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DISCUSSION

THE QUESTION OF DIFFUSE SECONDARY GROWTH OF PALM TREES: A COMMENT

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In a recent paper (Wiesberg & Linick, 1983), the authors investigated the $\Delta^{14}C$ levels in the stem of a coconut palm (*Cocos nucifera* L) to determine whether diffuse secondary growth occurred. The authors concluded that "there was no diffuse secondary growth over the entire mature stem during the last 25 years of growth, with the exception of a restricted zone in the center at medium height," though they did not define what they meant by a "mature" stem.

The palm was apparently planted ca 1860, and had developed a conical basal part up to ca 2m height, a virtually cylindrical part up to ca 13m, and a conical part above this. The authors assumed a constant rate of height growth, though this was not critical for their analysis. Samples were taken from the center and the periphery of the stem at various heights between 2.5m and 17.5m, from which the "wood" fraction was extracted for $\Delta^{14}C$ determination. Up to a height of 12.4m the $\Delta^{14}C$ levels were fairly constant, mostly between -20 and $+20$ $\Delta^{14}C‰$, and the levels then rose sharply, reaching $+420$ $\Delta^{14}C‰$. in the top sample. The $\Delta^{14}C$ levels were slightly higher in the samples from the center of the stem, at least in the upper parts of the stem. The pattern of $\Delta^{14}C$ levels up the stem was interpreted as showing a gradual rise in $\Delta^{14}C$, in accordance with the prevailing atmospheric $\Delta^{14}C$ levels since 1860, up to a height of ca 15m, above which the rise in $\Delta^{14}C$ was attributed to the bomb effect following nuclear weapons testing since 1955.

Unfortunately, the authors did not attempt to obtain precise dates for the formation of the stem at various heights, though it has been observed that coconut stems can be dated reasonably accurately from the number of leaf scars and by applying a growth rate of ca 12 leaves y^{-1} (Corner, 1966; Child, 1974). The height growth of stems changes markedly during the life of the palm (Child, 1974).

It is, therefore, uncertain whether the observed dramatic rise in $\Delta^{14}C$ levels above 15m height is simply recording the contemporary changes in atmospheric $\Delta^{14}C$, or whether there has been transport of more recent carbon to lower parts of the stem which may have undergone secondary thickening. Without accurate dating at particular heights, the results of this study are ambiguous and cannot be taken as a refutation of the hypothesis that secondary thickening is occurring in the upper part of the stem.

In their introduction (p 806), the authors state "an ideally cylindrical growth is almost proof of the absence of secondary growth; unfortunately, the opposite does not hold true." It is not clear from the description of the

coconut stem whether this was entirely conical or partly cylindrical and, therefore, where secondary growth might be present. In one place (p 807) the authors state that "Despite the fact that the stem was *not cylindrical,* there was no pronounced secondary growth over most parts of the stem," while they later state that (p 808) "It is worth noticing that the high activity is coincident with the upper limit of the *cylindrical* part of the stem and the bottom of the conical part." It seems probable that if there was any secondary growth, this should cease at the transition from the conical to the cylindrical part of the stem.

The conical base of the stem was not investigated though this is evidently a possible zone for secondary growth. Waterhouse and Quinn (1978) showed that the basal cone of the stem of *Archontophoenix cunninghamiana* (Wendl) Wendl et Drude underwent sustained diameter growth.

While it is clear that ^{14}C determinations may help to solve such problems as secondary growth in palms, it is apparent that in this study there was insufficient information to reject the hypothesis.

References

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