice quality, as well as on the comparative analysis of the costs of its use as an organic fertilizer. The experiment was carried out in the	Melchor, GIH | Garcia, SS | Lopez, DJP | Espinoza, LDL | Estrada, MC | Rosado, OR	Inst Natl Polytecn | University of Lorraine | Inst Natl Agron Paris Grignon | AgroParisTech | Universite Paris	INTERCIENCIA | 33 (11): 855-860 NOV 2008

SUGARCANE IN A MOLIC GLEYSOL OF CHIAPAS, MEXICO	Pujiltic sugarmill, Chiapas, Mexico. The treatments were vinasse of 150 and 250m(3).ha(-1), NPK fertilization (160-80-80), filtercake compost fertilizer of 15t.ha(-1) and a control treatment. Variance analysis was used. The results show that the vinasse and compost fertilizer applications did not affect the pH., the electrical conductivity or the cationic interchange capacity of the soil. Treatments with 250m(3).ha(-1) filtercake vinasse and compost increased the levels of organic matter, K and P in the soil. There were no significant differences in the yield of steins and juice quality was not affected. Finally the application of filtercake vinasse and compost fertilizer on the soil did not affect its chemical properties. However, a year of research is not enough time to determine with precision the residual effects of this product.		Saclay (ComUE) | Imperial Coll Sci Technol & Med | Imperial College London | COLPOS | Inst Natl Polytecn University of Lorraine Inst Natl Agron Paris Grignon AgroParisTech Universite Paris Saclay (ComUE) Imperial Coll Sci Technol & Med Imperial College London COLPOS	
Vinasse biogas for energy generation in Brazil: An assessment of economic feasibility, energy potential and avoided CO2 emissions	Energy recovery from waste is one of the strategies that can assist the expansion of renewable energy in Brazil. Among the various types of waste, vinasse, which is a residue that contains a high organic load, originates from the sugarcane industry, which is a very important industry for the Brazilian economy. Due to high levels of sugarcane harvesting in the country and the production of large amounts of ethanol, vinasse is, produced at high levels in Brazil. In this context, this paper presents an energy analysis of the avoided carbon dioxide emissions and economic viability associated with the combustion of biogas produced by the anaerobic digestion of the vinasse that results from the use of sugar cane planted in Brazil. Based on the literature review, data related to the process of biogas production from anaerobic digestion of the vinasse were collected and used for the calculation of the energy potential associated. The results show that to achieve economic viability for the use of this waste for energy, the following plantation areas would be required, considering their processed sugarcane equivalents: 14,580 ha (if considering the processing of sugarcane in attached plants), and 6000 ha (if considering the processing of sugarcane in autonomous plants). The total	Bernal, AP | dos Santos, IFS | Silva, APM | Barros, RM | Ribeiro, EM	Sao Paulo State Univ EESC USP | Fed Univ Itajuba UNIFEI MG | Nat Resources Inst | GEER Renewable Energy Grp | Sao Paulo State Univ EESC USP Fed Univ Itajuba UNIFEI MG Nat Resources Inst GEER Renewable Energy Grp Fed Univ Itajuba UNIFEI MG Nat Resources Inst	JOURNAL OF CLEANER PRODUCTION | 151: 260-271 MAY 10 2017

	energy potential of this use may reach 3.26 TWh(e)/y, which represents 0.52% of all domestic energy consumption in 2014. The potential to avoid emissions from the same use could reach 1.9 Mt CO2/y, which is approximately 2.1% of the emissions for the whole industry in Brazil in 2014. These results demonstrate the environmental and energy benefits that can be obtained via power generation from biogas produced by the anaerobic digestion of vinasse and highlight the need to include the use of such residue for energy in expansion plans for the Brazilian energy matrix. (C) 2017 Elsevier Ltd. All rights reserved.			
Vinasse organic matter quality and mineralizatio n potential, as influenced by raw material, fermentation and concentration processes	Both dilute and concentrated vinasse can be spread on agricultural fields or used as organic fertilizer. The effects of different characteristics of the original raw material on the biochemical composition of vinasse and their C and N mineralization in soil were investigated. Vinasse samples were obtained from similar industrial fermentation processes based on the growth of microorganisms on molasses from different raw material (sugar beet or sugar cane) and vinasse concentration (dilute or concentrated). The nature of the raw material used for fermentation had the greatest effect on the nature and size of the resistant organic pool. This fraction included aromatic compounds originating from the raw material or from complex molecules and seemed to be quantitatively related to acid-insoluble N. Samples derived from sugar beet were richer in N compounds and induced greater net N mineralization. The effect of evaporation varied with the nature of the raw material. Concentration led to a slight increase in the abundance of phenolic compounds, acid-insoluble fraction, and a slight decrease in the labile fraction of vinasses partly or totally derived from sugar beet. The effect of the dilute vinasse from sugar cane was greater. The concentrated vinasse had a smaller labile fraction, induced N immobilization at the beginning of incubation, and exhibited greater N concentration in the acid-insoluble fraction than the dilute vinasse. (C) 2007 Elsevier Ltd. All rights reserved.	Parnaudeau, V | Condom, N | Oliver, R | Cazevieille, P | Recous, S	INRA | Institut National de la Recherche Agronomique (INRA) | CIRAD CA Recycling & Risks | CIRAD | Unit Agr Laon Reims Mons | INRA Institut National de la Recherche Agronomique (INRA) Unit Agr Laon Reims Mons CIRAD CA Recycling & Risks CIRAD	BIORESOURCE TECHNOLOGY | 99 (6): 1553-1562 APR 2008

Vinasse treatment using a vegetable-tannin coagulant and photocatalysis	The large volume of sugar cane vinasse generated by alcohol distillation motivated current treatment to reduce vinasse volume by a concentration process and to eliminate pollutants in the wastewater. The vinasse concentration by the coagulation/flocculation process favored the use of the thickened sludge either for fertilizing purposes or for biogas production. The photocatalysis treatment of the clarified vinasse mineralized pollutants and reduced toxicity, with subsequent water reuse. The first series of coagulation/ flocculation experiments were carried out in a jar-test apparatus at room temperature with samples of 200 mL and several coagulant concentrations. In the second series of experiments, photocatalysis tests were performed on the clarified vinasse obtained by coagulation/ flocculation under conditions optimized in the first series of experiments. The photocatalysis tests were performed for five consecutive days with UV irradiation, using TiO2-P25 as photocatalyst. Significant reduction of toxicity, consistent with the reduction in chemical oxygen demand (COD), was found when the photocatalysis treatment subsequent to coagulation/ flocculation process was employed. Further, 98% reduction of turbidity and 87% reduction of color were obtained by the coagulation/ flocculation process. Coupled to the photocatalysis process, significant reductions in absorbance, toxicity and COD (80%) were also achieved.	de Souza, RP | Girardi, F | Santana, VS | Fernandes-Machado, NRC | Gimenes, ML	Univ Estadual Maringa | Universidade Estadual de Maringa | Dept Engn Quim | Univ Estadual Maringa Universidade Estadual de Maringa Dept Engn Quim	ACTA SCIENTIARUM-TECHNOLOGY | 35 (1): 89-95 2013
Why small-scale fuel ethanol production in Brazil does not take off?	Ethanol production on small scale (on-farm) substantially contributes to the effort to replace fossil fuels. However, the share of small scale production remains incipient, either due to inefficiency in the process or legal restrictions on the commercialization of hydrous ethanol fuel. The aim of this paper is to justify this incipient industry by detailing the small-scale ethanol production process and presenting operational data collected in the literature from the last three decades. The reviewed data showed that the inefficiency of the process affects the economic	Mayer, FD | Feris, LA | Marcilio, NR | Hoffmann, R	Dept Chem Engn UFRGS | Dept Chem Engn UFSM | Universidade Federal de Santa Maria (UFSM) | Dept Chem Engn UFRGS Dept Chem Engn UFSM Universidade Federal de Santa Maria (UFSM)	RENEWABLE & SUSTAINABLE ENERGY REVIEWS | 43: 687-701 MAR 2015

	feasibility by product losses in bagasse and vinasse or through excessive energy consumption. The feasibility of ethanol production on small scale requires addressing these technological obstacles through the integral use of co-products. (C) 2014 Elsevier Ltd. All rights reserved.			

DOCUMENTOS DE PATENTES		
TÍTULO	RESUMEN	SOLICITANTE
Anlage zur Herstellung von Alkohol aus Zuckerrohr	Die Anlage zur Herstellung von Alkohol aus Zuckerrohr umfasst eine das Zuckerrohr zerkleinernde Zerkleinerungsstufe (3) und eine das zerkleinerte Zuckerrohr in Zuckersaft und Bagasse trennende Extraktionsstufe (7). Der Zuckersaft wird in einer Gärstufe (19) zu alkoholhaltiger Maische vergoren. Eine Destillationsanlage (23) destilliert aus der Maische Rohalkohol, der in einer Entwässerungsstufe (27) dehydriert wird. Die in der Destillationsanlage (23) anfallende Vinasse wird in einer mehrstufigen Verdampferanordnung (33) für die weitere Verwendung, zum Beispiel als Düngemittel aufkonzentriert. Die in der Extraktionsstufe (7) anfallende Bagasse wird in einem Hochdruckdampferzeuger (39) verbrannt. Der in dem Hochdruckdampferzeuger (39) erzeugte Hochdruckdampf treibt eine Turbine (45) für die Erzeugung von elektrischem Strom in einem Generator (47). Der Abdampf der Turbine (45) beheizt eine Vorkonzentrierungsstufe (15), die den aus dem Zuckerrohr extrahierten Zuckersaft aufkonzentriert, bevor er in der Gärstufe (19) vergoren wird. Dies mindert den Energiebearf der Destillationsanlage (23). Der Abdampf der Vorkonzentrierungsstufe (15) wird in drei Teile aufgeteilt, wobei ein erster Teil die in der Destillationsanlage (23) benötigte Energie liefert, ein zweiter Teil die Entwässerungsstufe (27) beheizt und ein dritter Teil die Verdampferanordnung (33) energetisch versorgt.	GEA Wiegand GmbH,DE
Carbon fixation method for reducing the turbidity of sugarcane vinasse and thus processed vinasse	The invention relates to a method for processing vinasse, a byproduct of the distillation of fermented sugar cane must during alcohol production, with the aim of reducing the turbidity thereof for use as a culture medium for growing micro-organisms, including micro-algae and cyanobacteria. The method according to the invention is based on vinasse carbonation in a strong basic medium, with injection of CO2. Furthermore, the process according to the invention promotes carbon fixation and reduces the biological oxygen demand (BOD) and chemical oxygen demand (COD) of the vinasse, thus further promoting the physico-chemical and microbiological stabilisation thereof.	OURO FINO PARTICIPAÇÕES E EMPREENDIMENTOS S/A,BR | DOLIVAR CORAUCCI Neto,BR
Control of contaminant microorganisms in fermentation processes	A method for controlling growth of contaminant microorganisms in a fermentation process using a combination of (a) peroxide compound (PC) and (b) a quaternary ammonium compound (QAC). The method comprises adding PC and QAC to one or more steps of a fermentation process. In this method, the PC and QAC	E. I. DU PONT DE NEMOURS AND COMPANY,Wilmington,DE,US

with synergistic formulations containing peroxide compound and quaternary ammonium compound	may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	
Control of contaminant microorganisms in fermentation processes with synergistic formulations containing stabilized chlorine dioxide and peroxide compound	A method for controlling growth of contaminant microorganisms in a fermentation process using a combination of (a) stabilized chlorine dioxide (SCD) and (b) a peroxide compound (PC). The method comprises adding SCD and PC to one or more steps of a fermentation process. In this method, the SCD and PC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	E.I. DU PONT DE NEMOURS AND COMPANY,Wilmington,DE,US
Control of contaminant microorganisms in fermentation processes with synergistic formulations containing stabilized chlorine dioxide and quaternary ammonium compound	A method for controlling growth of contaminant microorganisms in a fermentation process and in a fermentation system using a composition comprising (a) stabilized chlorine dioxide (SCD) and (b) a quaternary ammonium compound (QAC). The method comprises adding SCD and QAC to one or more steps of a fermentation process. In this method, the SCD and QAC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	E. I. DU PONT DE NEMOURS AND COMPANY,Wilmington,DE,US
Drying furnace	The utility model discloses a drying furnace which is used for drying biomass, such as wood chips, plant straw, vinasse, bagasse, chaff and the like; a hot gas cylinder of a combustion furnace is communicated with a drying cylinder; an inlet of the drying cylinder is provided with a wet material spiral feeding mechanism; a dry material collecting device is positioned behind the drying cylinder; and the dry material collecting device is provided with a material return pipe communicated with a feeding fan of the combustion furnace. By utilizing the self flammability of the biomass such as wood chips, plant straw, vinasse, bagasse, chaff and the like, a small amount of the dried biomass is taken as fuel of the combustion furnace, so that the drying furnace greatly reduces the production cost, and improves the output return.	Hangzhou Qianjiang Drying Equipment Co. Ltd.,CN
Ecological organic fertilizer and preparation method thereof	The invention relates to an ecological organic fertilizer and a preparation method thereof, which belongs to the technical field of preparation of the ecological organic composite fertilizer. The method comprises the following steps: 1)weighting a base material and a nutrition material of the ecological organic fertilizer according to weight parts, wherein the base material comprises peat, poultry dung, bean dregs, wheat bran, alfalfa powder, oil cake, 25-	ZOU Jian,Guigang,Guangxi Zhuang Autonomous Region, CN

	40 parts of sugarcane branch and vinasse; the nutrition material comprises composite bacterial classification, urea, potassium ore powder, ground phosphate rock, calcium chloride, calcium chloride, natural potash magnesium sulphate, vermiculite powder, kaolin, slaked lime, borax, sodium tripolyphosphate, a silane coupling agent KH550, sodium selenite, white copperas zinc sulfate, ferrous sulphate and a proper amount of water; 2)preparing the base material; 3)preparing the nutrition material; 4)performing secondary fermentation; and 5)drying and granulating. The preparation method of the present invention is simple and easy to popularize, the crops are easily absorbed, fertilizer efficiency time is long, short/long-term nutrient requirements of plants can be completely satisfied, and plant quality can be effectively improved.	
Feed capable of promoting growth and development of pigs and preparation method of feed	The invention discloses a feed capable of promoting growth and development of pigs. The feed is characterized by being prepared from the following raw materials in parts by weight: 170-180 parts of corns, 70-80 parts of wheat bran, 25-27 parts of sweet potato rattans, 12-14 parts of vinasse, 9-11 parts of poplar leaves, 10-12 parts of peanut shells, 20-24 parts of dried sweet potatoes, 7-9 parts of sugar beet pulp, 8-12 parts of lettuce, 7-11 parts of radish leaves, 6-10 parts of cushaw stems, 3-5 parts of garlic bolts, 5-7 parts of officinal magnolia barks, 6-8 parts of radix salviae miltiorrhizae, 7-8 parts of polygonatum odoratum, 5-6 parts of herba epimedii, 20-25 parts of soyabean protein powder, 4-6 parts of limestone powder, 2-3 parts of salt, 3-4 parts of calcium hydrophosphate, 0.6-0.8 part of a ferrous fumarate preparation and 7-9 parts of nutrition additives. Through reasonable collocation of various components, the requirements of pigs on organic acid, nutrients and special substances are met; the feed is capable of promoting metabolism of pigs, promoting growth and development of the pigs; the added garlic bolts have the antibacterial and antiviral functions; the traditional Chinese medicine components have the efficacies of helping digestion, invigorating the stomach, calming the liver and dispelling wind.	Zongyang Xinglong Integrated Farming Co. Ltd.,Anqing,Anhui,CN
Feed for promoting growth and weight gain of pigs and preparation method thereof	The invention discloses a feed for promoting growth and weight gain of pigs and a preparation method thereof. The feed is prepared from the following raw materials in parts by weight: 150-160 parts of wheat bran, 60-70 parts of rice bran, 10-15 parts of malt roots, 24-28 parts of cottonseed meal, 10-14 parts of vinasse, 8-10 parts of grifola frondosa, 10-12 parts of lychee seed powder, 18-20 parts of dried sweet potato, 6-8 parts of lotus stem, 7-9 parts of purple lythrum herb, 9-11 parts of Indian rorippa herb, 6-10 parts of radix puerariae vine, 3-5 parts of garlic, 5-7 parts of fructus aurantii, 6-8 parts of cortex fraxini, 8-10 parts of liquorice roots, 6-7 parts of acanthopanax bark, 4-6 parts of shell powder, 14-15 parts of soybean oil, 2-3 parts of salt, 2-4 parts of calcium hydrogen phosphate, 0.5-0.7 part of ferrous fumarate and 6-8 parts of nutrition additives. the components of the feed provided by the invention are reasonably matched to meet the requirements of pigs on organic acids, nutrients and special materials, and can be used for promoting the metabolism of the pigs so as to promote the growth and development the pigs, moreover, the added traditional Chinese medicine components have the functions of resisting bacteria and viruses, enhancing immunity, diminishing inflammation and clearing heat, so	YE Hong,Foshan,Guangdong, CN

	that the resistance of the pigs to bacteria and viruses is reinforced, and the immunity of the pigs is improved.	
Fluid composition comprising lignin and vinasse	The present invention relates to a fluid composition comprising a solid fraction and a liquid organic fraction,wherein said solid fraction and said liquid fraction are present in a state of being intermixed,wherein said solid fraction comprises a lignin component,wherein said liquid fraction comprises an organic substance. Furthermore, the present invention relates to a process for the manufacture of such fluid compositions, to various uses thereof, and to a process for treatment of a lignocellulosic biomass.	INBICON A/S,DK
Granulated organic and organomineral fertilizer supplemented with biological additive and process for the production of granulated organic and organomineral fertilizer supplemented with biological additive	A granulated organic and organomineral fertilizer supplemented with biological additive and process for the production of granulated organic and organomineral fertilizer supplemented with biological additive is physically presented in the form of granules (G), having its formulation defined by the combination of organic and mineral matter (N,P,K), to which it is added, in addition, a bioburden in the form of bacteria, fungus and yeast that are selected to crops of interest, whether grasses, legumes, monocotyledons and dicotyledons, the granules (G) receive the bioburden at the time of its granulation; the selection of bioburden to be included in granules (G) is established according to the soil and crop analysis to be cultivated.	SUPER BAC PROTECAO AMBIENTAL S.A.,Sao Paulo,BR
Improved method for preparing concrete admixture by using vinasse prepared by distilling sugarcane molasses	The invention claims a cane with a distilled grain of concrete admixture of preparation method, wherein the invention method with the 1997 year 1 months 4 days of China patent No.36.110 different, the invention star stage does not use powder, and use of lees front condensation, and a final liquid product. The improved collecting insoluble substance content comprise a specific amount is 8-10 % of sugar cane lees, through two step (2) to concentrate the thereof reaches 60 degrees Brix lower at 66 ℃ temperature, the mix in the groove containing the formaldehyde and a soda ash. After the mixture is decanted into three (3) an exit height of the other of a groove in the exit to obtain insoluble substance is less than 1% of product. The product can change concrete structure, increase the plasticity, and increase of cement electrostatic dispersion in the concrete mixture.	BALANNACA LOUIS PERES,VE
Improved method for preparing concrete admixture by using vinasse prepared by distilling sugarcane molasses	The invention relates to a method for preparing a concrete admixture by using vinasse prepared by distilling sugarcane molasses, which is different from the Chinese patents No.36.110 applied on January 4th 1997. At the initiation phase in the method for preparing the concrete admixture by using the vinasse prepared by distilling the sugarcane molasses, powders are not used, but the vinasse before being subject to condensation is used, a liquid product is obtained finally. The improved method for preparing the concrete admixture by using the vinasse prepared by distilling the sugarcane molasses comprises	BALANNACA LOUIS PERES,VE

	the following steps: collecting specifically-quantitative sugarcane vinasse with 8-10% of an undissolved substance; carrying out condensation on the sugarcane vinasse in two steps so as to cause the sugarcane vinasse to reach 60 degrees in degrees brix at temperature of 60 DEG C, and mixing with formaldehyde and soda ash in a trough; and decanting the mixture into the other trough with three outlet heights, wherein the outlets can be used for obtaining a product of which an undissolved substance is less than 1%. The product can change structural characteristics of the concrete, and can improve the plasticity of the concrete and the static dispersion of cement in the concrete mixture.	
Improvement to vinasse-concentration plant integrated with an ethanol distillation facility	The invention relates to an improvement to vinasse-concentration plant integrated with an ethanol distillation facility and discloses a structural arrangement claimed as utility model for a concentration system which is the result of the combination of evaporation-type pipes with the function of reboiler (20) for the columns (25), a condenser (08) for alcoholic vapour (02) and a concentration evaporator (10, 11, 12, 13), a final heater for the wine (05), separators (21, 28, 29, 30), preheaters (22), flow pumps (37), an air-removal and vacuum-generation system (50, 51), a vapour duct (53) and evaporative condenser (15) which are fed exclusively by the condensation energy of the alcoholic vapour (02) of the second column (26) for alcohol distillation. Said invention is simply coupled at the outlet (B) from the second column (26) for alcohol distillation, which, via ducts (03, 04), conveys the alcoholic vapour (02) for condensation in the shell of the first-effect pipe (08).	CITROTEC INDÚSTRIA E COMÉRCIO LTDA,BR
Installation for producing ethanol from sugar cane	The invention relates to a system for producing alcohol from sugar cane, comprising a comminution stage (3) where the sugar cane is comminuted and an extraction stage (7) where the comminuted sugar cane is separated into cane juice and bagasse. The cane juice is fermented to an alcoholic mash in a fermentation stage (19). A distillation system (23) distills raw alcohol from the mash, which is dehydrated in a dehydration stage (27). The vinasse arising in the distillation system (23) is concentrated in a multistage evaporator arrangement (33) for further use, for example as fertilizer. The bagasse arising in the extraction stage (7) is burned in a high-pressure boiler (39). The high-pressure steam generated in the high-pressure boiler (39) drives a turbine (45) for generating electrical power in a generator (47). The steam exhaust of the turbine (45) heats a pre-concentration stage (15) concentrating the cane juice extracted from the sugar cane before said juice is fermented in the fermentation stage (19). The energy demand of the distillation system (23) is thus reduced. The exhaust steam of the pre-concentration stage (15) is divided into three parts, wherein a first part provides the energy required in the distillation system (23), a second part heats the dehydration stage (27), and a third part provides energy to the evaporator arrangement (33).	GEA Wiegand GmbH, Ettlingen,DE
Method for controlling growth of contaminant microorganisms in fermentation process and	A method for controlling growth of contaminant microorganisms in a fermentation process using a combination of (a) peroxide compound (PC) and (b) a quaternary ammonium compound (QAC). The method comprises adding PC and QAC to one or more steps of a fermentation process. In this method, the PC and QAC may be added to one or more components of a fermentation broth comprising inoculant, fermentable	E. I. DU PONT DE NEMOURS AND COMPANY

method for controlling growth of contaminant microorganisms in carbohydrate feedstock	sugar and process water. The invention provides a method for controlling growth of contaminant microorganisms in a fermentation process using a combination of (a) peroxide compound (PC) and (b) a quaternary ammonium compound (QAC). The method comprises adding PC and QAC to one or more steps of a fermentation process. In this method, the PC and QAC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water. Also provided is a method to control growth of at least one contaminant microorganism in a carbohydrate feedstock.	
Method for controlling growth of contaminant microorganisms in fermentation process	A method for controlling growth of contaminant microorganisms in a fermentation process and in a fermentation system using a composition comprising (a) stabilized chlorine dioxide (SCD) and (b) a quaternary ammonium compound (QAC). The method comprises adding SCD and QAC to one or more steps of a fermentation process. In this method, the SCD and QAC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	E. I. DU PONT DE NEMOURS AND COMPANY
Method for controlling growth of contaminant microorganisms in fermentation process	A method for controlling growth of contaminant microorganisms in a fermentation process using a combination of (a) stabilized chlorine dioxide (SCD) and (b) a peroxide compound (PC). The method comprises adding SCD and PC to one or more steps of a fermentation process. In this method, the SCD and PC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	E. I. DU PONT DE NEMOURS AND COMPANY
Method for obtaining a solid fertilizer and biofuel product from sugarcane vinasses and solid fertilizer and biofuel product obtained by means of said method	The present invention relates to a method for obtaining a solid fertilizer and biofuel product from sugarcane vinasses and solid fertilizer and biofuel product obtained by means of said method which allows optimum use of resources and high energy efficiency throughout the method, in addition to a solution for managing the residue constituted by vinasse, comprising a step A consisting of concentrating liquid vinasse (1) until obtaining concentrated vinasse (2) with a percentage of solid of at least 50%, a step B consisting of mixing the concentrated vinasse (2) with plant compounds (3), and a step C consisting of granulating the mixture obtained in step B until obtaining a solid granulated product (4) that can be used as fertilizer (4') and as biofuel (4'').	HPD PROCESS ENGINEERING S.A.,Getxo (Vizcaya),ES | Martinez Garmendia Ignacio,Getxo,ES
Method for producing organo-mineral fertilizer by hydrothermal carbonisation of sugarcane vinasse and bagasse and thus obtained product	The invention relates to a method for producing a water-retaining, organo-mineral fertilizer by hydrothermal carbonisation of sugarcane vinasse and bagasse, using an acid catalyst, preferably phosphoric acid, in a hydrothermal carbonisation method, adding value to these wastes and enabling their use within the production cycle, reducing the cost of transport, fertilizers and chemical treatments, inter alia.	UNIVERSIDADE ESTADUAL PAULISTA JULIO DE MESQUITA FILHO,BR

METHOD FOR THE PRODUCTION OF PETROCHEMICAL, AGRI-FOODSTUFF OR OTHER PRODUCTS USING BIOETHANOL OBTAINED AT A MULTIFUNCTIONAL BIOREFINERY	Method for the production of petrochemical, agri-foodstuff or other products using bioethanol obtained at a multifunctional biorefinery. The method comprises: a. production of bioethanol or of bioethanol and sugars from beet or other raw materials; b. production of another type of biofuel and/or chemical products from the bioethanol obtained in step (a) or from the by-products obtained in step (a); and c. production of biodiesel from oil from raw materials selected from the group that comprises CO2-cultured algae originating from step (a), as a carbon source, or oleaginous seeds, processed or unprocessed frying oil, or a mixture of both.	MERINO FERRERO Vicente,ES
METHODS FOR THE PRODUCTION OF FERMENTATION PRODUCTS FROM FEEDSTOCK	Methods and compositions for enhanced production of at least one fermentation product resulting from the fermentation of sugar containing medium obtained from one or more feedstocks are disclosed herein. The compositions disclosed herein comprise trehalase.	DANISCO US INC.,US | DUAN Gang,US | GOHEL Vipul,US | LIU Xuan,US | QIAN Ying,US | RANGANATHAN Kannan,US | ZHANG Xiaoping,US
New method for processing sweet sorghum or sugarcane to extract alcohol or sugar by using solar energy	The invention claims a new method of using solar heat can process extracting alcohol or sweet sorghum or cane sugar to 1. flat-plate solar water heater and a vacuum tube solar water heater is installed on the roof (generally called solar water heater) is straw drying, fermentation, alcohol desorption device and grain drying device to supply energy. 2. using solar thermal energy the sweet sorghum or sugarcane crushed material after crushing, drying and/or directly drying to form sweet sorghum grain or cane grain as raw material of producing alcohol or sugar. 3. made of black plastic film or rubber bag fermentation, desorption active carbon by solar heat energy absorbed by the ethanol, to obtain ethanol by cooling. 4. the heat energy of the solar water heater, extracting sugar cane straw granule to sugar or ethanol. 5. sweet sorghum and sugarcane of wine lees heat energy of solar water heater for drying, crushing quality feed for ruminant animals.	LI Da-jue,Beijing,CN
New method for processing sweet sorghum or sugarcane to extract alcohol or sugar by using solar energy	The invention discloses a new method for processing sweet sorghum or sugarcane to extract alcohol or sugar by using solar energy. The method comprises the following steps of: 1, arranging a flat solar water heater and a vacuum tube solar water heater (called as solar water heaters in general term) for providing energy for a straw dryer, a big fermentation bag, an alcohol desorption device and distilled grain drying equipment on a roof; 2, airing and/or directly drying the crushed sweet sorghum or sugarcane fragments by using solar heat energy to obtain sweet sorghum granules or sugarcane granules, and the granules to obtain a raw material for producing the alcohol or the sugar; 3, preparing a black plastic film or rubber into a big bag for fermenting, adsorbing ethanol adsorbed by active carbon by using the solar heat energy, and cooling the adsorbed ethanol to obtain the ethanol; 4, extracting the sugar in the sugarcane straw granules by using the heat energy of the solar water heaters to prepare the sugar or the ethanol; and 5, drying the distilled grains of the sweet sorghum or the sugarcane by using the heat	LI Da-jue,CN

	energy of the solar water heaters, and crushing the dried distilled grains to prepare high-quality feed for ruminants.	
Process and mechanism to produce granulated organic-mineral fertilizer based on concentrated vinasse	A process and mechanism to produce granulated organic-mineral fertilizer based on concentrated vinasse, comprising specific conditions of raw material preparation, volume and amounts of mixtures, humidity of the materials used in the mixture, homogenization, granulation, drying and packaging, relation on amount of the product intended to granulate versus length of the granulator cylinder, temperature of the gases for draying, speed of the gas for draying and relation on the length versus diameter of the dryer. To improve the fertilizer composition and its mixing with conventional fertilizers, the present invention uses other sub-products from the sugar cane mill and alcohol distillery industries to obtain organic-mineral fertilizers that replace conventional fertilizers, providing organic materials and microorganisms, required for the reactivation of the soil fertility and a superior approach by the plants, resulting in an increasing of the harvesting productivity and the use of smaller amounts compared with conventional fertilizers.	Kimel of Colombia S.A.,Palmira,CO
Producing energy from biological material	Described are methods and systems for producing synthesis gas. In some embodiments, the method includes microbiologically converting biological material to form methane and CO2; and reacting methane and CO2 formed in (a) with water and metal to form synthesis gas. Optionally, the method also includes cutting vegetation; fermenting the vegetation to form biogas comprising methane and CO2; and reacting the biogas with water and metal to form synthesis gas and metal oxide. In some embodiments of the invention, reacted metal is regenerated from metal oxide produced in the reaction. In some embodiments the regeneration comprises reacting the oxide in a bath of boiling zinc.	ENGINEUITY RESEARCH AND DEVELOPMENT LTD.,IL
Soil improver prepared by using vinasse	The invention discloses a soil improver prepared by using vinasse and relates to the technical field of vinasse utilization. The soil improver is prepared from the following raw materials in parts by weight: 150-160 parts of humus soil, 35-40 parts of vinasse, 25-30 parts of alfalfa, 20-25 parts of tea leaf residues, 20-25 parts of rape seed cakes, 15-20 parts of nut shells, 15-20 parts of ginkgo biloba leaves, 13-16 parts of hawthorn leaves, 10-15 parts of pig hair ash, 10-15 parts of rice bran oil, 10-15 parts of bone meal, 10-15 parts of bagasse, 8-12 parts of bitter gourd vines, 6-10 parts of astragalus mongholicus, 6-10 parts of polyacrylamide, 5-8 parts of taro leaves, 5-8 parts of glycyrrhiza and 3-6 parts of pepper leaves. The soil improver prepared by the invention contains rich mineral elements required by plant growth, so that the soil fertility is improved, and the soil hardening can be effectively alleviated, thus the water-retention rate of the soil is improved. In addition, by using ginkgo biloba leaves, hawthorn leaves, bitter gourd vines, taro leaves and pepper leaves, the soil improver not only can effectively kill insect pests in the soil, but also can prevent propagation of weeds so as to accelerate plant growth.	Jieshou Huasheng Plastic Machinery Co. Ltd.,Fuyang,Anhui,CN

System for producing alcohol from sugar cane	The invention relates to a system for producing alcohol from sugar cane, comprising a comminution stage (3) where the sugar cane is comminuted and an extraction stage (7) where the comminuted sugar cane is separated into cane juice and bagasse. The cane juice is fermented to an alcoholic mash in a fermentation stage (19). A distillation system (23) distills raw alcohol from the mash, which is dehydrated in a dehydration stage (27). The vinasse arising in the distillation system (23) is concentrated in a multistage evaporator arrangement (33) for further use, for example as fertilizer. The bagasse arising in the extraction stage (7) is burned in a high-pressure boiler (39). The high-pressure steam generated in the high-pressure boiler (39) drives a turbine (45) for generating electrical power in a generator (47). The steam exhaust of the turbine (45) heats a pre-concentration stage (15) concentrating the cane juice extracted from the sugar cane before said juice is fermented in the fermentation stage (19). The energy demand of the distillation system (23) is thus reduced. The exhaust steam of the pre-concentration stage (15) is divided into three parts, wherein a first part provides the energy required in the distillation system (23), a second part heats the dehydration stage (27), and a third part provides energy to the evaporator arrangement (33).	GEA WIEGAND GMBH,DE | SCHORMÜLLER Matthias,DE
Use of synergistic formulations containing peroxide and quaternary ammonium reduce growth of contaminant microorganisms in ethanol fermentation	A method for controlling growth of contaminant microorganisms in a fermentation process using a combination of (a) peroxide compound (PC) and (b) a quaternary ammonium compound (QAC). The method comprises adding PC and QAC to one or more steps of a fermentation process. In this method, the PC and QAC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	E. I. DU PONT DE NEMOURS AND COMPANY
Use of synergistic formulations containing stabilized chlorine dioxide and peroxide to reduce growth of contaminant microorganisms in ethanol fermentation	A method for controlling growth of contaminant microorganisms in a fermentation process using a combination of (a) stabilized chlorine dioxide (SCD) and (b) a peroxide compound (PC). The method comprises adding SCD and PC to one or more steps of a fermentation process. In this method, the SCD and PC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	E. I. du Pont de Nemours and Company
Use of synergistic formulations containing stabilized chlorine dioxide and peroxide to reduce growth of	A method for controlling growth of contaminant microorganisms in a fermentation process using a combination of (a) stabilized chlorine dioxide (SCD) and (b) a peroxide compound (PC). The method comprises adding SCD and PC to one or more steps of a fermentation process. In this method, the SCD and PC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	E.I. Dupont De Nemours and Company,US

contaminant microorganisms in ethanol fermentation		
Use of vinasse in the process of saccharification of lignocellulosic biomass	The use of stillage in a saccharification/fermentation process of lignocellulosic biomasses, regardless of the form of the biomasses and regardless of the use of the obtained final hydrolyzed broth. The beneficial effect conferred by the stillage to the saccharification process of lignocellulosic biomasses presents among other characteristics the ability to buffer the reaction medium, especially when such process takes place in an enzymatic route, but not limited to it, regardless of the type of biomass being used and the type of pretreatment to which the biomass is subjected. Fermentation processes, such as the ethanol production, using stillage as source of nutrients such as, for example, nitrogen, for growing microorganisms, but not limited to it.	CTC-Centro de Tecnologia Canavieira S.A.,Santo Antonio,BR | Galvao Celia Maria Araujo,Americana,BR | Teodoro Juliana Conceicao,Piracicaba,BR | Andrade Liliane Pires,Piracicaba,BR | Tome Jose Augusto Travassos Rios,Piracicaba,BR | Neto Oswaldo Godoy,Piracicaba,BR
Use of vinasse in the process of saccharification of lignocellulosic biomass	The present invention relates to the use of vinasse in the process of saccharification/fermentation of lignocellulosic biomass independently of the form the biomass is in and independently of the intended use for the final hydrolysed broth produced. More specifically, the present invention describes the beneficial effect that vinasse has on the process of saccharification of lignocellulosic biomass, since said vinasse has, among other features, the ability to act as a buffer in the reaction medium, particularly when such process occurs via an enzymatic route, but not limited to same, independently of the type of biomass that is being used and the type of pretreatment to which said biomass was submitted. The present invention further relates to fermentation processes, such as ethanol production, comprising the use of vinasse as a source of nutrients, for example nitrogen (N), for the growth of microorganisms, but not limited to same. The present invention is situated within the field of chemical engineering.	CTC - CENTRO DE TECNOLOGIA CANAVIEIRA S.A,BR | GALVÃO Célia Maria Araújo,BR | TEODORO Juliana Conceição,BR | ANDRADE Liliane Pires,BR | TOME José Augusto Travassos Rios,BR | NETO Oswaldo Godoy,BR
Using a stable chlorine dioxide and synergistic agent of the peroxide reducing contaminating microorganism in ethanol fermentation long	A method for controlling growth of contaminant microorganisms in a fermentation process using a combination of (a) stabilized chlorine dioxide (SCD) and (b) a peroxide compound (PC). The method comprises adding SCD and PC to one or more steps of a fermentation process. In this method, the SCD and PC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	E.I. Dupont De Nemours and Company,US
Using of synergistic formulations containing peroxide and quaternary ammonium to reduce growth of contaminant	A method for controlling growth of contaminant microorganisms in a fermentation process by using a combination of (a) peroxide compound (PC) and (b) a quaternary ammonium compound (QAC) is disclosed. The method comprises adding PC and QAC to one or more steps of a fermentation process. In this method, the PC and QAC may be added to one or more components of a fermentation broth comprising inoculant, fermentable sugar and process water.	E.I. Dupont De Nemours and Company,US

microorganisms in ethanol fermentation		
Vinasse duck feed and preparation method thereof	The invention claims a wine lees duck feed, the raw materials and the weight parts are as follows: 10-15 parts of corn, wheat secondary powder 30-40 parts, wheat 5-10 parts, lees 10-15 parts, rapeseed dregs 5-10 parts, petasites japonicas 4-6 parts, stone powder 0.5-1 parts, shell powder 0.5-1 parts, edible salt 0.2-0.3 parts, fermentation pigeon manure 5-8 parts, straw powder 2-4 parts, soybean 3-4 parts, modified bentonite powder 3-5 parts, calcium monohydrogen phosphate 0.5-1 parts, methionine 0.05-0.06 parts, lysine 0.3-0.4 parts, peanut shell 0.02-0.03 parts, grape seed 0.1-0.2 parts, Chinese herbal medicine 3-4 parts. The invention is featured with rational formulation is added in the modified bentonite powder, straw powder and pigeon manure fermentation as the raw material, not only can enhance the palatability and nutritional and duck feed intake of feed, but also for digestion, increase the feed utilization rate, duck daily and economic benefit of has good effect.	Fengtai Ruipu Agricultural Development Co. Ltd.,Huainan,Anhui,CN

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