A COMPARISON OF THE GROWTH AND YIELD DURING A 20 YEAR PERIOD OF AMELONADO AND UPPER AMAZON HYBRID COCOA IN GHANA

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SUMMARY

Progeny trials were planted at Tafo in 1952 and 1954 to compare 3 selfed local-Trinitarios, 1 outcrossed and 3 sibbed Upper Amazon progenies and 13 hybrids between Amelonado or local-Trinitarios and Upper Amazons; 1 trial included West African Amelonado. The Amazon hybrids and the outcrossed Amazon were particularly vigorous and precocious and maintained a yield advantage for 20 years. The 13 hybrids were similar in yield potential, but varied in net yield following differential losses from pod diseases, mainly caused by Phytophthora palmivora. Disease losses were lowest on one of the sibbed Amazons and the outcrossed Amazon and lower on Amelonado than on any of the 7 hybrids tested with it; in both trials losses were lower on Amelonado hybrids than on Trinitario hybrids.

There was wide variation in both size and growth rates of mature trees and no consistent relationship between continued growth and crop. It seemed that later yields were not prejudiced by the precocity of Amazon hybrids, the yields from all types fluctuated together. Because the differences in disease losses are likely to be accentuated under farmer's conditions, Amelonado hybrids are preferable to local-Trinitario hybrids. The results also suggest that commercially acceptable pure Upper Amazon varieties could be developed.

INTRODUCTION

Ghana's cocoa industry developed during the nineteenth century based on the introduced Lower Amazon Forastero variety, now known as West African Amelonado. In the early 1940s 95% of the trees were of this type, the remainder being descendants of other early introductions called 'local-Trinitarios' (Posnette, 1943). Amelonado is genetically uniform and as the local fermentation and drying processes vary little, the finished cocoa is uniform in flavour and physical characters, important features of Ghana's cocoa on the world market. Because of its predominant position, Amelonado is the standard by which farmers, chocolate manufacturers and thus breeders judge new varieties.

The agronomic advantages of Amelonado include uniformity, production of crop in well defined seasons, suitability for growing at close spacings and longevity. Yield
may be high under appropriate management (Cunningham et al., 1961) but Amelonado is susceptible to and sensitive of infection with many Ghanaian strains of cacao swollen-shoot virus (CSSV). Over most of the country it does not tolerate exposure which results from widespread loss of overhead shade or large breaks in the canopy. Other disadvantages are difficulty of establishment except under good conditions, slow initial growth and low yields in the early years. Many new plantings in the present cocoa areas are on exposed land following old cocoa which was destroyed by CSSV. It is in these circumstances that Amelonado can be particularly difficult to re-establish and the cocoa is at risk to reinfection with CSSV.

When cocoa research began in the mid-thirties it soon became apparent that the locally available germplasm would not permit a successful breeding programme. An introduction from Trinidad included seed of Forastero material which Pound (1940) had collected at Iquitos (IMC), Parinari (Pa) and Scavina (Sca) and on the Rio Nanay (Na), all in the headwaters of the Amazon. When planted alongside Amelonado and local-Trinitario selections in Ghana, these Upper Amazon types showed exceptional vigour and precocity (Posnnette, 1951; Knight & Rogers, 1955a). However, they were largely untried as parents so Knight & Rogers planted the 8th and 9th Progeny Trial Areas (P.T.A.'s) at Tafo to assess the breeding value of the introduced ecotypes.

In the 8th P.T.A., four months after planting it was clear that hybrids between Amazons and local selections were much more vigorous than Amelonado (Anon, 1952). When the 9th P.T.A. was planted in 1954, further trials with the hybrids were planned (Rogers & Knight, 1955) and by 1958 some had been chosen for possible commercial use and preparation for planting of seed gardens of the potential parents had begun (Gleninning & Edwards, 1961). Following assessments of early yields (Gleninning, 1963) and of quality (Gleninning, 1965) these hybrids were released to farmers in 1964 (Gleninning & Martinson, 1966). Further experience has shown that the hybrids are not equally suited for farmer's use, which has necessitated modifying the output of some of the seed gardens (Anon, 1970; Lockwood, 1974).

Although the hybrids require different management methods to those traditionally used for Amelonado, the advantages of early vigour, ease of establishment and precocity are such that hybrids are being used increasingly. Because Amazon parents are the only known source of these characters as well as resistance to CSSV (Posnette & Todd, 1951; Legg & Kenten, 1971a), they will be the basis of the breeding programme for the foreseeable future. Future varieties are likely to be similar to the present hybrids in agronomic characters, because an attempt to combine the advantages of Amazons in an Amelonado-like variety would take too long. The 8th and 9th P.T.A.s described here are the oldest formal experiments with the new types of variety.

MATERIALS AND METHODS

Posnette (1943) collected Ghanaian cocoa types, selecting individual trees for high yield, large pods and large beans. Taking Amelonado trees from yield recorded plots on experimental stations and the more variable local-Trinitarios mostly from farms,