

SELECTION OF COCONUT SEED-NUTS AND SEEDLINGS

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LITTLE is realised regarding the importance of selection work with coconuts, presumably because no experimental evidence has been advanced so far to support the methods of selection. In the present paper it is proposed to cover this aspect. The methods of selection as practised now and the response of selection on yield of the adult palms are detailed.

Before the value of selection can be appreciated, it is necessary to understand the breeding system of the palm or in a more common language, the process of natural pollination. The tall variety that is grown on a commercial scale in Ceylon is generally cross-pollinated. This is brought about by a succession of male and female phases. The female flowers become receptive after all the male flowers in that inflorescence have fallen off. Further, the next inflorescence generally opens after the female flowers of the previous inflorescence have passed receptivity. Thus for pollination, pollen has to be derived from another palm. Agents of pollination are both wind and insects. On the other hand, the behaviour of flowers in the varieties King Coconut and Dwarfs is different. Male and female phases overlap, making self-pollination possible.

Methods of Selection

Selection is practised at two levels, viz., seednut and seedling stages. Mr. Peiris, the former Geneticist, Coconut Research Scheme, has advocated the use of seed-nuts from selected mother palms, which are selected largely for their yield, provided that certain optimum morphological and environmental characters are satisfied (C.R.I. Leaflet No. 1). As the demand for seedlings increased, seed-nuts collected from selected mother palms were not sufficient to meet the requirements. Consequently, seed-nuts were collected from high-yielding blocks giving at least 4,000 nuts per acre, per year.

Seed-nuts are put down in nurseries, and the seedlings are stringently selected before transplantation on the following characters :—

- (a) Earliness in germination.
- (b) Rapidity of growth.
- (c) Sturdiness and freedom from what is known as "legginess."

Detailed descriptions of selection of seedlings are given in C.R.I. Leaflets Nos. 2 and 14. When these standards are adhered to, about 40 per cent. of the seedlings are rejected as unsuitable.

Response on Selection

A field experiment was put down at Ratmalagara Estate in 1939 by Mr. W. V. D. Peiris to test these methods of selection, both of seed-nuts and seedlings. The plantation is now in its 13th

year and has not reached full bearing capacity yet. However, from the data collected so far, two facts are clear :—

- (a) *Palms derived from selected seedlings have given significantly higher yields than those derived from unselected seedlings.*
- (b) *There are no significant differences in the yield of adult palms, whether they are raised from nuts collected from mother palms or high-yielding blocks.*

The explanation for the second phenomenon is clear from the breeding system of the palm. Mother palms are distributed amongst palms of varying bearing capacities. Generally, two to three mother palms are seldom found close together. Owing to natural cross-pollination, the identity of the male parent is not known ; it may be of diverse origin. Consequently, the yield of the progenies will be highly variable. In high-yielding blocks, the general population is composed of good yielders (if selected on proper standards) and consequently inter-pollination between them will give progenies that may be expected to be more consistent in yield.

The response on selection of seedlings was apparent in two directions, viz :—

- (a) *Early flowering,*
- (b) *Higher yield of nuts and copra.*

In the fifth year after transplantation, 8.3 per cent. of the seedlings from the selected groups and 3.5 per cent. of the seedlings from the unselected groups were in flower. In other words, about double the number of palms derived from selected seedlings have flowered in that year when compared to those derived from unselected seedlings. In the sixth year, the percentages of palms in flower were 42.4 and 32.3 respectively. It must be pointed out, that the term unselected does not connote rejected seedlings ; they are seedlings picked at random from a bed without any form of selection and therefore may include both good and bad ones.

During the first two years of bearing, *i.e.*, 6th and 7th years, the palms from selected seedlings gave 175 nuts per acre, whereas those from unselected seedlings gave only 79 nuts per acre. Subsequently, every year up to the 13th year, *i.e.* 1952, the palms in the blocks with selected seedlings have shown an increase of over 10 per cent. in yield of nuts and copra over those in the unselected groups. The pattern of yield from the various plots is such that at least this difference is likely to be maintained in the future.

Here then is evidence of the value of a simple agricultural process. *Selection of seedlings alone will increase the crop by about 10 per cent. There should not be any reluctance to destroy seedlings that do not conform to our standards, even if the rejections are more than 40 per cent. After all, the value of rejected seedlings is realised as early as during the first two years of bearing.*

Incidentally, one criterion of selection of seedlings is early germination. This seems to have considerable influence on the yield of adult palms. The periods taken for germination of a nut and subsequent yield of that palm are negatively correlated, *i.e.* a decrease in one factor is associated with an increase in the other factor. Similarly, the period taken for flowering and yield are negatively correlated. Both these correlations are statistically significant. Hence it pays to keep a record of germination of nuts in the nursery and reject all late germinations.

Concluding Remarks

From the experimental evidence presented above, it is apparent that there are no differences in the yield of palms, whether seed coconuts are collected from individual mother palms or high-yielding blocks. *In the latter instance proper selection of the blocks is of profound importance.* Great care should be taken that the high-yield of the block is contributed by a majority of the palms in the block due to their hereditary qualities and not due to particularly favourable environmental conditions. Low-yielders should not be left within the block and, if possible, within the immediate vicinity. Their inflorescences can be removed at regular intervals so that their pollen would not contaminate the block. The presence of low-yielding palms will greatly reduce the efficiency of this method of selection.

Selection of seedlings is of great importance, benefits of which are early-flowering and an increase in the yield of nuts and copra over unselected seedlings.

Mass selection is one of the commonest methods of plant breeding with cross-pollinated crops. It is practised to-day in a rather imperfect form, for only the seed parents are selected and the pollen parents are from the general population. It has been pointed out by other workers that, "this method in cross-pollinating species is only half as efficient a method as it might be." *For mass selection to be more effective, selected plants should be grown in isolation so that natural inter-pollination is between desirable types.* Then "the efficiency will be raised from 50 per cent. of the maximum possible by mass selection without control of pollen parent, to 90 per cent. and over."