SHORT COMMUNICATIONS

AN EFFECT OF KINETIN ON THE TRANSLOCATION OF ^{14}C-LABELLED PHOTOSYNTHATE IN CITRUS*

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This study indicates that the application of kinetin to a recently formed fruit enhances its ability to import photosynthetic assimilates. Cytokinins are known to influence the transport of plant metabolites (Letham 1967), and in the case of vine shoots Shindy and Weaver (1967) have recently demonstrated an effect of the kinin 6-(benzylamino)-9-(2-tetrahydropyranyl)-9*H*-purine on the translocation of ^{14}C-labelled assimilates. The present paper reports an effect of kinetin (6-furfurylamino-purine) on the accumulation of ^{14}C-labelled substrates by citrus fruits (cv. Washington Navel). In such crops the newly formed fruitlet is often unable to compete successfully with adjacent expanding leaves for substrates and this is thought to result in early fruit drop (Haas 1949; Sauer 1954).

Materials and Methods

The experiments made use of 2-year-old rooted cuttings of cv. Washington Navel raised in the glasshouse according to the method of Gates, Bouma, and Groenewegen (1961). A current growth flush had produced groups of two or three fruitlets at five points along a single well-developed shoot and these were designated groups 1–5 basipetally. Starting 25 days after the blossoms opened, kinetin was applied at 0 and 500 p.p.m. to the newly formed fruits.

The kinetin was first dissolved in a minimum volume of 0·1N HCl and the solution adjusted to pH 6·0 during dilution. A wetting agent was added to the final solutions and they were applied to the fruits with a camel-hair brush. Successive groups of fruits along the shoot had from one to five applications spaced at 3- or 4-day intervals.

Following the final kinetin application to a given group, $^{14}CO_2$ generated from 2 mg $Ba^{14}CO_3$ with a specific activity of 1·5 mc/m-mole was supplied to a nearby leaf, and the fed leaf and adjacent fruits were harvested 24 hr later. After measuring fresh weight, the fruits were sectioned and dried between filter paper at room temperature together with the source leaf and other tissues. The mounted specimens were then exposed to Kodak medical X-ray film which was developed after 3–8 days, depending on the level of radioactivity.

Prior to exposure, the source leaf was masked with transparent adhesive tape so that the image of adjacent tissues would not be obscured on the X-ray film. At the time of harvest, samples of fruit were taken for dry weight and moisture determination (dried at 80°C for 3 days), and this dried material was then ground to a fine powder and 5-mg subsamples, weighed to $\pm 0{\cdot}05$ mg and known to afford maximum counting efficiency for this type of material, were assayed for radioactivity in a Packard liquid scintillator.

Results and Discussion

The effect of 500 p.p.m. kinetin on the import of labelled assimilate into the treated fruit is shown in Figures 1–4 and in Table 1. Autoradiographs were prepared

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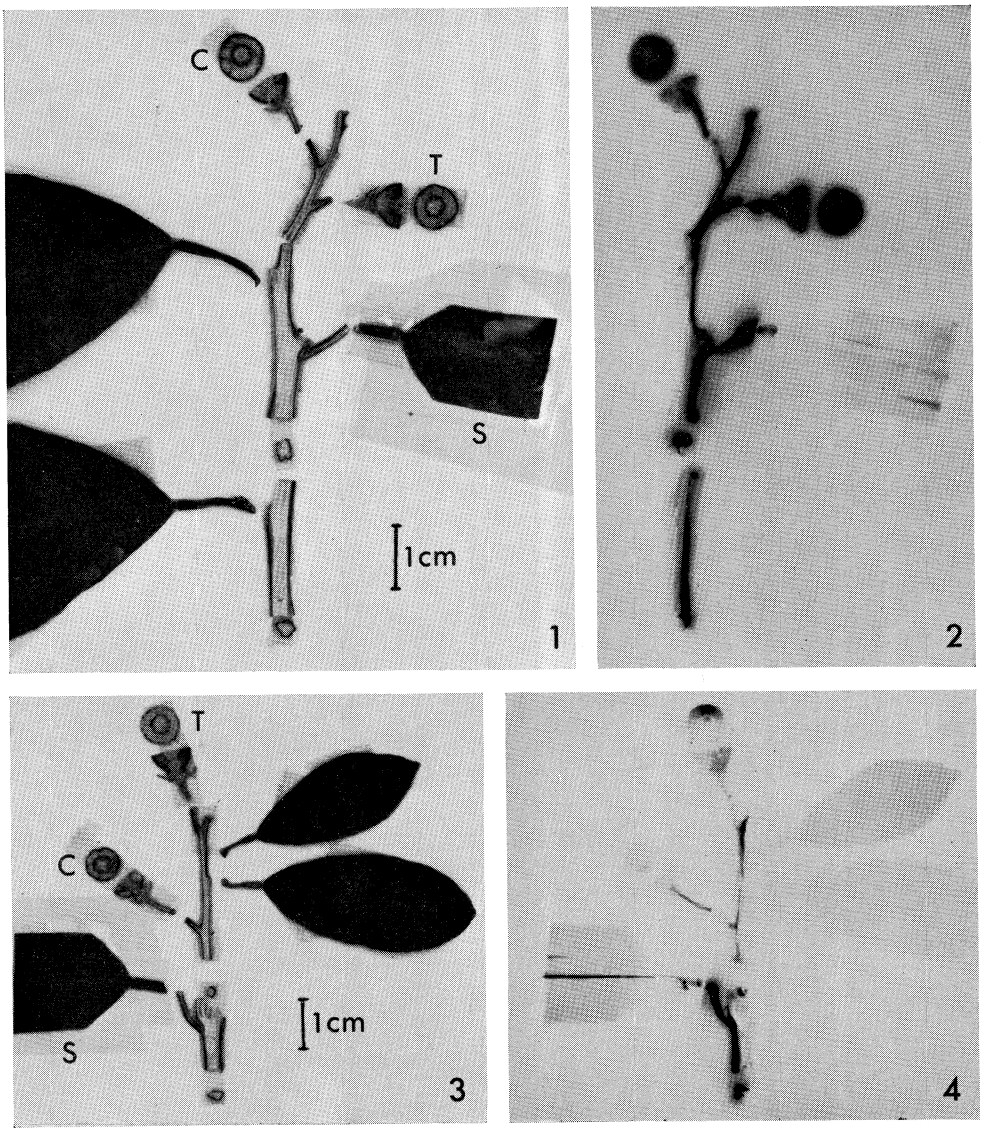
for all groups but only those for two groups are shown. In all cases the treated fruits showed a higher level of incorporation of labelled assimilate than the controls. In



Figs. 1–4.—Autoradiographs of shoots of orange tree (cv. Washington Navel) 24 hr after supplying $^{14}CO_2$ to the source leaf, *S* (Figs. 1 and 3) and after exposure to X-ray film for 7 (Fig. 2) and 4 (Fig. 4) days. Figures 1 and 2 show results for a single application of kinetin (500 p.p.m.), Figures 3 and 4 for two applications of kinetin at the same concentration. *T*, treated fruit. *C*, control fruit.

preliminary experiments, treatment with 100 p.p.m. kinetin gave inconsistent results; these results are not reported.

Following a single application of kinetin (Figs. 1 and 2) a treated fruit shows enhanced import of labelled assimilate, especially around the periphery of the fruit as seen in transverse section. Although the source leaf provides some basipetal translocate, it is noteworthy that adjacent leaves showed no import.

TABLE 1

EFFECT OF KINETIN ON THE IMPORT OF ^{14}C-LABELLED ASSIMILATES BY SMALL ORANGE FRUITS

Group No.*	No. of Kinetin Applications	Kinetin Concn. (p.p.m.)	Fresh Weight at Harvest (g/fruit)	Radioactivity of Dried Fruit (counts/min above background)†	
2	1	0	0·413	5,371	(123)
		500	0·494	17,105	(114)
1	2	0	0·377	152	(10)
		500	0·474	577	(16)
3	2	0	1·644	19,767	(625)
		500	0·923	51,866	(809)
4	4	0	1·568	71	(25)
		500	1·063	1,766	(10)
5	5	0	1·715	24	(2)
		500	0·793	3,700	(81)

* Group numbers refer to the position of the fruit cluster along the length of the parent shoot from apex to base.

† Radioactivity determined on 5 mg dried tissue. Standard errors for five subsamples given in parenthesis.

The autoradiographs in Figures 3 and 4 show essentially the same result as in Figures 1 and 2. In this case two applications of kinetin were made. The previous observation on translocation is confirmed. Although the control fruit was probably in a better location for the import of assimilates from this particular source leaf, it showed a lower level of radioactivity than the kinetin-treated fruit. The uneven distribution of label within this latter fruit is not necessarily due to the kinetin and has been a feature of other translocation experiments within the present project. The young leaves near the fruit in Figures 3 and 4 were still expanding and at that stage of their development they are known to represent substantial sinks for assimilates (Kriedemann and Alexander, unpublished data).

The data presented in Table 1 clearly indicate that kinetin affects the accumulation of labelled substrates in citrus fruits, irrespective of the position of the fruit on the shoot or of number of applications of kinetin.

References

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