

direct correlation with reduced weed infestation. This study further confirms earlier findings with regard to the reduced germination of the seeds of different species, being more in the case of Weedazol and Weedone treated plants⁶.

12 May 1986; Revised 16 June 1986

1. Sen, D. N., *Final Report US PL-480 Project*, University of Jodhpur, Jodhpur, 1979, p. 245.
2. Malik, D. S., Balyan, R. S. and Dhankher, R. S., *Ann. Arid Zone*, 1980, 19, 103.
3. Jha, P. K., Ph.D. Thesis, University of Jodhpur, 1982.
4. Kumar, S., Ph.D. Thesis, University of Jodhpur, 1984.
5. Misra, R., *Ecology work book*, Oxford and IBH Publishing Co., New Delhi, 1968, p. 244.
6. Singhal, B. K. and Sen, D. N., *Curr. Sci.*, 1981, 50, 414.

ENDOSPERM IN *HYDROLEA ZEYLANICA* VAHL (HYDROPHYLLACEAE)—A REINVESTIGATION

H. G. VIJAY GOPALRAJ URS

Department of Botany, University of Mysore,
Manasagangotri, Mysore 570 006, India.

ENDOSPERM development in Hydrophyllaceae is recorded to be cellular, nuclear and of an intermediate type¹⁻⁵. The occurrence of a chalazal haustorium in endosperm has been observed in species of *Phacelia* and *Nemophila insignis*², while a micropylar haustorium has been recorded in *Hydrolea spinosa*³. Both chalazal and micropylar haustoria in the same endosperm have been noted in *Nemophila aurita*². On the other hand, a total absence of haustorium has been recorded for *Hydrolea zeylanica*⁴ and *Romanzoffia sitchensis*². The present study is a reinvestigation of the endosperm development in *Hydrolea zeylanica* and is based on material collected from plants growing at the water margins of a pond in Aloka near Mysore city. It was undertaken to verify the absence of endosperm haustoria in the taxon since other species of the genus investigated³ organizes a micropylar haustorium.

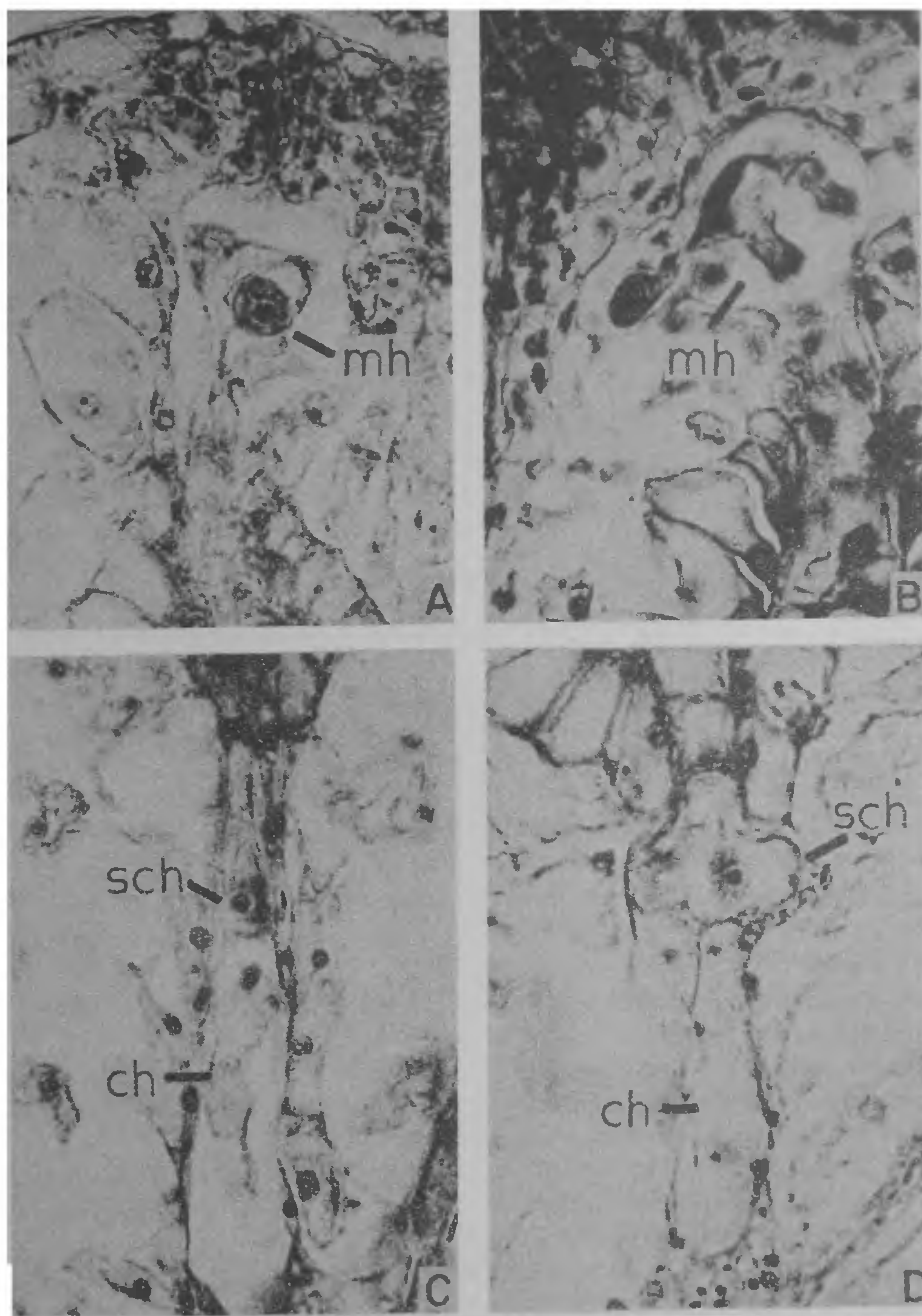
Fertilization is porogamous. The first division of the endosperm mother cell is transverse and delimits two approximately equal chambers. Of the two, the lower

primary chalazal chamber does not divide further but directly functions as the chalazal haustorium. It gradually elongates, and assumes a club-shape. Meanwhile, the upper primary micropylar chamber undergoes a transverse division producing two superposed daughter cells, the upper portion of which organizes the micropylar haustorium while the lower portion functions as the initial cell of the endosperm proper. The cell destined to organize the micropylar haustorium elongates initially. It soon enlarges destroying the surrounding integumentary cells and becomes bulbous. Its nucleus becomes hypertrophied (figure 1A). Short tubular extensions arise from the bulbous haustorium and ramify through the integumentary tissue destroying cells along their path (figure 1B). A few of these establish contact with the vascular strand of the developing seed. This haustorium remains single-celled and uninucleate throughout its period of activity.

Simultaneously, the initial cell of the endosperm proper undergoes repeated transverse divisions. Further divisions in the resulting cells are both transverse and longitudinal and consequently a massive homogenous endosperm tissue is organized.

The chalazal haustorium ceases its activity quite early during seed development. As the haustorial nucleus shows signs of degeneration an endosperm cell located towards the narrow end of the sac abutting the chalazal haustorium and just above it begins to enlarge and acquires dense contents (figure 1C). Its nucleus becomes hypertrophied. Soon a short lateral caecum is formed from the cell and extends towards the vascular strand of the developing seed destroying cells on its path (figure 1D). This secondary chalazal haustorium remains single-celled and uninucleate. Its activity, however, ceases along with that of the micropylar haustorium, by about the time the embryo assumes a globular shape.

The above observations clearly establish that both micropylar and chalazal haustoria do differentiate in *Hydrolea zeylanica*, contrary to the earlier report on the same taxon⁴. It is thus evident that the mode of initial endosperm organization in *Hydrolea zeylanica*, described here, is similar to that in *Nemophila aurita*². The haustoria are aggressive in both the taxa and the chalazal haustorium, in later stages, is similar in both. It is, therefore, surmised that a secondary haustorial development may also take place in *Nemophila* but this needs reinvestigation. Further, another species of *Hydrolea*, *H. spinosa*, investigated by Svensson² who failed to notice any haustoria, was later shown to possess a micropylar haustorium on reinvestigation by



Figures 1A–D. *Hydrolea zeylanica*. **A.** L. S. micropylar part of young seed showing haustorium ($\times 320$). **B.** L. S. Micropylar part of older seed to show haustorial extensions ($\times 340$). **C–D.** L. S. chalazal part of young seed showing haustoria. Note initiation and development of secondary chalazal haustorium ($\times 300$; $\times 325$). (mh, micropylar haustorium; ch, chalazal haustorium; sch, secondary chalazal haustorium).

Kainradl³. A critical study of endosperm development in other members of the Hydrophyllaceae and a reinvestigation of some already studied, are therefore desirable for a better understanding of the situation in regard to endosperm and for proper assessment of the

systematic inter-relationships in the Hydrophyllaceae.

24 March 1986; Revised 5 May 1986

1. Billings, F. H., *Flora*, 1901, **88**, 253.

2. Svensson, H. G., *Uppsala Univ. Arsskrift.*, 1925, 2, 1.
3. Kainradl, E., *Sitz. Ak. Wiener Akd. Math-Nat. Kl. Abt.*, 1927, 1, 167.
4. Mitra, J. N., *J. Indian Bot. Soc.*, 1947, 26, 51.
5. Davis, G. L., *Systematic embryology of angiosperms*, Wiley Eastern, New York, 1966, p. 142.

OCCURRENCE OF *ANTHERAEA MYLITTA* DRURY (LEPIDOPTERA: SATURNIIDAE) IN NORTH EASTERN INDIA: DISTRIBUTIONAL SIGNIFICANCE

K. THANGAVELU* and A. BARAH

Regional Muga Research Station, Central Silk Board,
Mirza 781 125, India.

* Present Address: Regional Sericultural Research Station,
Central Silk Board, 51, Court Road,
Salem 636 007, India.

ANTHERAEA MYLITTA Drury is confined to the tropics, mainly to the dense, humid tropical forests of the central and southern plateau of India¹ and hence known as tropical tasar. The larvae produce the tasar silk. Sporadic occurrence of *A. mylitta* in eastern India² and western Rajasthan³ was recently reported.

During a survey for wild sericigenous insects in north-eastern India, *A. mylitta* was found frequently on its natural food plants, viz *Ziziphus jujuba* L and *Shorea robusta* Roxb throughout Assam and Meghalaya, mainly at Boko (90° 21'E: 26° 18'N), Hahim (91° 18'E: 26° 03'N), suburban areas of Gauhati (91° 75'E: 26° 20'N), Dhupdhara (91° 10'E: 25° 90'N) and Titabar (94° 40'E: 26° 44'N) in Assam and Resubelpara (90° 56'E: 26° 05'N) and Adokgiri (91° 25'E: 25° 85'N) in Meghalaya. *A. mylitta* found in north-eastern India is mainly trivoltine. The first (May–June–July) and second (July–August–September) generations are non-diapausing and the third (October–April) generation usually undergoes pupal diapause from November to March (145–160 days). The egg-to-egg development of *A. mylitta* lasts 65–75 days in non-diapausing generations (7–10 days egg stage, 30–34 days prepupal stage, 22–26 days pupal stage, 6–7 days adult stage in male and 8–10 days in female) and 200–210 days in diapausing generation (10–12 days egg stage, 42–46 days larval stage, 2 days cocoon spinning stage, 10–12 days

prepupal stage, 145–160 days pupal stage, 6–7 days adult stage in male and 8–10 days in female).

The wide distribution of *A. mylitta* from the hotter areas of Rajasthan, and tropical areas of central and southern India to sub-tropical areas of north-eastern India indicates the adaptability of the tasar silkworm to climatic extremes leading to variations in the natural populations. Natural populations that are geographically isolated in course of time develop into distinct races by accumulating genetic differences leading to reproductive isolation⁴. The natural populations of *A. mylitta* of southern and central India form one breeding population and it is widely separated from those of western Rajasthan and north-eastern India and hence reproductively isolated. Unlike *A. yamamai* Guerin, *A. assama* Westwood, and *A. sivalika* Drury which are endemic species and confined to restricted area in Japan, Brahmaputra valley of Assam (India) and Deccan plateau of southern India, *A. mylitta* is widely distributed and also the different natural populations are widely separated. In course of time, these geographically/reproductively isolated populations of *A. mylitta* will evolve into distinct races/biotypes through natural selection. Isolation is an important element in the modification of species through natural selection and largeness of area is still more important especially for the production of species capable of enduring for a long period⁵.

17 March 1986; Revised 16 May 1986

1. Jolly, M. S., Sen, S. K., Sonwalkar, T. N. and Prasad, G. K., *Non-mulberry silks*, FAO, Rome, 1979, p. 15.
2. Chowdhury, S. N., *Muga silk industry*, Directorate of Sericulture and Weaving, Govt. of Assam, Gauhati, 1981, p. 7.
3. Dookia, B. R., *Sci. Cult.*, 1982, 48, 113.
4. Sinnott, W. W., Dunn, L. C. and Dobzhansky, T., *Principles of genetics*, Tata McGraw Hill, New Delhi, 1983, p. 286.
5. Darwin, C., *The origin of species*, Everyman's Library, Biddles Ltd., Guildford, Surrey, UK, 1982, p. 101.