Int. J. Curr. Res. Biosci. Plant Biol. 2016, 3(6): 82-86

EXCELLENT PUBLISHERS

International Journal of Current Research in Biosciences and Plant Biology

ISSN: 2349-8080 (Online) • Volume 3 • Number 6 (June-2016)

Journal homepage: www.ijcrbp.com

Original Research Article

doi: http://dx.doi.org/10.20546/ijcrbp.2016.306.010

Species Composition of Plant Communities in Pitlakes of Raniganj Coal Field, West Bengal, India

Debnath Palit[1]*, Debalina Kar[2], Sharmila RoyChowdhury[2], Aparajita Mukherjee[2], Babli Garai[2] and Piyali Kar[2]

[1]Assistant Professor, Department of Botany, Durgapur Government College, J.N Avenue, Durgapur 713214, debnath_palit@yahoo.com

[2]Research Scholars, Post Graduate Department of Conservation Biology, Durgapur Government College, J.N Avenue, Durgapur 713214 Durgapur, West Bengal, India

Corresponding author.

Abstract

Plants are the most vulnerable component among several other communities in every landscape which regulate ecological integrity and delicate balance of environment through complex interactions. The present investigation reveals the status of plant communities around the Pitlakes, Raniganj Coal Field, West Bengal which is an important coal production area of India. Total 56 species belonging to 25 families were recorded during 2014-2015. Euphorbiaceae and Fabaceae were the numerically dominant 'species enriched families'. Herbs (72%) are the most prevailing life forms among the observed plants. Some notable rich pilakes in terms of plant species occurrence include Real Kajora Pitlake (42, 75%), Babuisol Colony Pitlake (33,59%), Joyalbhanga Pitlake 1 (32, 57%), Jambad Pitlake 4 (31, 55%), Chora Pitlake and Western Kajora Pitlake with 30 species each (54%). As per the present investigation plant communities around Pitlakes of RCF, WB requires proper managerial decision regarding conservation and sustainable utilization in near future.

Article Info

Accepted:11 May 2016
Available Online: 06 June 2016

Keywords

Coalmine
Forest communities
Phytodiversity
Pitlakes

Introduction

Biodiversity conservation is one of the most important issue which have received wide recognition (Tscharntke et al., 2013; García-Llorente et al, 2016). Conservation of Phyto diversity constitute the vital sector of Biological conservation issues and approaches throughout the world (Shaheen and Shinwari, 2012; Hannah et al., 2012; Gnoumou et al., 2015; Nagaraja, 2016; Kumar et al., 2016).

Coal mine pit lakes are generated as a consequence of open cast mining process. Large excavated areas bearing vertical walls and enormous quantity of water typically characterize these aquatic systems. In West Bengal, especially in RCF region, open cast mining has become increasingly common over the last few decades through changes in excavation technology and ore economics. Moreover, such operations frequently leave a legacy of open mine pits once mining ceases. But few or limited number of attempts are exists regarding the surface mining generated pit lakes in this region (Palit et al., 2014; Gupta et al., 2013).

Pitlakes originated through opencast coal mining processes are relatively unexplored in this ecoregion. Keeping parity with this proposition the authors took the responsibility to study the concomitant plant community scenario of selected pitlakes in Raniganj Coal field, West Bengal for the first time towards better

management of these aquatic landscapes and key contribution towards biodiversity conservation. Specifically the objectives of the present study includes: a) assessment of the plant assemblage (inventory and occurrence of plant species) of Pitlakes in RCF region and b) to investigate dominance and area specific richness of plant communities in RCF Pitlakes.

Materials and methods

Study site

Raniganj Coalfield is the birth place of coal mining in the country. Area of Raniganj Coalfield is 1530 Km^{-2} spreading over Burdwan, Birbhum, Bankura and Purulia Districts in West Bengal and Dhanbad District in Jharkhand. Heart of Raniganj Coal Field (RCF) is, however, in Burdwan District bounded by Ajoy River in North and Damodar River in South. The preliminary survey on plants around the embankment of 10 selected RCF pitlakes was conducted during the period of 2014 to 2015 (Table 1).

Lake littoral zone, open water and embankment area of each pitlake was visually investigated followed by quadrat sampling for the assessment of concomitant plant composition using methodology adopted from Sutherland (2006).

Table 1. Description of study sites selected for analysis of plant community structure in RCF Pitlakes, West Bengal, India.

Sl. No.	Name of the pitlakes	ECL area	Latitude (N)	Longitude (E)	Age (Years)	Depth (Feet)	Elevation (Meter)
PLK01	Chora Pitlake	Bankola	23.671003°	87.193449°	30	80	74.8
PLK02	Joyalbhanga Pitlake 1	Bankola	23.695180°	87.283187°	35	70	84
PLK03	Jambad Pitlake 4	Kajora	23.644306°	87.172972°	60	120	93.7
PLK04	Western Kajora Pitlake	Kajora	23.602833°	87.14644°	40	40	78
PLK05	Atewal Pitlake	Kajora	23.60358°	87.162485°	40	60	83.2
PLK06	Khadan Kali Pitlake	Kajora	23.601608°	87.162325°	40	40	79.4
PLK07	Babuisol Sibmandir Pitlake	Kajora	23.598221°	87.169349°	15	60	74.8
PLK08	Real Kajora Pitlake	Kajora	23.634638°	87.184646°	20	100	106.7
PLK09	Chakrambati Pitlake	Kajora	23.610083°	87.159056°	15	90	78.3
PLK10	Babuisol Colony Pitlake	Kajora	23.598917°	87.163389°	30	30	81.5

Results and discussion

Pitlakes' floral assemblage observed during the study period is tabulated in Table 2. Total 56 species belonging to 25 families of frequent plant species dominating these pitlakes were observed constituting both terrestrial and aquatic vegetation. Euphorbiaceae and Fabaceae (10% each) were the most dominant family comprising 6 species each. Thirteen families were observed with only one species (Fig. 1). Herbs (72%) are the most prevailing life-forms among the studied plant communities (Fig. 2). Table 3 depicts the abundance status of different plant species in pilakes which reveals that the following decreasing pattern Real Kajora Pitlake (42, 75%), Babuisol Colony Pitlake (33,59%), Joyalbhanga Pitlake 1 (32, 57%), Jambad Pitlake 4 (31, 55%), Chora Pitlake and Western Kajora Pitlake with 30 species each (54%).

Table 2. Composition of natural vegetation in pitlakes.

SCO	Plant species	Family	PLK01	PLK02	PLK03	PLK04	PLK05	PLK06	PLK07	PLK08	PLK09	PLK10	TYPE
SP1	*Acacia nilotica* (L.) Delile	Fabaceae	-	-	+	+	+	-	-	-	+	+	T
SP2	*Achyranthes aspera* L.	Amaranthaceae	+	-	-	-	-	-	-	+	-	+	H
SP3	*Alternanthera sessilis* (L.) R.Br. ex DC.	Amaranthaceae	+	+	+	+	+	-	-	+	-	-	H
SP4	*Alternanthera tenella* Colla	Amaranthaceae	-	+	+	+	+	+	+	+	-	-	H
SP5	*Amaranthus spinosus* L.	Amaranthaceae	+	+	+	+	-	+	+	+	-	+	H
SP6	*Amaranthus viridis* L.	Amaranthaceae	+	+	+	+	+	+	+	+	+	+	H
SP7	*Andrographis echioides* Nees	Acanthaceae	-	-	+	-	-	-	-	=	+	-	H
SP8	*Andrographis paniculata* Nees	Acanthaceae	+	+	+	-	-	+	+	+	+	+	H
SP9	*Argemone mexicana* L.	Papaveraceae	+	+	+	+	+	+	-	+	+	-	H
SP10	*Azadirachta indica* A.Juss.	Meliaceae	+	+	+	+	+	+	+	+	+	+	T
SP11	*Boerhaavia elongata* Brandegee	Nyctaginaceae	+	-	+	-	-	-	+	-	-	-	H
SP12	*Butea monosperma* (Lam.) Taub.	Fabaceae	-	-	-	+	-	+	+	-	-	-	T
SP13	*Calotropis gigantea* (L.) W.T.Aiton	Asclepiadaceae	+	+	+	+	+	+	+	+	+	+	S
SP14	*Cassia sophera* L.	Fabaceae	-	-	+	-	+	-	-	+	+	+	T

SCO	Plant species	Family	PLK01	PLK02	PLK03	PLK04	PLK05	PLK06	PLK07	PLK08	PLK09	PLK10	TYPE
SP15	*Cassia tora* L.	Fabaceae	+	+	+	+	+	-	+	+	-	+	H
SP16	*Cleome viscosa* L.	Capparidaceae	+	+	-	-	-	-	-	+	-	-	H
SP17	*Clerodendrum viscosum* Vent.	Verbenaceae	-	+	+	+	-	+	+	-	+	-	H
SP18	*Croton bonplandianus* Baill.	Euphorbiaceae	-	+	-	-	-	+	-	+	+	+	H
SP19	*Cynodon dactylon* (L.) Pers.	Poaceae	+	+	+	+	-	+	+	+	+	+	V
SP20	*Cyperus rotundus* L.	Cyperaceae	-	-	-	-	+	+	+	+	-	+	H
SP21	*Dalbergia sissoo* Roxb.	Papilionaceae	+	-	-	-	+	+	+	+	-	-	T
SP22	*Datura metel* L.	Solanaceae	-	+	-	+	-	-	+	+	+	+	H
SP23	*Desmodium gangeticum* (L.) DC.	Fabaceae	+	+	+	-	-	-	-	-	-	-	H
SP24	*Eclipta alba* (L.) Hassk.	Asteraceae	+	+	-	+	+	-	+	-	+	+	H
SP25	*Emblica officinalis* Gaertn.	Euphorbiaceae	-	-	-	+	-	+	-	-	-	-	T
SP26	*Eragrostis coarctata* Stapf	Poaceae	+	-	+	-	+	+	-	-	+	+	H
SP27	*Euphorbia hirta* L.	Euphorbiaceae	+	-	+	+	+	-	-	+	+	+	H
SP28	*Ficus cunea* Steud.	Moraceae	+	+	+	+	+	+	+	+	-	-	T
SP29	*Hyptis suaveolens* (L.) Poit.	Lamiaceae	-	-	+	+	+	+	-	+	-	+	H
SP30	*Ipomoea maxima* (L.f.) Sweet	Convolvulaceae	+	+	-	-	-	+	-	-	+	+	H
SP31	*Ipomoea pes-tigridis* L.	Convolvulaceae	-	-	+	+	-	+	+	-	-	-	H
SP32	*Ipomoea pinnata* Hochst. ex Choisy	Convolvulaceae	+	+	-	-	+	+	+	+	-	+	H
SP33	*Jatropha curcas* L.	Euphorbiaceae	-	+	-	-	-	-	-	+	-	-	H
SP34	*Jatropha gossypiifolia* L.	Euphorbiaceae	+	-	+	+	-	-	-	+	+	-	H
SP35	*Kyllinga monocephala* Muhl.	Cyperaceae	-	-	+	-	+	+	-	+	-	-	H
SP36	*Lantana camara* L.	Verbenaceae	-	-	+	+	+	+	-	+	+	+	S
SP37	*Leonurus sibiricus* L.	Lamiaceae	-	-	+	+	-	-	+	+	-	+	S
SP38	*Leucas aspera* (Willd.) Link	Lamiaceae	-	+	-	-	-	-	-	+	+	-	H
SP39	*Ocimum canescens* A.J.Paton	Lamiaceae	-	+	-	+	-	+	+	+	+	+	H
SP40	*Oldenlandia corymbosa* L.	Rubiaceae	+	-	-	-	-		-	+	-	+	H
SP41	*Parthenium hysterophorus* L.	Asteraceae	+	+	+	+	+	+	+	+	-	+	H
SP42	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	-	+	-	-	+	+	-	+	-	-	T
SP43	*Phyllanthus amarus* Schumach. & Thonn.	Euphorbiaceae	+	-	-	-	-	-	+	-	-	-	H
SP44	*Polygonum barbatum* L.	Polygonaceae	-	-	-	-	-	-	+	+	+	-	H
SP45	*Saccharum spontaneum* L.	Poaceae	+	+	-	-	+	-	+	+	+	+	H
SP46	*Sida acuta* Burm.f.	Malvaceae	+	+	+	+	-	-	+	+	-	+	H
SP47	*Solanum sisymbriifolium* Lam.	Solanaceae	-	-	-	+	+	-	+	+	+	+	H
SP48	*Solanum surattense* Burm.f.	Solanaceae	+	+	-	+	-	-	-	-	-	-	H
SP49	*Tephrosia purpurea* (L.) Pers.	Fabaceae	-	+	-	+	+	+	-	+	+	+	H
SP50	*Tribulus terrestris* L.	Zygophyllaceae	+	+	-	-	-	-	-	-	+	-	H
SP51	*Tridax procumbens* L.	Asteraceae	-	+	-	-	+	+	-	+	+	+	H
SP52	*Urena lobata* L.	Malvaceae	-	-	+	+	-	-	-	+	-	+	S
SP53	*Vernonia cinerea* (L.) Less.	Asteraceae	+	-	+	-	-	-	+	+	+	-	S
SP54	*Vitex negundo* L.	Verbenaceae	-	-	+	-	-	-	+	+	-	+	S
SP55	*Xanthium strumarium* L.	Asteraceae	+	+	+	-	+	+	-	+	+	+	H
SP56	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae	-	+	-	+	+	+	-	+	+	+	S

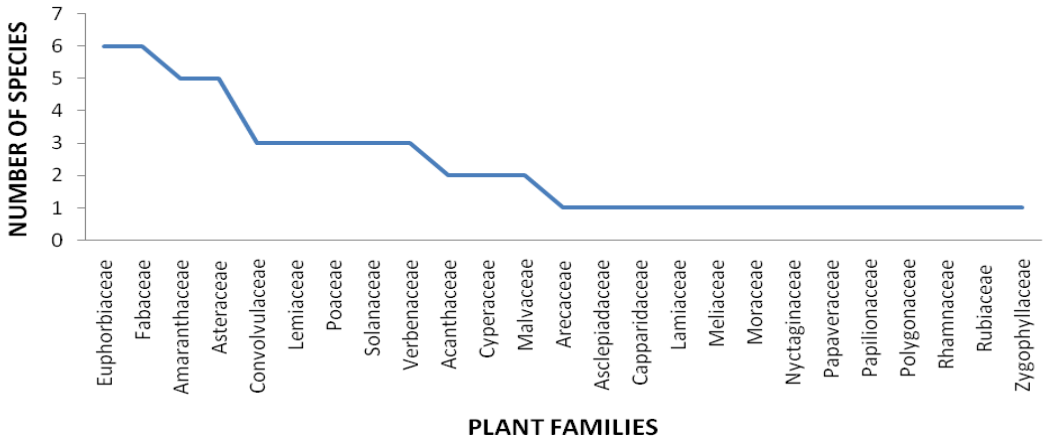

Fig. 1: Dominance of different plant families in Pitlakes of RCF.

Table 3. Abandance of plant species in studied Pitlakes of RCF.

Sites	Status	Frequency	Relative Frequency
Chora Pitlake	-	26	46
	+	30	54
Joyalbhanga Pitlake 1	-	24	43
	+	32	57
Jambad Pitlake 4	+	31	55
	-	25	45
Western Kajora Pitlake	+	30	54
	-	26	46
Atewal Pitlake	+	27	48
	-	29	52
Khadan Kali Pitlake	-	26	47
	+	29	53
Babuisol Sibmandir Pitlake	-	28	50
	+	28	50
Real Kajora Pitlake	+	42	75
	-	14	25
Chakrambati Pitlake	+	29	52
	-	27	48
Babuisol Colony Pitlake	+	33	59
	-	23	41

+ = Total number of species present, - = Total number of species absent

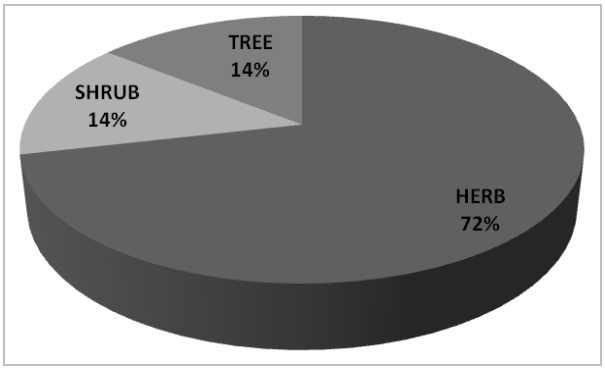

Fig. 2: Variation in plant type in Pitlakes of RCF.

Fig. 3 depicts the dendogram plot showing the clustering of studied pitlakes based on prevailing plant community structure during the study period. It was revealed that Atewal Pitlake, Real Kajora Pitlake, Chakrambati Pitlake, Babuisol Colony Pitlake constitutes the class of Pitlakes having similar pattern of plant association. Meanwhile two more groups were also derived as per the concurrent homogenous plant distribution which includes Jambad Pitlake 4- Western Kajora Pitlake- Babuisol Sibmandir Pitlake and Chora Pitlake, Joyalbhanga Pitlake 1. As per the present investigation plant communities around Pitlakes of RCF, West Bengal requires proper managerial decision regarding conservation in near future.

Inventory of phytodiversity in this ecoregion have been carried out by Bouri and Mukherjee (2011); Joshi (2012); Basu et al. (2013) and Bauri et al. (2013). However floristic scenario with special emphasis on Durgapur Forest Region is investigated by Bauri et al. (2013). While comparing the findings of the present investigation with Bauri et al. (2013) it was revealed that species richness is lower in the studied region (61 species vs 56 species). Under the same climatic condition this variation is observed might be due to sampling methodology used or relatively harsh and ecologically downtrodden habitat quality around Pitlakes which is still under different successional stages. Therefore, proper monitoring and conservative measures needs to be formulated for conservation of plant species in and around of pitlakes of Raniganj Coal Field region, West Bengal.

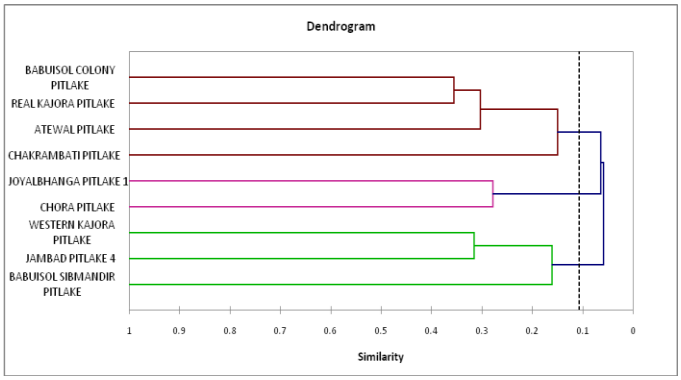

Fig. 3: Dendogram biplot showing the clustering of studied pitlakes based on prevailing plant community strucure during the study period.

Conflict of interest statement

Authors declare that they have no conflict of interest.

Acknowledgement

The study was supported by the Department of Science and Technology, Government of West Bengal. The financial assistance of WBDST is acknowledged.

References

Basu, P.S., Banerjee, A., Palit, D., 2013. Assessment of Diversity and Resource Potential of Non-Timber Forest Product (NTFP) in Selected Sites of Bishnupur Forest Division of Bankura District, West Bengal, India. New York Sci. J. 6(5), 46-53.

Bauri, T., Palit, D., Mukherjee, A., 2013. Phytosociology and pedological characteristics of selected beats of Durgapur Forest Range, West Bengal, India. Commun. Plant Sci. 3(3/4), 37-45.

Bouri, T., Mukherjee, A., 2011. Biological spectrum of Bankati forest areas in Burdwan district, West Bengal. Ind. J. Scient. Res. 2(4), 57-60.

García-Llorente, M., Castro, A.J., Quintas-Soriano, C., López, I., Castro, H., Montes, C., Martín-López, B., 2016. The value of time in biological conservation and supplied ecosystem services: A willingness to give up time exercise. J. Arid Environ. 124, 13-21.

Gnoumou, A., Ouedraogo, O., Schmidt, M., Thiombiano, A., 2015. Floristic diversity of classified forest and partial faunal reserve of Comoé-Léraba, Southwest Burkina Faso. Check List. 11(1), 15-57.

Gupta, S., Palit, D., Mukherjee, A., Kar, D., 2013. Inventory of pit lakes in Raniganj coal field, West Bengal India. J. Appl. Technol. Environ. Sanitation. 3(1), 55-60.

Hannah, L., Panitz, D., Midgley, G., 2012. Cape Floristic Region, South Africa. In: Climate and Conservation. Island Press/Center for Resource Economics. pp.80-91.

Joshi, H.G., 2012. Vegetation structure, floristic composition and soil nutrient status in three sites of tropical dry deciduous forest of West Bengal, India. Ind. J. Fund. Appl. Life Sci. 2(2), 355-364.

Kumar, A., Mitra, M., Adhikari, B.S., Rawat, G.S., 2016. Flora of Niti Valley: A cold arid region of Nanda Devi Biosphere Reserve, Western Himalaya, India. Check List. 12(1), 18-24.

Nagaraja, C., 2016. Diversity and composition of riparian vegetation across forest and agro-ecosystem landscapes of river Cauvery, Southern India. Trop. Ecol. 57(2), 343-354.

Palit, D., Kar, D., Mukherjee, A., Gupta, S., 2014. Pitlakes of Raniganj Coal Field, WB, India. Inventory and Water Quality Status. Technical Report. pp 68. http://www.grin.com/en/e-book/270503/pitlakes-of-raniganj-coal-field-w-b-india-inventory-and-water-quality

Shaheen, H., Shinwari, Z.K., 2012. Phyto diversity and Endemic richness of Karambar Lake Vegetation from Chitral, Hindukush-Himalayas. Pak. J. Bot. 44(1), 17-21.

Sutherland, W. J., 2006. Ecological Census Techniques. Cambridge University Press, UK.

Tscharntke, T., Clough, Y. Wanger, T.C., Jackson, L., Motzke, I., Perfecto, I., Whitbread A., 2012. Global food security, biodiversity conservation and the future of agricultural intensification. Biol. Conserv. 151(1), 53-59.

How to cite this article:
Palit, D., Kar, D., Chowdhury, C. R., Mukherjee, A., Garai, B., Kar, P., 2016. Species composition of plant communities in Pitlakes of Raniganj coal field, West Bengal, India. Int. J. Curr. Res. Biosci. Plant Biol. 3(6), 82-86. doi: http://dx.doi.org/10.20546/ijcrbp.2016.306.010