

# AGAVE INTENSIVE

## ARTHUR BLACK





I. Little clarity on terminology

II. Little lore and brief history

III. Primary genres of agave based spirits and NOM status

IV. Agave spirit sources of flavors – Elementary/Extensive

V. Tequila nom and comparison with “other agave” spirits

VI. Bacanora – Sotol overview and tasting

VII. Agave, Taxonomy, Inulin, Notion of Terroir

VIII. Mezcal NOM, Chemical analysis – Insane Breakdown –  
Tasting 4 mezcal from 4 species of agave

HERE WE GO

LOTS TO COVER

# Before we get Started

Some particular words to keep accurately in your head

- MAGUEY – From *Nahuatl* “Mayahuel”, Goddess of fertility
- AGAVE – Greek for “noble” defined by Linnaeus in 1753
- PULQUE – No disrespect, “agave beer” fermented largely from *Agave Maxisaga* from the southeast quadrant
- MEZCAL - From *Nahuatl* “ixcalli” for cooked & “metl” for agave
- MEZCAL WINE– Historical name prior to “Tequila Wine”, prior to “Tequila”
- TEQUILA – “a place of work”
- MEZCALERO – Anyone who produces mezcal
- PALENQUE – A farm with a still
- PALENQUERO – Anyone who produces mezcal and owns their own still



MAGUEY  
MAYAHUEL

Everyone loves breasts and drunk rabbits



Zapotecs  
“Cloud People”



# Tequila/Mezcal Brief History

- *Agave* cultivation all over Mexico is dated by historians to 2<sup>nd</sup> century BCE. By Indian legend, much earlier
- *Pulque* is most likely North America's first fermented beverage.
- *Mezcal* is most likely 1<sup>st</sup> distillate.
- Spaniards brought the art of distillation in 1521, but *distillation precedes Spanish conquests!!!!*
- Despite a national, cultural tradition of mezcal production, the actual area that became Tequila, gained its reputation out of a growing concentration of distillers, hence the name, "a place of work"
  - \*Tequila was officially established in 1656



# Mezcal/Tequila Brief History

- First license sanctioned by Spanish crown went to Jose Maria Guadalupe Cuervo in 1795 in Tequila
- Hundreds of species of Agave have been growing & cultivated for thousands of years. But.....
- Azul (“blue in Spanish”) identified by botanist, Weber, in 1902 became that which is associated with Tequila and was adopted by the initial resemblances of a classification system in the mid-20<sup>th</sup> century.
- In 1949, Tequila’s *Norma Oficial Mexicana* was implemented, *Agave Tequilana Weber Azul* plant was the plant of choice.
  - Geographic boundaries and criteria became law. The *Tequila Regulatory Council*, or CRT, licensing approved, numbers assigned and the NOM system came to life
- International recognition of the delimited areas of Tequila was not recognized until 1996.
- Mezcal Nom (1995 sort of), Sotol (2004) and Bacanora (2006)

# Agave Based Spirits

**\*Please come to appreciate the historical and cultural usage as “mezcal” as a category versus “mezcal” as a classified spirit**

**Mezcal has a NOM now, yo!!!!!!**

- **Tequila** – Primarily from Jalisco and blue agave
- **Mezcal** – Most associated with Oaxaca, though 8 states make mezcal. Mostly *Espadin*, but some 28 (30-50) species can be used
- **Bacanora** – From the state of Sonora from *Augustifolio*, aka *Espadin* – some claim *pacifica* and *palmieri* agave species
- **Sotol** – From state of Chihuahua from *Dasyilirion* species
- **Mezcal de Olla** – Utilizes an “olla” or a clay pot
- **Raicilla** – Made in western Jalisco from *lechuguilla*, *Inaeguidens* and *Maximiliana* agave species named after a region of same name
- **Tuxca** – From *Txcacuesco* in Jalisco, regional species
- **Comiteca** – From the state of Chiapas from the *atrovierns haw* agave species

**\*Anything without a NOM can make basic *Destilado de Agave***





**United States of America**

**Sonora**

**Chihuahua**

**Mexico**

**Jalisco**

**Michoacán**

**Oaxaca**

**Guatemala**

# Sources of Flavor in Agave Spirit Elementals

**AS BASIC AS IT GETS**

- Agave
- Water
- Fermentation
- Distillation
- Maturation

# VARIABLES COMPREHENSIVE

- **Agave:**
  - Agave species – Type, age, ripeness
  - Growing conditions – Temp, growing season, elevation
  - Preparation – Oven, Auto-clave, underground (earth, stone)
- **Water:**
  - Natural water – mineral content (iron, manganese, nitrogen, potassium)
    - Spring v River source
  - Processed water
- **Fermentation:**
  - Natural yeast vs. cultured yeast
  - Cultured: proprietary vs. generic strain
  - Length of fermentation, temperature of fermentation, vessel (oak, steel, animal skin?)
  - Bagasse ratio
- **Distillation: Influences the alcoholic character of the spirit**
  - Proof – Especially if you're considering an oak regimen
  - Type of still – Pot (size, copper, steel), continuous, olla, oak (pine)
  - Material of still – Copper, steel, clay, wood
  - Times distilled – Impurities, esters, volume/cost drivers
  - Temperature and length of distillation – Faster = more impurities, slower = less
- **Maturation: Determines the finished style**
  - Joven Abocado
  - Silver/white/blanco
  - Reposado
  - Anejo
  - Extra-Anejo

These three categories are applicable to Mezcal, Sotol, Bacanora– not Extra Anejo

# Tequila Defined

**Location:** To be called tequila, tequila must come from one of the five entitled states of production - Jalisco, Nayarit, Guanajuata, Michoacan, Tamaulipas

## Production Criteria:

- **Min 51% Blue Agave**
- **Labelled 100% = 100% Azul (otherwise – who knows?)**
- **Twice Distilled – Nom doesn't specify still criteria**
  - There are variations in ratios, but an acceptable volume ratio is an initial volume of 30,000 L reduces to 10,000 L of *ordinario*, reduced to approximately 2,500 L of *tequila*: thus, <1/10 of original volume at the end of the process!
- **Min Alc:** 35% abv
- **NOM**- Normas Oficial Mexicana – All Tequillaros have a NOM #
- **CRT**- Consejo Regulator de Tequila – Regulatory body that monitors production. The CRT establishes the **Normas**, or recognized criteria that define tequila.
- **DOT**- Denominacion de Origin de Tequila
- Post 2006, bulk shipments are allowed to US (joven, gold, mixto)

































# Other Spirits Production vs Tequila

- Agave: Many
  - Harvest: Longer
  - Preparation/cooking:
    - Underground-longer
  - Begasso: High ratio
  - Fermentation: Longer
  - Distillation:
    - Min X2 & Longer
  - Aging: Not so much
- Agave: Azul
  - Harvest: Shorter
  - Preparation/cooking:
    - Oven/autoclave/now “diffusers”
  - Begasso: None/optional
  - Fermentation: Shorter
  - Distillation: Now min1
  - Aging: More employed

United States of America

Sonora  
Baconora

Mexico

1 of 31 states, located in NW Mexico. Approximately 70,000 sq miles sharing 350 miles of border with New Mexico and Arizona. Sierra Madre Occidental and Baja Peninsula define land

**West** – The coast to the Gulf of California

**Middle** – Dominated by plains and rolling hills

**East** – Mountains dominate in the east

**4 recognized “regions”**

Sonora River, High Sierra, Sierra Baja, Central and Southern Region

Oaxaca

Guatemala



# Bacanora



- **Order: Asparagales**
- **Family: Asparagaceae**
- **Sub – Family: Agavoideae**
- **Genus: Agave**
- **Species: Agave Angustifolia/Espadín**

Named after a small town, Bacanora, in Sonora.

Bacanora received a domestic DO on November 6<sup>th</sup> in 2000, the Bacanora NOM regulating production was passed on October 28<sup>th</sup> in 2005. In 2006, the Consejo Sonorense Promoter de la Regulation del Bacanora was formed.

Nom states Bacanora must be made from *Agave Augustifolia* (espadin), but wild *silvestre* are employed as well as *Agave Pacifica* aka *Yaquiana*

- Sourced from within the 35 municipalities making up Sonora and be distilled to no less than 38% and no more than 55%

# Bacanora Production

## Rancho Tepua

25,000 scattered with wild plantings of *Sylvestre* aka *Angustifolia* Haw

Vinatero: Robert Contreras, maker of ***Ciejo Rojo***

Underground joven is 1.5 to 2.5 meters – brick lined, covered with metal lid, then earth and cooked for 1.5 days

Roasted agaves are broken up with axes, shredded then put into 200 l tubs

Spring water is added to surface level of bagasso.

2x distilled in 700 l still then diluted with purified water.



*Tepache*



*Capacity*



*La Perlas*



United States of America



Mexico

Chihuahua  
Sotol

Largest state in Mexico, very mountainous,  
greatest concentration of forests in Mexico  
and home to Copper Canyon (larger and  
deeper than the Grand Canyon)



# Sotol

- Order: Asparagales
- Family: Asparagaceae
- Sub-Family: Nolinaceae
- Genus: Dasylirion
- Species: Dasylirion wheeleri



AKA – Desert Spoon, Dasylirion is a stem succulent related to the yucca, that has been utilized by the Apache, Tarahumara and the Paquime Indians for millennia.

NO AGAVE – means it's not technically a mezcal

The NOM for sotol received its DO on April 15<sup>th</sup> in 2004 – NOM 159-SCFI-2004), regulated by *Consejo Mexicano de Sotol*.

Primarily produced in Chihuahua, can be produced in Coahuila & Durango

Yield for Dasylirion is lower than agave. You get a bottle per plant (20% of tequila and some mezcal)

# SOTOL Production

## Ocho Cientos

Largely the same process as with Bacanora, including the presence of a *pina* despite the different genus.

*Pinas* are cooked for 3 days underground, then fermented for 6-8 days.

1<sup>st</sup> distillation in a 350 Copper still. 2<sup>nd</sup> in 200 l

Bagasso



200 L still







# AGAVE

Family – *Asparagaceae*,  
*Cactaceae* (cactus)



Hundreds of species, though few are produced industrially; most are not employed in spirit production or are harvested wildly.

Monocarpic plants (semelparous organisms) reproducing iteroparitously either naturally or cultivated

No glucose or fructose, instead a complex carbohydrate compound known as *inulin* that must be hydrolyzed (saccharification) into fermentable sugars suited to a base alcohol suited (*tequila*) to distillation.





# INULIN

By itself, inulin a sweet polymer within the sap of an agave plant that can be extracted for production of “pulque”, which is different than “tepache”

Pulque – Sap is extracted from a cavity of the plant, fermented to low alcohol proof, but not distilled.

Some other things out there with levels of Inulin

- Wheat 1-6%
- Garlic 9-11%
- Onion 2-6%
- Banana .3-.7%
- Asparagus 2-3%
- Leek 3-10%
- Artichoke 16-20%



\*some 36,000 other vegetables and plants

Inulin found in the primary “agave distillates” of Mexico has a slightly different composition than that destined for pulque production



# Taxonomy/Smaxonomy

- **Order:** Asparagales
- **Family:** Asparagaceae
- **Sub – Family:** Agavoideae
  - **Genus:** Agave
- **Species:** Agave Angustifolia/Espadín



## SOME MAJOR PLAYERS

AGAVE GENUS

Species	Sub-Species
Tequilana	Azul
Angustifolia	Espadin
Potatorum	Tobala
American Oaxacensis	Arroquena
American Oaxacensis	Coyote
Rhodacantha	Mexicano

### Other Things to Consider

1. Mis-information
2. Cross planting
3. Cross breeding
4. Simply put, NO IDEA
5. Regional Names

**12 “primary” dialects of Oaxaca**  
 Zapotec, Chinantec, Mixe, Chatino,  
 Trique, Cuicatec, Huave, Nahuatl, Zoque,  
 Amuzgo, Chocho, Ixcatec

# Excessive Tables

Agave Species	Sub-Species/Sub-Varieties	Brands
Agave Americana var. oaxacensis	<ol style="list-style-type: none"> <li>1. Coyote – chato</li> <li>2. Arroqueno</li> <li>3. Sierra Negra</li> <li>4. Blanco</li> </ol>	<ol style="list-style-type: none"> <li>1. Siete Misterios, Vago</li> <li>2. El Jolgorio, Del Maguey</li> <li>3. Mezcalero #4</li> <li>4. -</li> </ol>
Agave Americana	1. Americana – Mezcal, Serrano	
Agave Potatorum	1. Tobala	1. Del Maguey, Vago
Agave Karwinskii	<ol style="list-style-type: none"> <li>1. Madrecuixe</li> <li>2. Bicuixe</li> <li>3. Tobasiche</li> <li>4. Barril</li> <li>5. Cuixe</li> <li>6. Tripon</li> <li>7. Largo</li> <li>8. Cirial</li> <li>9. Verde</li> <li>10. Penca Verde</li> <li>11. Mexicano o san martin</li> <li>12. Amarillo</li> </ol>	<ol style="list-style-type: none"> <li>1. Yuu Ball, Wahaka</li> <li>2. Mezcalero #6, Mezcaloteca</li> <li>3. El Silencio, Pierdre</li> <li>4. El Jolgoria, Scorpion, Banhez</li> <li>5. El Jolgoria</li> <li>6. Mezcal Real Minero</li> <li>7. Mezcal Real Minero</li> <li>8. Mezcal Union</li> <li>9. Espiritu Lauro</li> <li>10. In Situ</li> <li>11. Espiritu Lauro</li> <li>12. Mezcaloteca</li> </ol>

# Excessive Tables

Agave Species	Sub-Species/Sub-Varieties	Brands
Agave Rhodacantha	Mexicana Amarillo, Amarillo Grande, Penuda	Siete Misterios
	Mexicanito de campo, Mexicano de campo	
	Mexicano	El Jolgorio
Agave Cupreata Papalome, Papalote	Cupreata, Ancho, Maguey de Mezcal, Bravo	Mezcales de Leyenda
Agave Cupreata	Chino	Mezcaloteca
Agave Angustifolia	Espadin	Many
	Pacifica (wild espadin), Rubescens	
Agave Salmiana Crassispina	Salmiana, Verde, Manso, Cinarron	El Tinieblo
	Horse Caballo	El Koch
Agave Maximiliana	Lechuguilla, Manso, Tecolote, Pata de Mula	

# Excessive Tables

Agave Species	Sub-Species/Sub-Varieties	Brands
Agave Inaequidens	Lechuguilla, mansa, tecolate, pata de mula	-
Agave Univittata	Lechuguilla, bruta	Raicillia El Real
Agave Durangensis	durangensis	Mezcales de Leyenda
Agave Durangensis	cenizo	Mezcal El Mas pais
Agave Tequilana	Blue agave	All tequila and many mezcals
Agave Marmaorata	Tepeztate	El Jolgorio, Del Maguey
Agave de Lumbre	De Lumbre	El Koch
Agave Pasmó	-	-
Agave Cierago	-	-
Agave Pasmó y cuela	-	-
Agave Pasmó y Cuelo	-	-



# More Still.....

Agave Species	Sub-Species/Sub-Varieties	Brands
Agave Esperrima Jacobi	Maguey de Cerro	-
	Bruto o Ceniza	-
Agave Weberi Cela	Maguey de Cerro	-
Agave Iophanta	Estoquillo, Mezortillo	-
Agave Funkiana	Henequen, istle de juamave	-
Agave Hookeri	Ixquitecatl, Mezcal Bravo	-
Agave Kerchovei	Pasmo, Janali, Acalla, Escobeta	-
Agave Palmeri	Mano Largo, Chino bermejo, Lechuuguilla	-
Agave Scabra	Bruto, de Carro , Serrano	-
Agave Seemanniana	Maguey Chato	El Koch
Agave Shreve	Mahi Totasa, Bacanora, ceniza	-

# Lastly.....

Agave Species	Sub-Species/Sub-Varieties	Brands
Agave Pelona	Verde Pelona	El Koch
Agave Covallis	Jabali	-
Agave Sierrudito	-	El In Sito
Agave Liso	-	-
Agave Pulquero	-	-

## Maturation Periods

Espadín	7 -9 years
Mexicano	7- 9 years
Aroqueño	9 - 13 years
Coyote	5 - 8 years
Sierra Negra	15 - 20 Years
Tobalá	8 - 15 Years

# Denominations Of Origin - Mezcal



- Regulation began in 1994 under 07-SCFI-1994
- Nom in Place: International DO in 1995, but took 10 years for official regulation & certification 2005
- Comercon's inception 1997 – “Mexican Council for Quality Regulation of Mezcal” – Norma became official in 2003 and Comercon began certifying producers in 2005
- Comercon official has to be driven to the palenque for sample extraction and tanks are sealed.
- Tests are conducted for alcohol levels, acid TA and organic

compounds

Compound	Min	Max	Unit
Alcohols Superior (fusel oils)	100	400	mg/100 ml
Acids	-	170	mg/100 ml
Methanol	30	300	mg/100 ml

- Min Alc: 36 – 55%
- Twice distilled: SI
- **Typo I:** 100% agave & **Typo II:** 80% agave

# States that can make Mezcal

1. Oaxaca
2. Guerrero
3. Guanajuato
4. San Luis Potosi

5. Zacatecas
6. Durango
7. Tamaulipas
8. Michoacán

**Six Counties in Oaxaca:**  
Sola de Vega,  
Miahuatlan, Yautepec,  
Ocotlan, Tlacolula, Ejutla



# Brief Chemical Analysis of Mezcal

- Various Compounds: Ethanol, higher alcohols (Methanol and others), other “primary” volatile compounds like Esters, Aldehydes, Ketones, Carbonyls, Acids, Furans, Terpenes
- Ethanol – 2 carbon
- Higher alcohols – 2+ carbon alcohols
  - 1-propanol, 2-methyl-1-propanol (isobutanol), 1-butanol (amyl alcohol), 3-methyl-1-butanol (isoamyl-alcohol)
- Methanol – simplest alcohol – single carbon
- Esters – 18 identified – primarily ethyl acetate, ethyl hexanoate, ethyl octanoate, 2-phenethyl
- Carbonyls – Intermediaries when aldehydes are produced by yeast activity (acetaldehyde)
- Terpenes – Large group of organic compounds that exist in different numbers within different agave species. Primary terpenes include: citronellol (rose oil, geranium), linalool (florality), limonene (orange oil), farnesol (aroma enhancer), a-nerolidol (woody, “bark”)
- Furans – Stable compounds not too similar benzene (noted for a sweet smell)

## SOURCES OF COMPOUNDS

Agave	Cooking	Fermentation	Distillation
Terpenes, Fatty acids, saponins, inulin	saccharification	Alcohols, esters, aldehydes, terpenes, furans	Acetals, acids, alcohols, ketones, aldehydes, esters, phenols, furans, terpenes

# United States of America



Michoacán

Oaxaca

Guatemala

# Siembra Metl

## Don Mateo Mezcal of Michoacan

- **Order: Asparagales**
- **Family: Asparagaceae**
- **Sub – Family: Agavoideae**
- **Genus: Agave**
- **Species: Agave Cupreata**



- Produced at the *vinata* of Don Jose Emilio Vieyra Rangel at 7500 elevation between the Rio Balsas basin and the Eje Neo-volcanico de la Sierra Madres de Sur
- The Vieyra family owns 3 ranches (“Predio” or property): El Limon, El Tularcillo and Barranca del Agua
- They also contribute and source from a communal orchard, used for nursery of new baby plants are cultivated
- Ovens are 6.5 feet deep and 20 feet in diameter, holding 12 – 14 tons of agave





# Oaxaca – Terroir?



**GEOGRAPHY** – 60,000 sq miles of desert, coniferous woods, rainforests, lagoon, coastal lowlands: Divided into 5 zones – Mesa del Sur, the Sierra, southern border of Veracruz, coastal plain of the pacific, Isthmus of Tehuantepec

**“Minerality”** – Variables to consider: Agave, locality, ambient yeast, water source, fermentation, distillation methods and “colas” ratio.

# Aquillino's & Uncle Rey








 Aquilino García López

Image © 2015 DigitalGlobe  
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Image Landsat  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google earth

# Aquillino's joven



# Roasting the Agave

**Quixe**

**DRIED  
BAGASSO**



**Espadin**



# Tohona



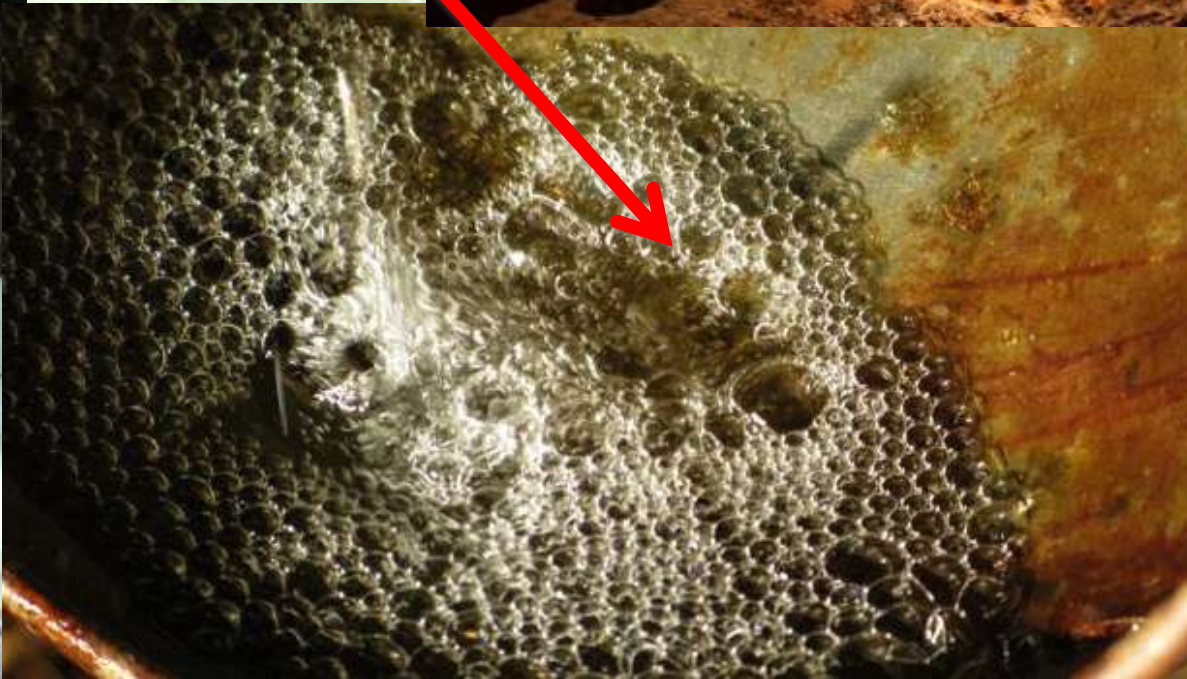


# Tepache in Tina



# Distillation

PERLAS



# Mexicano

- Agaves: Mexicano
- Village: Candelaria Yegole
- Grind: Stone
- Type of Still: Copper
- Distillations: Two
- Batch: 450 liters
- Fermentation Date:
- Age: Joven



# Pechuga

The Pechuga production season is limited to year end due to the special ingredients: Wild mountain apples and plums that must be in season and cannot be substituted. This mezcal is the most rare we have ever encountered.

Pechuga is begun with Minero mezcal that has already been double distilled. In preparation for a third distillation they place about 75 liters of mezcal in the still and add about 25 lbs of wild mountain apples and plums, big red plantain bananas, pineapples, a handful of almonds and a few pounds of uncooked white rice.

Next, a whole chicken breast (pechuga), skin removed, bone structure complete, is washed in running water for about three hours to remove any grease. This is then suspended by strings in the atmosphere of the still and a 24 hour, third distillation is begun. The vapor passes over the pechuga and condenses into a crystal clear liquid that has an amazing taste and smoothness.

The reason for the breast they say, is so the mezcal is not dominated by the fruit...a balance. Upon completion the pechuga is removed from the still and hung in the family Altar room...the most important space in the house.



Village - *Santa Cantarina Mina*

# Tobala

## The Wild Mountain Maguey

This maguey is found growing naturally only in the highest altitude canyons, growing in the shade of oak trees like truffles.

Tobalá's form is different than the maguey Espadin (Sword) or maguey Azul (Blue). It is smaller and broader leafed. It takes about eight Tobala piñas (hearts) to equal one piña from either of the more commonly propagated and cultivated Magueys.

Our Tobala has a sweet, fruity nose, with a mango and cinnamon taste and long, extra smooth finish. The pueblo elevation is around 8,200 feet, with a mountainous, tropical microclimate. We keep our production limited, to not mess with nature and to continue with the traditional way... being very careful to never overharvest and allow mother nature to do her job.



Village - *Teotilan del Valle*

# Solomon Rey Rodriguez

- Producer: Salomón Rey Rodriguez
- Location: Sola de Vega, Oaxaca
- Mezcal: Tobalá en Barro,  
Ensamble en Barro, Arroqueño



NO TAHONA – Mallets are used to smash the cooked pinas for 12 hour periods. “Uncle Ray” has arthritis, so his wife and children have to use the hammers.....They weigh about 20 lbs.

# Tobala In Nursery



Uncle Rey has 3 tina and .....a canoe









# Distillation

Mezcal de Olla



# MEZCAL VAGO

## Coyote en Barro

- Agaves: Coyote
- Mezcalero: Salomon Rey Rodriguez
- Village: Sola de Vega
- Grind: Mallets
- Type of Still:  
Olla de Barro
- Distillations: Twice
- Batch:
- Fermentation Date:
  
- Age: Joven



# CLOSING

- Pulque is America's oldest beverage
  - Mezcal is arguably America's oldest distillate
  - Agaves: A lot and we're still figuring it out
  - Brands: Probably 6 dozen out of 4,000 mezcaleros (compared to a 1,000 plus tequila)
- 
- 2009 Exports 414,608 Liters or 46,067 9L cases
  - 2010 Exports 610,685 Liters or 67,853 9L cases
  - 2011 Exports 647,989 Liters or 71,998 9L cases
    - Mezcal bottled with the worm was down 18% in 2011.
- USA is the #1 export market with a growth rate of 30%