

THE ADVENTITIOUS ROOTS OF *MELALEUCA*
LINARIIFOLIA Sm.

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(Plates xviii.-xix.)

It has long been noticed at Richmond, N. S. Wales, and near Sydney, that the Swamp Tea-tree (*Melaleuca linariifolia* Sm.) has its very papery bark more or less covered and interpenetrated by fine, irregularly branching growths having all the appearance, at first sight, of some climbing plant making free use of the stem as a support. In reality they are outgrowths from the stem, which, growing through the bark now reach the air, travel over the tree for varying distances, then re-enter the bark and end, usually, low down therein close to the wood; probably only now exposed through wearing away of the outer bark. Within the bark they flatten out, and branch in such a way as to accommodate themselves to a necessarily restricted location between the bark sheets, which are sufficiently loose to allow of their penetration in any direction. These adventitious roots arise below the cambium, and are covered with a protective bark very similar to that of the twigs, their centres being occupied by a cylindrical fibro-vascular strand. From one to three feet in total length, even longer in some cases, they vary in diameter from less than 2 mm. to as much as 1 cm.; in some cases they assume even stem-like dimensions; for in a few old trees such growths, arising at some point in the stem 10 or 12 feet above the ground, have eventually reached it, struck root, and become Banyan-like secondary stems, though remaining closely appressed to the parent-stem. A few of the smaller growths arising near the ground have also entered it and struck root. The distal ends of these bark-penetrating root-growths show nothing resembling hairs or a root-cap; they are paler in colour than the rest of the enclosed root, which is

reddish, like the unexposed bark-layers; the terminal cells are loosely compacted and free from any protective covering. On stripping away the stem-bark down to near the wood, the course of these growths is readily traced to both terminals. Within the lower layers of bark, there is a rapid accumulation of watery liquid which forms blister-like swellings. In seeking a cause for these exceptional growths, we need to consider the conditions under which the trees live. Usually found near watercourses or in swamps, these trees are seldom found away from such locations as allow of their becoming surrounded by water after heavy rain, with the consequent filling of creeks and waterholes. The trees may stand for months actually in water; whilst, on the water disappearing, their location may dry out, leaving them to battle through periods of drought. They have, therefore, to contend with two very opposite sets of conditions as regards water-supply, shortage, even to almost complete absence; and, at the other extreme, actual flooding which may endure for months. It is worthy of note that these conditions operate with respect to certain Eucalypts, Casuarinas, and other species of *Melaleuca*; adventitious roots have, however, only so far been seen on the tree under notice. It would be interesting to know the actual root-conditions especially with regard to root-hairs, as to quantity and variability in number during the extremes referred to; also whether any symbiotic organisms exist thereon; and if so whether there is any correlation between their presence and the conditions of habitat. Fungus mycelle is commonly found here on roots of many and diverse plants; its presence may have a special significance in relation to our soil and climatic conditions. With respect to the part played by these adventitious roots in the life of the tree, several suppositions present themselves. They may function as aërating organs, though the extremities are never exposed directly to the air, being always hidden beneath the bark layers. The stilt-roots of the Mangrove are probably not analogous.*

*"Respiration in the roots of Shore-plants," Dr. J. Bancroft, Report Aust. Assocn. Adv. Science, Sydney, 1887, vol.i. p.327.

These Tea-tree adventitious roots can hardly be air-passages, for they arise, as do true roots, not in the bark, but from beneath the cambium; therefore, connecting with the tissues in use for conveyance of sap upwards. Their place of origin and the peculiar situation of their terminations seem to indicate that they are in some way connected with the tree's water-supply; possibly they are a means for reinforcing it at certain times from the stores in the lower layers of bark. Our observations have been made during the last few years, which have been noticeably dry; the outgrowths appear as dry as the outer bark; though, as stated, there is a plentiful supply of moisture deep down in the bark. The trees have suffered much through the continuous dry seasons; and are very bare of leaves; apparently a flooded period is required to restore them thoroughly to full vigour.

A third possible explanation suggests that these outgrowths may be of no special present use, but have been so in the past; that they are vestigial organs. It has been stated that "adventitious roots occur in places where the atmosphere is warm, stagnant, and loaded with moisture;" these conditions would be present for considerable periods when these trees stand in water, as we have seen to be the case for months together. The fact that such root-growths seek the dark recesses of the bark is quite natural, if they are really absorbing organs approximating in function to true roots; though in this case their action will be like that of hairless roots in water, absorption taking place through the loose unprotected cells at their extremities.

These roots should also be compared with those of the Moreton Bay and other fig-trees; those of the latter striking directly into the air, and remaining there. Taking all the circumstances into consideration, it is believed that these adventitious roots are of assistance in the general upward sap-circulation, performing auxiliary duties at some special time, most likely during one of some particular stress. This may be when the soil-roots are completely immersed in water, and are perhaps unable to function properly; at such times it is possible that these roots take up the

duty of supplying water to the higher parts of the tree; or it may be that they operate specially during drought. We are disposed to think the former is the more likely.

We have not succeeded in finding any published references to the occurrence of adventitious roots in any species of *Melaleuca*.

EXPLANATION OF PLATES XVIII.-XIX.

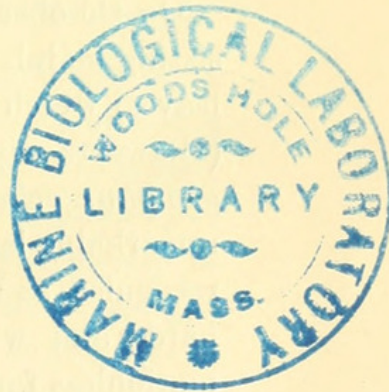
Plate xviii.

Melaleuca linariifolia Sm.

Photograph of portion of a stem, showing the bark with "adventitious roots;" in the lower part the outer bark has been cut away to show the penetrating habit(College Farm).

Plate xix.

Photograph of an old tree(Rickaby's Creek) showing Banyan-like arrangement of large adventitious roots, which have become stems through entering the soil and rooting.





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