

Heterogametic (XY) condition of the female, such as it exists in *C. indica*, is very rare in plants. It has so far been observed in *Fragaria elatior* by Lilienfeld.⁷ In *C. indica* parthenogenetically developed plants in which the male element has been completely excluded have been observed to segregate into male and female individuals during three successive parthenogenetic generations, showing that it is the female which is heterogametic. This is corroborated by the heteromorphic (XY) pair of chromosomes observed during mitosis in cells of the root tip of the female plants. This inference of heterogametic condition of the female is further confirmed by the statistical analysis of the size variation of the pollen grains. Frequency distribution of the pollen-size variation gives a sharp unimodal curve indicating the homogametic condition of the male. In those cases where male is heterogametic such curve is bimodal (Greguss Pal⁸).

From cytological study, segregation of parthenogenetic progenies and pollen analysis, it is clearly evident that the female of *C. indica* is heterogametic and the male homogametic.

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¹ McKay, J. W., *Bot. Gaz.*, 1939, 89, 416.

² Sutaria, R. N., *Jour. Univ. Bombay*, 1936, 4, 21.

³ Mensinkai, S. W., *Ann. of Bot., N.S.*, 1939, 3, 763.

⁴ Gates, R. R., *Nature*, 1939, 144, 794.

⁵ Koller, P. C., and Darlington, C. D., *J. Genet.*, 1934, 29, 159.

⁶ Yosiro Sinoto, *Proc. Imp. Acad. Tokyo (Japan)*, 1928, 4, 175.

⁷ Lilienfeld, J. A., *Japanese Jour. Bot.*, 1936, 8, 119.

⁸ Greguss Pal, *Mathematische Naturw. Ungarische Akademie*, Budapest (Hungary), 1927, 44, 378.

Macadamia ternifolia F. Muell., the Queensland Nut

THE writer published an account of floral anatomy and embryology in *Macadamia ternifolia* F. Muell. some two years ago¹ and subsequently some further observations about the floral vascular structure were made in the same plant.

These necessitated the publication of a second paper as a supplementary contribution to the subject. After the final preparation of this for the press (the paper has now appeared in the January issue of *Current Science*, 1940),² the writer came across a paper by Hartung and Storey³ on "The Development of the Fruit of *Macadamia ternifolia*" in a recent number of the *Journal of Agricultural Research*. Evidently, these authors have not had any access to the first paper by the writer on *Macadamia*,¹ for they make no reference to it which contains a description of many interesting features in the development of the ovule.

Hartung and Storey³ describe the development of the integuments of the ovule and point out at great length that in the formation of a hard shell in the mature seed it is only the outer integument that takes part, thus contradicting the earlier opinion of Francis¹ who regarded the shell as a combined testa and tegmen. In this connection it must be noted that the present writer had already stated in his first paper on *Macadamia*¹ that the shell is "formed by the outer integument" and that "within this hard coat are the thin and crushed inner integument, a few surviving layers of the peripheral portions of the nucellus and the remnants of the endosperm". He had further remarked that "all these are pressed firmly together and fusing with"—better, clinging to—"the outer hard coat of the seed, form a smooth and shining internal lining for the outer integument." Hartung and Storey³ further discuss the nature of the fruit and remark that during their study "considerable doubt arose as to the accuracy of the generally accepted classification of the fruit as a drupe and of the shell of the nut as an endocarp or putamen". They call attention to the statement by Francis¹ that "A considerable amount of confusion exists in the descriptions of the fruit in systematic, botanical literature" and state that "He advances evidence in support of the fact that the nut is truly a seed and the fruit in which it is contained is not a drupe but a follicle." It is thus clear that the term *nut* may only be retained for common usage and for the purposes

of trade, the true nature of the fruit having been long ago pointed out by Francis.⁴

There are several other features in *Macadamia ternifolia* which are met with in the developing seed following fertilization (cf. Kausik¹) and the reader will have to look in vain for an allusion to any of these in the paper by Hartung and Storey.³ The chalazal region of the ovule contains a meristematic region, which can be detected even in young stages, and on account of the activity of this region, especially after fertilization, several layers of additional cells constituting an extensive nutritive tissue arise at the base of the ovule. This tissue is next invaded by the lower end of the embryo-sac which forms a number of processes containing a few free endosperm nuclei. The cellular portion of the endosperm is restricted only to the upper half of the embryo-sac.

A chalazal meristematic region has been recorded in the literature of the Proteaceæ in a few other members also, as *Protea lepidocarpon* (Ballantine⁵), *Grevillea robusta* (Brough,⁶ Kausik⁷), and more recently in *G. Banksii* (Kausik⁸). Further, the writer has pointed out the formation of a remarkably worm-like structure, discovered for the first time and designated the *Vermiform appendage* of the endosperm, which invades the chalazal nutritive tissue in the developing seed of *Grevillea robusta* and *G. Banksii*. A similar structure has also been seen in *G. hilliana* and it is probable that it is a constant feature in the genus *Grevillea*.

In so far as Hartung and Storey³ have not referred to any of the above interesting features already described in *Macadamia ternifolia* and in the other investigated members of the Proteaceæ, it must be remarked that their paper, which otherwise forms a welcome addition to the meagre literature of the family, falls short of being complete, even though the contention of the authors be that their interest lay chiefly in discussing the nature of the fruit in the Queensland nut.

With regard to the floral vascular structure in *Macadamia ternifolia* the writer has to say

that he has very recently published a detailed account of it (Kausik²) in which he has also fully discussed the nature of the perianth and that his observations agree with the rather too brief account given by Hartung and Storey.³ One interesting point (not mentioned by Hartung and Storey) is that in the formation of the vascular supplies to the perianth segments the midrib strand shows a distinctly double origin at the time of separating from the receptacular stele. Finally, it may be mentioned here incidentally that the writer has also now completed a study of the vascular anatomy of the flower in *Grevillea robusta*, the results of which are set forth in a separate paper to be published elsewhere. In this paper it has been shown that the staminal trace arises in the form of a pair of strands towards the inside of the midrib strand of the perianth and that the two members of the pair are seen distinctly separated from each other not only at the base of the flower but also for some considerable distance higher up in the perianth, fusing only below the level at which the anthers are no longer adnate to the floral envelope. This feature has been discussed in the light of the origin of the stamen from a branch-system as proposed by Wilson.⁹

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¹ Kausik, S. B., *Proc. Ind. Acad. Sci.*, 1938, 8, 45.

² —, *Curr. Sci.*, 1940, 9, 22.

³ Hartung, M. E., and Storey, W. B., *J. Agric. Res.*, 1939, 59, 39.

⁴ Francis, W. D., *Proc. Roy. Soc. Queensland*, 1928, 39, 43.

⁵ Ballantine, A. J., *Ann. Bot.*, 1909, 23, 161.

⁶ Brough, P., *Proc. Linn. Soc. N.S.W.*, 1933, 58, 33.

⁷ Kausik, S. B., *Ann. Bot.*, N.S., 1938, 2, 899.

⁸ —, *Ibid.*, 1939, 3, 812.

⁹ Wilson, C. L., *Amer. J. Bot.*, 1937, 24, 686.