No.	Purification stage	Total solids mgm. per c.c.	Activity in mm. min./mgm. enzyme		Ratio (A)/(B)
			Ascorbic acid/catechol (A)	Phenol (B)	
1	Initial extract precipitated with Am_2SO_4 and precipitate suspended in water and dialysed	10	0·25	0·2	1·25
2	(1) Precipitated with alcohol in the cold 30-60 per cent. and precipitate taken up in water	6	6·0	5·0	1·20
3	(2) Precipitated with acetone in the cold 33–60 per cent. and precipitate taken up in water	2	3·7	2·1	1·8
4	(3) Adsorbed on $Ca_3(PO_4)_2$ gel at pH 5·0 and eluted with M/20 Na_2HPO_4	1·0	11·0	2·5	5·6
5	Further precipitation of (4) with acetone in the cold 33–60 per cent.	0·5	20·0	1·6	12·5

presence of a subsidiary factor, in addition to the main portion of the catechol (or diphenol) oxidase. This factor gets eliminated during the purification and is partly replaceable by catechol. Work on the further purification of the enzyme is being continued.

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Vascular Anatomy of the Flower of *Macadamia ternifolia* F. Muell. (Proteaceæ)

SINCE the publication of an account of floral anatomy in *Macadamia ternifolia* F. Muell. sometime back[1] the writer had occasion to make a more detailed examination of the floral structure in the same plant. Some of the previous interpretations concerning the nature of the perianth traces and the morphology of the nectar-secreting disc at the base of the ovary are now found to be incorrect in certain respects. The writer is grateful to Prof. Arthur J. Eames, of Cornell University, U.S.A., who, being requested to give an opinion in the matter, very kindly pointed out the discrepancy in the earlier account.

It is stated in the paper cited above that the perianth in the modern Proteaceæ represents the whorl of calyx and that the marginal strands of the perianth segments which arise by forking of four large strands separating from the receptacular stele represent traces to a lost corolla. Such an interpretation was offered on the strength of the remarks by Joshi and Rao[2] in their work on the floral anatomy of some Nyctaginaceæ; these authors state with regard to the two sets of traces to the perianth that one method of interpreting is "that each set of traces belongs to a separate whorl of leaves and formerly in this family there were two whorls of perianth leaves, the traces of the lower set belonging to the sepals and those of the upper to the petals. At present these two sets of traces are running in the same whorl owing to the disappearance of one whorl." This interpretation is inconsistent with the detailed observations now made in *Macadamia ternifolia*. The perianth segments are strictly sepals in nature and their vascular connections are quite normal as in many other angiosperms

(Eames and MacDaniels, 1925),[3] each segment showing the usual midrib strand and two marginal strands (Fig. 5).

The origin of the midrib strand of the perianth segments is rather interesting. Corresponding to the four midrib strands of the four perianth segments there are formed as many pairs of strands separating from the receptacular stele. The members of each pair next move out upwards at the base of the flower (Figs. 3 and 4) and finally fuse with each other before actually entering a perianth segment as a large median strand (Fig. 5). In this connection Prof. A. J. Eames expresses in a personal communication: "The origin of the midrib trace of the sepal from two strands is remarkable." This point was, therefore, very critically examined and it is found that there is a distinct double origin of each midrib strand as shown clearly in Figs. 3–5 and in the Photomicrograph 1. From each midrib strand is then separated to the inside the single trace for the stamen (Figs. 4 and 5).

Regarding the nectar-secreting disc which develops as a ring-like structure at the base of the ovary, it is stated in the previous account that it is a new structure without any definite morphological status in the flower. This interpretation was based on a study of insufficient material and its exact nature could not be precisely determined. Further, it was influenced to some degree by the remarks of Brough[4] regarding the same structure in another member of the Proteaceae, *Grevillea robusta* Cunn. Brough states that "The fact that the nectar scales are, in this family, often four in number, and alternating with the perianth segments, suggested" to him "that they might constitute a reduced and modified inner whorl of floral leaves, or in other words represent the vestiges of an ancestral normal corolla", but that "There is no indication, whatsoever, of any associated vascular tissue, and consequently, no ground for interpreting the scale as the morphological equivalent of a reduced perianth." On the other hand, a very careful examination of

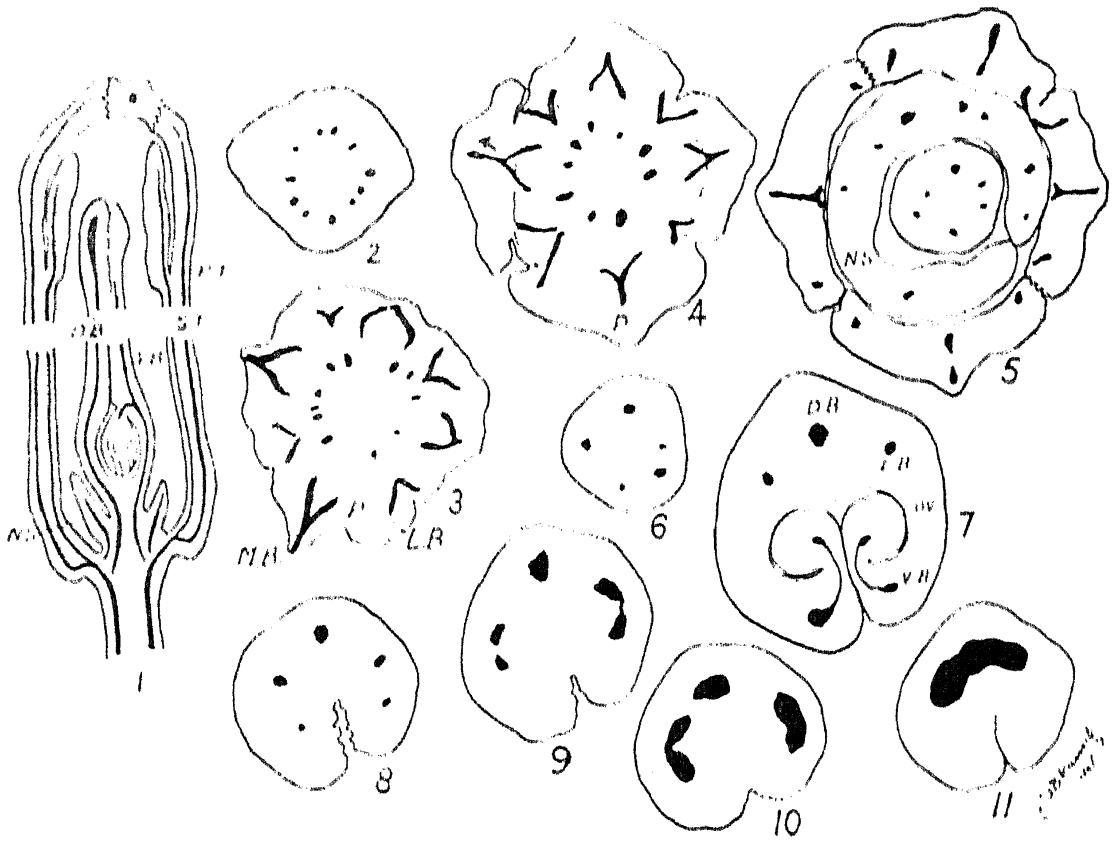

FIG. 1. Longitudinal section of flower showing the vascular connections for the various floral organs. FIG. 2. Transverse section of the base of flower. FIGS. 3–5. Series of transverse sections showing the departure of traces to the perianth segments. FIG. 6. Transverse section of the base of gynoecium. FIG. 7. Transverse section of the gynoecium at the region of the ovule showing ovule traces. FIGS. 8–11. Series of transverse sections of the style and stigma.

the disc as now made appears to throw definite light on its exact morphology in the flowers of *Macadamia,* which may presumably be true of the other Proteaceæ too. In the tissue of the disc there are found scattered here and there a few feebly developed vascular strands (Fig. 5), whose cell elements, however, do not seem to become fully tracheal in nature in so far as they lack the characteristic markings of the wall of a true tracheal tissue. They appear merely as strands (Fig. 1) composed of elongated cells with more and more diminished cell

PHOTOMICROGRAPH 1—showing the double origin of the midrib strand and the formation of marginal strands for the perianth segment.

contents as the disc grows older (Photomicrograph 2). These strands may, therefore, be

PHOTOMICROGRAPH 2—showing the longitudinal section of the base of flower with vascular strands in the nectar secreting disc.

reasonably inferred to constitute the remnants of a more highly developed vascular tissue in an ancestral form. It is further highly probable that the vascular elements in the disc disappear completely in some members of the Proteaceæ, as in *Grevillea robusta.* Arber[5] states that organs may often persist even though the vascular traces supplying them have disappeared completely. As Wilson and Just[6] remark, "It is undoubtedly true, that in some cases at least, what may appear to be rudimentary organs have persisted with no corresponding vascular supply; such structures may, however, be really organs which can only be interpreted by a comparative study of other and closely related forms." A good instance of this seems to be met with in *Macadamia ternifolia.* We may, therefore, rightly regard the disc as a much reduced corolla in the flowers of the modern Proteaceæ, and this suggestion is further strengthened by the fact that in the place of the disc there are sometimes seen in the family four scales alternating with the perianth segments.

It is interesting to point out here that Joshi[7] regards the disc-scale in the flowers of *Stellera chamæjasme* Linn., a member belonging to the Thymelæaceæ, as a part of a much reduced corolla. This appears to be rather significant, because the families Proteaceæ and Thymelæaceæ are regarded to be probably related to each other in some way by some systematists, as Hutchinson[8] in recent years.

After the departure of the traces to the outer floral organs the receptacular stele shrinks to form a ring of vascular tissue showing a number of strands. Of these strands all, except five large ones which supply the single carpel, gradually fade away at the summit of the receptacle. The five strands of the carpel which are from the beginning quite independent of one another, arrange themselves in the wall of the gynœcium (Fig. 7) as one dorsal, two lateral, and two marginal or ventral strands. The traces for the ovules are formed higher up in the gynœcium from the two ventral strands (Fig. 7). In *Banksia* too, another member of the

Proteaceæ, the carpel has similarly five strands derived independently from the stele of the receptacle. Such a vascular condition of the carpel is regarded by Eames[9] as probably representing a somewhat specialized case derived from an original three-trace carpel, "chiefly through branching of the midrib, and by a working back of this branching tendency to the stele."

The further behaviour of the five strands of the gynœcium in the style and stigmatic regions in *Macadamia* has already been fully described in the previous paper and some of the figures in the series of transverse sections from the base upwards are reproduced here for the sake of completeness of the present account.

In conclusion the floral structure in *Macadamia ternifolia* F. Muell., may be briefly stated as follows: The flowers are probably derived from a dichlamydeous ancestry, the modern perianth representing the whorl of calyx with the usual vascular connections as in most other angiosperms and the nectar-secreting disc constituting a much reduced inner whorl of floral leaves, namely, the corolla. The vascular tissues in the disc are feebly developed, or they may be entirely lost as in some members of the family, for instance, *Grevillea robusta*. Adnation of the whorl of stamens and perianth has occurred followed by a fusion of the two sets of traces and consequent on the reduction of the corolla. The simplicity of floral construction in *Macadamia ternifolia*, which may well be true of the other members also, as revealed by a study of vascular anatomy seems best, therefore, to be regarded as a derived condition through reduction of floral parts.

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Serum Phosphatase in Pulmonary Tuberculosis

The serum phosphatase of normal persons and of persons affected with pulmonary tuberculosis has been determined (S. K. R.) by the method of Bodansky.[1] The serum phosphatase of persons with pulmonary tuberculosis is, on the average, higher than normal. Oral administration of 200 to 250 mgm. of vitamin C in the form of 10 g. of sun-dried *Emblica officinalis* pulp for ten days lowered the serum phosphatase content in more than 71 per cent. of pulmonary tuberculosis cases as compared with a decrease in 14 per cent. only in controls receiving no additional vitamin C in the form of *Emblica officinalis*.

Description	Phosphatase units (av.)	Description	Phosphatase units (av.)		Remarks
			Before exp.	After exp.	
Normal	1·63 (0·68–2·28)	Control (P.T.)	2·82 (1·56–4·96)	3·54 (1·52–5·04)	Phosphatase lowered in 14·3% cases
Pulmonary tuberculosis	3·95 (1·32–9·96)	200–250 mg. 'C' for 10 days (P.T.)	4·53 (1·32–9·96)	2·41 (0·92–9·36)	Phosphatase lowered in 71·4% cases

Figures within brackets indicate limits.