cuticular transpiration reported previously[7] was not verified. So far, however, we can only speculate about the mechanism whereby the fusicoccin opens the stomata. It is known that stomata open as the guard cells increase in turgor. As fusicoccin increases the absorption of water by leaf disks of tomato[15], perhaps it increases absorption of water by guard cells to a greater extent than the surrounding epidermal cells. Recent work[16] has suggested that movement of potassium ions into the guard cells in the light could account for the increase in turgor. Certainly fusicoccin can increase the permeability of cells to potassium ions[15], but for stomata to open in the dark there must be a source of energy other than light or immediate photosynthetic products. The greater rates of respiration found in disks treated with fusicoccin[15] may provide this source of energy.

NEIL C. TURNER
Connecticut Agricultural Experiment Station,
New Haven, Connecticut.

ANTONIO GRANITI
Istituto di Patologia Vegetale,
University of Bari,
Italy.

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Control of Flower Growth and Development by Gibberellic Acid

THE presence of gibberellin-like substances in floral parts (petals plus ovary)[1] and demonstrations that gibberellic acid (GA_3) can promote the growth of sepals and petals[1,2] have indicated that gibberellins are involved in the growth of flowers. Further evidence, presented here, indicates that in carnation the application of GA_3 diverts assimilates to the flower and hastens development towards anthesis.

Plants of carnation (*Dianthus*), variety 'White Sim,' bearing a single shoot with a terminal flower were taken when elongation of the calyx was complete but the petals had not yet grown to fill the cavity of the bud. About 0·4 ml. of aqueous solution of GA_3 was injected into this cavity. One hour later carbon dioxide derived from sodium carbonate–14C, with an activity of 45 μCi, was fed to a leaf that was five leaf pairs from the floral bracts. Illumination was provided by "daylight" fluorescent lamps giving an intensity of about 14,000 lux at the surface of the fed leaf. The leaf was exposed to $^{14}CO_2$ for 2 h and plants were allowed to remain for a further period at a low light intensity before they were assayed for radioactivity. During treatment, air temperature was maintained at $22 \pm 1°$ C. Radioassay of plant parts was by a technique similar to that described by O'Brien and Wardlaw[3]. Material was dried at 85° C and ground to a powder. Samples were then plated onto stainless steel planchettes and radioactivity was determined using a thin mica end-window Geiger–Müller tube.

Table 1 shows the radioactivity in the flower after 5 and 18 h in terms of counts per minute and also as a percentage of the total activity in the whole plant, including the roots. There was a diversion of assimilates to the flower as a result of the localized application of GA_3 apparent 5 h after feeding the $^{14}CO_2$ and only 6 h after the application of GA_3. Analysis of variance showed the effect to be highly significant ($P < 0·01$). The response to GA_3 was not peculiar to the developing tissues of the flower, for when the growth substance was applied to the stump of the stem after removal of the flower accumulation of ^{14}C-labelled assimilates was promoted in the treated part. This suggests an effect similar to the hormonally induced transport of metabolites[4] in French bean, although in this case GA_3 was effective in directing transport only when applied together with indol-3-yl-acetic acid.

Table 1. ACCUMULATION OF CARBON-14 IN THE FLOWER OF CARNATION AS AFFECTED BY APPLICATION OF GA_3 TO THE FLOWER BUD

Hours after start of feeding $^{14}CO_2$	Activity in flower (c.p.m.) Water	GA_3 10 p.p.m.	GA_3 40 p.p.m.
5	2,114 (3·6)*	3,259 (5·6)	4,085 (7·2)
18	19,060 (26·6)	23,608 (31·3)	26,062 (35·9)

Four plants received each treatment.

* Values in parentheses represent activity in the flower as a percentage of the activity in the whole plant.

Table 2 shows results of a long term glasshouse experiment where GA_3 was injected into flower buds at intervals of about 3 days throughout development[1]. Growth in terms of the dry weight of the flower during the first 4 weeks was increased significantly ($P < 0·01$) by GA_3. The rate of flower development was also increased so that, with the highest concentration of GA_3 used, flowers opened on average 7 days earlier than usual. GA_3 had no significant effect on the dry weight of the flower at the time of opening, presumably because the effect of a faster rate of growth was offset by a shorter period of growth. Confirmation of these effects has been obtained in similar experiments.

Table 2. EFFECT OF GA_3 APPLIED TO THE DEVELOPING FLOWER OF CARNATION

	Water	GA_3 2 p.p.m.	GA_3 20 p.p.m.	GA_3 200 p.p.m.
Dry weight of flower after 4 weeks (g)	0·16	0·19	0·25	0·27
Dry weight of flower at opening (g)	1·27	1·20	1·18	1·18
Days to opening of flower	55	52	50	48

Twelve plants received each treatment.

Previous results led to the suggestion that processes controlling the rate of development of the flower also control the partition of dry weight between the flower and the rest of the shoot[5]. The results reported here indicate that gibberellins occurring in the flower may have a role in linking these aspects of development and growth, regulating progress towards anthesis on the one hand and determining the distribution of assimilates on the other hand.

G. P. HARRIS
B. JEFFCOAT
J. F. GARROD
Department of Horticulture,
University of Reading.

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