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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.

Federal Department of Agric. Research,
Umudike,
Private Mail Bag 26,
Umuhia-Ibeku,
East Central State,
NIGERIA.

Our Ref: UFR.51/2/21

20th March, 1971.

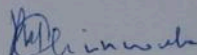
Sir,

CLASSIFICATION OF YAM & CASSAVA VARIETIES

We in Umudike station of the Nigerian Federal Department of Agricultural Research are embarking on collection, identification and eventual classification of local varieties of yams (*Dioscorea*) and of cassava. But unfortunately we have no professional training in taxonomy and would be grateful if you would acquaint us with the statistical taxonomy used by you (1967) for cassava.

Your early action will be greatly appreciated.

Yours faithfully,



P.M. CHINWUBA,
PRINCIPAL RESEARCH OFFICER I/C.

Dr. D. Rogers,
Taxmetrics Laboratory,
University of Colorado,
Boulder,
Colorado 80302,
U. S. A.

PMC/Psajuz.

O.P. Ifenkwe,
Federal Dept. of Agric. Research,
Umudike,
Private Mail Bag 26,
Umushia,
East Central State, NIGERIA.

8th March, 1971.

Dr. D.J. Rogers,
Thymetrics Laboratory,
University of Colorado,
Boulder Colorado,
8030 R,
U.S.A.

Dear Dr. Rogers,

Your address was given to me by Mr. P.M. Chinwuba, Principal Research Officer i/c. of this Station, on his return from Ibadan where he attended a conference on Root Crops. He told me of your interest in cassava work especially on the method you are adopting for the classification of cassava.

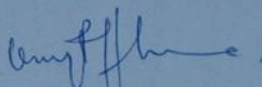
Presently, I am working on this and would be very grateful if you can make available to me any information you may have on this subject and any other relevant work on cassava including any papers on breeding and agronomy work you may have.

I must mention that I am not quite experienced on this job and would be very grateful for any assistance you can render to me. I will like to keep in touch with you always to enable me refer to you some of the problems I might encounter.

I am looking forward to hearing from you soon.

Thanks for your co-operation.

I am,
Yours faithfully,



O.P. IFENKWE.

IBADAN OFFICE:
BARCLAYS BANK CHAMBERS
BANK ROAD
P.M.B. 5329
IBADAN,
TELEPHONE: 21451/2

LAGOS OFFICE:
29, ISOBO AROBODU AVE.
P.O. BOX 145,
IKEJA, NIGERIA.
TELEPHONE: 33931

INTERNATIONAL INSTITUTE OF
TROPICAL AGRICULTURE

THE FORD & ROCKEFELLER FOUNDATIONS

Cable Address:
TROPFOUND, LAGOS.

25 February, 1971.

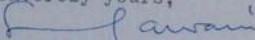
Dr. D. J. Rogers,
Division of Population Studies,
Department of Biology,
University of Colorado,
Boulder, Colorado 80302.
U. S. A.

Dear Dr. Rogers,

Dr. B. T. Kang of our Institute has advised me to get in touch with you for a number of your publications pertinent to our research program. Kindly send us reprints of your papers listed below:

1. Appan, S. G. & D. J. Rogers, 1969.
Taximetric methods for delimiting biological species. XI International Bot. Congress, Seattle.
2. Appan, S. G. & D. J. Rogers, 1970.
The closed gene pools of Manihot delimited by computer-aided taximetric methods to aid utilization of the wild genetic wealth in cassava improvement programs. Tropical Root & Tuber Crops Newsletter 3: 16-18.
3. Appan, S. G., D.J. Rogers, G.N. Hersh; and H.S. Fleming. 1970.
A strategic program for genetic engineering of cassava. Proc. 2nd. International Symposium on Trop. Root & Tuber Crops 1: 79 - 82.
4. Fleming, H.S. & D.J. Rogers. 1970.
A classification of Manihot esculenta using information carrying content of a character as a measure of its classificatory rank. Proc. 2nd. International Symp. Tropical Root & Tuber Crops 1: 66 - 71.
5. Rogers, D.J. & S. G. Appan
Cassava based nourishment generating system capable of functioning in ecologically and economically impoverished areas.
6. Rogers, D.J. 1965.
Some botanical and ethnological considerations of M. esculenta. Economic Botany 19:369 - 377.

Sincerely yours,


S.M. Lawani, Librarian.

Sent refinito
Dr. Harris, Dept. Geog., King College
Gower St. London, WC1E 6BT

Barbara Kewoiz

c/o Academic Press

New York

(for London Office)

(Economic Botany
paper)

Home address:

8, Bedford House

the Avenue,

London W4

O. A. Denton
Fed. Dept. of Agric. Research
P. M. B. 5042
Ibadan
Nigeria.

List of resistant mosaic-
resistant *Spergularia* of *Cassava*
that could be used in breeding
purposes.

CHHEDA H. R.
AGRONOMY dip
Univ. of IBADAN
NIGERIA

Possible students
From him -
Pl. Breeding -
Send reprints.

Bede N. Okigbo
Head Dept of Plant/Soil Science
University of Nigeria
Nsukka, Nigeria
26/2/71

Dear Dr. Rogers:

It would be very much appreciated if you could send us as many reprints on Manihot work as possible but more especially on the taxonomy, computer techniques, genetics and breeding techniques. It would also be very much appreciated if you could help to get Dr. Popenoe send us seeds of high protein and mosaic resistant lines or species through The Federal Department of Agricultural Research.

Plant Quarantine Section
Moor Plantation, Ibadan
Nigeria

Thanks for your cooperation
Sincerely yours
B. N. Okigbo

From Dr C. OYOLU

① Which is the species without HCN?

Mauhot Pringlei, found in N.E. Mexico.

② List of recommended species for breeding with *M. esculenta*?
Please give gist of characteristics of each.

Which of the species can you send to me?

Sand also Proc. Int. Symp.
1st Conf. + 2nd Conf.

Dr C. OYOLU,
University of Nigeria,
Nsukka,
East Central State,
NIGERIA.

23rd Feb. 1971

Dear Prof. Rogers

I would be very grateful to receive the following reprints when you return to the United States of America:-

- ① Appan, S.G. and D.J. Rogers 1969. - Taximetric methods for delimiting biological species. XI International Bot. Congress. Seattle. Abstract of papers P. 5.
- ② Appan, S.G. and D.J. Rogers 1970. The closed gene pools of *Manihot* delimited by Computer-aided taximetric methods to aid utilization of the wild genetic wealth in cassava improvement programs. Tropical Root and Tuber Crops Newsletter 3:16-18
- ③ Appan, S.G., D.J. Rogers; G.N. Herish and H.S. Fleming 1970. - A strategic program for genetic engineering of cassava. Proc. Second International Symp. Tropical Root and Tuber Crops 1:79-82.
- ④ Fleming, H.S. and D.J. Rogers 1970 - A classification of *Manihot esculenta* using the information carrying content of a character as a measure of its classificatory rank. Proc. Second International Symp. Tropical Root and Tuber Crops 1: 66-71.
- ⑤ Rogers, D.J. 1953. - Variation in *Manihot utilissima* and related species. Year book of American Philosophical Society p166-168.
- ⑥ Rogers, D.J. 1963. - Studies of *Manihot esculenta* Crantz and related species. Bull. Torrey Bot. Club 90:43-54.
- ⑦ Rogers, D.J. 1965 - Some botanical and ethnological considerations of *Manihot esculenta*. Econ. Bot. 19:369-377.
- ⑧ Rogers, D.J. 1967 - A computer-aided morphological classification of *Manihot esculenta* Crantz. Proc. International Symp. Tropical Root Crops Trinidad. 1: 57-80.
- ⑨ Rogers, D.J. and S.G. Appan 1970 - Untapped genetic resources for cassava improvement. Proc. Second International Symp.

- ⑩ Rogers, D.J. and S.G. Appan. In Press. Cassava - based nourishment generating system capable of functioning in ecologically and economically impoverished areas. *Tropical Root and Tuber Crops Newsletter*.
- ⑪ Rogers, D.J. and H.S. Fleming. In Press. A computer - aided classification of *Manihot esculenta* cultivars. *Econ. Bot.*
- ⑫ Rogers, D.J. and M. Milner 1963 - Amino acid profile of manioc leaf protein in relation to nutritive value. *Econ. Bot.* 17: 211-216.

Vernacular names 128

Type names 224

Collector 563

Collector # 1394

Country of collection 46

Province / State of collection 159

Herbarium 32

23rd December, 1970

Professor W. Rogers
The Department of Biology, Division of Population Studies
The University of Colorado
Bouldeir,
Colorado 80302
USA.

Dear Professor Rogers

The West Africa Office of the Ford Foundation, in close collaboration with the International Institute for Tropical Agriculture, Ibadan and l'Institut de Recherches Agronomiques Tropicales, Paris are currently organising a series of seminars on agricultural research in West Africa.

The next in the series will be on the subject of

"Research on Root and Tuber Crops in West Africa"

and will be held from 22nd - 26th February, 1971 at the Conference Centre, the University of Ibadan, Nigeria.

On behalf of the cosponsors of the seminar, I have great pleasure in inviting you to attend and to give a paper on the taxonomy of the genus Manihot.

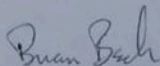
We hope to bring together most of the people currently engaged upon root crop research in West Africa. Most of these are young scientists who have little or no experience of the techniques you are using and who would benefit very much by meeting you personally and discussing their work.

The Ford Foundation will give you a Travel Fellowship which will provide for your airfare, per diem allowances en route and the cost of your accommodation at the University of Ibadan.

.../2.

I sincerely hope you can come for I have worked on cassava for many years and would be very happy to make your acquaintance.

Yours sincerely,



Brian D. A. Beck,
Programme Specialist in
Agricultural Research.

- Enclosed. 1. A general letter to delegates
with data forms for completion.
2. A provisional programme for the seminar.

BDAB:ea

THE FORD FOUNDATION
47, MARINA P. O. BOX 2368
LAGOS.

CABLES : FORDWAN, LAGOS

TELEPHONES: 27525/6,7,8,9.

16 June 1971

Chron BDAB
Chron SAO
File

Professor D.J. Rogers
Department of Biology
Division of Population Studies
The University of Colorado
Boulder, Colorado 80302
U.S.A.

Dear Dave,

I have at last had a letter from the New York office confirming that your \$ 1,232.06 was paid to you in April. I regret that it all took so long.

In accordance with Haldore Hanson's Travel Fellowship letter, could I remind you about providing us with a short report giving your comments on the Root and Tuber Crop Seminar and then I can close this file.

Have you been able to make any progress with T.P.I. about collecting the literature on root crops? C.I.A.T. asked me the other day where the best cassava bibliography was to be found, and I advised them to get in touch with you.

With my best wishes,

Yours sincerely,

Brian

Brian D.A. Beck
Programme Specialist in
Agricultural Research

BDAB:cls

22nd March, 1971

Professor W. Rogers
The Department of Biology, Division of Population Studies
The University of Colorado
Boulder
Colorado 80302
U.S.A.

Don B. Beck

This is not a nit-picking reminder about a summary of your address to the Root Crop Seminar. I have now got around to preparing the summary paper and in the discussions you suggested that there were at least fifteen species, closely related to Manihot esculenta, that you considered would be of value in breeding for resistance to C.M.V.

I would like to include this species list as an appendix to the summary. Could your "Computing Machines" also give me a list of addresses of sources of seed, because none of the West African delegates are familiar with the areas in which you found them.

The material Guillermo brought into Nigeria is doing fine, though the Plant Quarantine Service is still quivering with shock. I have now established with them that there is no quarantine necessary for seeds of Manihot spp.. I would like to get seed of the fifteen species, plus anymore you may recommend for IITA. For instance, we both agree that M. melanobasis and M. saxicola are not true species, but whatever they are, they do have a very high crude protein content in the tubers. Now that my original collections are lost, where can I get new seed ?

One further request, could you let us have two sets of your reprints Manihot taxonomy, one for my library here and one for the IITA library. The papers that you consider most important, I will photocopy here and send to the cassava people at the seminar, including the French, but I don't think the French market is large enough to have them translated.

With my best wishes.

*Yours sincerely
Brian*

Brian D. A. Beck,
Programme Specialist in
Agricultural Research.

CLASSIFICATION OF MANIHOT

Introduction

The objective of this paper is to aid various workers in the improvement of cassava (Manihot esculenta) by providing them with the most up-to-date classification of the genus Manihot, and/the relations between the wild species of the genus and the cultivated species. Because there is imperative need to introduce new genetic material for various needs, such as breeding resistance to virus diseases, improvement of quantity and quality of the raw roots, and to fit the plants better into many different environments, all those interested in the improvement of cassava should know what materials are available and where these may be found. There is a wealth of species with qualities of importance in breeding that have never been used, and the species that have been used already, such as Manihot glaziovii, M. saxicola, and a few others, are not necessarily the best species for the purposes intended.

Unfortunately, I cannot give a full accounting of the classification in the time allotted, because we recognize some 95 species in the genus, and some of them are interesting only for reasons that are purely botanical. The range of variation in morphological types in Manihot is considerable: acaulescent species no more than 10 cm. tall, sprawling semi-woody shrubs, and trees up to 12 meters tall. The range in geography of the species extends from the southwestern United States through Mexico, Central America, South America and the West Indies. There are no species of the genus native to any other parts of the world. In ecological relations, species are found from desert areas, savannahs, and scrubby woodlands to tropical rainforest. Altitudinally, the species are generally confined to areas below 1500 meters, but one species, M. rubricaulis, in Mexico grows up to 2000 meters. Thus, there is a wealth of potentially useful germ plasma to aid plant breeders in designing new variations suitable to

meary requirements.

History of classification of Manihot

Before actual consideration of some of the species and their classification, a short sketch of the history of classification is useful. The understanding of this history should help workers in agriculture to understand why we taxonomists seem to be forever changing names and concepts. After all, the knowledge we gain in ^{any} scientific endeavor causes us to modify our concepts to fit new evidence, and no one expects plant breeders today to use techniques known and used a century ago. For these same reasons, the concept of species changes, with new evidence, and with newer concepts. In our attempts to classify Manihot, we have used the latest species concept, and hopefully our efforts come closer to objective reality than the work done by taxonomists in earlier times.

Although cassava was known and used for countless centuries in the tropics of the New World, the first ~~written down~~ knowledge of the crop ~~in chronicles did not occur until~~ ^{came in} the early part of the 16th century, ~~and~~ when Caspar Bauhin, a Swiss botanist, described plants brought back from Brazil by Andre Thevet. After Bauhin, other preLinneean botanists wrote some interesting observations about the cultivation and use of the plant among the natives of various parts of the New World. While the ^{Indian} name Manihot is a western European spelling of the words describing the plant, this name did not become formalized by the botanists until 1754, by Miller in The Gardener's Dictionary. Linneaus himself placed the species into the genus Jatropha, a source of much confusion in the names for some time after his first publication in 1753. The first acceptable name for the species ^{M. asculantia} was provided by Crantz, a Viennese botanist, in 1766. Unfortunately this name was unknown to Pohl, another Viennese botanist who did the first serious study of the species of the genus, and as a result Pohl gave entirely new names to the cultivated species. Pohl in 1827 designated the cultivated species M. utilissima, and separated the sweet and bitter variations by applying another specific epithet to

those variations which are designated "sweet". Pohl's name for the sweet variations is M. aipi. Following Pohl's work, the next serious study of the genus Manihot was done in Switzerland by Mueller von Argau/ Mueller in 1866. Mueller followed Pohl, ~~ix~~ using M. utilissima, but changed M. aipi to M. Balmata, among other changes for other species of the genus. Pax, in 1910, was the next ~~XXXXXX~~ botanist to reclassify the genus. By 1910, well over 150 names for species in the genus were in common use. Pax indicated that there 125 species in the genus. For the cultivated species, this author also accepted Pohl's name, M. utilissima, but changed the name for the sweet variations again, to M. dulcis. It is instructive to examine the work of the three authors, Pohl, Mueller, and Pax, to try to find what differentiate differences they employed to ~~XXXXXXXXXX~~ the cultivars into separate species. None of them agree as to what characteristics of the plants clearly indicate sufficient difference to make two separate species. Only in 1938 was the original species name, M. esculenta, again used, this time by an Italian botanist, Ciferri. It was the latter author who indicated that there was no valid means by which the variations of the cultivated species could be separated into separate species. His decisions have been corroborated by many workers who have found that the variants are almost entirely interfertile, and I have followed his decision to cut the confusion by maintenance of one species name for all the variations of ~~XXXXXXXXXX~~ cassava.

The above discussion abbreviates the historical aspects drastically. There are other considerations, but the ones given are intended to indicate what happened, and why the confusion over names has occurred.

Methods of deriving the present classification

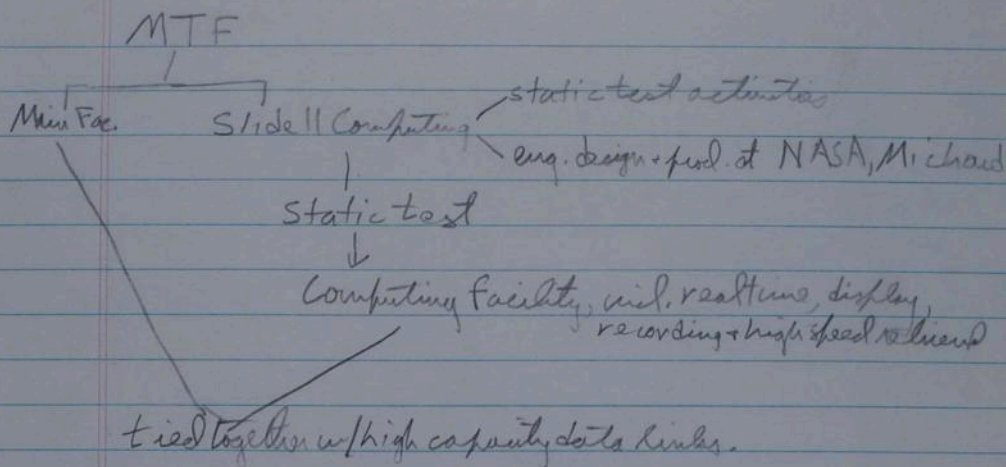
Because of the great confusion in the species names, a number of new procedures had to be adopted in order to provide the best evidence for any changes I cared to make. First, I spent nearly 15 years, travelling and collecting herbarium samples of the various species in most of the growing area of Latin America. Following these collections, I devised a number of

of computer programs to aid in making the classification more objective. With these programs, and with the additional collections of specimens, added to over 3500 herbarium specimens from most of the world's collections, I was able to proceed with establishing the correct species, and relating these to geographical and ecological considerations. The results of the classification are given below.

Generic classification

The genus Manihot is subdivided into subgeneric categories of Sections. The species of the genus generally fall into two geographic categories, between North and South America, and these categories are reflected in the sectional differentiation: two sections in North America, and 17 sections in South America. Because Manihot esculenta is a cultigen (definition = or cannot be determined, a species in cultivation, whose wild ancestors have been lost, and which requires the aid of man to survive), we have established a separate section including only this one cultivated species. Figure 1 illustrates the sectional divisions we have established. The sectional divisions were established using the "skyline" computer printout, as illustrated in Figure 2. Many of the sections ~~xxx~~ contain ~~xxxx~~ species of little interest to the plant breeder, but several of the sections show interesting relationships to ~~xxx~~ cassava. As many in this audience know, cassava will ~~xxxxx~~ hybridize easily with many other species of the genus. However, some of the species show more potential value for hybridizing with cassava than others.

In North America, Section Aesculifolia, with 11 species, ~~xxxxxx~~ contains potentially valuable genetic material of interest to plant breeders. Unfortunately, ~~xxxxxx~~ only one of these species is now maintained in a garden from which seeds or cuttings may be obtained, and that is Manihot Pringlei,



Want to become
Environmental Serv. Center for Gulf Region
Provide:

1. Housekeeping + gen'l admin. support — ?
2. Data proc., progr. + computing.
- 3.
- 4.
5. > not w/pt to us.

thru:

NASA contractor, (G.E.L.T.V.) not NASA itself
A No. of Fed. organizations committed - NOAA, et. al.
MTF has invited G.M.R.C. to locate some G.E.P.
activities at MTF. to get University participation.

Protection of our programs -
Guarantee of ownership.

Protection of Taxinetics Lab since the pilot
program has been completed -
1. Continue of staff into GEP program.

Should U. Colo. become a member of GURC?

How is budget payment to be made -
H + A → FSU -
Dome → Bioregulation.

Other collaborators from GURC -

Who pays them

Are there any administrative problems
for us with them?

Are they to be stipended at MTF?

THE FORD FOUNDATION

47, MARINA, P. O. BOX 2366,
LAGOS

CABLES: FORDWAN, LAGOS

TELEPHONES: 27525/6,7,8,9.

29 March 1971

Chron BDAB
Chron SAO
File

Professor D.J. Rogers
Department of Biology
University of Colorado
Boulder, Colorado 80302

Dear DADE

In as much as you did not receive your air ticket or expenses for international travel, but did receive your expenses in Nigeria, your travel grant is hereby supplemented to cover the cost of your actual out-of-pocket expenses listed in your letter of 2nd March, to a total of \$ 1,232.06.

Yours sincerely,

Brian

Brian D.A. Beck
Programme Specialist in
Agricultural Research

BDAB:cls

Slide 11

2. No wild forms, exactly like the cultimens
but some species, like Carthopisum
which could be feral species
refer to Jack Harbin's work.

Slide 12, 13

3. Included in esculenta some very
different plants -

4. Breeding potentials -

The classification indicates a number
of interesting potentials -
for example -

Slide 14, 15, 16

Slide 17

a) M. Pringlei

b) M. oaxacana

And others which include species from
both N. + S. AM.

Slide 18

Problem with M. Ploixii -
probably already has its own
virus problems

Slide 19.

Last, M. esculenta can be beautiful
the variegated form used in Hawaii

Summary -

Much broader base for change than
previous -

International cooperation, ~~can~~ as that of
ERAT and IITA, can, if properly used
move much faster.

My job in this can be to serve as a
resource for information - not to direct
the development of any one particular objective.

We now have a clear picture of relationships.

Refer to illustrations in book.

Please leave papers for others
to see -

If anyone interested please
address me at - TAXImetrics Lab.
Dept. of Bio. U. Colo.
Boulder, Colo. 80302
USA

Seminar at Ibadan, Feb. 23

1. Introduction -

- a. The paper represents about 15 years of work on cassava and its relative wild species.
- b. Two major efforts went in - studies of plants themselves and computer development.
- c. Extra illustrations on cassava etc. in back of room.

2. Objectives (purpose)

1. Relationship amongst all species of the genus.
2. Indicate some interesting relations of *M. esculenta*.
3. Give an historical background as an understanding of nomenclatorial and relational difficulties.

3. Purpose of classification per se -

1. Delimit the species - biological concept - clonal gene pool.
2. Provide information about what and where genetic materials to be found.
3. Build a data bank and retrieval system.

4. Historical sketch of classificatory studies

1. 1536 (or thereabouts) C. Bauhin - a European herb list.
2. Tournefort 1600's and others used *M. Thovetic*.
3. Upon introduction of a strict code of Nomenclature, all species names commence recognition from 1753 - Linnaeus' *Sp. Plantarum*.
 - a) Miller - 1st Validated name of the genus
 - b) Linnaeus - lumped it with *Jatropha*.
 - c) Crantz - 1st designated species *esculenta*.
 - d) Pohl - 1st real botanical study, in 1827.
1st used *M. titchianum* and *M. aipi*.

- e) Miller, 1866 - DC Prodr. reduced some names and changed others - *M. aipi* → *M. palmata*.
- f) Pax, 1910 - Pf Pflanzenfamilien - added many species (136) - *M. utilis*, and changed some from *M. palmata* to *M. dulcis*.
- g) Ciferri, 1936 - 1st mod. bot. to accept Crantz's original name *esculenta*.

5. Methods used - no details here

1. Developed to give maximum info. and best possible correlation.
2. Programs used - TAXID, CHAPANAL, GRAPH.
3. Demonstration of some results in back of room.

6. Categories & classification - presently 96 species - Genus *sublimitisima*:

Slides 1, 2, 3

S. Amer.	- 13
N. Amer.	- 2

- 1 - for *M. esculenta*.

Species diversity clearly greater in S.A.M.

- 1) but only one section showing close rel. to *esculenta*.
- 2) Other sections rubber bearing, or v. low shrubs, or simple, unlobed leaves, or climbing vines.

Sections related to *n. esculenta*.

Slide 4, 5, 6,	1. In S. Am. section <u><i>prohemis</i></u> -
7, 8, 9, 10.	2. In N. Am. " <u><i>arsenifolia</i></u> -

Section *Esculent a* -

1. As earlier indicated, *M. escul.* a composite sp

GENUS MANIHOT 19 sections 96 species

CULTIVATED — 1. **ESCULENTA** ————— 1 species

- 2. **MULTIFIDA** ————— 15
- 3. **ANISOPHYLLA** ————— 2
- 4. **CARTHAGINENSIS** ————— 2
- 5. **VIOLACEA** ————— 14
- 6. **GRACILIS** ————— 9
- 7. **ANOMALA** ————— 2
- 8. **MIRABILIS** ————— 2
- 9. **GLAZIOVII** ————— 7
- 10. **PERUVIANA** ————— 3
- 11. **PROCUMBENS** ————— 4
- 12. **PUSILLA** ————— 5
- 13. **TOMENTOSA** ————— 1
- 14. **SALICIFOLIA** ————— 6
- 15. **PELTATA** ————— 3
- 16. **TRIPARTITA** ————— 1
- 17. **COERULESCENS** ————— 2

**SOUTH
AMERICA**

**NORTH
AMERICA**

- 18. **AESCUlifOLIA** ————— 11
- 19. **FOETIDA** ————— 6

M. Pringlei Watson
acaulifolia (HBK) Pohl
rubiculis -ssp. *rubiculis*
" *violacea*
oaxacana R+A
Danicose Griseb
angustiloba (Torr.) M. Arg. emend R+A
tristis ssp. *saxicola*
leptopoda ~~M. Arg. Pohl~~ (M. Arg.) R+A
arvicophylla (Riesb.) M. Arg.
caithaguanensis (Georg.) M. Arg.
pseudoglaucina Pax.

Species collections

localities

- 1) Dr. Alcides Teixeira, Dir. — has several spp — I am
São Paulo Botanic Gard. not sure which.
São " , Brazil.
2. Dr. Popovoe, Director — has
Fairchild Tropical Garden M. Pringlei
Miami, Fla.

Some species of importance, but not new in
collections.

- M. aesculifolia — S. Mexico. M. pringlei
M. rubricaulis — N.W. Mexico. N.E. Mexico
- M. oaxacana — Tehuantepec, Mexico.
- M. angustifolia — N.W. Mexico.
- M. saxicola — Guianas.
- M. pilosa — near Rio de Janeiro, Brazil.
- M. pseudo glaziovii — Pernambuco, Brazil.

There are a few others which anyone can have listed
by writing to me — I don't have any of these
myself, nor do I know anyone ~~here~~ who
does.