associated with the juvenile leaf form in *Ipomoea*[6]. Allsopp[7], discussing the effect of growth substances on heteroblastic development, suggests that the mechanism of the action of these substances in delaying the onset of the adult leaf form is through their effect in diverting nutrients from the apex to other organs thereby producing changes in the shoot–root ratio, generally inhibiting growth and depressing the activity of the apex. In *Ipomoea*, however, both 2,3,5-triiodobenzoic acid and gibberellic acid treatment increase shoot growth and leaf production, indicating increased rather than decreased activity of the apex. But there is a relative depression of root growth. Whether this reduced root growth has a causal relation to leaf form, for example, by bringing about a deficiency of phyllocaline or some other substance produced by the roots as suggested by Audus[8], requires further investigation.

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[1] Robbins, W. J., *Amer. J. Bot.*, **44**, 743 (1957).
[2] Scurfield, G., and Moore, G. W. E., *Nature*, **181**, 1276 (1958).
[3] Njoku, E., *New Phytol.*, **55**, 91 (1956).
[4] Brian, P. W., *Nature*, **181**, 1122 (1958).
[5] Humphries, E. C., *Nature*, **181**, 1081 (1958).
[6] Njoku, E., *New Phytol.*, **56**, 154 (1957).
[7] Allsopp, A., *Nature*, **173**, 1032 (1954).
[8] Audus, L. J., "Plant Growth Substances", 321 (London, 1953).

Occurrence of Gibberellin-like Substances in the Coconut

Coconut milk contains substances which promote the growth of plant tissue cultures and isolated embryos. Some of these have been isolated[1,2] and one has been shown to be 1 : 3-diphenylurea[3]. Mauney *et al.*[4] have found a growth-factor which is mainly in the flesh of the coconut.

Substances which are physiologically gibberellin-like, in so far as they promote increased growth of genetic dwarfs of some plants, have been found in the immature seeds of a number of species of plant[5]. One of these has been identified[6] as gibberellin A_1. Experiments are described below which indicate that gibberellin-like substances occur in milk, flesh and embryos of the coconut. The growth-promoting properties of coconut milk may well be in part due to such materials.

Coconut milk was acidified to *p*H 2·5 and was stirred with activated carbon (20 gm./l.). The carbon was eluted with 70 per cent acetone. The acetone was then distilled off *in vacuo*, and the aqueous residue acidified and extracted with ethyl acetate. The ethyl acetate was dried and distilled off, and the residue was dissolved in ethanol and spotted on chromatography paper. Chromatograms were run in the following solvent system : chloroform/water/ethanol/formic acid (20 : 2 : 4 : 1). A chromatogram run from one spot was tested for gibberellin-like activity by the use of the wheat leaf section test[7]. Using this as a guide, the presumed active part of the main chromatogram was eluted with water and this was extracted with ethyl acetate. The eluate was concentrated and applied to the leaves of intact dwarf peas in ethanol.

The solid endosperm was macerated in a blendor with carbon tetrachloride to remove most of the oil. The solvent was filtered off, and the solid material was extracted with ethanol at room temperature overnight. The endosperm was filtered and pressed, and the ethanol solution was distilled *in vacuo*. The aqueous residue was filtered, acidified to *p*H 2·5 and extracted with ethyl acetate. The acid fraction was removed with 1 per cent sodium bicarbonate solution, which was acidified and extracted with ethyl acetate. This was concentrated and chromatogrammed as in the case of the milk. In this experiment the whole chromatogram was eluted in two parts, as the activity appeared to be spread over a large area.

The solidified coconut oil remaining when the carbon tetrachloride had been distilled off was stirred with water. The fat was filtered off after chilling. The water was then treated in the same way as the aqueous residue in the experiment described above.

Embryos found in some of the coconuts were extracted like the solid endosperm.

Table 1. Growth-rate of 'Meteor' pea seedlings expressed as percentage of that of untreated seedlings, after application of extracts of coconuts

Substance extracted	Fresh weight equiv. (gm.) of extract applied to each test plant	Days after treatment				
Exp. 1		0–2	2–5	5–9	9–12	12–16
Meat	457	218	314	256	219	200
Exp. 2		0–3	3–6	6–10	10–14	
Meat R_F 0–0·4	166	181	307	309	184	
Meat R_F 0·4–1·0		195	184	136	87	
Oil R_F 0–0·4		240	284	250	150	
Oil R_F 0·4–1·0		231	253	209	140	
Embryos R_F 0–0·4	1·9	227	281	277	165	
Embryos R_F 0·4–1·0		240	361	486	353	
Oil (embryos) R_F 0–0·4		263	261	281	197	
Oil (embryos) R_F 0·4–1·0		190	184	109	100	
Exp. 3		0–3	3–6	6–11	11–14	
Milk	188*	192	225	220	109	

* ml. of coconut milk.

The results given in Table 1 show that gibberellin-like activity was found in all parts of the coconut. The activity of the milk extracts cannot be directly compared with that from the meat, as a different sample of nuts was used. The activity of the extract of the embryos was remarkably high and needs to be confirmed ; this will be done when more coconut embryos are available. The nuts used in these experiments were fairly mature with a high proportion of solid to liquid endosperm. It is possible that younger nuts would contain more gibberellin-like activity, for whereas the embryos seem to contain an amount of gibberellin-like substances of the same order as young bean seeds[6], the endosperm contains much less, while in bean seeds the activity is distributed more or less evenly through all the tissues of the seed[7].

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[1] Schantz, E. M., and Steward, F. C., *J. Amer. Chem. Soc.*, **74**, 6133 (1952).
[2] Duhamet, L., and Mentzer, C., *C.R. Acad. Sci., Paris*, **241**, 86 (1955).
[3] Schantz, E. M., and Steward, F. C., *J. Amer. Chem. Soc.*, **77**, 6351 (1955).
[4] Mauney, J. R., Hillman, W. S., Miller, C. O., Skoog, F., Clayton, R. A., and Strong, F. M., *Physiol. Plant.*, **5**, 485 (1952).
[5] Phinney, B. O., West, C. A., Ritzel, Mary, and Neely, P. M., *Proc. Nat. Acad. Sci.*, **43**, 398 (1957).
[6] MacMillan, J., and Suter, P. J., *Naturwiss.*, **45**, 46 (1958).
[7] Radley, M., *Ann. Bot.*, **22**, 297 (1958).