highest on *S.*22 but, with the higher digestibility of 'Tetila Tetrone', intake was estimated to be higher on the latter. The average weight of the two groups of calves was similar at this time.

The hay made from plots 1*a* and *b* was fed to one pair of dizygous twin cattle housed in individual pens during a four-month period. The hays fed to the animals were changed over at intervals. The mean intakes, lb. of organic matter per 100 lb. live weight, were 1·7 for *S.*22 and 1·8 for 'Tetila Tetrone'. The O.M. digestibility of the hays measured *in vitro* was 73·8 for *S.*22 and 76·7 for 'Tetila Tetrone'. When an animal was fed 'Tetila Tetrone' hay it appeared to gain weight at a faster rate, but with the complication of gut fill in the short periods of feeding the validity of this measurement is doubtful. The fæces of the animal fed *S.*22 always appeared to be firmer but the dry matter contents were again similar (*S.*22 13·2 per cent, 'T. Tetrone' 13·6 per cent).

All the results favour the tetraploid varieties. The differences between *S.*22 and 'Tetila Tetrone', if confirmed, could be sufficient to have a significant effect on animal performance during a grazing season.

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Wax and the Water Vapour Permeability of Apple Cuticle

The storage characteristics of apples depend on the variety. In particular some varieties have a tendency to shrivel or 'wilt' because they have lost excessive water by transpiration. The transpiration rate of an apple will clearly depend on the resistance to water vapour movement of the apple cuticle.

If an apple cuticle is separated from its adjacent tissues and is then immersed in warm ether, the ether soluble fraction, referred to here as 'wax', amounts to some 50 per cent of the total cuticular matter[1]. It has been shown that transpiration from leaf surfaces[2] and insects[3] is affected if the cuticular wax is disturbed. The question arises, therefore, as to what influence wax has on the permeability of apple cuticles.

The varieties selected for study were the relatively wilt resistant 'Granny Smith', and the relatively wilt susceptible 'Golden Delicious'. Eight disks of apple skin were carefully peeled from each of these varieties, which were of normal maturity and had been in cool store. To prevent the disks curling, they were mounted on a polythene annulus. The underlying cellular matter was removed using a gentle enzyme method[4]. Cuticular wax was removed from half the disks by soaking them for half an hour in two successive solutions of hot chloroform. The central area of each cuticle (5 cm²) was then sealed with micro-crystalline wax over an aluminium pot containing distilled water. The pots were placed in an air stream circulating at 70 ft./min and controlled at 25° C and 50 per cent relative humidity. The rate of loss of water was determined gravimetrically. The method was so designed that it was not necessary to handle the cuticle surface.

The results thus obtained are shown in Table 1. The limits quoted are the standard error of the means.

To check the reliability of the method, the transpiration of whole apples under the same conditions was measured. The permeabilities of the apple cuticles were then calculated on the assumption that the vapour inside the apple was saturated.

Table 1. Permeabilities with and without Wax

	Wax intact	Permeability (mg day⁻¹ cm⁻²) Wax removed (uncorrected)	Wax removed (corrected*)
Granny Smith	1·5 ± 0·2	67 ± 7	107
Golden Delicious	3·2 ± 0·4	64 ± 4	98

* It is necessary to apply a small correction for the impedance of the dead air between the water surface and the cuticle, and the stagnant air film adhering to the outer surface. To determine this impedance, a thin porous paper of negligible impedance was sealed across a pot in place of the cuticle. The measured permeability was 180 mg/day⁻¹ cm⁻². This corresponds to an air layer of total thickness 1·8 cm. The correction is negligible for the low permeability cuticle with intact wax.

The results shown in Table 2 are believed to be in error by not more than 10 per cent. They show reasonable agreement with the more direct measurements.

Table 2. Permeabilities measured *in situ*

	Permeability (mg/day⁻¹ cm⁻²)
Granny Smith	2·5
Golden Delicious	4·0

The difference in permeability between cuticles with and without wax is striking. For 'Granny Smith' the ratio is 1 : 70 and for 'Golden Delicious' 1 : 30.

These figures demonstrate that the cuticular wax is a prime factor determining the impedance to water vapour of an apple cuticle. The reason for the difference between the varieties is not known. It is possible that the density or geometry of the lenticles is important or it may be that the distribution or type of wax plays the dominant part. Further work aimed at resolving this point is in progress.

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Promotion of Cell Division in Tissue Cultures by Gibberellic Acid

It is well established that gibberellic acid (GA) stimulates not only cell extension but also cell division in intact plants[1,2]. It has been shown that cambial division is stimulated when GA is applied to disbudded woody shoots (including those of *Acer pseudoplatanus*)[2], but that the derivative cells do not undergo further expansion and differentiation unless indolyl-3-acetic acid is also supplied; moreover, the rate of cambial division is greatly enhanced when both hormones are applied simultaneously. Reports on the effects of GA on the growth of tissue cultures are more contradictory. Netien[3] states that GA inhibits callus tissue growth while Schroeder and Specta[4] obtained an increase in callus tissue growth in the presence of GA. Nickell *et al.*[5] investigated a large number of tissues grown in callus culture and found that GA (10 p.p.m.) in some cases caused promotion and in other cases caused inhibition of growth. These experiments were carried out on callus cultures grown on agar and in all cases the results were expressed in terms of fresh weight increase. It cannot be said from this whether GA is effecting cell division or cell enlargement, though Schroeder *et al.* suggest from anatomical observations that there was an increase in cell number in their experiments.

A series of experiments has been carried out using tissue derived from the cambium of sycamore (*Acer pseudoplatanus*), growing both on agar as a callus, and in liquid suspension culture. In both cases a modified Heller salt medium with added vitamins was used as the culture medium. No coconut milk was added to the medium.

In the case of cells grown in liquid suspension culture GA was found to promote cell division at concentrations from 15 to 50 p.p.m. but not below 15 p.p.m. (Fig. 1). At