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1. Rao and Seshadri., *Proc. Ind. Acad. Sci.*, 1942, A3 161.
2. Murti *et al.*, *Ind. Journ. Pharm.*, 1940, 2, 206
3. Siddiqui and Mitra., *Journ. Sci. Ind. Res.*, 1945, 4, 5
4. Kirtikar and Basu., *Indian Medicinal Plants.*, 1, 537

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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1. Watson, *Bull. Ind. Indus. and Lab.*, 1923, No. 430, 27-41.
2. U. P. Govt. Memorandum (Budget 1947, Grant No. 39, Account 72).

THE BIOLOGY OF *EARIAS CUPREOVIRIDIS* WLK.*

THE failure of cotton crop in the Punjab in 1905 and in Sind in 1906¹ brought spotted boll-worms, *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

so far as it hibernates for a fairly long period. But during the period of activity its general behaviour is very similar to those of the other two species. In 1944 and 1945, the time at which the pupæ entered into hibernation was not very variable. Caterpillars collected from field or bred in laboratory in the first fortnight of October or later entered into hibernation as they pupated. The date of emergence of moths from hibernating pupæ, however, varied. In 1945 the first moth emerged on 20th March, the last one on 27th May, the largest number of them emerging in the first fortnight of May; during 1946 the first moth emerged on 26th March, the last on 5th May with the majority emerging in the second fortnight of April.

Further, it was possible to rear this species, generation after generation, all through winter, at two constant temperatures, 86° F. and 80° F. At both these temperatures the insect remained active and did not show any sign of hibernation. At 86° F. the total life-cycle was completed in about 23 days, while at 80° F., it took about 28 days. The total duration of life-cycle of this series is thus longer than that of *E. fabia* by about 3 days at 86° F.¹⁰ At other temperatures too this species takes somewhat longer than *E. fabia* to complete its life-cycle. Butac's (1933) observation fully supports this conclusion.

Therefore, temperature appears to be the main factor, if not the only factor, that brings about hibernation. With a view to studying the influence of low temperature on hibernation, some observations were made. A number of freshly formed pupæ from larvæ bred at 86° F. were exposed to 70° F., and moths emerged from all of them within three weeks. Again, fully-fed larvæ reared at 86° F. were exposed to 70° F., where they pupated within two days, and from these also moths emerged within three weeks. On the other hand, pupæ got from larvæ kept at 70° F., when transferred to a high temperature of 86° F., took longer to emerge as moths as compared to the pupæ from the larvæ at 86° F. It is hence evident that low temperature acting on the larval stage and not the pupal stage bring about hibernation.

Humidity, which is another important ecological factor, does not appear to have any marked influence on hibernation; and during March-May when the hibernation ends, humidity generally remains very low; at high temperatures, as stated above, it was possible to rear generation after generation throughout winter months.

At Delhi *E. cuprioviridis* has been found only on *Sida grevioides* which is a common weed in this locality. Lefroy² and Fletcher and Misra¹ recorded some species of *Hibiscus* and jute as its hosts, while in the Punjab it has been bred from *Sida cordifolia* and *Malvestrum tricuspidatum*,⁵ two weeds commonly found in several parts of the province, and also rarely from two cultivated plants, *Hibiscus esculentus* and *Althea rosea*. In the laboratory this species was bred all along on *Hibiscus esculentus* without difficulty. With some difficulty the insect was also bred on flower-buds and bolls of cotton; and later, three consecutive generations were reared on the same food-

plant. Moths of the first generation as also of subsequent generations behaved quite normally and laid viable eggs. These observations suggest that the insect is a potential pest of *Hibiscus esculentus* (*bhindi*) on which it is found even under field conditions in parts of the Punjab, and it is also possible that it may at any time start attacking cotton. With the rapid extension of cotton and the evolution of numerous varieties of different texture there is every danger that this insect may divert its attention to cotton in India also.

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New Delhi, M. HAROON KHAN.
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1. Fletcher, T. B., and Misra, C. S., *Rep. Proc. Third ent. Meeting*, 2, Pusa, 1919, 78.
2. Lefroy, H. M., *Indian Insect Life*, 1906, 456.
3. Fletcher, T. B., *Rep. Proc. Second ent. Meeting*, Pusa, 1917, 127-135.
4. *Ibid.*, *Rep. Proc. Third ent. Meeting* 1, Pusa, 1919, 78.
5. Haroon Khan, M., *et al. Indian J. Agr. Sci.*, 1945, 15, (Press.)
6. Hampson, G. E., *Cat. of Noctuidæ*, 1912, 11, 505-506.
7. Li (Fweng-seen), and Ma (tsing-chao). *Yerb., Bur. Ent.* 1933, 3, (*Abstr.*) *Rev. Appx. Ent. Ser.* 23; 306.
8. *Bulletin Research Institute*, Formosa, No. 122, 113 (*Abstr. Rev. App. Ent. Ser. A*, 1936, 25, 228).
9. Butac, F. L., *Phillipine J. Agriculture*, 1938, 2, 137.
10. Ahmad, T., and Ghulamullah, 1933, *Indian J. Ent.*, 1939 1, 17.

DIASPORE WITH PYROPHYLLITE FROM HAMIRPUR DISTRICT, UNITED PROVINCES

MISRA¹ has recently shown that the long-known deposits of steatite of Hamirpur district in U.P. are deposits of pyrophyllite. The main deposit occurs at Gorahri (79° 37'-25° 27') associated with quartz reefs traversing Bundelkhand—granites and gneisses. In no case is the mineral found in the granites and gneisses; it is invariably restricted to the quartz reefs. Three new deposits were subsequently discovered in the quartz reefs at Turra (79° 27'-25° 29'), Girwar (79° 29'-25° 31') and Pahari Garhi (79° 31'-25° 32'). A hydrothermal origin has been advanced for the origin of these deposits.

At Gorahri where regular mining is being done diaspore was discovered in the form of geode-like bodies in the veins of pyrophyllite. The average diameter of these bodies measures about 5". The mineral shows compact masses, purple radiating crystals, and well-developed greyish-white pearly crystals up to 1.25" in length. The second variety is extremely brittle. The average specific gravity and hardness are 3.22 and 6 respectively.

Under the microscope thin sections show elongated blades and needles, and one set of fine cleavage lines are very characteristic, though sometimes traces of another set of cleavage lines are seen. Almost all sections show straight extinction with respect to the cleavage lines. The length of the mineral is