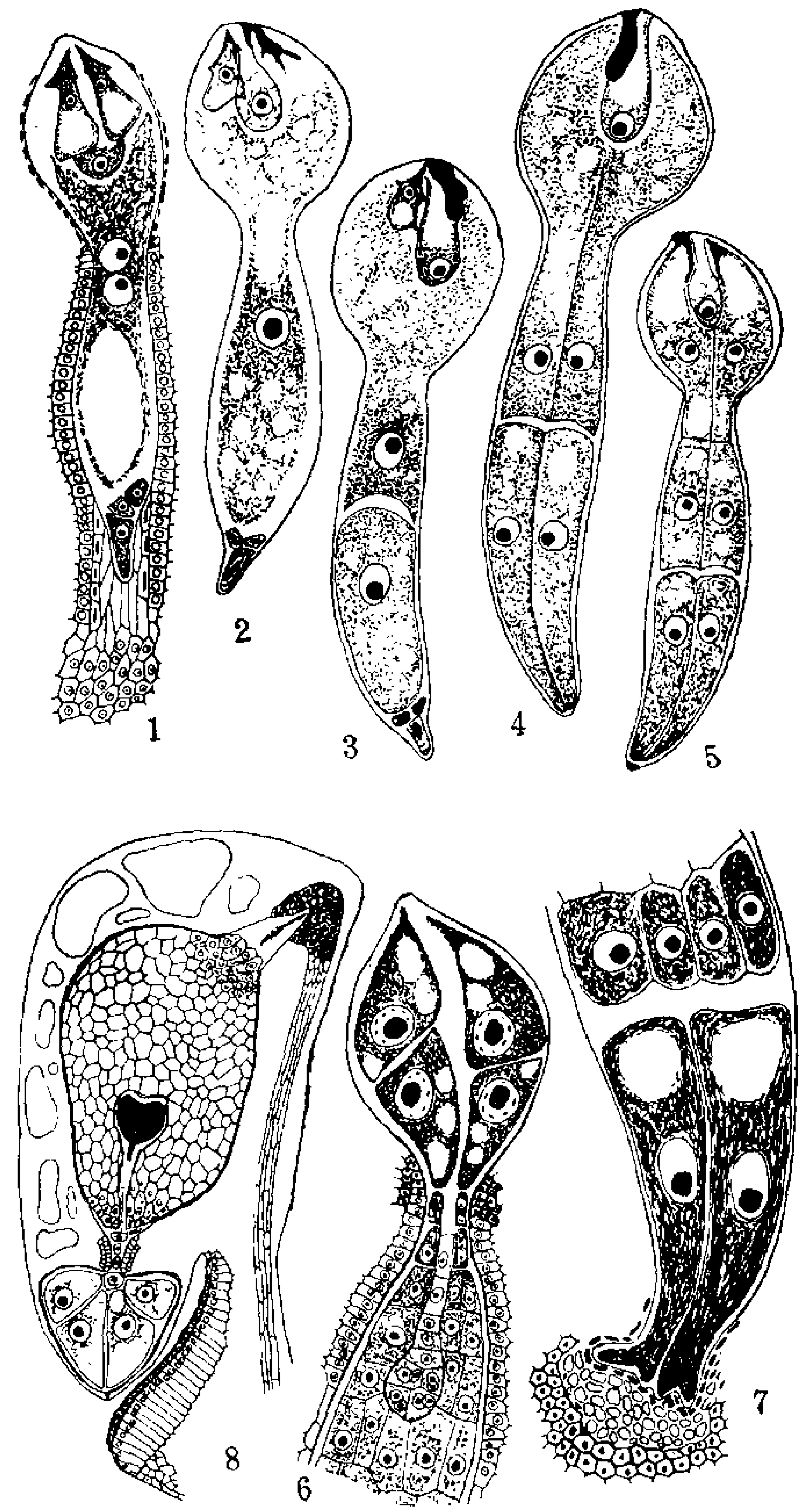
ENDOSPERM FORMATION IN *ANISOMELES* SP.

The present study embodies a short account of the origin and development of endosperm in *Anisomeles malabarica* and *A. indica*. Further work on the embryological and other morphological aspects of these plants is in progress.

The embryo-sac in both species exhibits two distinct regions, *viz.*, a broadened micropylar part containing the egg apparatus and a narrow chalazal part invested by a jacket of integumental nutritive cells. The region between these two parts is constricted, where, the polar nuclei fuse to form the secondary nucleus (Fig. 1).

After fertilization, the primary endosperm nucleus moves to the middle of the chalazal end of the embryo-sac and divides by a transverse wall to form two chambers (Figs. 2 and 3). The nuclei in both the upper and lower chambers now divide by longitudinal walls (Fig. 4). The lower two cells do not divide further but assume the function of an haustorium, and begin to penetrate in the direction of the vascular trace. The two upper cells, on the contrary, divide once more by transverse walls resulting in four cells (Fig. 5). Thus three primary tiers of two cells each are formed in the embryo-sac. The uppermost cells divide once more by transverse walls into four cells which enlarge and organise micropylar haustorial apparatus (Fig. 6). The middle cells, which lie between the two-celled chalazal and four-celled micropylar haustoria, divide further by vertical and transverse walls and give rise to a massive central endosperm tissue in which the embryo becomes embedded ultimately. The nuclei in the micropylar haustorial cells enlarge considerably and show conspicuous nucleoli (Figs. 6 and 7). The chalazal haustorium begins to function earlier than the micropylar haustorium and disorganises after absorbing the nutrition transported by the vascular trace. The micropylar haustorium takes part in the absorption of the disintegrating integumental tissue and continues its function until the embryo has reached considerable size. The passage between the micropylar haustorium and the central endosperm



FIGS. 1–8. *Anisomeles indica*

Fig. 1. Eight-nucleate embryo-sac × 800. Fig. 2. Post-fertilisation embryo-sac showing the prominent primary endosperm nucleus × 800. Fig. 3. Embryo-sac divided into micropylar and chalazal chambers × 800. Fig. 4. Formation of longitudinal walls in the upper and lower chambers of the embryo-sac × 800. Fig. 5. Embryo-sac showing the three primary pairs of endosperm cells ×560. Fig. 6. Micropylar haustorium and embryo × 800. Fig. 7. Chalazal haustorium at an advanced stage × 800. Fig. 8. *A. malabarica*.

A longitudinal section of the ovule showing the micropylar haustorium, endosperm tissue, lacunæ in the integument and the obturator × 160.

tissue is constricted into a narrow isthmus through which nutritive material is transported to the growing embryo by means of conducting cells which are transformed endosperm cells (Fig. 8).

The development of the central endosperm tissue takes place simultaneously with the growth of the haustoria and finally it attains a large size by destroying the surrounding ovular tissue (Fig. 8). In advanced stages, a section of the ovule reveals a large mass of endosperm enclosing the growing embryo and the remnants of the haustoria, both micropylar and chalazal, still persisting.

The pro-embryo descends into the central endosperm tissue by means of its long suspensor and the embryo is initiated in its terminal cell by a vertical wall. The embryo enlarges to such an extent as to displace the endosperm tissue almost completely.

The ovule in both species is characterised by the presence of a massive obturator over the micropyle. The sub-epidermal cells of the obturator become elongated as the development of the embryo progresses (Fig. 8).

In conclusion, I wish to acknowledge my indebtedness to Dr. L. Narayan Rao, Professor of Botany, for his kind guidance.

S. Narasimha Murthy.

Department of Botany,
Central College,
Bangalore,
June 6, 1942.

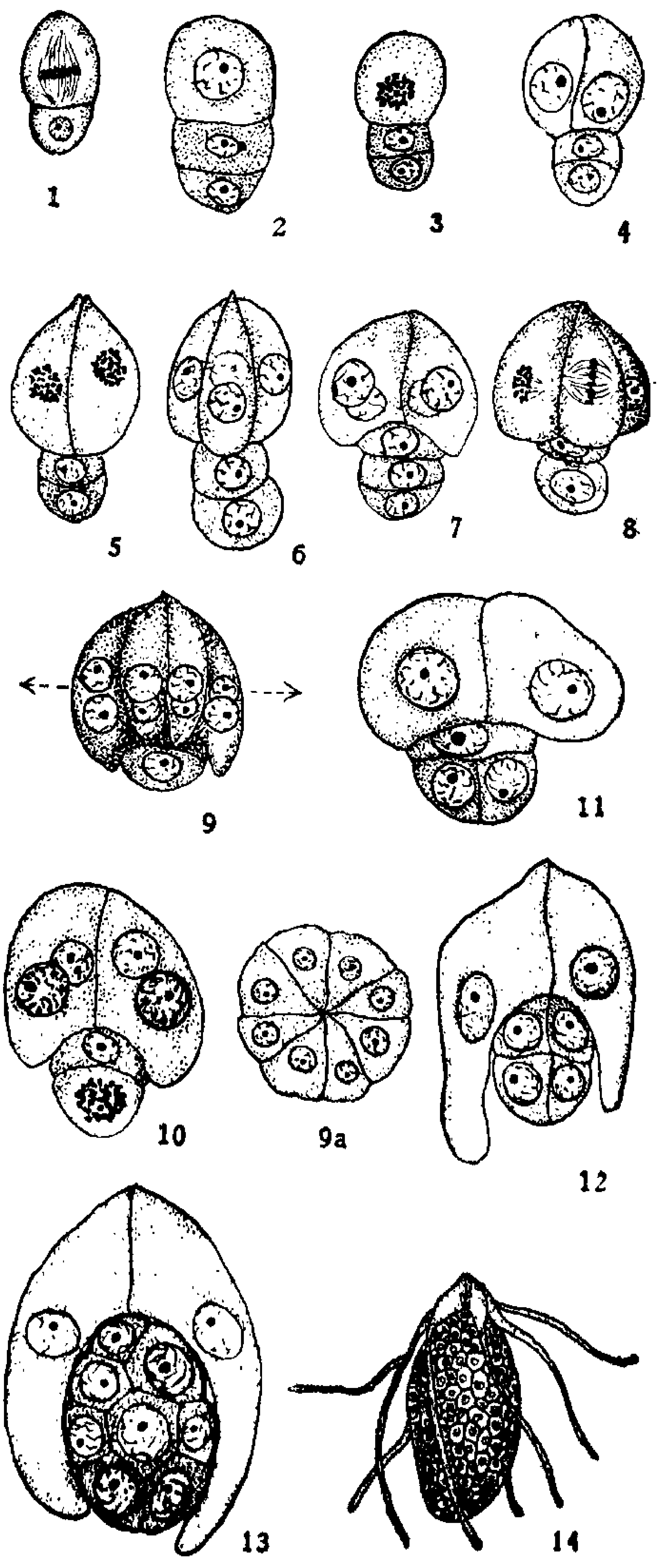
MORPHOLOGICAL STUDIES IN THREE SPECIES OF *VANDA*

Orchids present much morphological variations especially during the post-fertilization development. This note is confined to observations on the following species of *Vanda*:—

V. parviflora Lindl.
V. spathulata Spreng.
V. Roxburghii Br.

Development of the embryo was traced in greater detail in *V. parviflora*, but the course of development appears to be similar in all the three species.

The development of the embryo-sac is of the



Figs. 1 to 13 × 450; Fig. 14 × 80.

Normal-Type, sometimes presenting a tendency towards a reduction in the number of nuclei at the antipodal end of the embryo-sac. Double fertilisation occurs. The primary endosperm