At the commencement of germination, contrary to the usual description[2], the proximal region (*e*) of the cotyledon elongates and the enveloping portion of the cotyledon is forced through the 'soft eye', while the plumule and radicle remain enclosed. This portion of the embryo outside the endocarp enlarges, and the plumule then breaks through the cotyledon to develop into the shoot, while the radicle emerges after a few weeks as the first root.

This embryo is comparable to that typical of the family Gramineæ (Fig. 3). It may be considered as having been derived from the latter, by the scutellum (*X*) and the epiblast (*Y*) extending over the plumule and tending to fuse completely, while the haustorial region (*Z*) extends into the endosperm to increase the surface of absorption.

It is hoped to publish an account of the mature embryo-sac and the development of the embryo, as work on these is under way.

I should like to thank Prof. I. V. Newman for directing my attention to this problem.

E. M. Selvaratnam

Department of Botany,
University of Ceylon,
Colombo.
Nov. 12.

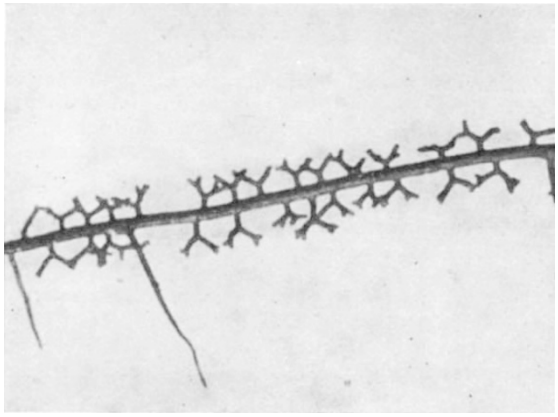
[1] Johansen, D. A., "Plant Embryology", 252 (Waltham, Mass.: Chronica Botanica Co., 1950).

[2] For example, Sampson, H. C., "The Coconut Palm", 78 and 79 and Plates XX *A* and *B* (London: John Bale, Sons and Danielsson, Ltd., 1923).

Forking in Pine Roots

Forking of the short-root system of pine is frequent in Nature and is known to be due to the influence of mycorrhizal mycelia and probably also to certain other types of root fungi. Slankis[1] has demonstrated that in excised pine roots growing in a nutritive solution, forking can be produced by exudates of mycorrhizal fungi (for example, species of *Boletus*) and by growth substances like β-indoleacetic acid and α-naphthaleneacetic acid.

In some experimental studies carried out at Bedford College, pots carrying Scots pine seedlings were fitted into the necks of earthenware jars. The roots of the seedlings growing from the bottom of the pots formed a root system in the leaching water that collected in the containers. Irrespective of the type of potting soil used, the root system developing in the leaching water showed (1) rich forking of the short roots (see accompanying photograph) when the seedlings in the pots had formed mycorrhizas, (2) no forking when the seedlings in the pots possessed no mycorrhizal associations. None of these container roots exhibited any trace of mycorrhizal or other infection. It would appear that the forking is induced by exudates of the mycorrhizal fungi in the potting soil washed into the containers. (So far there is no indication that other washings from the soil are responsible for the forking.) These results conform with Slankis's observations on excised roots.



Forking of a pine root growing in a container with leaching water (× 2)

A further point of interest is that in some experiments in which plants with intracellular (haustorial) infection were used, the container roots were forked and possessed infection of the haustorial type.

Ida Levisohn

Bedford College,
(University of London),
Regent's Park,
London, N.W.1.
Dec. 3.

[1] Slankis, V., *Physiol. Plant.*, **1**, 390 (1948); *Svensk. Bot. Tidskr.*, **43**, 603 (1949); *Physiol. Plant.*, **3**, 40 (1950).

Effect of Adding Penicillin to Turkey Starter Mash

Following reports by Stokstad and Jukes[1] that the addition of aureomycin to the diet of chicks stimulated growth, and by Whitehall *et al.*[2] and Groschke and Evans[3] that other antibiotics had a similar effect, it has now become almost universal practice in the United States to supplement the starter mash of chicks and turkeys with one or other of these agents. In Great Britain, Coates *et al.*[4] confirmed that growth stimulation occurs in chicks and discussed the possible mode of action of the antibiotic.

The importance of rapid growth in table poultry, perhaps more particularly in turkeys, will be readily appreciated, and since, generally speaking, the weights of growing turkeys obtained in Britain compare unfavourably with those of birds of the same age reared under American conditions, it was decided to try the effect of the addition of penicillin to the starter diet.

Crystalline penicillin (sodium salt) was added at the rate of 12·6 gm. per ton to a standard turkey-rearing mash. Feeding, which was *ad lib.*, commenced at a day old and was continued for twelve weeks. In this particular series of experiments, five groups of approximately fifty turkeys were used. These were hatched at different dates throughout the summer; at the time of writing, the oldest are 21 weeks. A similar number of turkeys were kept as controls under identical conditions.

A very striking increase in growth-rate occurred in every group of treated birds. At four weeks the average weights were 1·26, 1·24, 1·12, 1·02 and 0·84 lb., compared with 1·03, 0·87, 0·64, 0·79 and 0·61 lb. respectively in the control groups.

This improvement was observed in all groups throughout the experiment and continued after the feeding of penicillin was stopped. In the oldest group of treated birds at 20 weeks, the heaviest stag was 20·75 lb. and the average weight was 16·4 lb., compared with a heaviest weight of 16·25 lb. and an average weight of 14·7 lb. in the comparable control pen. The average weight of hens was 12·1 lb.

© 1952 Nature Publishing Group