## X. THE POLLINATION SYNDROME

Recently I came across a paper on the pollination of the terrestrial orchid Listera ovata and I have observed with pleasure that the author also checked on the 'reverse' side of pollination, viz. the question whether cross-pollination by insects is compulsory. This reminded me of the large list of Malesian orchids which Dr. J.J. Smith (1928) listed in which he had observed self-fertilization.

Flower biologists will probably explain this as exceptions to the rule. So it may be, but how many experimental data are there to support this opinion? They largely base their opinion on observations of flower visits and visitors, how insects and other animals manage to utilize structural plant devices in order to attain their goal, nectar, pollen, scent-substances, etc. They have successfully correlated a number of structures of inflorescences or flowers with flower visitors and they have called these structure 'pollination syndromes'. These occur in taxonomically unrelated families.

The considerations have further led to the view that the evolution of specialized plant structures went hand in hand with specialization of animal ecology, of which the fig-wasps and Ficus — whose existence became mutually dependent on one another — is the example of co-evolution.

Such a desperately close situation obviously does not occur in Orchidaceae, which range second in flower specialization. It seems also not to occur in Asclepiadaceae with their equally specialized floral structure. In single indoor grown potplants of several Stapelias I have observed flowers to set fruit with viable seed. I must confess that I have not verified whether they develop through apogamy, but the fact that they produced fruit only occasionally is not favourable for that idea.

Further simple observations made on some indoor potplants in my house seem to indicate that they are not aware of their syndrome. Among them were several long-tubed, vividly coloured Gesneriaceae adapted to visits by birds, of the genera Aeschynanthus, Columnea and Streptocarpus. Occasionally they produced seed pods spontaneously, and all flowers artificially self-pollinated did the same. In all cases tested the seed proved to be viable. This means anyway that self-fertilization is quite successful. Also Fuchsia, Clivia and Aspidistra produce fruit indoors, although this is rare in Fuchsia.

In my garden I have several species, in single specimens which fruit abundantly, of Canna, Fritillaria, Hypericum, Paeonia, and a poorly specimen of Streptopus which I introduced from the Swiss forest and also is doing its best. Though I will not advance that insects have not played a role in their pollination, it can hardly have been the same insects as they would have had in their home-country. Anyway, again, there is no doubt about their self-fertilization.

Having come so far, the reader will be no longer in doubt about my growing criticism about the real significance of the syndromes. The fervent promotors of this aspect in flower biology mostly, or at least frequently, confine themselves to observation in the field, but hardly ever practise experimenting. I know even of one who never bagged any flower to check his idea. It is clear to me, however, that in scientific flower biology complementary proof is badly needed, difficult to achieve as it may be in cases.

We should never forget that insects and other animal vectors behave just as man, that is, grab as grab can, whatever may be useful or agreeable.

But the question remains open whether they are compulsory for pollination and subsequent setting of viable seed.

We have to detach ourselves from the idea that self-fertilization in plants is something abnormal or undesirable, illegal or distasteful. Why should it be?

In this respect I remember vividly what the late Dr. O. Hagerup (Copenhagen) reported in 1951 about his experience on a small islet of the Faroes where he pursued flower biological studies. He observed to his utmost surprise that in a certain very bad year when storms raged over the islet, with hardly any insects observable, syndrome-bound plants still set fruit in absence of the syndrome vector.

If I were somewhat younger, and had less urgent work to perform, I would have liked to make extensive observations in greenhouses — where often only one specimen is grown of each species — and assemble, with the help of gardeners, all data on setting of fruit in such plants, which must necessarily be due to self-fertilization, while their pollination cannot have happened with the usual insect vectors belonging to the syndrome assigned to them. I would not be surprised if the majority were capable of self-fertilization.

Another important set of data to check on the possibility of self-fertilization is of course the exotic plants grown in out-door botanic gardens, because they also are remote from their syndrome-pollinators and are mostly grown as single individual plants or are derived from a single import. Tropical botanical gardens harbour many of such exotics and provide excellent opportunity for such observations.

The remarks made above have by no means the purpose to deny the effectiveness of pollination by animal vectors. As appears from the observations made indoors, self-fertilization will generally lead to less fruit setting as compared with pollination of all flowers by insects. This is, however, not essential, as the result in the field would be merely a lower population density of the species. This makes it, in the tropics, precisely more interesting.

The subject of self-fertilization has in the tropics a wider impact and could play an important role in the maintenance of species. In reminding that many species in the tropical rain-forest have, as far as we can ascertain, a very low population density, the possibility of self-fertilization is a most important asset for keeping alive. It provides plant species with self-perpetuating freedom, a safeguard against extinction.

A most striking example of such a case is the curious Bignoniaceous climber Tecomanthe speciosa, of which only one living specimen was ever located in an almost inaccessible place in the Three King's Islands, north of New Zealand. The plant has large zygomorphous flowers. From cuttings it has been brought into cultivation in New Zealand and elsewhere. See Hunt (1972). It is perfectly self-fertile.

I will end this talk about syndromes, that of the plants, and that of pollination biologists, by adding my own syndrome of autonomous evolution, because the effectiveness of self-fertilization in a large number of plant species would be in perfect agreement with that theory.

The reason for writing this short note is my wish, that with the development of ecological studies, including flower-biology, in Malesia, notably in Malaya and Bogor, the flower biology subdiscipline should be approached with a critical, open mind. Mere field observations of pollinating agencies are quite insufficient and represent merely a sort of alpha flower biology; they should be sustained by bagging and artificial pollination experiments. These will be, in some cases, far from easy to perform in practice. For example in the case of bat-flowers, as I know from some clumsy, unsuccessful efforts made by myself in my Bogor period. However, they might yield most interesting results. It would be, for example, extremely interesting to know if it could be proved whether Parmentiera, Kigelia, Oroxylum and Parkia are self-compatible. And, furthermore, whether also self-pollination with subsequent fruit-setting can occur.

*References:*

HAGERUP, O. (1951). Pollination in the Faroes in spite of rain and poverty of insects. Kong. Danske Vid. Selsk. Dansk. Bibl. Medd. 18, n. 15: 1-48.

HUNT, D.R. (1972). Bot. Mag. 179: t. 618.

SMITH, J.J. (1928). Zelfbevruchting bij Orchideeën. Natuurk. Tijdschr. Ned. Ind. 88: 1-19, 7 fig.

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