

Ascorbic Acid (Vitamin C) and the Germination and Growth of Seedlings

SCARCELY anything is known regarding the phyto-biological role of vitamin C in the life of the higher plants, and so far as I am aware, no attempt has been made to investigate experimentally their responses when treated with this substance.

The experiments outlined in this note involved the examination of some 2,500 seeds and seedlings. The seeds were germinated on filter paper in Petri dishes, and both these and the seeds were sterilised. The ascorbic acid was dissolved in sterilised distilled water and 3-5 c.c. of this solution was added daily to each Petri dish containing 40-50 seeds. The filter-paper of the controls was moistened with the same quantity of sterilised distilled water. No nutrient substance was supplied, and the experiments were concluded when the reserves of the seeds were exhausted (generally in 12-13 days). The average total amounts of ascorbic acid supplied during this period were, for the different concentrations used, namely, 1/10,000, 5/10,000, 2.5/1,000 and 5/1,000, 4 mgm., 20 mgm., 95 mgm., and 150 mgm.

The observed effects on wheat were as follow. With concentrations of 1/10,000 and 5/10,000; no stimulation of germination, but an acceleration of growth and an increase of 25-30 per cent in the length of the shoots. At the end of the experiments, the weight of the shoots of the treated plants—as compared with the controls—showed an increase of 25-30 per cent and that of the roots an increase up to 50 per cent. A concentration of 2.5/1,000 exercised a slight inhibitory effect upon germination and a very marked one (24-45 per cent) upon the growth and weight of the seedlings. The concentration of 5/1,000 proved to be practically lethal.

Oats were much less sensitive both as regards the stimulatory and the inhibitory effects of ascorbic acid. On the other hand, it was noticed that upon seedlings of plants—such as tomato and paprika—which have naturally a high vitamin C content, a concentration of 5/10,000 was enough to exercise inhibitory effects.

Adult tomato plants treated with a 1/10,000 concentration of ascorbic acid showed no acceleration of growth and flowering, but although the number of fruits produced was less than in the controls, their total weight was 20 per cent greater.

Titration of the vitamin C content of the treated seedlings and tomato plants revealed no increase as compared with the controls.

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Swarming of *Vorticella*

WE have observed a phenomenon of swarming in two common species of gregarious vorticellids which has apparently not been recorded hitherto.

Vorticella campanula is found living in crowded groups on pond weed. In an aquarium, the whole population of a group will leave their stalks almost simultaneously and become free-swimming. They do not disperse, but remain for an hour or two suspended from the weed in thread-like swarms. Fig. 1 is a photograph (half natural size) showing three such threads. One of the threads is seen to have a triple

base: it arose by the fusion of three threads brought into contact by water movements. Each thread has a mucous core which is collectively secreted by the swarmer, each individual contributing its own mucous strand to the thread. The swarmer, after swimming actively for a time—some very close to the thread, some actually within it—finally settle down again in groups on solid objects.

We have observed this swarming many times, not only in *V. campanula*, but also in another gregarious form, *V. chlorostigma*. Usually, in the latter, the swimming animals collectively form a globular cloud, like a minute swarm of bees. Within this they appear to move quite freely; but the swarm as a whole can be dragged through the water with a needle; and it was demonstrated in other ways that in this species too the swarming individuals are united by mucus. The new sessile groups, formed by the settling of a swarm, sometimes swarmed again after twenty-four hours, and occasionally this was repeated on three or four successive days.

We cannot say what is the stimulus that causes *Vorticella* to swarm. Continuous observation, extending over the complete sessile and free-swimming cycle, proved that swarming is not, at any rate immediately, connected with asexual reproduction or with conjugation. Obviously such behaviour, in natural conditions, admirably subserves the dispersal and settlement in contiguity of a gregarious sessile protozoon.

A full account of these observations will be published in the *Proceedings of the Zoological Society*.

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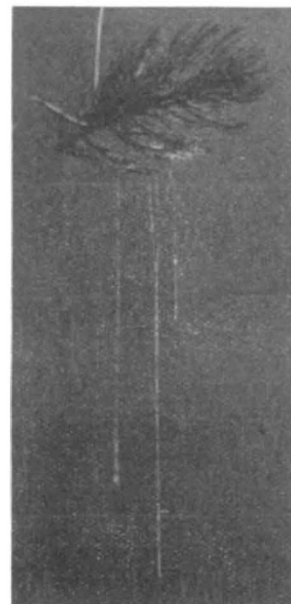


FIG. 1.

Puff and Profile Theory of the Vowels

THE portions of sound film tracks reproduced in Fig. 1 are from registrations of the vowels *oo* (as in *boo*), *ee* (as in *bee*), *ah* (as in *bah*), *ay* (as in *bay*), *æ* (from *a* in *an*). The registration in each case shows a series of contiguous short bits of vibration in each of which the movement begins strongly and fades rapidly to zero. Such a movement occurs only as a free vibration, that is, as the movement of a vibratory system disturbed in its equilibrium and then left to itself. A vibration of this kind is produced when the air in the vocal cavity is rarefied or condensed by snapping the thumb out of the mouth or by closing and suddenly opening the glottis. Such a sudden