PERENNATION AND VEGETATIVE REPRODUCTION IN *ZEUXINE SULCATA* LINDLEY

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(With 1 figure in the text.)

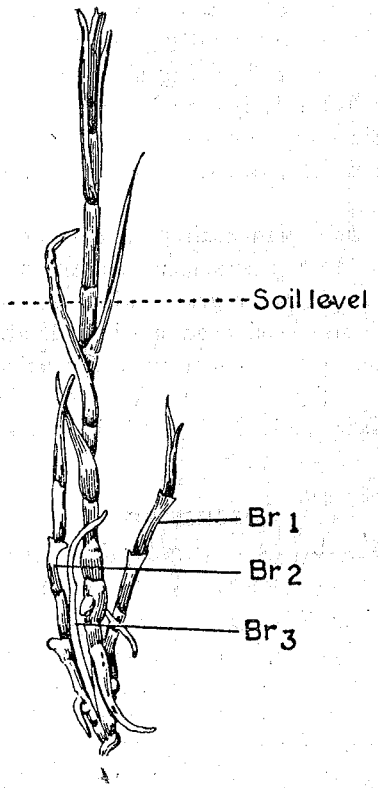
Zeuxine sulcata Lindley is a very widely distributed orchid in Asia. It is found in Afghanistan, India, Java, China and Philippines. Hooker (1) describes it as the commonest Indian orchid, it being met with throughout the plains and the low hills of the country from Punjab and Sindh to Assam and Chittagong and southward to Ceylon.

In the plains of northern India this orchid grows during winter. Then green ærial shoots with erect grass-like membranous leaves are produced. These mostly range between 2 to 6 inches in height. The erect stem has sometimes a creeping base and there it bears a number of fleshy roots. The shoots ultimately produce terminal spikes of small white flowers. From these are produced capsules containing a very large number of seeds. These ripen and are shed towards the end of winter and after this these aerial shoots also wither and die away. The orchid passes the summer underground and new green aerial shoots are again produced on the advent of the next winter season. Nothing, however, is known about the condition in which the orchid passes the unfavourable season, even though it is so common all over the country.

Last year during the month of April, the writer was on a short holiday to a place called Hoshiarpur in the sub-himalayan tracts of Punjab. Here plants of this orchid were found growing in a small grassy plot on the bank of a rainy season stream, which is locally known as 'Cho'. The place was at a distance of about three miles from the town. It was just the beginning of summer. The orchids had already fruited and the seeds had been shed and they were in various stages of withering. As the time appeared to be opportune, it was decided to look these up for their mode of perennation. For this purpose a few plants were dug out from the ground along with the soil and brought home. There these were placed in a bucket of water and the soil was gradually and carefully removed, so that there was no danger of any parts getting broken. One such plant

with complete underground parts is sketched in the accompanying text-figure,—the aerial portion had mostly died away ; and it clearly reveals the mode of perennation of the orchid.

It appears that in this orchid towards the close of the growing season, and before the advent of the hot dry season, certain underground branches are formed from the basal nodes of the main stem. These are marked Br1, Br2, and Br3 in the figure. They are of the



Zeuxine sulcata. A plant dug out from the soil during the month of April The parts below the line marked soil level are all underground. Br1, Br2 and Br3 are the perennating underground branches. *Normal size.*

ordinary form and become fairly large, often producing 6 or 7 internodes and short membranous scaly leaves from the nodes. Often they develop their own adventitious roots. In some cases a root is formed on the node of the old axis of the plant just below such a branch. In colour, these new branches are nearly white, while the main stem is more or less brownish. Sections of the various parts of the plant showed that all the food material is transferred to these new branches and their cortex becomes packed with solid carbohydrates.

After these branches have been formed, the main stem withers and dies away. Only these branches packed with food material are left behind in the soil. They never come to the surface and act as the means of tiding over the unfavourable season. On the advent of the next growing season, however, they are probably again stimulated to activity and grow up into new plants.

The form and disposition of these underground perennating branches suggests why these have been overlooked up to this time. The plants of *Zeuxine sulcata* usually grow in fairly compact clay soil. In such a soil if the main flowering shoot is pulled out, the underground branches will be always, on account of their position in the soil, left behind. Since this is the usual method of taking out of small herbaceous plants, this may account for the non-observance of these structures so far.

The number of such perennating branches on one plant may be one, two or more. In the specimen figured, there are three such branches. As each of these can grow up into a new plant, more than one offspring may be produced from one individual. So these underground branches also serve as a means of vegetative reproduction and multiplication. Many times in nature plants of *Zeuxine* are found in small clusters. Their method of vegetative reproduction explains this.

Discussion.

The method of perennation of *Zeuxine sulcata* is of great interest on account of its extreme simplicity. In no other terrestrial orchid, a method simpler than this has been recorded. In the majority of such orchids, only buds are laid toward the end of the growing season and they develop into shoots only on the advent of the next season. Here, however, they begin their development in the same season and form fairly big underground branches. The common feature between the two cases is that the green aerial shoots develop only at the beginning of the next favourable season and the unfavourable season is passed entirely underground. In the majority of terrestrial orchids during this period food is stored either in internodal or root tubers, but in *Zeuxine sulcata*, it is directly transferred to these underground branches which have to grow into aerial shoots later on and there are no such special organs for this purpose. The form of these underground branches is also just ordinary and shows no special peculiarities.

The mode of perennation of *Zeuxine sulcata* is of further interest on account of the possible light that it may throw on the origin of more complex methods of perennation found in the terrestrial orchids.

especially on the origin of such complex tubers as those of Ophrydeae (*Ophrys, Orchis*, etc.). According to Rendle (2) the tubers of this tribe "consist of next year's stem-bud, which has united very early with the fleshy adventitious root standing exactly beneath it." It has been mentioned above that sometimes in *Zeuxine*, there stands an adventitious root on the same node from which a perennating branch arises and exactly beneath it. It may thus represent the simpler condition from which the more complex tubers of Ophrydeae may have been derived by postponement of the development of the branches for sometime, tuberisation of the adventitious root and the fusion of the two.

Summary.

The method of perennation of *Zeuxine sulcata* is very simple. Towards the end of growing season, certain underground branches are formed from the basal nodes of the main stem and food material is stored up in these. They act as the perennating organs of the plant during the unfavourable season and grow up into green aerial shoots on the advent of the next growing season.

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Literature Cited.

1. HOOKER, J. D.—The Flora of British India. Vol. V. London, 1890.
2. RENDLE, A. B.—The Classification of Flowering Plants. Vol. I. Cambridge, 1930.