

Starting from the margin, the early start of the olivine in the crystallisation of the magma is indicated by its occurrence in the selvage rock, as phenocrysts in a groundmass of minute grains of hypidiomorphic pyroxene with interstitial felspar. The study of the groundmass further suggests that the pyroxene started crystallising earlier than the plagioclase. As we approach the centre, the rock becomes a fine grained dolerite with ophitic to sub-ophitic texture. Both the plagioclase and the pyroxene are idiomorphic and the pyroxene often shows evidences of reaction with the magma as revealed by the presence of corroded borders and of reaction minerals like biotite. The material from the centre of the dyke is a coarse gabbro with sub-ophitic texture. The continued corrosion of the pyroxene has effaced any tendency in it towards idiomorphism. The moulding of the pyroxene round the plagioclase suggests that the pyroxene had a longer range of crystallisation than the felspar.

It would thus appear that these observations of ours are distinctly in support of the views recently expressed by Fenner² regarding the interpretation of the ophitic texture.

A full account of the rocks including chemical analyses will shortly be published elsewhere.

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March 12, 1934.

Sex Control in Papaya.

PAPITA *Carica papaya* is a dieceous tree and about half of the trees are male and half female. Various attempts have been made to eliminate the male papaya and to secure a type which will produce only female plants. Normally flowers in the male are small and are borne in long branching panicles 2 to 3 ft. in length. The flowers in the female tree on the other hand are large and almost sessile and are borne along the side of the trunk in the axils of the leaves.

The fruit is of great commercial value and it is a constant source of trouble to the grower to see about half of his papaya trees develop male flowers. It has been found

possible to change the sex by mutilation. At the Hawaii Experiment Station 22 perfectly sterile staminate papaya trees were beheaded. When the new growth appeared on those trees it was found that the trees had become strictly female trees bearing large fruit.¹

From the Botanical Garden at Jaswant College, Jodhpur, I supplied some papaya seedlings to Mr. G. N. Singhal, Head Master, Darbar High School, Jodhpur. After about a year he complained of all of them turning out to be male. I suggested beheading. Accordingly the plants were beheaded to remove the cluster of leaves at the top, so that no axillary male shoots may develop. This distance is about a foot from the apex. Two new shoots appeared in two cases and only one was kept in each case. Only one shoot developed in each of the other two.

All the four beheaded have developed into strictly female trees. One of them is bearing large fruits. The other is bearing female flowers. The third was killed after it had borne female flowers. The fourth has also produced female flowers.

Beheading according to some observers never produces the desired result. It is advisable, however, to try beheading before cutting the male papaya.

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A Note on the Life History of *Sagittaria guayanensis* H.B.K.

FOLLOWING my observations on the life history of *Limnophyton obtusifolium* Miq. (*Current Science*, 2, p. 12), I have been able to investigate *Sagittaria guayanensis* H.B.K. another member of the *Alismaceae* collected from Bharatpur. The following is a brief summary of this work.

There is a many-celled archesporium in the anther. The tapetum, the endothecium and a single middle layer are formed as usual, by the divisions of the primary parietal layer. The tapetum gives rise to a periplasmodium. The middle layer degenerates very early, even before the mother cells have finished the reduction divisions.

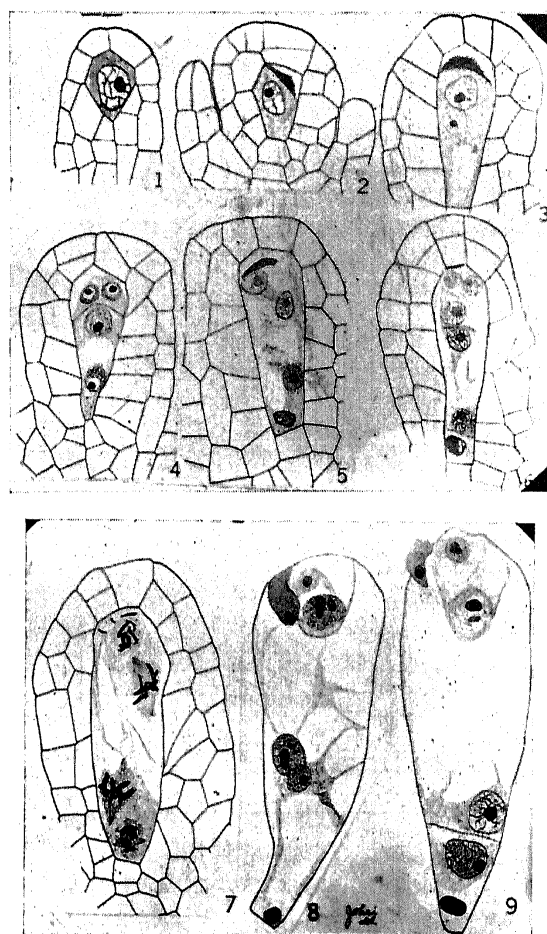
The divisions are successive and the resulting tetrads are usually iso-bilateral.

¹ Wilcox, E. V., *Tropical Agriculture*, p. 120, 1916. Appleton & Co., N. York.

² C. N. Fenner, *Journ. Geol.*, 34, 1926, p. 756.

The microspore nucleus divides giving rise to the tube and generative cells. After some time the nuclei lie free in the cytoplasm. The generative nucleus divides in the pollen grain to form two spherical nuclei, which later on become spindle-shaped. Sometimes, these male nuclei show a clear area around them, but I could not make out a definite cytoplasmic layer round them.

Usually there is a single hypodermal archesporial cell in the nucellus (Fig. 1), but sometimes there are two lying side by side or one above the other. In one case there



was an indication of the presence of three archesporial cells in the same nucellus.

The archesporial cell directly functions as the megaspore mother cell which divides into two cells of which the lower produces the embryo sac. The upper degenerates early (Fig. 2) but in rare cases its nucleus may divide into two before degeneration (Fig. 4).

The nucleus of the lower cell undergoes two divisions to produce a four-nucleate embryo sac (Figs. 3-5). After this stage, only the two micropylar nuclei divide in the

majority of cases and a six-nucleate embryo sac is organised as in *Limnophyton obtusifolium* and the other *Alismaceae* investigated by Dahlgren¹ (Fig. 6). Less frequently one or both of the chalazal nuclei may also divide forming a 7- or 8-nucleate embryo sac respectively (Fig. 7). Such a variation in the number of nuclei has also been reported by Frisendahl² in *Elatine*. Evanescent cell plates may occasionally appear on the spindles of the embryo sac (Fig. 6).

All stages of double fertilisation have been seen. The pollen tube as it enters the embryo sac always disorganises one of the synergids. Generally the two polar nuclei and one male nucleus fuse simultaneously (Fig. 8). The fusion nucleus is situated in the middle of the embryo sac a little nearer the chalazal end.

The endosperm is of the Helobiales type. A definite wall is formed after the first division of the primary endosperm nucleus (Fig. 9), as reported by Schaffner³ on *Sagittaria latifolia*.

The embryo is of the *Alisma*-type.

I am greatly indebted to Dr. P. Maheshwari for his kind help and useful suggestions and criticisms.

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March 24, 1934.

The Band Systems of CdF.

THE spectrum of the molecule CdF as produced in the arc shows a number of band heads which are classified into two systems. One of these, the yellow-green, lies between 5300 and 5550 A.U. This system is degraded towards longer wavelengths. The other, the orange system, lies between 6025 and 6300 A.U. and is degraded towards the shorter wavelengths. The equations representing the two systems are:

¹ Dahlgren, K. V. O., "Die Embryologie Einiger Alismatazeen," *Svensk Bot. Tidskr.*, **22**, 1-17, 1928.

² Frisendahl, A., "Über die Entwicklung chasmound kleistogamer Blüten bei der Gattung *Elatine*." *Meddelanden fran Göteborgs bot. trädg.*, **3**, 99-142, 1927.

³ Schaffner, J. H., "Contribution to the life history of *Sagittaria variabilis (latifolia)*," *Bot. Gaz.*, **23**, 252-273, 1897.