

selves cyclical phenomena. A control mechanism is necessary to cause this flux from cycle to cycle.

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Natural Pollination of Cocoa

SEEDS from pods set by natural pollination on a clone which, when self-pollinated, gives 25 per cent albino seedlings¹ have been raised in a nursery and scored for this character. The plot is square, 13 × 13 trees, and is surrounded by other cocoa.

Of 3,382 pods examined over five seasons (1956–60) 1,251 (37 per cent) gave no albino seedlings, and were therefore classified as being due to pollination from outside the plot (category 'a' pods). Of the 2,131 pods which gave segregating progenies 308 (9 per cent of total pods) gave too few albino seedlings for the segregation ratios to be accepted as 3 : 1 (χ^2 test), and it appears that these pods must have resulted from pollinations involving a proportion of pollen from outside the plot together with pollen from the plot itself (category 'b' pods). In the 1960 season 892 pods were examined, giving a total of 30,089 seedlings of which 4,292 were albino, these being obtained from 612 of the pods (69 per cent). Had all these segregating pods given 3 : 1 ratios 5,190 albino seedlings would have been expected. Of the 612 segregating progenies 41 (5 per cent of total pods) were classified in category 'b' and the remainder in category 'c' (with ratios individually acceptable as 3 : 1). However, only 78 of the albino seedlings were from category 'b' pods, and the 4,214 albino seedlings from the 571 category 'c' pods were substantially fewer than the expected 4,815 had they all given true 3 : 1 ratios. It is clear, therefore, that many of the pods accepted as giving 3 : 1 ratios also resulted from pollinations involving a proportion of pollen from outside the plot.

Progenies involving pollen from both outside and inside the plot could arise from a flower being visited by more than one pollinating insect, and this is known to occur^{1,2}; but as the proportion of flowers which remain unpollinated is high, usually more than 80 per cent and at times of heavy flowering often as high as 98 per cent^{3–5}, it seems likely that most of these pollinations are due to single insects carrying pollen from more than one flower. Evidence in support of this view is found in the higher proportion of pods in category 'b' harvested near the centre of the plot.

Two types of pollinating insect are believed to be concerned; various species of midge can effect cross-pollination¹ (including, of course, pollinations between different flowers of the same tree or clone) while small crawling insects, particularly certain species of ants, can effect self-pollination⁵. If some part of the 3 : 1 ratios are due to pollination by crawling insects, then the proportion of the pollinations due to flying

insects which involve mixed pollen must be judged to be yet higher, although no precise estimate is possible. When it is further considered that pollinations involving pollen from more than one flower within the plot are not distinguishable from those involving pollen from only a single flower, and similarly pollinations involving pollen from more than one flower outside the plot cannot be separated from those involving only single flowers, it is tempting, in view of the frequency of observably mixed pollinations, to conclude that a very large proportion and perhaps the vast majority of pollinations by flying insects involve pollen from more than one flower.

Pods in category 'a' range in frequency from 24 to 46 per cent of total pods in various parts of the plot, being more common around the edges, while those in category 'c' (47 to 67 per cent) are commoner towards the centre⁶; but the pattern is markedly eccentric. The highest frequency of category 'c' pods and the lowest of category 'a' roughly coincide, and occur not at the centre of the plot but below and to the left of the centre, looking up the slope on which the plot is planted. As mentioned above category 'b' pods are also less frequent near the edges; they range in frequency from about 4 to 16 per cent, and are commonest above and to the right of the centre of the plot. Thus the proportion of pollen from outside the plot reaching a given point in the plot would appear to be controlled not only by the distance of that point from the edge of the plot but also by some second factor, which is probably air movement influencing the direction of movement of the pollinating insects.

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Cultivation of Isolated Tissue derived from the Pericycle of Roots

In the growing root the pericycle is the site of the interesting morphogenetic activity, the initiation of lateral root primordia. This tissue also participates in the initiation of vascular cambium, which leads to the production of the secondary tissues of the root. For the investigation of the factors which initiate these activities in the pericycle and lead to the formation of organized tissues such as root primordia or cambium, it is desirable to have pericycle tissue isolated from the morphogenetic influence of neighbouring tissues. Surgical isolation would be almost impossible because of the small number of cells involved and the risk of injury.

A method for the production of large quantities of tissue from cells originating in the pericycle has been developed as the result of earlier observations. Goldacre¹ showed that, in isolated roots of flax, many lateral root primordia were present. Treatment of these roots with indolyl-3-acetic acid (IAA) induced waves of cell division, in the quiescent pericycle, originating from each unemerged lateral root primordium. Treatment with IAA also caused degeneration of much of the root cortex tissue.