Summary of Discussions

Origin, Dispersal, and Evolution

Rapporteur: D. Plucknett

Discussion Leaders: D. Plucknett, D. G. Coursey, and F. Martin

Yams

Yams were domesticated in at least three different areas, and some have become so domesticated that the sexual process no longer exists. It is probable that the yam has been cultivated for 10 000 years or more. During this period the degree of domestication has varied. Some remain toxic or poisonous.

D. alata is virtually sterile, the only known seeds and seedlings have been found in the Central Tuber Crops Research Institute in India and in Bogor in Indonesia. It is probable that evolution has continued by asexual means probably through aerial tubers, which are common. In Puerto Rico one form has given rise to many subtypes over many years.

In the case of *D. esculenta*, there is still much sterility but nevertheless fertile forms exist; flowering types have been reported in the Solomon Islands. In general there is a prevalence of male flowers.

D. rotundata is nearly sterile but recent selection for flowering types in IITA has led to more profuse flowering types that also have higher yields. It is interesting to speculate on the criteria for selection in primitive agriculture that selected for less flowering and apparently also lower yields. For future selection of higher levels of flowering, the search should be conducted in forest areas not in the research stations

because the yam is a forest plant that under natural conditions produces seeds and seedlings.

D. trifida is the only wild edible yam of the Americas; originating in the Amazon basin, it flowers freely.

Sweet Potato

No other tropical root crop has received so much research on its origins. Current theory places its origins in the new world. A hexaploid, it probably came from diploid or tetraploid forms, which may exist today in the wild. Dr Nishiyama and coworkers in Japan, have studied sweet potato origins more than any other group. They found diploid and tetraploid plants that cross with sweet potato. *Ipomoea trifida* is the only wild hexaploid plant. Dr Nishiyama believes that *I. batatas* came from *I. trifida.*

The problem of self-incompatibility of sweet potato presents problems. How and from what sources did self-incompatibility in sweet potato arise? Self-incompatibility results from three different genes. Wild lines are not self-incompatible. Where, then, are the wild progenitors that are perennial and have some degree of self-incompatibility? Nishiyama collected mainly in Mexico but maybe the ancestors of sweet potato are here somewhere in northern South America? A wild tetraploid line was found near Cali: Where are the others?

Aroids

The aroids probably originated in forest margins or swamps. Their special adaptation to wet conditions made them useful for early man who selected the plants and devised intricate systems for growing *Colocasia* and *Cyrtosperma.*

All five main edible genera *Alocasia, Amorphophallus, Colocasia, Cyrtosperma,* and *Xanthosoma* are vegetatively propagated. However, the plants can produce flowers and seeds, although the conditions for this are not well understood. Seedlings can be obtained and be grown to maturity. The many varieties probably arose from chance seed setting and selection by man.

The yam/aroid food crop complex was one of the earliest agricultural systems. Magnificent stone-walled irrigated terraces were constructed in Asia and Oceania by early man to grow *Colocasia.* Some anthropologists believe that *Colocasia* may have been the first irrigated crop and that rice may have been a weed of *Colocasia.*

Chromosome numbers are important in plant type. Diploid *Colocasia* have a large main corm and few cormels, whereas triploids have numerous cormels. In general, diploid and triploid plants differ somewhat in tolerance of water regime, and in crop duration.

The taxonomy of all edible aroids is confused, especially in *Xanthosoma, Alocasia,* and *Cyrtosperma.* Of first priority for study is the cultivated *Xanthosoma* complex.

The future of aroids will be based largely on their adaptation to difficult lands. Potential yields of *Colocasia* and *Xanthosoma* are very high.

In Asia, *Colocasia* and yams were both important as food crops, and were usually grown together. In Africa, the association between yams and aroids was not well developed.

Cassava

There are three centres of diversity of cassava in Latin America. The State of Goias in Brazil has 38 species, Mato Grosso 70, and N.E. Brazil more than 20. In Mexico there are 17 or 18. Part of the history of dispersal of cassava is related to the Arawak Indians who originated in Venezuela or the Guyanas and moved to

Central America 2000 years ago and later returned to South America. However there is evidence that cassava was cultivated more than 6000 years ago in the North Coast of Colombia. Nevertheless the word "Yuca," used widely for cassava in South America, is an Arawak word suggesting that it may have been spread by them.

In Mexico there are only "sweet" cassavas and in Brazil there is tremendous variation. As the Indians moved north it is possible that they only took the sweet cassavas. In Mexico cassava arrived quite late, possibly after the Spanish arrived.

Potato

The region near Lake Titicaca between Peru and Bolivia was probably the place of origin of the potato. Russian workers believe the point of origin was farther south, in Chile. There are many wild and cultivated species in the Andean highlands, and there are wild species of *Solanum* in Mexico and Guatemala.