THE ORIGIN OF THE HAUSTORIA IN THE OVULE OF *LOBELIA*

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DR. G. O. COOPER (1942) has recently published a paper on the embryology of *Lobelia cardinalis* L. in which it is stated that the synergids and antipodal cells function as micropylar and chalazal haustoria respectively.[1] The only recent work on the Lobeliaceæ and Campanulaceæ, referred to by him, is that of Kausik (1938) on *Lobelia nicotianaefolia*. There is no mention whatever of the works of Rosén (1932), Kausik (1935), Hewitt (1939) and others.

Kausik (1935, 1938) and Hewitt (1939) report that the synergids and antipodal cells in *Lobelia* degenerate at the time of fertilisation and this is in agreement with the observations made by Rosén (1932) and Safijovska (1934) on the allied family Campanulaceæ.[2] There is thus no possibility of their being responsible for the haustorial outgrowths which are clearly endospermal. In the absence of any material of *L. cardinalis* and the improbability of my being able to get it for the duration of the war, I requested Dr. S. B. Kausik of Bangalore for the loan of his preparations of *L. trigona* so that I might make an independent study of them in the light of Dr. Cooper's observations. The result of this study confirms Dr. Kausik's interpretation that the haustoria (both micropylar and chalazal) originate from the endosperm and have nothing to do with the synergids or the antipodal cells which degenerate at the time of fertilisation or shortly afterwards.

It may be added that really haustorial synergids are probably known only in a few Compositæ but even there a detailed and illustrated account of their development has never been published up to this time. In all other cases the occurrence of synergid haustoria (for a meaning of the term "haustorium" see Schnarf, 1929, pp. 352–55) is extremely doubtful. To mention a parallel instance, Heinricher (1931/32), in his monograph on the genus *Lathræa*, stated that the micropylar haustoria are derived from the synergids and the chalazal from the antipodals. This was promptly contradicted and disproved by Glišić (1932) wao made a thorough study of *Lathræa squamaria* and found that the haustoria are derived from the endosperm. The report of V. K. Srinivasan (1940) on the persistent and

[1] In the original (Cooper, p. 81) the order is given as "chalazal and micropylar" but this must be an oversight.

[2] Some authors include both the families (Lobeliaceæ and Campanulaceæ) under a common name.

presumably haustorial synergids of *Angelonia* has already been criticised by Maheshwari and Navalakha (1941) and more recently by Dr. C. V. K. Iyengar (1942). Two similar looking structures seen in *Myriophyllum alterniflorum* have been shown to be derived by a vertical division of the basal cell of the suspensor (Stolt, 1928). It is noteworthy that in this case these two cells develop even the " filiform apparatus " and hooks found in genuine synergids and the similarity is so deceptive as to mislead even the most cautious unless he has taken pains to obtain a complete series of stages in the development.

Further, it is to be noted that although one would expect *three* chalazal haustoria (granting their antipodal origin) in *Lobelia cardinalis*, actually only *two* are present and to explain this Dr. Cooper (p. 77) says that the third antipodal cell becomes " appressed " owing to the growth of the endospermal cells. Again, although double fertilisation is figured and said to take place normally there is no trace of the pollen tube in any of Cooper's figures either at the time of fertilisation or after it. On the other hand, in Kausik's (1935) figures of *L. trigona* and Hewitt's (1939) of *L. amoena* the pollen tube is quite clear and unmistakable. One would like to know how the synergids react to the pollen tube in *L. cardinalis* since in all other plants of the Lobeliaceæ and Campanulaceæ, at least one or both of them begin to disorganise on its impact.

I wish to thank Dr. Kausik for the loan of his preparations of *Lobelia trigona*. Some material of *Wahlenbergia gracilis* and *Sphenoclea zeylanica* (Campanulaceæ) as well as *Lobelia trigona*, which I recently collected from Dacca, also shows that the antipodal cells and synergids are ephemeral and the haustoria are formed from the endosperm. A more detailed account of the embryology of these plants particularly with reference to the haustoria (on whose exact origin from the endosperm there seems to be no agreement), will follow in due course, but meanwhile it is suggested that Dr. Cooper may re-examine his preparations of *L. cardinalis* in the light of the above remarks.

SUMMARY

From a comparison of Dr. G. O. Cooper's work on *Lobelia cardinalis* with the figures and descriptions of other workers on the embryology of the Lobeliaceæ and Campanulaceæ, there seems to be no doubt that the haustorial structures which Dr. Cooper believes to have been derived from the synergids and antipodal cells are really formed from the terminal portions of the endosperm cells—a condition which is of wide occurrence in the Sympetalæ.

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