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The mining activity and its impact on plant biodiversity: A case study at Bhiwani open cast mining zones-Haryana, India

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ABSTRACT

The mining is a destructive activity generated by human being for providing strength and security to his living standard. The mining in the concerned zones provides raw materials in the form of crusher, gravels and stones, etc. for construction of roads, railway lines and other infrastructures. From the last few years the mining rate has increased several times. It results in the loss of biodiversity of both flora and fauna and physiographic features of the concerned region. After the mining operation in any area is over, the sign of same lie for decades and may be forever. It results in creation of so many environment related problems and health hazards. During the study, impacts of mining over plant biodiversity at six sites have been evaluated. At the entire sites, a total of 96 different plant species of herbs, shrubs and trees belonging to 36 families and 88 Genera were identified. The entire sites are considered biodiversity rich, which have threat of loss due to mining and its related activities.

Key words: - Mining, destruction, biodiversity, environment, species. *Abbreviations:* - *KB* – *Khari Battar, KL* – *Kaliyana, NK* – *Nigana Khurad, DH* – *Dharan, KH* – *Khanak, DA* – *Dadam, HA* – *Habit, T* – *Tree, S* – *Shrub, H* – *Herb.*

INTRODUCTION

The mining is that a process in which the materials (stones) are removed from the sites by boring and blasting and then send for further processes like crushing, etc. Both types of mining either open cast or underground, cause destruction of natural scene. This activity has led to development in all the sectors viz. social, economical, transport, educational and industrial, etc. in one hand and so many serious concerns related with physical, chemical and biological environment in another. There is no doubt as to make our society healthy and prosperous; environment which lay developmental foundation of a nation, must be healthy and prosperous [1].

A wide realization all around today is that, the environmental changes are because of men ignorance. The certain disaster in the form of tsunamis, earthquake, global warming, land slide, drought and flood, etc. are appearing suddenly from times to time causing great loss of life and properties. Owing to habitat destruction and over exploitation, the biodiversity has faced a serious threat. India has its unique identity in the world due to great diversity of natural ecosystems [2] and rich plant diversity in its different parts [3]. It contains around 49,000 plant species, 2.4% total geographical area and 08% biodiversity of the world [4]. To provide sustainability in environment, it is essential to preserve plant biodiversity. The plants purifies air through process of photosynthesis by taking CO_2 and releasing O_2 and also remove many toxicants from air, water and soil [5, 6].

The plants absorb heat and release water vapour to maintain temperature [7, 8]. They also increase humidity in the environment [9]. The plant prevents soil erosion [10, 11] and increases soil fertility [12]. The mining zones which are under study and have been under mining from a long time, contain around thousands mines and around five hundred stone crushing mills. At present all the zones are avoided of mining as the Honourable Supreme Court of India have banned mining and the matter is under consideration. The present paper is to observe the impact of mining over existing plant biodiversity and then to recommend the proper strategies for its conservation.

MATERIALS AND METHODS

The present study has been carried out during April 2012 - September 2013 at Bhiwani open cast mining zones of Aravalli hill range namely 'KB' situated at $28^{0}34'56.22$ ''N latitude and $76^{0}10'57.34$ ''E longitude at an elevation of 229m, 'KL' at $28^{0}33'08.41$ ''N latitude and $76^{0}11'49.27$ ''E longitude at an elevation of 231m 'NK' at $28^{0}47'55.60$ N latitude and $75^{0}55'44.21$ ''E longitude at an elevation of 234m, 'DH' at $28^{0}50'03.72$ ''N latitude and $75^{0}55'33.31$ ''E longitude at an elevation of 225m 'KH' at $28^{0}54'13.61$ ''N, latitude $75^{0}51'33.22$ ''E longitude at an elevation of 233m and 'DA' at $28^{0}53'02.81$ ''N latitude and $75^{0}50'55.14$ ''E longitude at an elevation of 321m from sea level. All the zones were around 15km in length and inside 40km from Bhiwani. The weather of Haryana is hot in summer with temperature up to 48^{0} C [13]. This area has cool winter with unreliable rainfall [14]. The months of May and June generally face dust, thundershowers, storm, etc. [15].



Figure 1: The map showing study area of Bhiwani open mining zones (Haryana), India

The concerned zones were regular visited for carrying out the inventory study of plant biodiversity existing there. The species were photographed and kept in files for easily identification. The species were identified with the help of available literature [16, 17, 18, 19, 20, etc.]. The local names were asked from the local people of the concerned zones.

RESULTS AND DISCUSSION

The entire sites under study contain around five hundred crushing mills, which have high demand of stones as raw material. The stones are to be removed by boring, blasting and transporting to the crushing mills for further processing. All the study sites are rich sources from plant biodiversity point of views. From the entire sites a total of 96 different plant species belonging to 36 families and 88 Genera have been noticed and can be categorized under endangered species. The total species noticed from the entire sites are as KB – 71, KL – 69, NK – 62, DH – 67, KH – 92 and DA – 76.

The mining activity directly ruins the vegetation cover. The areas where boring and blasting have taken place; don't contain any type of plant species as the top soil layer has been totally removed. The inventory studies of plant biodiversity at the study sites indicate that all the sites contain approximately equal status of the plant species except Khanak which have highest diversity than other sites.

Family/Species	I ocal name	KR	KI	NK	рн	кн	DA	НА
Acaranthaceae	Local hant	KD	KL	1111	DII	IXII	DA	IIA
Ruellia patula	Phutkanda	+	+	+		+	+	Н
Amranthaceae	Thutkundu							
Aerva tomentasa	Bui	+	+	+	+	+	+	S
Achyranthes aspera	Ulta Bharut	+	+	+	+	+	+	Н
Amaranthus spinosus	Cholaai		+	+	+	+	+	Н
Chenopodeum album	Bathua	+	+	+	+	+	+	Н
Pupalia lappacea	Gol Bharut	+		+	+	+	+	Н
Apocynaceae								
Leptadenia pyrotechnica	Khinp		+			+	+	Н
Asclepidaceae								
Colotropis procera	Aakta	+	+	+	+	+	+	Н
Asteraceae								
Artemisia caudate	Barna			+		+		Н
Cirsium vulgare	Kandai	+	+		+		+	Н
Conyza canadensis	*		+		+	+	+	H
Dicoma tomentosa	*	+			+	+	+	H
Echinops echinatus	Pahdi Kandai	+	+	+	+	+	+	H
Parthenium hysterophorus	Kangres Ghas		+	+		+		H
Tridax procambens	*	+	+	+	+	+	+	H
Verbesina encelioides	Bansla Genda			+		+		H
Vernonia cinerea	*	+	+			+		H
Xanthium strumarium	Bharut	+	+	+	+	+	+	н
Boraginaceae	Dl 41 41							TT
Heittropium strigosum	Phadi radka	+			+	+	+	н
Burgeraceae	Saahlar							т
Boswellia serrala	Gugel					+	+	1 C
Commiphora wighti	Gugai	+	+	+		+	+	3
Opuntia ficus indica	Nagfani							ч
Copporação	Nagrani					Ŧ		11
Capparactat	Kair	-	+	-	-	-	+	т
Cleome gynandra	*	+ +	+ +	+ +	+ +	+ +	+ +	H
Capparidaceae								
Crateva religiosa	Pahadi Peepli			+		+	+	Т
Commelinaceae	r unuar r oopn							-
Commelina benghalensis	*	+	+		+	+	+	Н
Composita								
Leunaea nudicaulis	Jangli Gobhi	+	+	+	+	+	+	Н
Convolvulaceae								
Convolvulus arvensis	Bel Dholi	+	+	+	+	+	+	Н
Evolvulus numularius	*	+	+	+	+	+		Н
Ipomoea pestigridis	Jhad Bel	+	+		+	+	+	Н
Cucurbitaceae								
Citrullus colocynthis	Gadumba	+	+			+		Н
Cucumis callosus	Kachari	+	+	+	+	+	+	Н
Melothria maderaspatana	Khati bel	+		+			+	Н
Momordica balsamica	Jangli Karela					+		Н
Cyperaceae								
Cyprus rotundus	Dila Ghas	+	+	+	+	+	+	Н
Euphorbiaceae	5 11							
Euphorbia hirta	Dudhi	+	+	+	+	+	+	Н
Febaceae	D 1 1							T
Acacia arabica	Babul	+	+	+	+	+	+	I T
Acacia nilotica	Kikar Dahadi Jaradi	+	+	+	+	+	+	
Acacia senegal	Panadi Jandi	<u> </u>	+	+		+	+	1 T
Albizia leobeck	Sinham	+	+			+		1 T
Dulbergia sissoo Prosonis cinenaria	Jandi	+	+		+	+	+	1 T
Chamagorista nomana	Dhaderan	+	+	+	+	+	+	1 S
Chamaecrista nomane	Vahuli Kilton		+			+	+	5
Desmodium gengeticum	Kondhra	+	+	+	+	+	+	ь Н
Galega officinalis	*	- T	- T - +	-	-	- -	- T - +	H
Rvnchosia minima	Pativa Ghac	+	-r +	+	+	+	+	H
Tephrosia nurpurea	Bel Ghas	- T	+	+	+	+	- T - +	Н
Lamiaceae	Der Gilas		Г	Г	Г	F	Г	11
Clerodendrum multiflorum	Arni	+	+			+		S
Ocimum basilicum	Jangli Tulsi	1	+		+	+	+	Ĥ

Table 1: The table shows the entire plant species with family, scientific and local names at all the six sites of Bhiwani open cast mining zones

Ocimum canum Sims	Sadak Tulsi	+	+	+	+	+		Н
Leguminoseae								
Indigofera linnaei	Pahadi Bel	+			+	+	+	Н
Malvaceae						+		
Abutilon indicum	Peeli Buti	+		+	+	+	+	S
Growia topar	Ibadi	-		-	-	-	-	5
Malianna	Jiladi	Ŧ		т	т	т	т	5
Meliaceae	N							T
Melia azadirachta	Neem	+	+	+	+	+	+	1
Menispermaceae								
Cocculus pendulus	Pilwani Bel		+		+	+	+	Н
Moraceae								
Ficus religiosa	Peepal	+		+		+	+	Т
Nyctaginaceae								
Boerhaavia diffusa	Santi	+	+	+	+	+	+	Н
Papaveraceae								
Argemone mexicana	Kandai pili		+		+			н
Розсезе	Tundui pin							
Phraemites australis	*							S
Allotonongia cimicing	Ihamia Dada					+		5 11
Alloteropsis cimicina	Jhernia Bada	+	+	+	+	+	+	H
Aristida adscensionis	Pahadi Ghas	+	+	+	+	+	+	Н
Bothriochloa ischaemum	Jhernia	+	+	+		+	+	Н
Brachiaria distachya	Ghas		+	+	+	+	+	Н
Brachiaris ramose	Ghas	+	+	+	+	+	+	Н
Calamagrostis stricta	Sirtia Ghas	+	+	+	+	+	+	Η
Cenchrus ciliaris	Anjan	+	+	+	+	+	+	Н
Cenchrus echinatus	*	+		+		+	+	Н
Cenchrus longispinus	Chhota Anian	-	+	+	+	+	+	н
Cympogon iwarncusa	Pahadi Ghas	+	+	, +	+	, +	+	н
Cympogon Jwunicusu	Doob Ghas	-	-	-	-	-	-	н
Cynodon dderyion	Malida Chas	- T	- T	т	т	т	т	11
Daciylocienium aegyptium	Makda Gilas	+	+	+	+	+		п
Desmostachya bipinnata	Daabh	+				+		H
Dichanthium annulatum	Kala Jhernia	+	+	+	+	+	+	Н
Echinochloa colona	Samak			+		+		Н
Eleusine indica	Chaar Sirtia	+	+	+	+	+	+	Н
Eragrostis minor	*		+	+	+	+		Н
Erogrostis tenella	Chidiya Ghas	+	+	+	+	+	+	Н
Heteropogon contortus	*	+			+	+	+	Н
Saccharum spontaneum	Jhund	+	+	+	+	+	+	Н
Portulaceae								
Portulaça ayadrifida	*	+	+	+	+	+	+	н
Pteridoceae								
A diantum ingigum	*							ц
Adiantum incisum		+	+		+	+	+	п
Rhamhaceae	D 11 '							-
Ziziphus mauritian	Badberi	+				+	+	T
Ziziphus numularia	Jhadi	+	+	+	+	+	+	S
Salvadoraceae								
Salvadora oleoides	Jaal					+	+	Т
Sapindaceae								
Cardiospermum halicacabum	Bel	+	+		+	+	+	Η
Simaroubanceae								
Ailanthus excelsa	Kabli Neem	+		+		+		Т
Solanaceae		<u> </u>						
Datura metel	Dhatura	+	1		+	+	+	н
Physalis minima	Bambhola	T L		_ر	۲ بر	г 	г 	ч
	Damonoia	+	+	+	+	+	+	п
Solanum surratense			+		+	+	+	Н
withania somnifera	Asawgandha	+				+		Н
Typhaceae	_							
Typha angustifolia	Patera					+		Н
Xanthorrhoeaceae								
Asphodelus tenuifolius	Payajiya	+	+		+		+	Н
Zygophylaceae								
Balenite aegyptiaca	Marehlan	+	1	+	+	+	+	Т
Fagonia indica	Dhaman	+			+	+	+	Н
Tribulus terrestris	Bhankhri	+	+	+	+	+	+	Н
1.100000 1011000110	Shansin	т	Г	F	F	F	г	

*Local name not available.

The total numbers of species at the entire six sites show a little difference of species. The Khanak is having largest number of total species. The difference of the total species is due to the level of mining, total area covered and interferences of the local people at the sites for grazing, fodder, fuel wood and timber, etc.





Figure 2: The numbers of herbs, shrubs and tree and comparison between entire six study sites



CONCLUSION

There the two things matter side by side, first is the employment of thousands of the people linked with mining activities which provides them regular jobs and also raw materials for construction of the roads, railway lines and all types of others infrastructure. The second is the rich plant biodiversity existing at the study sites. The mining operational way has been totally un-sustained and without properly monitoring, which need approval of Environmental Management Plan. The biodiversity should be supported and conserved for which the Government and the local people should involve heartily. The mining should not allow at all, if yes then in a sustainable way, so that the safe and clean environment can be provided to our future generation like we received from our ancestor.

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