A NONDESTRUCTIVE TECHNIQUE FOR COLLECTING IMMATURE COCONUT INFLORESCENCE FOR TISSUE CULTURE[1]

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A technique was developed to collect nondestructively immature inflorescence for tissue culture purposes. Outstanding elite donor palms can now be preserved as a continuous source of explants and a continuous evaluation of their performance and phenotypic qualities is now possible.

Tissue culture technologies are gaining the limelight in a number of biotechnological studies. Palm tissue culture particularly towards asexual propagation has been the objective of a number of laboratories in the world. Oil and date palms have been successfully cloned, but coconut appears to be recalcitrant.

Explant identification and collection are very important considerations of tissue culture particularly for a crop like coconut. The French had earlier developed a technique to collect nondestructively leaf explants from elite oil palm for micropropagation. The whole crown is severed from the donor palm at a predetermined point whereby the meristem is barely missed to allow it to develop normally again. It is easy for other crops where there are several growing points which are the preferred explant type. Coconut has only one growing point and inflicting damage to it might be destructive and could result in losing an elite explant source.

Coconut inflorescence has been identified to be an ideal explant source because of the presence of numerous meristematic points. Moreover, it is being produced by the tree continuously, thereby assuring a steady supply of explants. However, collecting the ideal immature inflorescence which is still within the cabbage poses a great threat to the life of the coconut palm.

This paper reports a method developed to collect nondestructively the desired immature inflorescence for tissue culture work.

The Phyllotaxy of the Coconut Palm

The phyllotaxy of the coconut crown is so arranged that each leaf gets the maximum amount of light. The arrangement is clockwise or counterclockwise, giving rise to the right or left spiral, respectively. If the bunches hang towards right of the petiole, the spiral is to the left, and when bunches hang toward the left, the spiral is toward the right. The direction of the spiral varies from tree to tree but remains the same throughout the lifespan of any particular tree.

For this purpose, it is important to identify the proper inflorescence. The spear leaf is numbered zero and the outer leaves are consecutively numbered as 1 (nearest to the spear leaf), 2,3,4, etc.

After the palm has commenced flowering, which varies according to the type of palm, soil, and climatic conditions, each leaf has an inflorescence at its axil. The coconut is a monoecious plant producing male and female flowers separately on the same inflorescence. The inflorescence appears at first in the axil of the leaf as a pear-shaped, flat structure, completely protected by two sheaths and is collectively know as the spadix. It is at this stage that an inflorescence is collected for tissue culture purposes.

The Technique

The spear leaf is marked in the selected donor palm. The leaf bearing the number 4 inflorescence is also marked. To lighten the crown as well as give room to the target frond, some of the older leaves are cut into half. Slowly the leaf bases covering the number 4 frond are removed. When the crown is still quite heavy and there is the tendency for it to break, the rest of the younger fronds are also cut. Slowly, the stipules at the base are removed. Then, a cut is made on the abaxial surface of the petiole of the number 4 frond at about the level of the inflorescence. Petiole tissues are then stripped away carefully to expose the inflorescence (Fig 1). When the inflorescence is completely exposed it is severed from the base (Fig. 2).

The number 4 spadix is about 100-200 mm depending on the cultivar or hybrid. Tall cultivars have longer, larger

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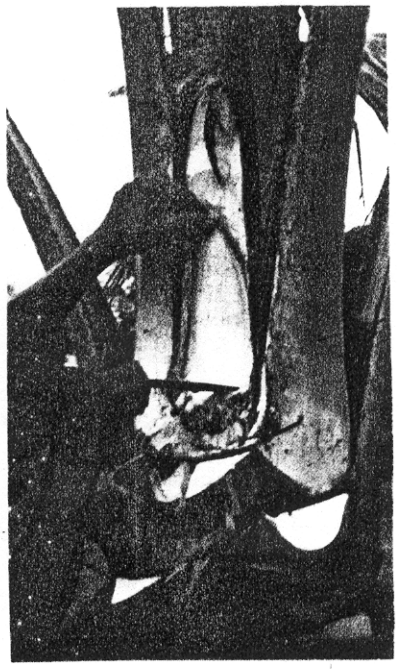

FIGURES 1 & 2. Collection of the inflorescence from a standing coconut palm

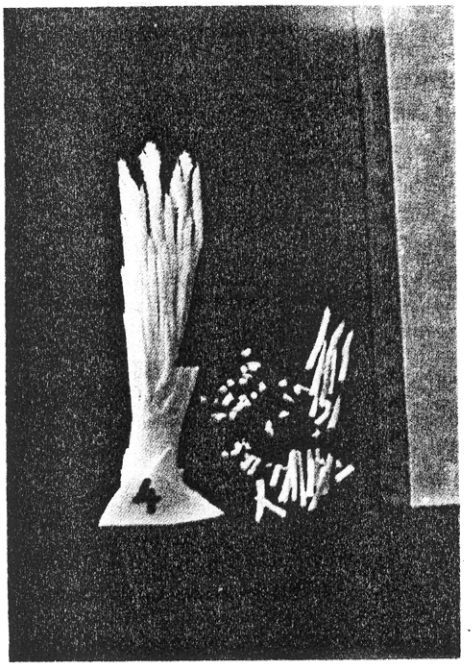

FIGURE 3. Photo showing the size of the inflorescence and portions of spikelets used as explants

FIGURE 4. Coal tar is immediately painted on the wound to prevent fungal/pest attack.

number 4 spadices, while the dwarfs have shorter, smaller spadices. The bare inflorescence is about 80-100 mm. The middle portion of the spikelets (Fig. 3) contains very immature male flowers and all the tissues are still diploid. Sections from this area, about 1-2 mm in size, are the ideal explants for coconut tissue culture. Reproducible callus readily form from these explants under the right induction conditions for coconut.

The wounded portion is then immediately painted with a copper-based fungicide paste and finally with coal tar (Fig.4). These treatments will prevent the attack of secondary pathogens and repel pests from attacking or colonizing on the exposed tender tissues. Growth of the palm will continue with the normal production of leaves, inflorescence, and nuts. After 6 mo, the portion where the inflorescence was collected will have gone down the phyllotaxy of the coconut palm and a new inflorescence could again be collected if need be.

The technique has been perfected and is now routinely used to collect immature coconut inflorescence for coconut tissue culture studies at the PCA-Albay Research Center in the implementation of the Philippine-German Coconut Tissue Culture Project.

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