Effect of Gibberellin on the Growth of Pollen Tubes

POLLEN grains have recently been used to study the effects of gibberellin. Kato[1] obtained a marked stimulation in germination and tube growth in *Lilium longiflorum*. In 50 mgm./l. of gibberellin the tube growth was five times that of the control during five hours. In a more extensive study Chandler[2] confirmed the growth-promoting property of gibberellic acid on pollen grains of 27 species, and 7 of these showed an increase in the percentage of germination as well as tube length.

I have investigated the effects of gibberellin (obtained through the courtesy of Dr. L. G. Nickell, Chas. Pfizer Inc., New York) alone and in combination with kinetin and 3-indoleacetic acid on the pollen grains of *Pisum sativum*. The individual effects of kinetin, 3-indoleacetic acid and boric acid were also tried.

The pollen was cultured in cavity slides by the usual hanging drop technique in a basal medium consisting of sucrose (1·0 *M*) and agar (1 per cent). The aqueous solutions of gibberellin, 3-indoleacetic acid, kinetin and boric acid in concentrations of 0·05, 0·1, 5, 10, 50, 100, 250, and 500 mgm./l. were added to the basal medium just before sowing the pollen grains. For every concentration, five sets with two cultures each were tested.

The most marked effect of gibberellin was on the tube growth. In 0·05 mgm./l. (Table 1) the tube length was 2,822μ, that is, more than seven times that of control (389 μ). At higher concentrations the growth was more than the control, but it gradually declined and at 500 mgm./l. the tubes measured only 367 μ.

Table 1

Medium	Concentration (mgm/l.)	Percentage germination	Tube length (μ)
1. *BM* (control) ..	0·0	92	389
2. *BM* + gibberellin	0·05	94	2822
3. *BM* + boric acid	100·0	96	1444
4. *BM* + kinetin ..	50·0	98	1212
5. *BM* + 3-indole acetic acid ..	50·0	89	930
6. *BM* + *kinetin + gibberellin ..	50·0	91	1029
7. *BM* + *3-indole acetic acid + gibberellin	50·0	92	897

BM = basal medium : sucrose 1·0 *M* + agar 1 per cent
The percentage of germination is based on the averages of 500 or more pollen grains, and tube lengths on the averages of 50 tubes. All cultures were maintained at 25° ± 1° C., for 24 hours.
* Concentrations of kinetin (50 mgm./l.) and 3-indoleacetic acid (50 mgm./l.) were kept constant

In 0·05 mgm./l. of gibberellin the tubes were smooth and straight, while at higher concentrations (100–500 mgm./l.), as in the control, considerable bloating (that is, broadening at tips) and bursting of pollen grains was observed.

Gibberellin had no promoting effect on germination. The percentage (92–94) remained almost constant in 0·05–250 mgm./l. of gibberellin and there was an inhibitory effect at 500 mgm./l. yielding only 59 per cent germination.

The maximum tube growth obtained with other test substances, for example, boric acid, kinetin and 3-indoleacetic acid was definitely higher than the control, but the effect of gibberellin was much more pronounced (Table 1).

Gibberellin in combination with kinetin did not bring about any improvement in tube growth. With 0·05 mgm./l. gibberellin + 50 mgm./l. kinetin the tube length was only 930 μ as compared to 2822 μ in 0·05 mgm./l. of gibberellin alone. The maximum tube length in kinetin + gibberellin measured only 1,029 μ, which was almost the same as that obtained in 50 mgm./l. of kinetin alone. Similar response was obtained with 3-indoleacetic acid + gibberellin. Thus, it is obvious that the addition of kinetin or 3-indoleacetic acid to gibberellin does not promote tube growth.

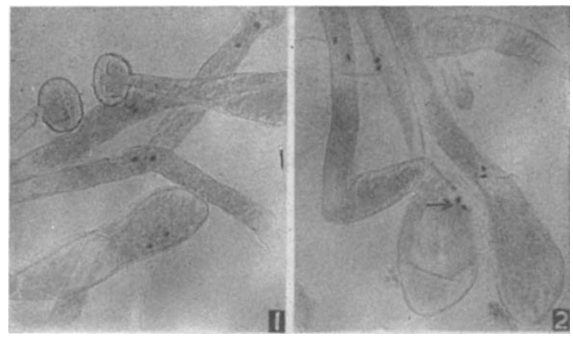

Fig. 1. Pollen tubes with two male gametes (× 160)

Fig. 2. Same, showing two and four gametes ; the arrow points to two overlapping gametes (× 160). (In both cases pollen was germinated in sucrose 1·0 *M* + agar 1 per cent + gibberellin 0·05 mgm./l.)

A notable effect of gibberellin was the stimulation of generative cell to divide frequently (96 per cent) and produce two male gametes (Fig. 1). Rarely, both the gametes divided once again resulting in four sperm cells (Fig. 2). In control, however, only 7 per cent cases of division of the generative cell were observed.

In conclusion, it may be stated that this study supports the previous observations of stimulation of pollen tube growth by gibberellin and reports for the first time, as far as I am aware, the stimulatory effect on the generative cell and male gametes.

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Action of Inhibitor-β on the Growth of *Striga* Seedlings

THE presence of a growth-inhibitory substance or substances in plant extracts, moving in paper chromatography with ammonical iso-propanol between R_F 0·55 and 0·8 was first demonstrated by Bennet-Clark and Kefford[1] who suggested the name inhibitor-β. These are now known to occur widely in plant material[2,3], and according to Varga and Ferenczy[2] the chromatographic behaviour is suggestive of a phenolic acid. Recently Bently[4] reported that the inhibitor-β zone from potato peelings contained at least six components (possibly fatty acids) and that inhibition in *Avena* straight-growth assays was caused by toxicity at greater than normal physiological