

52.6 per cent and 'root disease' to 52.8 per cent. Root production is greatly favoured by heaping moist river sand and/or coir dust around the stem base. Using these materials and no hormones, I have induced thousands of roots from the aerial stems of 15 coconut palms and one *Areca catechu*² at the Central Coconut Research Station, Kayangulam, Kerala (India). But it is striking that, though millions of coconut palms have produced aerial roots, none has developed suckers in consequence.

As Gangolly and Pandalai seem to be unaware of the published work on clonal reproduction, I review it briefly. By air-layering³, or marcottage, that is to say the induction of roots at a height on the stem followed by sawing through the stem below them and replanting, one can prolong the life of a valuable tree but one cannot, of course, multiply it. (Gangolly and Pandalai have misquoted me as describing this rejuvenation as suckering.) Exceptional palms produce aerial ramifications⁴, and most of these branches may be air-layered⁵, and a small clone may be produced. The inflorescences^{6,7} and flower stalks^{8,9} of coconut palms sometimes develop into 'hulhi-shoots' and it should be possible to layer these. The most hopeful method, though still a difficult one, is to reverse the flowers into vegetative shoots, and then get them back to the seeding habit, after they have been successfully layered and propagated as individual plants. Such shoots have reversed to the fruiting phase in the coconut¹⁰, and *Elaeis guineensis*¹¹. Schwarzbach¹² has achieved the same result in the grass *Poa alpina* by simple physiological treatments.

Vegetative Propagation in the Coconut

Gangolly and Pandalai¹, in their communication on vegetative propagation of the coconut palm (*Cocos nucifera* L.), mention only one method, namely, the induction of suckers, but state that "there was no sign of suckering seen in any of the treatments so far". They state that they induced root formation from the stem near ground-level with certain hormones and hence conclude that "inducing meristematic activity in the coconut is possible".

But the induction of roots, especially near the base of the coconut stem, has never been difficult. The lowest part of the stem, generally called the bole, which is conical and buried in the soil, is the main root-producing region. Root production begins at the lowest point, the apex of the cone. When the palm attains middle age the bole surface is usually covered with roots, and later on roots are frequently produced from the aerial stem. According to Monon et al.⁴, about 40 per cent of the palms seen by them produced aerial roots, which could be at any height of the stem. Water-logging raised the percentage to



Fig. 1. Mechanical splitting of growing point yields two shoots in coconut.



Fig. 2. Individual shoots (S in all) of a young suckering coconut. Six of these have now become young coconut palms at Kayangulam, Kerala.

Another and perhaps easier method is to split the growing point mechanically, by which I have induced suckers in the coconut¹⁴ (Fig. 1) and *Areca catechu*. Stimulation of the axillary buds of young seedlings is also hopeful. I have reported several instances of suckering in young coconut palms¹⁵. The shoots of six clumps have been separated (eight shoots of one of the clumps can be seen in Fig. 2), and these hence, now growing at Kayangulam, may be valuable for future studies. Tissue culture methods¹⁶ may also prove successful.

T. A. DAVIS

Biometry Research Unit,

Indian Statistical Institute, Calcutta, 35.

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