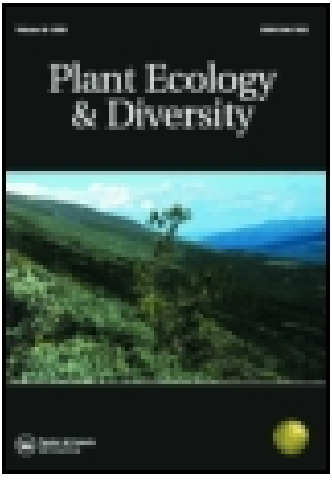
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On the Growth and Fertilisation of Cypripedium Calceolus

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On the Growth and Fertilisation of Cypripedium Calceolus.

By A. D. Webster, Llandegai, Penrhyn.

(Read 8th July 1886.)

The following notes have been made at various times as opportunities offered over a period of several years, but principally during the present season, as exceptional opportunities were afforded me of studying the plant in a semi-wild state. Nearly two dozen flowers were produced by established, out-door specimens of this Cypripedium and its near American ally *C. parviflorum* (some botanists consider the latter a continental variety of *C. Calceolus;* and as regards structure, mode of growth, and time of flowering, the two are nearly identical). Two strong, healthy plants that had been established for several years were marked off for investigation as regards time of appearing, rate of growth, period of flowering, and method of fertilisation; and the following diary, kept from the time the buds appeared above the ground until the flowers had withered away, may be useful in following out the life history of this singularly interesting plant. The bud, remarkably plump and healthy looking, appeared above ground on 19th April 1886.

On 26th April it was $2\frac{1}{2}$ inches high, the weather during that time being very favourable for growth, with warm, sunny showers. On 3rd May the height was $4\frac{3}{4}$ inches, and the leaves were beginning to open out from the stem. On 10th May it was 8 inches high, and thus showed a growth of $3\frac{1}{4}$ inches in six days.

At this stage the lower leaves were almost perfectly developed and the flower bud visible. On 17th May the height was 9 inches, the leaves being fully developed, and the flower bud plainly visible. On 24th May the full height $12\frac{1}{2}$ inches was attained, at which period the flower was fully developed and half open. This was the greatest rate of growth during any week, although only one-quarter inch more than during the six days from 3rd May to 10th May. During the five weeks from 19th April, when the bud first appeared, until 24th May, when the plant and flower was fully developed, the weather was satisfactory for growth.

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The flower remained open for twenty days, or until 12th June, when it collapsed.

Fertilisation.—As regards fertilisation, I may state at the outset that no native orchid on which I have experimented is more difficult to understand, or has more completely baffled my observations than this. That Darwin's description of the wonderful manner in which the pollen of this orchid is removed by insects is true, I am, however, well able to corroborate, for on several occasions I have seen insects visit the flower by the large opening in the labellum, and after repeated failure to get out by the same way, owing to the inflected edges, at last force themselves out by one of the two orifices close to the anthers, and in doing so their backs were smeared with the glutinous pollen.

This part of the work, the removing of the pollen, is neatly enough performed, but how the pollen is to be brought in contact with the stigma has puzzled me greatly. It is quite evident that unless the same insect visits another, or revisits the same flower, fertilisation cannot take place, and from all my observations that such is likely to occur is very improbable, although by no means impossible, for the following reasons:—

1. The difficulty of escape experienced by an insect that visits the flower.

2. Only those insects which experience the greatest difficulty can remove the pollen.

1. When an insect of sufficient size to remove the pollen enters the labellum of the flower by the large opening at the top, I have invariably noticed that its first aim is to escape again, for a search after nectar seems out of the question. In all cases that have come under my own notice, the insect first tries, for several times in succession, to escape by the way it entered, but the edges of the labellum are incurved, and the numerous fine hairs within the flower are pointed downwards from the edges on each side, so that escape by scaling the sides is well-nigh impossible. I have seen on different occasions several insects, after much labour, ascend the edges of the labellum, but when they came to the incurved edges, which may be considered the special barrier, back they fell into the bottom of the labellum. I have seen this repeated several times by the

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same insect, until, tired and disgusted, the attempts to escape by this way were given up. Next, the insect, allured, no doubt, by the light emitted through three colourless, almost transparent lines at the upper end of the labellum, crawls towards these, but by this way also finds escape out of the question. These light lines, however, have conducted the insect to near the upper end of the labellum, and within a short distance of the two small orifices, situated one on either side of the anthers. A rush is now made for exit by this way, and as the hairs here point in the opposite direction to those on the flat sides of the labellum, the insect crawls easily up to the small orifice, and after two or three attempts forces its way out. In so doing it becomes smeared with the pollen, with which it inevitably comes in contact, the anthers being placed directly above the small orifices and under the stigma.

The pollen is so sticky and the orifices so small that insects (small bees excepted) which come in contact with the former are frequently unable to free themselves, and so perish. Again, I have frequently found insects, that were of too large a size to escape by these orifices, dead within the labellum.

Now, from these observations, it is hardly to be expected that an insect, after once experiencing the difficulty of escape from the labellum, would turn round and revisit the same flower or that on another plant; indeed, in all the instances that have come under my own notice, the insect's escape from this temporary prison was quickly followed by desertion of the locality in which the plants grew.

That cross fertilisation is thus effected to any great extent I cannot think; and although Darwin and others have seen insects visit the flowers of this Cypripedium, and escape with pollen attached to their back, it is not on record, and I believe no one has yet seen the same insect visit another flower or revisit the same one. The temptations for insects to visit the flower are, likewise, small indeed, for I have frequently watched for hours, during bright sunny weather, when insect life was abundant, their visits to the various alpine plants growing in close contiguity, but rarely did one approach the score of

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Cypripedium flowers in full bloom. Occasionally I have seen insects alight on the labellum, but the temptations to enter the flower must have been few, to judge from their speedy departure.

2. Only such insects as experience the greatest amount of difficulty in escaping from the flower can remove the pollen.

When small insects, even up to the size of our common brown ant, enter the flower, and creep out again by either of the orifices near the anthers, their backs will not come in contact with the pollen, as the distance between this and the portion of the labellum on which they tread is too great, being in most specimens that I have measured one-eighth of an inch.*

Small bees, such as the sand wasp and others, are of the size to remove the pollen, but then the difficulty they experience in escaping is great. I have placed several of these within the labellum of the flower, and saw them force their way out besmeared with the pollen, but usually a good deal of time and great effort is expended in thus effecting an escape, and, to my mind, impresses the insect with the idea not to venture into such a trap again.

From all my observations then, I incline to think that but little temptation to visit the flower is offered to insects, and that from difficulty of exit, insects which have once entered this prison chamber, are not likely to do so a second time. But it may be asked, If the fertilisation of *Cypripedium Calceolus* is so imperfectly performed, how is the plant so abundant on the Continent? To this I would reply, that, like *Epipactis latifolia* (about which I had the honour a year ago of contributing a paper to the Society), Nature, as if to make up for imperfect fertilisation, has endowed this plant with a peculiarly safe method of reproduction, viz., by increase of the root; for, when favourably situated, established plants of this Cypripedium increase rapidly, single crowns soon spreading over a wide area.

* A specimen, with the glutinous pollen attached, was sent for identification to Professor Westwood, who named it *Syrphus syzittapipiens*, Linn.

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