begun. Following are some data obtained from these experiments. The average number of roots per cutting is given, with the probable error.

It seems impossible to explain these results on the theory that ethylene acts in the same manner as a growth hormone. It will be seen that the ethylene alone increases the number of roots by 4.3, and the heteroauxin alone increases it by 11.2. If the ethylene acts in the manner of a growth hormone, the ethylene and heteroauxin together could not increase the number of roots by more than 15.5, or the sum of the two preceding figures. Nevertheless, in this experiment the increase was not 15.5 or less, but 28.6. It appears, therefore, that ethylene can not be acting directly to stimulate root formation, but that it must in some way cause the growth hormone to become more active.

In none of the above experiments can the ethylene have acted in the same manner as a growth hormone. It seems probable, therefore, that all the effects of ethylene on growth are to be explained, not as direct effects of ethylene alone, but as effects of ethylene on a growth hormone.[5]

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THE ANTISCORBUTIC VALUE OF DANDELION[1]

RECENTLY two studies[2,4] appeared in SCIENCE concerning the chemical composition of dandelion and its value as a food. Bennett[2] has shown that dandelion contains large amounts of protein, fat and little fiber. It contains much more calcium and phosphorus than either lettuce, cabbage leaves, mangold leaves or spinach. According to Sherman,[3] however, there is much less calcium in dandelion than in the above-mentioned vegetables, and Youngburg[4] finds the phosphorus to be much lower. We were especially interested in the vitamin C content of dandelion and have determined it by three different methods: (1) Titration by the oxidation-reduction indicator, 2,6-dichlorobenzenone indophenol; (2) the authors' enzymic method[5]; (3) animal assay, using guinea-pigs as experimental animals. Analysis by both chemical methods has shown that the ascorbic acid content of dandelion varies between 0.08 and 0.10 mg per g of fresh greens. The animal experiments have shown that 10 gms of the plant are necessary for proper growth and the prevention of loss of weight and the development of scurvy, when using the basal diet of La Mer, Campbell and Sherman.[6] Our experiments show that the ascorbic acid content of dandelion is about 0.1 mg per gm, which is only 1/6 to 1/10 of that of spinach and is much less than that of cabbage. The minimum protective dose of ascorbic acid for guinea pigs, when macroscopic evidence is considered, is 0.9 mg per animal per day, according to Birch and associates.[7] This figure is probably more nearly correct than the one of 0.5 mg given by Göthlin.[8]

For comparison we are showing the vitamin C content[9] of the greens of parsnips, parsley and turnips (Table I). Some of these are quite rich in this ingredient.

TABLE I

	Ascorbic acid mg per g
Dandelion, greens	0.08–0.10
Spinach, fresh	0.92–1.0
Cabbage, new[10]	0.40
Parsley, greens	1.4 –1.8
Parsnips, "	2.10–2.16
Turnips, "	1.1 –1.2
Beets, "	0.36–4.0

Thus, although dandelion contains more protein, fat, carbohydrates, iron and ash than some other leafy foods, it is not a good source of vitamin C.

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5 This is also in agreement with the work of van der Laan. "Also sind bei Avena die Beschädigungen, die durch Aethylengas verursacht werden, auf eine Hemmung der Wuchsstoffbildung zurückzuführen." Recueil des travaux botanique néerlandais, XXXI: 733, 1934.

1 This investigation was aided by a grant from the Committee on Scientific Research, American Medical Association.

2 Bennett, SCIENCE, 80: 142, 1934.

3 Sherman, "Food Products," third edition, The Macmillan Company, New York, 1933.

4 Youngburg, SCIENCE, 80: 338, 1934.

5 Tauber and Kleiner, *Jour. Biol. Chem.*, 110: 559, 1935.

6 La Mer, Campbell and Sherman, *Jour. Am. Chem. Soc.*, 44: 165, 1922.

7 Birch, Harris and Ray, *Biochem. Jour.*, 27, 590, 1933.

8 Göthlin, *Nature*, 134: 569, 1934.

9 Tauber and Kleiner, *Jour. Biol. Chem.*, 108: 563, 1935.

10 Bessey and King, *Jour. Biol. Chem.*, 103: 687, 1933.

BOOKS RECEIVED

CHALK, L. and others. *Fifteen South African High Forest Timber Trees. Vol. III of Forest Trees and Timbers of the British Empire.* Pp. 103. Illustrated. Oxford University Press. $2.50.

HERRICK, GLENN W. *Insect Enemies of Shade-Trees.* Pp. viii + 417. 321 figures. Comstock, Ithaca, N. Y. $5.00.

JONES, H. SPENCER. *Worlds without End.* Pp. xv + 329. 32 plates. Macmillan. $3.00.

SCHMIDT, HARRY. *Einführung in die Vektor- und Tensorrechnung unter besonderer Berücksichtigung ihrer physikalischen Bedeutung.* Pp. v + 125. 20 figures. Max Jänecke, Leipzig. 5.80 RM.

SUTHERLAND, G. B. B. M. *Infra-Red and Raman Spectra.* Pp. xi + 112. 27 figures. Methuen, London. 3/-.

WALSH, J. L. *Interpolation and Approximation by Rational Functions in the Complex Domain. Vol. XX of Colloquium Publications.* Pp. ix + 382. American Mathematical Society.