consequently irregular in outline. The eighth element is much smaller than the rest and is often elusive on account of its small size and

FIG. 2.

Riccia himalayensis St. (Ms.). Chromosomes: (*a*) and (*b*) Polar views of equatorial plates in antherids ; (*c*) in a meristematic cell of the thallus. × 1200.

dot-like form. This is perhaps the reason why authors like Beer[10] (1906) have said that the reduced number of chromosomes in *Riccia glauca* is either seven or eight. In our preparations also we did get plates showing only seven chromosomes but in other clear metaphase plates the occurrence of the eighth element was unmistakable. The attachment of the seven large chromosomes is atelomitic and that of the small eighth element telomitic. There is no heterochromosome in this species; and the diploid number of chromosomes seems to be 16. It is interesting to note that this very number is found in two other species studied by Lorbeer[11] (1934) and Siler[12] (1934), namely in *Riccia fluitans* and *Riccia donnellii*, whereas the great majority of the species like *Riccia crystallina, Riccia sorocarpa, Riccia arvensis* have only 8 chromosomes in the diploid condition. Evidently *Riccia himalayensis* is a diploid species as contrasted with species like *Riccia crystallina* which have the basic eight number. This is perfectly in accordance with Heitz's[13] (1927) observation that 'the liverworts with 8 or 9 chromosomes are predominantly dicœcious, whereas those with 16 or 18 or other multiples of the basic number are predominantly hermaphroditic'.

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[1] McClung, C. E., *Biol. Bull.*, 1902, **3**, 43.
[2] Wilson, E. B., *Science*, 1905, **20**, 564.
[3] Allen, C. E., *Ibid.*, 1917, **46**, 466.
[4] Showalter, A. M., *Bot. Gaz.*, 1921, **72**, 245-49.
[5] McAllister, F., *Bull. Torrey, Bot. Club.*, 1928, **55.**
[6] Kashyap, S. R., *New Phytol.*, 1914, **13,** 206, 226 ; *Ibid.*, 1915, **14,** 1 and 308 ; *Journ. Bom. Nat. Hist. Soc.*, 1917, **24,** 343 ; "Liverworts of the Western Himalayas and the Punjab Plain," Part I, 1929 and Part II in collaboration with R. S. Chopra, 1932.
[7] Mehra, P. N., *Proc. Ind. Acad. Sci.*, 1938, **8, 1.**
[8] This species is perhaps synonymous with *Riccia discolor* L. et L. (*Vide* Kashyap, *New Phytol.*, 1915, **14,** 18 ; see also *Journ. Bom. Nat. Hist. Soc.*, 1917, **24,** 349. A somewhat similar opinion about this species has been expressed by Dr. S. K. Pande of the University of Lucknow, in a letter to the senior author (T. S. M.) dated 29th October 1940.
[9] See Campbell, D. H., *Mosses and Ferns* (3rd Ed.), 1918, p. 34 ; see also Pande, S. K., *Journ. Ind. Bot. Soc.*, 1933, **12,** 117.
[10] Beer, R., *Ann. Bot.*, 1906, **20,** 288.
[11] Lorbeer, G., *Jahrb. wiss. Bot.*, 1934, **80**, 565.
[12] Siler, M. B., *Proc. Nat. Acad. Sci.*, 1934, **20,** 603.
[13] Heitz, E., *Abhandl. Naturwiss. ver. Hamburg*, 1927, **21,** 48.

SOIL ALGÆ OF LAHORE

FOR sometime past effort has been made to study the Algal flora of some of the representative soils from Lahore with particular attention to record, if possible, some of the new forms not already reported to be occurring in the soil. Accordingly three types of surface soils, namely,

garden, field and grass soils were taken and portions of these dissolved in Detmer and Bristol culture solutions. The flasks were put in the green house and after about a fortnight onwards different forms of Algæ which appeared were studied and recorded. The material was fixed in 4 per cent. formalin in test tubes for future work. Permanent slides were made in pure glycerine.

Myxophyceæ: A number of species of Oscillatoria and Lynbgya have been described. One species of Oscillatoria seems to be new.

Chlorophyceæ: The interesting forms recorded here are a species of Pandorina and Phacotus. Both these two genera have not been reported before from the soil as far as it has been possible to ascertain from the literature.

Euglenaceæ: Here a new form from the soil, namely, Trachelomonas has been recorded.

Altogether three new genera, namely, Pandorina, Phacotus and Trachelomonas have been recorded from the soil and which have not been reported before. Full details of this work will appear in due course and intensive study of soil Algæ is in progress.

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Waksmann, S, A., *Principles of Soil Microbiology* 1932.

West and Fritsch, *British Freshwater Algæ*.

Bristol, B. M., *Ann. Bot.*, 1920, **34** ; *New Phytologist*, 1919-20, 18 & 19.

A NOTE ON THE DEVELOPMENT OF THE FEMALE GAMETOPHYTE IN *ABROMA AUGUSTA* L. AND *PENTAPETES PHOENICEA* L.

Abroma augusta and *Pentapetes phœnicea* are both members of the family Sterculiaceæ. The former is commonly cultivated for its medicinal importance while the latter grows as weed in Bengal during the monsoon.

Literature on the embryology of the family Sterculiaceæ is meagre. Sharma[1] has referred to the relevant literature on the subject and recorded his observations on gametogenesis in three species in an earlier issue of this *Journal*.

The present investigation shows that the archesporial cell is hypodermal in origin in both the plants studied. It cuts off a parietal cell and then functions as the megaspore mother cell. The megaspore mother cell is pushed considerably inwards within the nucellus due to the division of the overlying cells. Two megaspore mother cells lying side by side have been observed in *Abroma augusta*. The reduction division is normal and a linear tetrad of megaspores is produced in both the plants, but in *Abroma augusta* some "T-shaped" tetrads have also been observed. The chalazal megaspore becomes functional in every instance. The usual course of development follows and a normal eight-nucleate embryo-sac is produced. In *Abroma augusta*, however, two binucleate embryo-sacs have been observed to lie side by side. It appears that this has resulted from the activity of the second megaspore mother cell. The mature embryo-sac shows the normal organization but the antipodals are ephemeral. The ovules have two integuments and the nucellus is completely enclosed by these.

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[1] Sharma, Y. M. L., *Curr. Sci.*, 1938, **7**, 284.

PHYSIOLOGY OF POLLINATION IN ORCHIDACEAE

IN Orchidaceæ, the stimulus of pollination is necessary not only for the continued development of the ovary but also for the initiation of the ovules in several species. Normally pollination shortens the life of the blossom and brings about changes in the colour of the perianth. The gynostegium enlarges and the ovary is stimulated to grow into a fruit. These