Hunt Institute for Botanical Documentation
5th Floor, Hunt Library
Carnegie Mellon University
4909 Frew Street
Pittsburgh, PA 15213-3890
Telephone: 412-268-2434
Email: huntinst@andrew.cmu.edu
Web site: www.huntbotanical.org

The Hunt Institute is committed to making its collections accessible for research. We are pleased to offer this digitized item.

Usage guidelines
We have provided this low-resolution, digitized version for research purposes. To inquire about publishing any images from this item, please contact the Institute.

Statement on harmful and offensive content
The Hunt Institute Archives contains hundreds of thousands of pages of historical content, writing and images, created by thousands of individuals connected to the botanical sciences. Due to the wide range of time and social context in which these materials were created, some of the collections contain material that reflect outdated, biased, offensive and possibly violent views, opinions and actions. The Hunt Institute for Botanical Documentation does not endorse the views expressed in these materials, which are inconsistent with our dedication to creating an inclusive, accessible and anti-discriminatory research environment. Archival records are historical documents, and the Hunt Institute keeps such records unaltered to maintain their integrity and to foster accountability for the actions and views of the collections' creators.

Many of the historical collections in the Hunt Institute Archives contain personal correspondence, notes, recollections and opinions, which may contain language, ideas or stereotypes that are offensive or harmful to others. These collections are maintained as records of the individuals involved and do not reflect the views or values of the Hunt Institute for Botanical Documentation or those of Carnegie Mellon University.

About the Institute
The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

TO Rogers

DATE TIME

MEMO

M Sternberg

OF Gen. Dept. Bubbly

PHONE

TELEPHONED	RETURNED YOUR CALL
PLEASE PHONE	CAME TO SEE YOU
WILL CALL AGAIN	WANTS TO SEE YOU

ask about Professor

642-5517 his office

or later

524-5597 his home.

Want to confirm your lab

Thurs at 3.

STANFORD UNIVERSITY STORES 8-9295

BY CW

Food Research Institute Seminar, November 19, 1971

Some Biological Problems of Manioc and their Implications for Development.

1. Manioc--what is it?

Common names--manioc, cassava, yuca, mandioca, aipim, macacheira, bitter m., sweet m., tapioca. Others less common.

Derivation of these names from various S.Am. Indians, either for plants themselves, or for products of roots.

Scientific names--Manihot (the genus, family Euphorbiaceae), M. utilissima, M. dulcis, M. palmata, M. Aipi, M. esculenta. These the most frequently encountered, a few others.

My choice of scientific names is M. esculenta.

2. What's reason for this concern?

People's use of the name influences the way the crop is employed, and there are some biological and use problems which can cause problems if we accept incorrect terminology.

3. My studies of M. esculenta

Began with interest in evolutionary studies--how did present plants come into being?

Approach to understanding depends on knowledge of what presently exists.

Must define the boundaries of the biological species

Considered as a study in biological classification, a part of taxonomy or systematic biology.

4. Definition of cultigen--any one cultivated plant species

cultivar--a single type within a cultigen maintained under man's care as a kind with certain desirable qualities.

5. Classifications I have made

One, the intraspecific variation within the cultigen, M. esculenta

Two, the interspecific variation within the genus Manihot.

Samples and data:

Regions--confined to western hemisphere tropics--most of the regions representing the normal areas of cultivation, in most of the different ecological zones--hot & dry, hot & moist, cool, forested and savannah, etc.

Data types--morphological, or physical appearence descriptions, of approximately 500 population samples.

These data clustered using computer programs designed specifically for biological classification.

Results:/ (1) Produced a classification which sets the limits of variability within the cultigen (designated as a freely interbreeding population)--some 19 groups of closely-related cultivars.

(2) a classification imbedding the cultigen into the genus, showing the closeness of relationship of the/95 wild species to the cultigen.

(3) from this study I conclude that all the variations of sweet and bitter manioc are better considered in one complex species.

(4) Given the classification, we are in better position to proceed to programs in agricultural development with more certainty of achieving goals of improved cultivatars than would otherwise be the case.

(5) The narrowness of programs to date, using only a very few wild species.

Additional data I have gathered on the cultivars strengthen our conclusion that there is but one species:

starch concentration

other carbohydrates--ie. sugars

HCN concentrations--the HCN exists in plant as a cyanogenic glucoside, i.e. a CN^- radical attached to a monosaccharide.

Conc. varies in amount and position (location) within the root.

Plants normally called "sweet" concentrat most of the cyanogen in the peel; the "bitter" ones have th cyanogen distributed generally throughout the root.

Concen. varies greatly under influence of envirnomental conditions.

More xx implications for development from these considerations in a moment.

SLIDES 1 - 17

Slides 1 - 7 give some ideas about the ranges of variation in the plants.

Slide 8 represents a typical cluster of roots.

Slides 9 - 12 show structure of flowers, and tell something about why the variability comes into existence.

Slides 13 - 17 show some of types of fields and plantings.

a closer look at almost any field shows that there are several ~~xxxxxxxf~~ cultivars grown together--farmer usually not careful about separating one from another. This is the typical situation.

Consequences of mixing cultivars.

variation in production of roots

" " " " HCN

" " maturation time.

Add to the above variability, hybridization (accidental) with various wild species, we get a much more unpredictable result.

S L I D E S 18 to 21 show some of the 95 wild species.

LIGHTS

Food resources from Manihot esculenta

fresh roots--used as boiled vegetables (or made into a paste)

processed roots--used in a multitude of ways

leaves--used as a fresh type of spinach--boiled and macerated.

Quantities used

very difficult to determine how many fresh roots are used--

statistics available never differentiate.

Processed roots seem to make up major use of cassava--statistics

do not differentiate between those for human consumption

versus those used in industrial materials, or for animal feed.

Leaf use seems to be most common in West Africa, though used

sometimes in Latin America--in Brasil, feferred to as "manicoba".

Processing techniques

Countless variations of processing methods, varying from country

to country.

S L I D E S r e presenting but two of these, one from near Kinshasa,

one from northeastern south America.

In both of these, seen that roots are indiscriminately bunched,

and thus are from several different cultivars, Recall

the variability in HCN conc. Result a single processing

technique may or may not be stasfactory for removal of all HCN.

Fermentation techniques--process important in most areas, though not

shown in the South American technique.

LIGHTS Reasons for fermentation, and importance

Improve flavors, probably removal of some HCN; probable

addition of microbial protein.

Implications of food products with some remnant, ~~mixm~~ microquantities of HCN.

Not speaking of concentrations sufficient to kill at one eating.

Rather, effects on nutrition of less than lethal doses.

Some studies tentatively link HCN ingestion with:

reduced levels of essential sulfur-bearing amino acids.

Neuropathy--small degeneration of nervious tissue

Goeterogenesis

May be, then, that kwashiorkor is a result of daily ingetions of microquantities of CN^- from cassava, rather than because of tendency to have high quantities of calories from carbohydrates in the diet.

Summary--lack of proper knowledge of the variability in the plants and their products has serious effects for agricultural development and for nutrition. Important to keep in mind that we are dealing with an extremely variable cultigen, variable in form an function. Furthermore, processing techniques may, or may not perform the function required to produce an entirely safe food product.

Show last 2 slides, if time permits.

Slides

Habit - Slide 1
" 2
" 3
" 4
" 5

Leaf Slide 6
" 7 - also shows symptoms of mosaic.

Root " 8

Flower " 9 - inflores.
" 10 - ♀ fl
" 11 ♂ fl.
" 12 ♀ fl. of M. grahami

Production in field " 13 - Peru
" 14 - Colombia
" 15 - Congo - Kimbara
" 16 - " "
" 17 - Mexico

Wild relatives " 18 - M. pseudoglaziovii
" 19 - M. Pringlei
" 20 - M. aesculifolia
" 21 - " "

Methods of preparation " 22 - Congo - ferment.
" 23 - " - "
" 24 - " - drying cossettes
" 25 - " " "
" 26 - " - chicken wangue
" 27 - " "
" 28 - " "

Slides

Method of preparation - Slide 29 - Surinam - roots
" 30 - " - peeling
" 31 - " - grating
" 32 - " - press
" 33 - " - baking - cassabe
Use of leaves " 34 - Congo - market
" " " (decoctus) " 35 - Hawaii
" " " " " 36 - "

FOOD RESEARCH INSTITUTE SEMINAR

Friday

November 19, 1971

Speaker:	David Rogers Visiting Scholar, Food Research Institute Professor of Biology, University of Colorado
Subject:	Biology of Manioc and Its Implications for Development
Time and Place:	3:30 - 5:00 fr314 (Seminar Room, Food Research Institute, Galvez and Serra Streets)