

substances the presence of which can be demonstrated by extraction with solvents and by microchemical reactions. In this way it can be shown that the cytolastic process may be highly selective; and that the changes occurring, for example in composts, may bear reference to the balance of cell-wall constituents in the materials employed.

The accompanying photomicrographs illustrate some of the salient features in the changes described above.

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¹ Waksman, S. A., Umbreit, W. W., and Cordon, T. C., 'Thermophilic Actinomycetes and Fungi in Soils and Composts', *Soil Science*, 47, 37 (1939).

² Baker, F., and Martin, R., 'Disintegration of Cell-Wall Substances in the Gastro-Intestinal Tract of Herbivora' (with references to previous publications, 1931-1937), *NATURE*, 141, 877 (1938).

³ Baker, F., and Martin, R., 'Studies in the Microbiology of the Caecum of the Horse', *Z. Bakt., Abt. II*, 99 (1939).

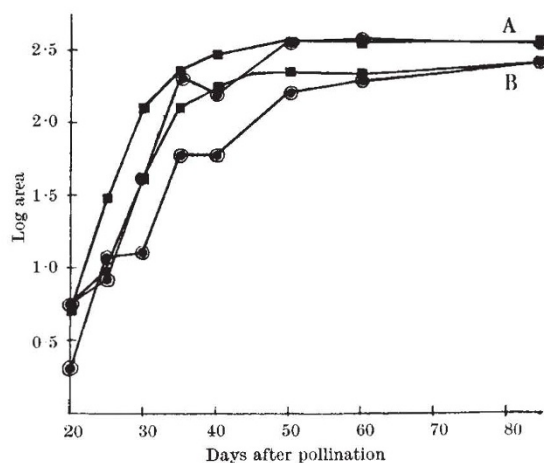
⁴ Bailey, I. W., and Vestal, M. R., 'The Significance of Certain Wood-destroying Fungi in the Enzymatic Hydrolysis of Cellulose', *J. Arnold Arboretum*, 18, 196 (1937).

Hybrid Vigour in the Tomato

THE vigorous growth of hybrids between closely related varieties has been widely observed, and for several years the phenomenon has received the attention of geneticists. Investigations have also been made on the physiology of hybrid vigour (heterosis). Ashby¹ and Luckwill² have shown that in the tomato heterosis is manifested at an early stage in the life-history, between fertilization and seed ripening, so that the ripe hybrid seed, resulting from cross-pollination, is larger and heavier than that of the parent strain. In a recent experiment a different result has been obtained, and the causes of this contradiction have been investigated.

Two lines of tomato (105 and 107) were crossed in both directions and also *artificially* self-pollinated. Fruits were killed and fixed at different times after pollination and the seeds and embryos measured. If the development of the hybrid embryo is compared with that of the selfed maternal parent, it is found that in each case the hybrid embryo is significantly larger in the earlier stages of development, but that this initial advantage is not maintained. In the ripe fruit the hybrid embryo is the same size as the embryo of the selfed maternal parent. This is illustrated in the accompanying graph. The final size of the reciprocal hybrid embryos, which are of identical genetic constitution, is significantly different, and is evidently determined by the maternal parent. The final size of a hybrid embryo is thus no criterion of the degree of heterosis. The results for the size of the whole seed were exactly similar, and this agrees with the fact that, in the tomato, seed size and embryo size are highly correlated.

The relation of the embryo to the fruit is a double one. Development of fruit and size attained depend on the presence of growing embryos: but the size of seeds is also determined or limited by the nutritive supplies from the fruit. In this investigation of the tomato it was found that 'fruit weight' was highly correlated with 'seed number' (0.735 ± 0.041) and this confirms the first relation. Also 'mean seed weight' was directly correlated with 'fruit weight/seed number', that is, 'fruit weight per seed' (0.560 ± 0.061). This illustrates the second. It may be said, therefore, that the 'mean seed weight'



MATERNAL INFLUENCE ON EMBRYO DEVELOPMENT.

A. 107 and (107 × 105). B. 105 and (105 × 107).

○ Parent embryos; ■ hybrid embryos.

is determined primarily by the number of seeds which chance to develop in a fruit.

In a further experiment with the tomato, the seeds of hybrids were compared with those of the selfed parent, the more usual technique of allowing self-pollination to take place *naturally* being employed. In the hybrids (*artificially* pollinated) the seed number was lower and the value of fruit weight/seed number much higher. The mean seed weight of the hybrid was greater than that of the selfed parent. Data are given in the following table.

	Parent 107 Natural pollination	Hybrid 107 × 105 Artificial pollination	Ratio hybrid parent
Mean seed No.	207	143	
Mean fruit wt. per seed	0.554	0.702	1.27
Mean seed wt. (mgm.)	3.055	3.866	1.27

This is the result obtained by Ashby and Luckwill. It is clear, however, that the greater seed size is not due to heterosis, but to the fact that fewer seeds developed in the hybrid than in the naturally selfed—and therefore more efficiently pollinated—parent. In the embryo development experiment first quoted, where all the progeny were the result of artificial—less efficient—pollination, there is no difference between the seed size of the hybrid and that of the maternal parent.

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¹ Ashby, *Ann. Bot.*, n.s., 1 (1937).

² Luckwill, *Ann. Bot.*, n.s., 1 (1937).

A Gold Sol Test for Bovine Mastitis

ERADICATION of bovine mastitis is one of the major problems confronting dairy research, and the solution of the problem depends to a large extent on trustworthy methods for detecting udder infections, particularly of the sub-clinical type. Many tests have been proposed, but none appears to compare in reliability with the method of isolating the causative micro-organisms by plating on selected media.