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VEGETATION OF THE PATHORGORA PHOSPHATE MINES AREA, SINGHBHUM DISTRICT, BIHAR

S. C. NANDI
Burdwan University, Burdwan
AND
P. K. MUKHERJEE
Calcutta University, Calcutta

ABSTRACT

Vegetation of the phosphate mines area at Pathorgora, in Singhbhum Dist., Bihar is discussed. Near-absence of Sal (*Shorea robusta* Gaertn. f.) is the most dominant feature. Occurrences of plants in relation to phosphate ore are also discussed.

Pathorgora is located on the south-eastern part of the Singhbhum district, Bihar and is situated at 22°32′ north and 86°27′ east. The total area is 8.397 sq. kms and the terrain is an undulating plateau consisting of a few scattered hills (Banadungri, Merodungri, Chaudaldungri, Lutidhiri, etc.) rising to about 200 m above the main plateau, chiefly in the northern parts. There are innumerable pits (due to open cast mining) of varying sizes in the area at different elevations. The area lies between Mosabani in the east, Surda in the west, Dhobani ranges on the south and in the north it is limited by the Mosabani-Tatanagar Road (Figs. 1 & 2).

The area is composed of pre-cambrian sedimentary piles, volcanic flows, and granite rocks much of which is now metamorphosed to different degrees. The metasedimentary rocks are represented by mica-schists, biotite-chlorite-quartz schists and quartzites. The soda granite consists of albite and quartz. Considerable apatite-magnetite mineralisation occurs along the fringes of the rocks within the Dhanjori basic volcanics or within the quartz chlorite schists. Laterite occurs on some hill tops. The place is usually interbedded with quartz laminae. On weathering the latter breaks up into numerous stones which

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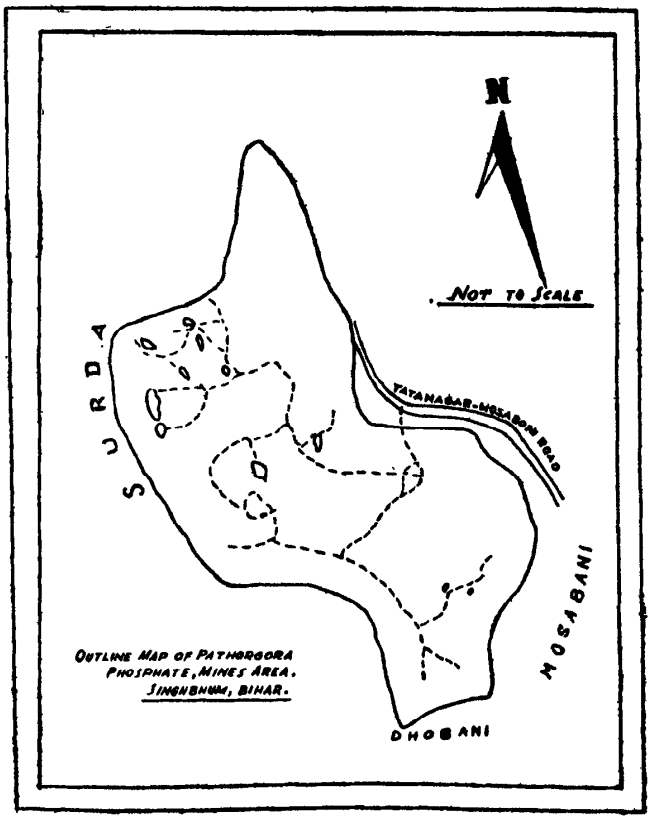

Fig. 1

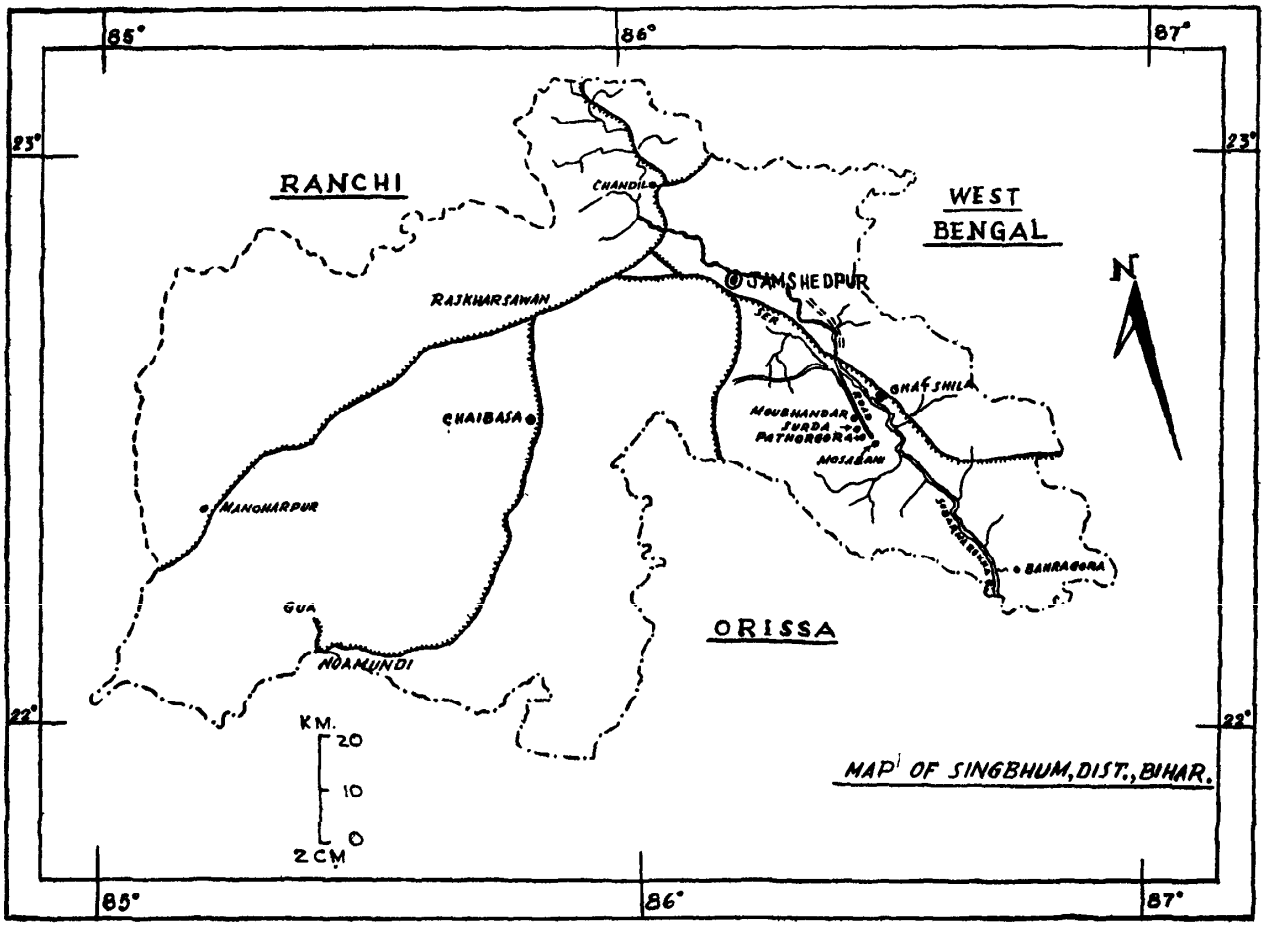

Fig. 2

often thickly strew the surface. The clays derived from these schists are usually hard and impermeable. Ore mineralisation constituting the apatite-magnetite deposits are apatite [$Ca_5F(PO_4)_{3-7}$]; martite (Fe_2O_3); ilmenite (FeO) and rutile (TiO_2) (Dunn, 1937; Banerjee, 1962; Sarkar, 1966b; Sengupta, 1964). Ore bodies are located along the surfaces and dip at angles at depth. The ore bodies are not confined to a definite zone or zones, rather they occur along the periphery of the Soda granite bodies with basic rocks or albite-quartz-chlorite schists or biotic schists within the Dhanjori basic volcanics (Sarkar, 1966b). These ores and their enclosing rocks are chemically analogous and the latter being a basic rock is supposed to have high content of the constituents of these ores. Soils are mostly loamy, deficient of organic matter (except under forests).

The mining for phosphate ores is being carried out here for quite a long time and since 1937 the operations are being done by the Indian Iron and Steel Company. The estimated reserve of ore is 2.4 million tons of which proved reserves extend to 0.35 million tons (Mr. C. V. Mallick—personal communication).

The analyses of phosphate ores reveal the concentration of P_2O_5 from 13.49% (in granitic rocks) to 38.88% (in volcanic rocks —Lutidhiri); Fe_2O_3 (1.97%-30.12%); FeO (0.58%-4.88%); CaO (17.51%-50.86%); Al_2O_3 (5.06%-7.17%) (Sarkar, 1966b; De *et al.*, 1978). Of the trace elements range of Co is 0.1-1.0 at shallow depths and that of Ni is 0.1-1.0 (Sarkar, 1966a). The soil pH ranges from neutral to slightly alkaline (7.0-7.5).

The climate is of the monsoon type. The average maximum temperature is 37.0°C

which may rise to 43°C in the month of May and the average minimum temperature is 9.3°C, the lowest being in the month of January.

The rainfall regime is bixeric. There are two wet seasons, one of short duration (at most a few days) in February and a longer one from June to October. The average maximum rainfall is 140 cm (Mr. C. V. Mallick—personal communication).

The observations about the vegetation were carried out during five field tours, carried out at intervals varying from three to five months starting from April 1978. The voucher specimens are preserved in the herbarium of the Department of Botany, Burdwan University.

The flora of the district has been studied by Haines (1910, 1921-25), Mooney (1937, 1950), Ghosh (1966), Srivastava (1958), Mazumdar and Biswas (1971). In the present work the characteristic vegetation of the phosphate mines area at Pathorgora is analysed.

VEGETATION: The vegetation of the area is of typical tropical mixed dry deciduous type. Most common trees of the open plateau are *Terminalia bellirica* (most frequent on flat hill tops), *Diospyros peregrina*, associated with *Azadirachta indica, Madhuca indica, Syzygium fruticosum, Diospyros melanoxylon, Zizyphus mauritiana* var. *fruticosa, Aegle marmelos, Lannea coromandelica, Acacia torta, Bombax ceiba, Dalbergia lanceolaria, Syzygium jambos, Tamarindus indica, Mangifera indica. Terminalia arjuna, Butea monosperma, Schleichera oleosa* and *Ficus benghalensis* are of very rare occurrence.

Plants on the slopes of the hills are *Holarrhena antidysenterica, Cleistanthus collinus, Woodfordia fruticosa, Gardenia latifolia, Ziziphus mauritiana* var. *fruticosa, Z. oenoplia, Adina cordifolia, Phyllanthus emblica, Cassia fistula, Anogeissus latifolia, Lannea coromandelica* etc.

Among the climbers the following have been noted: *Dioscorea bulbifera, D. pentaphylla, Smilax macrophylla, Bauhinia anguina, Teramnus labialis, Tragia involucrata, Hemidesmus indicus,* etc.

Herbs are not so frequent specially under the forest growth, but those found in some clearences and on the side of foot tracks include: *Andrographis paniculata, Solanum surattense, Rungia pectinata, Evolvulus nummularius, Heliotropium indicum, Coldenia procumbens, Desmodium triflorum, Indigofera linifolia, Achyranthes aspera, Sida acuta, Gnaphalium indicum, Tridax procumbens, Borreria articularis, Boerhavia diffusa, Phyllanthus virgatus,* etc. *Argemone mexicana, Evolvulus alsinoides* and *Sphaeranthus indicus* occur chiefly on the crop lands after harvest.

Vanda tesellata is the only epiphyte usually found growing on trees like *Diospyros melanoxylon, Mangifera indica* and *Madhuca indica.*

Three parasitic plants found in the forest are *Cuscuta reflexa, Viscum articulatum* and *Dendropthoe falcata.*

The pits caused by open cast mining harbour on their sides mainly grasses like *Alopecurus aqualis, Heteropogon contortus, Themeda quadrivalvis, Chrysopogon aciculatus, Eragrostris tenella, Themeda arundinacea* along with *Woodfordia fruticosa, Mimosa rubicaulis* and *Trema orientalis.*

On the floor of the pits are found *Amischophacelus axillaris, Murdania nudiflora, Cyperus rotundus, Glinus lotoides, Polygonum hydropiper, Borreria articularis, Lindernia viscosa, Leucas cephalotes* etc.

The aquatics mainly found in the water collected in these pits are *Salvinia cucullata, Azolla pinnata, Ceratopteris thalictroides, Limnophila indica, Aeschynomene indica* etc.

The most interesting feature of the vegetation of the area is the near absence of

Shorea robusta which constitutes the dominant element of the neighbouring areas and the district in particular. Here, it is replaced by *Cleistanthus collinus, Lannea coromandelica, Gardenia latifolia* and *Holarrhena antidysenterica* on the hill slopes and by *Anogeissus latifolia, Ziziphus mauritiana* var. *fruticosa, Z. oenoplia, Woodfordia fruticosa, Adina cordifolia,* etc. on the flat hill tops (particularly on Merodungri and Banadungri). A few specimens of *Shorea robusta* along with other associates occur on the flat hill tops of Lutidhiri where it is capped by laterite and is not at all a major element there. The forest evidently is of the dry mixed deciduous type of Champion (1936) and Champion and Seth (1968) and is rather a degenerated type. The observations corroborate Mooney (1941) regarding the change of 'Sal' formations. The near absence of Sal in the area may be due to the following factors: (i) Higher soil pH (Puri, 1955, 1966); (ii) Rarity of laterite and general dry and impervious soil, and (iii) Presence of Cobalt and Nickel as trace elements in the soil. Roy (1974) from his studies on the Sukinda valley, has suggested the disappearance of *Shorea robusta* in Nickel ore zones. The abundance of *Cleistanthus collinus* confirms the view expressed by Meher-Homji (1971) of its conspicuousness at lower altitudes in open type of forests. However, the occurrence of *Croton oblongifolius* in this dry belt is an interesting feature.

Where ore bodies of phosphate were adjacent to the surface, practically no forest exists on the sides of the pits and even if they were present (assuming their destruction prior to mining) no appreciable regeneration of forest is seen inspite of long years of abandonment. In contrast, in places where ore bodies were covered deeply by a top layer of laterite and other submetamorphosed rocks, forest growth is to some extent luxurious on the sides of the pits there. Probably, rock phosphates, whose solubility is exceedingly low and are not available to plants, act as a deterrent for deep rooting forest plants in areas having phosphate ores nearer to the surface. However, several grasses (*Themeda arundinacea, T. quadrivalvis, Alopecurus aqualis*) and also *Woodfordia fruticosa, Mimosa rubicaulis* are seen growing on the walls of the pits, sometimes even on the remnants of phosphate rocks probably due to their greater absorption ability of Calcium, though experimental proof to this is yet to be obtained. Moreover, some herbaceous plants like *Tridax procumbens, Borreria articularis* have their leaves more dark green, shiny and fleshy with little lateral branching which probably indicates phosphate deficiency in such areas (Black, 1968), due to higher soil pH.

Agriculture has occupied much of the plain-lands. Most of the forests near to habitations have been relegated to rugged terrain. Mining activities have also destructed some of the forests and the plateau tops have become bare. Forest fires, either accidentally or intentionally are not rare. So far no forest plantation have been seen in the area and the rather poor forests preserved on the hill tops are slowly diminishing.

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