Elite Cassava Germplasm from CIAT

CIAT is a nonprofit organization devoted to the agricultural and economic development of the lowland tropics. The government of Colombia provides support as host country for CIAT and furnishes a 522-hectare site near Cali for CIAT's headquarters. In addition, the Fundación para la Educación Superior (FES) makes available to CIAT a 184-hectare substation in Quilichao and a 73-hectare substation near Popayán. CIAT also co-manages with the Instituto Colombiano Agropecuario (ICA) the 22,000-hectare Carimagua Research Center in the Eastern Plains of Colombia and carries out collaborative work on several of ICA's experimental stations in Colombia; similar work is done with national agricultural agencies in other Latin American countries. CIAT is financed by a number of donors represented in the Consultative Group for International Agricultural Research (CGIAR). During 1983 these CIAT donors are the governments of Australia, Belgium, Canada, the Federal Republic of Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States; the International Bank for Reconstruction and Development (IBRD), the Inter-American Development Bank (IDB), the European Economic Community (EEC), the International Fund for Agricultural Development (IFAD), the OPEC Fund for International Development; the Rockefeller Foundation, and the Ford Foundation. In addition, special project funds are supplied by various of the aforementioned donors plus the Kellogg Foundation, the United Nations Development Programme (UNDP), and the International Development Research Centre (IDRC).

Information and conclusions reported herein do not necessarily reflect the position of any of the aforementioned governments, agencies, or foundations.

Elite Cassava Germplasm from CIAT

CIAT, Centro Internacional de Agricultura Tropical

Centro Internacional de Agricultura Tropical (CIAT)
Apartado 6713
Cali, Colombia
May 1983

CIAT (Centro Internacional de Agricultura Tropical). 1983. Elite Cassava Germplasm from CIAT. Cali, Colombia. 20 p.

Press run: 300
Also available in Spanish.

Through repeated evaluations in several locations, the CIAT Cassava Program is able to offer elite clones well adapted to diverse edapho-climatic conditions and suitable for various end uses. This pamphlet lists these clones, along with describing yield, quality and resistance characteristics. Clones are available upon request as *in vitro* cultures. They may offer an opportunity for: 1) direct release as a cultivar following appropriate evaluation, and/or 2) for use as cross parents in a breeding program.

In addition to clones sent as *in vitro* cultures, hybrid seeds from selected parents are also available. Seeds provide a high level of variability and good possibilities for local selection.

CLONAL MATERIAL

Procedures for requesting cassava clones

Requests should normally be made by matching characteristics desired in a given selection /breeding program with the list of characteristics for each clone. As the preparation and shipment of each clone involves considerable expense, CIAT expects that only clones would be requested which would have potential usefulness in the country where they will be introduced.

Each recipient is advised to include with the request an import permit from the national quarantine authorities, if it is required. Requests should be sent with the attached form to:

Dr. W.M. ROCA
Unidad de Recursos Genéticos
CIAT
Apartado aéreo 6713
Cali, Colombia

Phytosanitary certificate and phytosanitary statement

All the source materials for preparing *in vitro* cultures are taken as meristem tips from plants grown at the CIAT-Palmira station. All shipments are inspected by Colombian quarantine authorities, and a phytosanitary certificate issued by them is included with the consignment. CIAT includes an additional phytosanitary statement, which reads as follows:

"This statement is meant to provide supplementary information, but not to substitute the Phytosanitary Certificate issued by the Colombian authorities.

The in vitro *meristem cultures of cassava (*Manihot esculenta *Crantz) contained in this package are vegetative samples. They were aseptically prepared from terminal buds of sprouted stakes, which were under heat therapy for 4 weeks.*

The stakes were taken from visually healthy plants, free of symptoms of cassava bacterial blight, superelongation, and Diplodia *spp. stem rot. These plants were also indexed using the latest available techniques for cassava viral diseases and found negative for the following: Common and Caribbean mosaics, latent viruses affecting differential clones, and frog skin disease.*

The cultures were free of cassava insects and mites and from the eggs of these pests. To the best of our knowledge this plant material was free of cassava diseases and pests at the time of dispatch."

Form of shipment

All clones are sent as well-established plantlets in test tubes. Normally, five to ten test tubes are shipped for each clone requested, but more could be shipped in special cases. Each plantlet is individually cultured in a test tube with sterile media. Test tubes are placed in protective packaging to minimize possibility of breakage during transit. Unless otherwise requested, packages will be sent via airmail to most destinations.

Post-receipt handling procedures

CIAT will inform by telex or cable of the details of shipment so that the recipient can be prepared as necessary. This will be especially important for those cases where the consignment will be held by quarantine authorities, so that undue delays and possible losses of material do not occur. Detailed instructions for post-receipt handling and propagation will be included on request.

Other clonal material available

Though elite clones or hybrid seed should provide possibilities for promising selections for most regions, special requests for other germplasm bank accessions or hybrid clones will also be considered. Other clones available include a germplasm collection of approximately 3000 accessions.

BOTANICAL SEED

Up to several thousand seeds can be made available according to needs and selection capabilities of the requesting institution. Cross parents used and quantities of reserve seed available change constantly, so each request for seeds will be considered individually on the basis of material available at the time of the request. This should be sent to:

Dr. CLAIR H. HERSHEY
Fitomejoramiento Yuca
CIAT
Apartado aéreo 6713
Cali, Colombia

EVALUATION OF INTRODUCED GERMPLASM

In order to continually improve the cassava clones or crosses we have available, CIAT requires information on the performance of the materials we distribute internationally. Further details can be provided on evaluation procedures for programs who desire them.

DESCRIPTION OF CLONES

The description of the cassava clones is divided into six basic sections: 1) origin or cross parents; common name; other remarks; 2) general adaptation in different edapho-climatic zones; 3) yield and quality characters; 4) general potential use; 5) morphological traits; 6) resistance/tolerance characters.

For most of the quantitative traits (such as yield, quality and resistance) descriptions are given in terms of a scale designating high to low trait expression. Because expression of these traits varies considerably according to environmental conditions, reporting of exact numerical data can be misleading unless details of environmental conditions are also given for each trial. More extensive data for some of the yield, quality and resistance characters can be found in CIAT Annual Reports.

The following is a description of the variables listed for each clone. Unless otherwise specified, the following scale is used:

--	=	Very low
-	=	Low
0	=	Intermediate
+	=	High
+ +	=	Very high

General adaptation in edapho-climatic zones

CIAT has divided cassava-growing regions into six basic zones based on soil and climatic conditions. For each edapho-climatic zone, major biological and physical yield constraints are also described.

Zone	Description	Major yield constraints
I	Lowland tropics with prolonged dry season	Drought, mites, thrips, mealybugs, termites, bacteriosis, root rots, viruses.
II	Acid soil savanna	Low soil fertility, drought, bacteriosis, superelongation, anthracnose, *Cercospora* leaf spot, mites, mealybugs, lace bugs.
III	Tropical rainforest without pronounced dry season	Low soil fertility.
IV	Intermediate altitude tropics (800-1400 m.a.s.l.)	Thrips, mites, mealybugs, bacteriosis, mycoplasma, anthracnose, root rots, and viruses.
V	Highland tropics (1400-2000 m.a.s.l.)	Low temperature, phoma leaf spot, anthracnose, mites.
VI	Subtropics	Low winter temperature, bacteriosis, superelongation, anthracnose.

Yield and quality characters

Yield: general yielding ability in edapho-climatic zones where the clone is adapted.

Dry matter: Root dry matter content (also highly correlated with root starch content).

HCN: HCN content of root parenchyma tissue.

Ease of harvest: Ease of manual harvest (+ + = very easy; —— = very difficult).

General potential use

Fresh consumption: Requires low HCN, intermediate to high dry matter, and good texture.

Animal feed: HCN level of fresh roots not critical; intermediate to high dry matter preferable.

Starch extraction or flour:	Requires intermediate to high dry matter; HCN requirements vary by region.
Industrial alcohol:	Few stringent quality requirements; intermediate to high dry matter preferable.

Morphological traits

Root shape:

Shrt	=	short
Med	=	intermediate
Lng	=	long

Root surface color: color of peridermis

Wt	=	white
Ylw	=	yellow
LtBr	=	light brown
DkBr	=	dark brown

Root inner surface color: color of sclerenchyma

Wt	=	white
Ylw	=	yellow
LtPnk	=	light pink
Pink	=	pink

Root flesh color: color of parenchyma

Wt	=	white
Ylw	=	yellow

Mature stem color:

Grey	=	grey
YlwBr	=	yellowish brown
LtBr	=	light brown
DkBr	=	dark brown
OrBr	=	orange brown

Branching habit: based on number of levels of apical branching

Plant height: (+ + = very tall; -- = very short)

Leaf apex color:

Gr	=	green
PrpGr	=	purplish green
GrPrp	=	greenish purple
Prp	=	purple

Leaf petiole color:

Gr	=	green
LtRed	=	light red
Red	=	red
Prp	=	purple

Leaf pubescence (apex): pubescence of young, unexpanded leaves.

Resistance/tolerance characters

Bacteriosis:	*Xanthomonas campestris* pv. *manihotis*
Superelongation:	*Elsinoe brasiliensis (Sphaceloma manihoticola)*
Phoma leaf spot:	*Phoma* sp.
Anthracnose (lowland):	*Colletotrichum* or *Glomerella* spp.
Anthracnose (highland):	*Colletotrichum* or *Glomerella* spp.
Pre-harvest root rot:	various pathogens
Thrips:	*Frankliniella williamsi, Corynothrips stenopterus, Caliothrips masculinus*
Mononychellus mite:	*Mononychellus* sp.
Oligonychus mite	*Oligonychus* sp.
Mealybug:	*Phenacoccus herreni*
Lace bug:	*Vatiga manihotae*
Whitefly:	*Aleurotrachelus socialis*
Soil acidity	
Low phosphorus	

CLONE	ORIGIN OR CROSS PARENTS; COMMON NAME; SPECIAL REMARKS	GENERAL ADAPTATION IN EDAPHO-CLIMATIC ZONE						YIELD AND QUALITY CHARACTERS				GENERAL POTENTIAL USE			
		LOWLAND TROPICS, LONG DRY SEASON I	ACID SOIL SAVANNA II	LOWLAND HUMID TROPICS III	MIDDLE ALTITUDE TROPICS IV	HIGHLAND TROPICS V	SUB-TROPICS VI	YIELD	DRY MATTER	HCN	EASE OF HARVEST	FRESH CONSUMPTION	ANIMAL FEED	STARCH EXTRACTION OR FLOUR	INDUSTRIAL ALCOHOL
M Col 22	Cordoba, Col.	+ +	—		0	— —		+	0	0	+	+ +	+	+	+
M Col 72	Sucre, Col.	+ +	—		+	— —		+	+	0	+ +				
M Col 638	Meta, Col.	—	+ +		—	— —		0	0	0	0	—	—	—	—
M Col 1468	Campinas, Brazil; "Mantequeira"; CMC 40	+	+	0	+	—	+ +	+ +	—	—	+	+ +	+	+	+
M Col 1522	Cauca, Col; "Algodona"; "Popayán"; CMC 92					+ +		+	—	+					
M Col 1684	Amazonas, Col.	+ +	+	+ +	0	— —		+ +	—	+ +	—	— —	—	+	+ +
M Col 1894	Colombia		+ +		0	— —		+	0	—					
M Col 1964	Colombia		+ +		0	— —		+	—	0					
M Col 2017	Huila, Col.					+ +		+	—	—					
M Col 2019	Huila, Col.					+ +		+	0	+					
M Col 2059	Cauca, Col.					+ +		0							
M Col 2061	Cauca, Col.					+ +		0	+	0					
M Col 2215	Cordoba, Col.	+ +				— —		+	+ +	—					
M Ven 25	Venezuela	+ +	—		0	— —		+	+ +	+ +					
M Ven 77	Venezuela, similar to M Col 1914, M Col 1916, M Pan 12B, M Pan 19, M Pan 101	+	+ +		0	— —		+	0	0	—	+	0	0	0
M Ven 156	Tachira, Ven; CMC 76	+ +			+			0	+	0					
M Bra 12	Brazil	+ +	— —		+	— —		+ +	0	0	+	+ +	+ +	+	+
M Cub 74	Cuba, "Señorita"						+ +	+							
M Ecu 72	Zamora chinchipe, Ecuador	+	— —		+	— —									
M Mex 59	Chiapas, Mex.	+ +	0		+	— —		0	—	+	—				

	LEVEL OF RESISTANCE TO:																						
	MORPHOLOGICAL TRAITS										DISEASES							INSECTS AND MITES						SOIL PROBLEMS	
CLONE	ROOT SHAPE	ROOT SURFACE COLOR	ROOT INNER SURFACE COLOR	ROOT FLESH COLOR	MATURE STEM COLOR	BRANCHING HABIT	PLANT HEIGHT	LEAF APEX COLOR	LEAF PETIOLE COLOR	LEAF PUBESCENCE (APEX)	BACTERIORIS	SUPERELONGATION	PHOMA LEAF SPOT	ANTHRACNOSE (LOWLAND)	ANTHRACNOSE (HIGHLAND)	CERCOSPORA LEAF SPOT	PRE-HARVEST ROOT ROT	THRIPS	*MONONYCHELLUS* MITE	*OLIGONYCHUS* MITE	MEALYBUG	LACE BUG	WHITEFLY	SOIL ACIDITY	LOW PHOSPHORUS
M Col 22	Shrt	Wt	Wt	Wt	Grey	0	0	GrPrp	Gr	0	−−	−	−	+	−−	0	+	+	−	−	0	0	−−	−	0
M Col 72	Shrt	Ylw	Ylw	Ylw	Grey	−	0	GrPrp	Gr	+	−	+	−	+	−	0	0	0	0	+ +	0	+ +			+ +
M Col 638	Med	Ylw	Wt	Ylw	YlwBr	+ +	0	GrPrp	Red	+	+ +	+	0	−	+	+	−−	+	0	0	−	0		−	0
M Col 1468	Shrt	DkBr	Pnk	Wt	LtBr	−	+	Prp	Red	−−	+	0	0	+	0	+	−−	−−	−−	0	−−	−	−−	+ +	0
M Col 1522	Med	LtBr	Ylw	Wt	YlwBr	+ +	+	PrpGr	Gr	+	−	−	+ +	−−	+	+	+	+	+	+		+			
M Col 1684	Med	Wt	Pnk	Ylw	YlwBr	0	+	Gr	LtRed	−−	0	0	−−	0	−	0	+	−−	−−	+		−	+ +	+	0
M Col 1894	Shrt	LtBr	Wt	Wt	Grey	0	+	PrGr	LtRed	−−	+	+						−−	−−	−−		0	+ +		+
M Col 1964	Shrt	Ylw	Wt	Wt	Grey	0	0	Gr	Gr	+	+	0						+	0	−		+			0
M Col 2017	Shrt	DkBr	Wt	Wt	DkBr	+	0	Gr	Gr	+			0		+			+ +	+						
M Col 2019	Shrt	DkBr	Wt	Wt	YlwBr	+	0	PrpGr	Gr	+			0		+			+ +	+						
M Col 2059	Shrt	DkBr	Wt	Wt	YlwBr	+	0	PrpGr	Gr	+			+ +	0	+ +	0	+								
M Col 2061	Med	DkBr	Wt	Wt	DkBr	+	+	PrpGr	Gr	+ +			0	−−	+ +	0	−	+ +	+						+ +
M Col 2215											0			+		−	+ +	+	+						
M Ven 25	Shrt	LtBr	Wt	Wt	DkBr	−	+	Prp	LtRed	−	0	−		0				−	0	−	−	0			+
M Ven 77	Long	DkBr	Pnk	Wt	LtBr	−	+	PrpGr	Gr	0	+ +	+ +	−	+ +	+	−−	+ +	−	−	−	−	−		+ +	+
M Ven 156	Med	LtBr	Pnk	Wt	YlwBr	−	+	Gr	Gr	+	−	−		0			0	0	+	−−		0		0	+
M Bra 12	Med	Wt	Pnk	Wt	Grey	0	+	Gr	Red	+ +	−	−−	0	+ +	+ +	−	+	+ +	+	−−	−−	0	+	−	−
M Cub 74	Med	DkBr	Pnk	Wt	Grey	0	+	Gr	Prp	+	−	+						+			−				
M Ecu 72											−	−				−		+ +	+	+		+			
M Mex 59	Long	LtBr	Wt	Wt	DkBr	+ +	+	Gr	Prp	0	−−	+	−	−	+	0	−−	0	0	0	−	0	−−	+	+ +

CLONE	ORIGIN OR CROSS PARENTS; COMMON NAME; SPECIAL REMARKS	GENERAL ADAPTATION IN EDAPHO-CLIMATIC ZONE						YIELD AND QUALITY CHARACTERS				GENERAL POTENTIAL USE			
		LOWLAND TROPICS, LONG DRY SEASON I	ACID SOIL SAVANNA II	LOWLAND HUMID TROPICS III	MIDDLE ALTITUDE TROPICS IV	HIGHLAND TROPICS V	SUB-TROPICS VI	YIELD	DRY MATTER	HCN	EASE OF HARVEST	FRESH CONSUMPTION	ANIMAL FEED	STARCH EXTRACTION OR FLOUR	INDUSTRIAL ALCOHOL
M Pan 70	Chiriquí, Panamá; similar to M Mex 16, M Mex 17, M Pan 114, M PTR 26, M Ven 218	+	—		+	——		+	+	0	——				
M Per 245	Perú		+ +		—	——		+	0	0					
ICA HMC 1	Hybrid sel. of ICA, Colombia	+			+ +	+		+							
ICA HMC 2	Hybrid sel. of ICA, Colombia	+	+	+	+ +			+ +				+ +	+	+	+
CM 91-3	M Col 688 x M Col 1438*	0	+	0	+ +	——		+ +	0	0	0	+ +	+ +	+ +	+
CM 308-197	M Col 22 x M Col 361	+	—		+ +	——		+	—	+	0	—	+ +	+	+
CM 342-170	M Col 22 x M Col 1468	+ +	—	0	0	——		+	0	0	+	+	+ +	+	+
CM 344-71	M Col 113 x M Ven 307	+ +	—		+ +	——		+	0	+	—	+	+ +	0	+
CM 430-37	M Col 1438 x M Col 647	0	+ +		+	——		+	0	——	0	+ +	+ +	+	+
CM 489-1	M Col 882 x M Ven 270	0	——	—	+ +	——		+ +	——	—	+	——	+ +	0	+ +
CM 507-37	M Col 1438 x M Col 1684	+	+ +	+ +	+	——		+ +	0	+ +	0	—	+	0	+ +
CM 523-7	M Col 655A x M Col 1515	+	+ +	+	+	——		+	+ +	0	+	+	+	+	+
CM 681-2	M Ven 185 x M Col 22	+ +	——		0	——		+	0	0	+ +	+ +	+	+	+
CM 849-1	[M Ven 305 (O.P.)] x M Ven 218 = SM 76-66 x M Ven 218	+	0		+ +	——		+ +	0	+	0	0	+ +	+ +	+ +
CM 955-2	(M Col 22 x M Col 647) x M Ven 218 = CM 309-37 x M Ven 218	+ +	——		+ +	——		+	0	0	—	+ +	+	+	+
CM 976-15	(M Col 22 x M Ven 270) x M Col 1684 = CM 321-160 x M Col 1684	+ +	0		+	——		+ +	+	+	0	—	+ +	+ +	+ +
CM 981-8	(M Col 22 x M Ven 270) x M Col 1292 = CM 321-170 x M Col 1292	+ +	0		+ +	——		+ +	+ +	0	—	+	+ +	+ +	+ +
CM 982-20	(M Col 22 x M Ven 270) x M Col 1684 = CM 321-170 x M Col 1684	+ +	—		+	——		+ +	—	+	0	—	+ +	+ +	+ +
CM 1015-16	M Col 22 x M Col 1684	+ +	—		+	——		+ +	0	+	0	—	+ +	0	+ +
CM 1305-3	(M Col 113 x M Ven 185) x M Col 1684 = CM 446-22 x M Col 1684	+ +	—		+ +	——		+ +	—	+ +	—	——	—	+ +	+ +
CM 1335-4	(M Col 1438 x M Ven 270) x M Col 1292 = CM 462-1 x M Col 1292		+ +		0			+ +	+ +	0	+	+	+ +	+ +	+ +
CM 1585-13	(M Col 22 x M Ven 270) x (M Col 22 x M Col 647) = CM 321-78 x CM 309-56		+ +		0			+	0	——	+	+	+ +	0	+ +

	LEVEL OF RESISTANCE TO:																							
	MORPHOLOGICAL TRAITS										DISEASES							INSECTS AND MITES						SOIL PROBLEMS	
CLONE	ROOT SHAPE	ROOT SURFACE COLOR	ROOT INNER SURFACE COLOR	ROOT FLESH COLOR	MATURE STEM COLOR	BRANCHING HABIT	PLANT HEIGHT	LEAF APEX COLOR	LEAF PETIOLE COLOR	LEAF PUBESCENCE (APEX)	BACTERIORIS	SUPERELONGATION	PHOMA LEAF SPOT	ANTHRACNOSE (LOWLAND)	ANTHRACNOSE (HIGHLAND)	CERCOSPORA LEAF SPOT	PRE-HARVEST ROOT ROT	THRIPS	*MONONYCHELLUS* MITE	*OLIGONYCHUS* MITE	MEALYBUG	LACE BUG	WHITEFLY	SOIL ACIDITY	LOW PHOSPHORUS
M Pan 70	Long	LtBr	Pnk	Wt	Grey	0	+	Gr	LtRed	+	— —	+ +	0	+	0	—	+	+	+	— —		0	0		0
M Per 245	Shrt	LtBr	Wt	Wt	LtBr	—	0	PrpGr	Red	0	+ +	0		+		+		— —	+		0	0		+ +	+
ICA HMC 1																									
ICA HMC 2																									+
CM 91-3	Med	DkBr	Pnk	Wt	DkBr	+	0	Gr	Prp	+	+	—		0		+		0	—		— —			0	+
CM 308	Med	Wt	Wt	Wt	Grey	+ +	0	Gr	Gr	+	— —	+						+							
CM 342-170	Shrt	Wt	Pnk	Wt	Grey	0	0	Gr	Prp	+	—	—	—	0	0	—	— —	+	—		—				
CM 344-71	Shrt	Ylw	LtPnk	Ylw	YlwBr	+	+	Gr	LtRed	+	— —	—	—	+	0	0	+	+							
CM 430-37	Med	DkBr	LtPnk	Wt	DkBr	+	0	Gr	LtRed	—	+ +	+						0						—	0
CM 489-1	Med	Ylw	LtPnk	Ylw	LtBr	—	+ +	PrpGr	Red	0	— —	— —						—	—		— —	—			
CM 507-37	Med	DkBr	Wt	Ylw	LtBr	+ +	0	PrpGr	Gr	— —	+	+		0		0		— —			—			—	+
CM 523-7	Shrt	DkBr	LtPnk	Wt	DkBr	—	+	PrpGr	Red	—	+ +	+	0	+	0	—	— —	0			— —			+	+ +
CM 681-2	Shrt	Ylw	Ylw	Wt	YlwBr	0	—	Gr	Gr	+	—	— —						+			—				
CM 849-1	Med	LtBr	Ylw	Wt	DkBr	0	+ +	GrPrp	Prp	+	0	+ +						+							
CM 955-2	Med	DkBr	Ylw	Wt	Grey	—	+	Gr	Red	+ +	— —	— —						+							
CM 976-15	Med	LtBr	Ylw	Wt	LtBr	0	+	Gr	Prp	0	0	+ +						—							
CM 981-8	Med	LtBr	LtPnk	Wt	YlwBr	+	+	Prp	Prp	0	0	+						+							
CM 982-20	Med	LtBr	LtPnk	Wt	Grey	+	+	PrpGr	Red	—	—	+						0							
CM 1015-16	Med	Wt	Ylw	Ylw	Grey	0	—	GrPrp	LtRed	—	—	— —						—							
CM 1305-3	Med	DkBr	LtPnk	Wt	Grey	0	+	Gr	LtRed	—	0	— —						—							
CM 1335-4	Med	DkBr	Wt	Wt	LtBr	0	0	Gr	Prp	0	+ +	+		+		—		+						—	+
CM 1585-13	Shrt	LtBr	Wt	Ylw	YlwBr	0	0	GrPrp	Gr	—	+ +	+ +		+ +		+ +		+							