

Another and perhaps easier method is to split the growing point mechanically, by which I have induced suckers in the coconut¹⁸ (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 palms¹⁹. The shoots of two clumps have been separated (eight shoots of one of the clumps can be seen in Fig. 2), and these clones, now growing at Kayangulam, may be valuable for future studies. Tissue culture methods²⁰ may also prove successful.

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- ¹ Gangolly, S. R., and Pandalai, K. M., *Nature*, **191**, 1218 (1961).
- ² Menon, K. P. V., et al., *Ind. Coconut J.*, **8**, 79 (1955).
- ³ Davis, T. A., *Areca nut J.*, **11**, 9 (1960).
- ⁴ Davis, T. A., *Bull. Ind. Central Coconut Com.*, **12**, 224 (1958).
- ⁵ Burkill, T. H., *Garden's Bull.*, **3**, 1 (1923).
- ⁶ Jacob, K. C., *J. Bombay Nat. Hist. Soc.*, **37**, 901 (1935).
- ⁷ Davis, T. A., *Bull. Ind. Central Coconut Com.*, **9**, 197 (1956).
- ⁸ Davis, T. A., *Oleagineux*, **16**, 653 (1961).
- ⁹ Iyengar, M. O. P., *J. Ind. Bot. Soc.*, **3**, 289 (1922).
- ¹⁰ Davis, T. A., *J. Bombay Nat. Hist. Soc.*, **47**, 527 (1948).
- ¹¹ Thomas, C. A., *Ind. Coconut J.*, **14**, 132 (1961).
- ¹² Andy, P., *Trans. Linn. Soc.*, **26**, 661 (1870).
- ¹³ Shortt, T., *A Monograph on Coconut Palm* (Madras, 1888).
- ¹⁴ Davis, T. A., *Ind. Coconut J.*, **2**, 11 (1948).
- ¹⁵ Quisumbing, E., *Philippine Agric.*, **15**, 3 (1927).
- ¹⁶ Davis, T. A., *Science and Culture*, **25**, 332 (1959).
- ¹⁷ Schwarzenbach, F. H., *Ber. der Schweiz. Bot. Gesell.*, **66**, 204 (1956).
- ¹⁸ Davis, T. A., *Current Sci.*, **29**, 273 (1960).
- ¹⁹ Davis, T. A., *Bull. Ind. Central Coconut Com.*, **9**, 179 (1956).
- ²⁰ Steward, F. C., *Canad. J. Bot.*, **39**, 441 (1961).

It was not our intention, nor was it considered necessary or feasible, to review the whole aspect of clonal propagation in such a short communication as that referred to¹. Our main object was to bring to the notice of interested workers the observation made by us on one aspect of root production in the course of work in progress on the crop with hormones and other growth-promoting substances. Nevertheless, the points relevant to our work have been fully covered in our communication, and the other references given in Mr. Davis's communication² were felt quite irrelevant in our preliminary account.

The point made by Mr. Davis that aerial rooting in coconuts occurs in Nature is not controverted, but as he himself admits, the phenomenon is observed rather more in the diseased condition of the palms or in the case of palms growing under unfavourable environmental conditions. Observations and experience from our work at this Research Station go to show that, under normal conditions of growth, aerial rooting occurs only very rarely. It was just this aspect that interested us in studying the effect of hormonal applications on root production also, in an experiment designed primarily to see whether coconuts can be made to produce suckers. It was seen that in the trees treated with certain hormonal combinations referred to by us, root production was general and profuse, quite in contrast to the results obtained in untreated trees.

It is wrong to say that we have misquoted Mr. Davis, although we admit that the second reference tagged to ref. 6 in our communication could also have gone along with ref. 4, which is co-authored by Davis. The subject-matter of both ref. 4 and the second one of ref. 6 is the same, the latter being purely a duplication of the former, and there was, indeed, no need at all to quote the latter or other publications of Mr. Davis on the same subject^{3,4}. In ref. 5 and the first

one under six, mention has been made by us about reports on natural suckering and it is surprising how it can be misinterpreted as confusing between suckering and rejuvenation, especially when we have covered the citation of the literature on rejuvenation under ref. 4.

In regard to the methods of 'clonal reproduction' referred to by Mr. Davis², such as layering 'bulbil shoots' and getting them back to the seeding habit, splitting growing points by mechanical means, tissue culture and perhaps others, we feel that at the present stage of knowledge these are nothing more than pure hypothetical possibilities as Mr. Davis himself conscientiously points out and as every reader can see, or chance successes, the practical utility of which has never been demonstrated. Suffice it to say that these methods do not seem to offer at present prospects of any utility in practical coconut growing.

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- ¹ Gangolly, S. R., and Pandalai, K. M., *Nature* **191**, 1218 (1961).
- ² Davis, T. A. (preceding communication).
- ³ Davis, T. A., *Indian Farming*, **11**, 19 (1961).
- ⁴ Davis, T. A., *Oleagineux*, **16**, 653 (1961).

Endemic-Exotic Earthworm Competition in the American Midwest

It is commonly believed that in areas of European colonization introduced lumbricids tend to supplant the endemic earthworm fauna. Stephenson¹ gives several examples. More recently the spread of *Allolobophora caliginosa* in New Zealand has been documented^{2,3}, and G. E. Gates⁴ has described the distribution of European species in India.

Replacement of the native earthworms of the genus *Diplocardia* in the central United States by introduced lumbricids was described by Smith⁵, whose observations were supported by Goff⁶, and has been commonly accepted, despite the very limited number of observations. More recent observations in the United States have clouded the issue: W. J. Harman⁷ without comment has listed *D. singularis* as the most common earthworm in Lincoln Parish, Louisiana. Causey⁸ in Arkansas apparently accepted Smith's views. *D. riparia* has been reported to remain very common in the blacklands prairie soil of Oklahoma and Texas^{9,10}. However, the prairie chernozem soils of eastern South Dakota have been reported to have had their zonal horizonation almost completely destroyed by *Lumbricus terrestris*^{11,12}. The original earthworm fauna, if any, is not known. Shackelford¹³ did find diplocardias in an Illinois prairie. A diplocardian has been found to be common in the uplands of southern Michigan¹⁴, and *D. riparia* has been found to form part of the earthworm population of an agricultural soil in Nebraska¹⁵.

It has been recently suggested that changes in land-use, resulting in a changed habitat and food supply, are the causes of the replacement of endemic by exotic forms^{14,16}. This, too, remains a hypothesis, albeit a reasonable one. Some exotic forms seem to occupy previously unoccupied niches.

During the spring of 1960 field reconnaissance was undertaken near St. Louis, Missouri, to determine the extent of replacement of diplocardias by lumbricids in forest soils. Four sites, several miles apart, were selected, each in a different drainage basin. Precise locations are given in a previous publication¹⁷. The