

THE SEEDS OF *Tinospora cordifolia*, MIERS.

THE recent note by Joshi and Rao on "Fruit and Seed Development in *Tinospora cordifolia*, Miers, without Fertilisation and Embryo Formation inside"¹ was read by me with a certain amount of surprise. In a previous issue of this journal² Prof. B. Sahni has made some further remarks on exembryonate seeds and asks two pointed questions: "How does the *Tinospora* seed germinate if at all?" and (2) "Whence does the seedling take its birth?"

Joshi and Rao have omitted these points altogether and thus the latter part of their paper loses a great deal of its value and interest.

About two years ago I started some work on the morphology of this plant, the material of which had very kindly been fixed and imbedded by Mr. Babulal Gupta of this Department. Due to unavoidable circumstances I had to give up my work for some time and it is only recently that I have taken it up again.

I can definitely say that the seeds of *Tinospora cordifolia* do possess an embryo and they germinate in the normal way. The

Immediately on receipt of the paper by Joshi and Rao, I sowed 75 seeds of which 50 germinated within a week and the seedlings were entirely normal in appearance (Figs. 2, 3 and 4). Of those that did not germinate, some were dug out and on dissection an embryo was found in every one of them. This indicates that germination was merely delayed or perhaps stopped in these cases due to entirely different causes. Apart from this, I have also been able to find seedlings growing in nature.

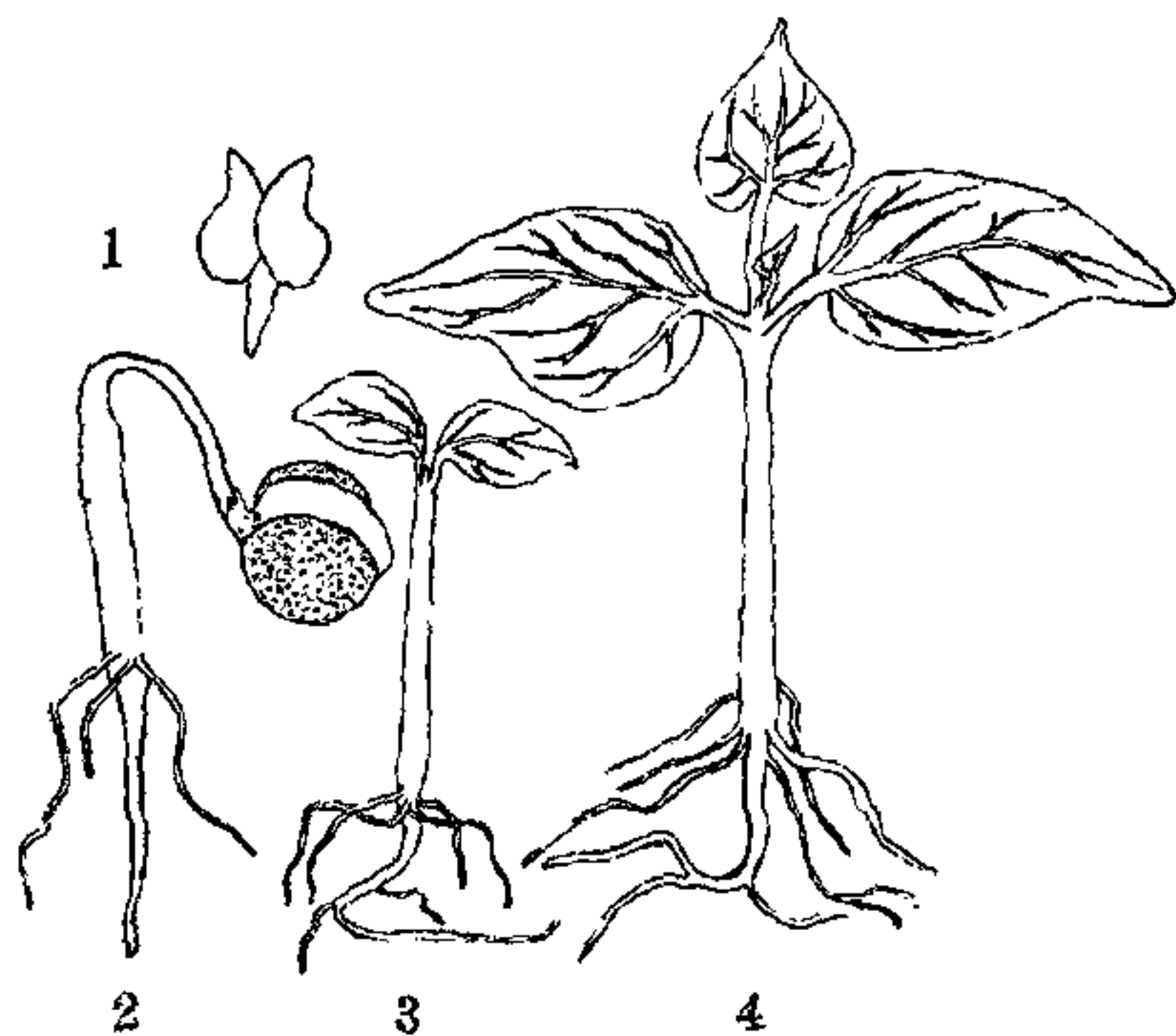
It is true that male plants are very rare in this species and the chances of effective pollination are meagre. This merely suggests that the development of the embryo is parthenogenetic—a fact recorded for several Angiosperms and for *Disciphania Ernstii*³ (Ernst, 1886), a member of the family Menispermaceae itself.

It is therefore to be desired that Joshi and Rao will re-examine their preparations and remove the source of error, wherever it lies. I reserve further remarks for a future occasion.

My preparations have been examined by Dr. P. Maheshwari and I have his support for my conclusions.

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Figs. 1-4.

1. Embryo dissected out of a seed soaked in water. \times Natural Size.

2. Young seedling. \times Natural Size.

3. Same, slightly older. $\times \frac{1}{2}$.

4. Young plant showing two cotyledons and 2 new leaves. $\times \frac{1}{2}$.

embryo is very hard pressed to the endosperm and is difficult to recognise as the cotyledons are very thin and their colour is the same as that of the endosperm. Fig. 1 shows an embryo dissected out of a seed.

¹ Curr. Sci., 1934, 3, 62.

² Ibid., 1934, 3, 109.

WITH regard to the earlier note of Dr. Sahni¹ and the above note of Mr. Bahadur Singh, I would point out that the observations of Rao and myself do not exclude the possibility of occurrence of exembryonate seeds in *Tinospora cordifolia*. As was pointed out by us, the case appears to be comparable in all essentials with what is seen in *Cycas*. We only showed that it is possible in *Tinospora* for the seed and the fruit to develop without the formation of embryo inside. The conclusion was based mostly on the study of microtome sections, and I hope after further investigation Mr. Singh would be able to agree with it. The species can be propagated either from exembryonate seeds or as is the usual practice in gardens, from cuttings.

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³ Ernst (1886) Quoted in Schnarf, K., *Vergleichende Embryologie der Angiospermen*, 1931, 73.

¹ Sahni, Curr. Sci., 1934, 3, 109.