

fused with Na_2CO_3 the material is only slowly decomposed, but fusion with either potassium bisulphate or sodium bisulphate results in complete decomposition of the material and the fused mass thus obtained dissolves readily and almost completely in hot dilute H_2SO_4 . These inclusions give no tests for either calcium or manganese, but no attempt was made to test for the presence of alkalis. A very pure sample of these inclusions obtained as indicated above was analysed and the results obtained are as follows :

ANALYSIS OF INCLUSIONS.

Oxides.	Per cent.
TiO_2	65.85
FeO (by difference)	18.84
Fe_2O_3	15.31
SiO_2	trace
Total ..	
	100.00

A complete analysis of the entire garnet showed a titanium content of nearly 1.0 per cent. Since careful tests with clear garnet grains as well as with the quartz inclusions found therein, showed complete absence of titanium, it appears certain that all the titanium associated with the garnet is present in these black inclusions.

A microscopic study indicated that crystals of rutile are sometimes present in the inclusions to the extent of 7 to 8 per cent. This small quantity of rutile cannot account for the high percentage of TiO_2 found by chemical analysis. The chemical analysis shows also that the TiO_2 content is far in excess of the ferrous oxide required to form normal ilmenite, and that there is in addition a large proportion of ferric oxide. Further work is in progress with a view to explain the large TiO_2 content of these inclusions.

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A Preliminary Note on the Development of Embryo-sac in *Averrhoa carambola* Linn.

THE earlier work on the development of the embryo-sac in Oxalidaceæ is limited to a few species of *Oxalis* worked out by Hofmeister (1858), Johnson (1881), Billings (1901), Hammond (1908) and Schürhoff (1926) as cited by the latter author¹ in his book, besides work on other phases of its embryology. Hence

it has been thought worthwhile to examine first an arborescent representative, *Averrhoa carambola*. The writer, however, hopes to complete the work on other Indian representatives of the family and the material has already been accumulated.

During the early stages of the ovule, the nucellar cells at its tip stain like archesporial cells, although only one of them grows further to form the megaspore mother-cell. The single archesporial cell undergoes a periclinal division and cuts off a parietal cell. The latter again divides further to form a not extensive parietal tissue above the embryo-sac. The megaspore mother-cell undergoes the usual heterotypic and the homotypic divisions resulting usually in a linear tetrad and occasionally in a T-shaped one. Both the types of tetrads have, however, been seen in the same ovary. The chalazal megaspore is the functional one and develops in the normal manner into an 8-nucleate embryo-sac, after three successive free nuclear divisions. In the young embryo-sac the antipodal cells are organised first. They degenerate early before fertilisation. The synergids then differentiate out and become hooked. The polar nuclei start from their respective poles, meet about the middle of the embryo-sac, move upwards and take their position near the egg-apparatus. The embryo-sac undergoes an increase in size on all sides. It crushes the parietal tissue above and the nucellus on the sides and ultimately becomes situated just below the nucellar epidermis except at its chalazal part. Thus the embryo-sac follows a normal course of development and becomes 4-nucleate just before fertilisation due to the early degeneration of the antipodals. These observations accord with those of the earlier investigations.

Full details of the embryology of this species will be published elsewhere in due course.

In the end the writer takes great pleasure in expressing his sincere thanks to Mr. I. Banerji for valuable guidance during the progress of the work and also wishes to express his deep indebtedness to Prof. S. P. Agharker, M.A., Ph.D., for affording facilities in the Botanical Laboratory, University College of Science, Calcutta, where the investigation has been carried out.

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¹ Schurhoff, P. N., *Die Zytologie der blüten-pflanzen*, Stuttgart, 1926.