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2. Murti *et al.*, *Ind. Journ. Pharm.*, 1940, 2, 206
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A NOTE ON THE CALCAREOUS MARL DEPOSITS OF U. P.

THE object of the present note is to record the (i) nature and occurrence, (ii) physical and chemical aspects, and (iii) the suitability of the marl, found in the districts of Lucknow, Unao, Rae Bareilly and Barabanki for economic purposes. These deposits were first discovered and studied for cement manufacture by R. J. Hallidy, and the results were recorded in 1923.¹ Later on in 1941, the author carried out for about a year and a half the preliminary survey and prospecting of these deposits.

(i) *Nature and Occurrence.*—These are fresh-water marls. The deposits are found in many places along the valleys of the rivers Sai, Gomti, Gogra, etc., or generally in the low lands, *jhils*, *tals*, swamps or the old beds of rivers. The marls lie under 6-15 feet of clay, and occur more or less as lenticular basin-shaped deposits of relatively small size. There is nothing on the surface which indicates deposition of marl underneath. Generally the areas are highly cultivated. It has been observed by the author that sugarcane grows quite profusely in the lands where the marls lie below.

(ii) *Physical and Chemical Aspects.*—Marl as found in nature is very wet, and may contain more than 30 per cent. of moisture. It is fine and sticky. The colour varies from grey to whitish grey. The darker colour is generally due to the presence of much organic matter, both mollusc shells and plants. The shells may sometimes be absent, whereas in some cases the marl is made up entirely of shells. The good quality marls usually contain very little of fine sand or grit.

It is a chemical deposit of calcium carbonate, containing 39 per cent. CaO. The alkalis are less than 1 per cent. while the silica is little more than 16 per cent. Fe₂O₃, TiO₂, and MgO, which are objectionable for cement manufacture are within the limits of British Standard Specifications for Portland Cement.

(iii) *Suitability for Cement Manufacture.*—It is generally felt that lime made out of marl is definitely better and cheaper than that from other sources. The tensile strength and expansion of the limes obtained from various sources support the above idea.

The physical and chemical studies of the marl deposits reveal that they can be used for the manufacture of cement only after calculation, as the percentage of CaO is lower than

the one required by British Standard Specifications of Portland Cement.

(iv) *Extent of Deposit.*—The material is found in pockets up to 50 chains long and from 150-1,000 ft. in width. The thickness of marl varies from 3-12 ft. with an average of 4½ ft. and the overburden of clay is 4-12 ft. thick. The most important pockets are in the Basah Jhil in the Unao and Rae Bareilly districts.

(v) *Quantity Estimated.*—The total estimated deposit of marl in the three districts of Unao, Rae Bareilly and Lucknow is about 35.9 million tons. Besides these three districts, the areas in the district of Barabanki are yet to be examined.

(vi) *Facilities for Development.*—Owing to the nature and mode of occurrence of the material, the examination, prospecting and development present certain peculiar difficulties, such as inflow of water. The most suitable method for getting the marl would be by dredging, and the cost involved in this method is considerably lower than that of mining a limestone deposit. Further, the calcination treatment does not require much labour or huge machinery, since it requires only a small wet grinding and crushing plant, and the addition of bauxite to the slurry. The position of these deposits is ideal from the point of view of cheap labour and easy transportation to the factory and the market.

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THE BIOLOGY OF *EARIAS CUPREOVIRIDIS* WLK.*

THE failure of cotton crop in the Punjab in 1905 and in Sind in 1906¹ brought spotted bollworms, *Earias fabia* and *E. insulana*, into prominence. Since then these two species have been under close investigation. A third species of *Earias*, *cupreoviridis*, however, has not been recorded from cotton, but only from some cultivated *Hibiscus* species and capsules of jute² in India; and this has only been casually studied. Fletcher,^{3,4} Fletcher and Misra,¹ and Haroon Khan *et al.*,⁵ recorded the host plants and distribution of this species in several tracts of India, while Hampson⁶ reported that the species is also found in parts of Africa and South-Eastern Asia.

For sometime *E. cupreoviridis* has been known as a pest of cotton in China,⁷ Formosa⁸ and Philippine Islands;⁹ and there is every danger of its attacking cotton in India as well. Some preliminary observations on the biology of this insect made at Delhi during the last two years are recorded here.

It has been observed that *E. cupreoviridis* remains active in Delhi from April to October hibernating for the rest of the year in the pupal stage as long as the mean laboratory temperature remains below 80° F. This species hence differs from *E. fabia* and *E. insulana* in