

## Natural hybrids between *Manihot reptans* Pax and *M. alutacea* Rogers & Appan

By  
Nagib M. A. Nassar

Departamento de Genética e Morfologia, Universidade de Brasília  
Brasília, DF, Brasil.

Natural hybrids between *M. reptans* and *M. alutacea* in Goiás state, Brazil are described. Hybridization occurred in disturbed habitats where there is a sympatric distribution of the parental species. There is evidence for progressive introgression of germplasm in *M. reptans*.

**Key words:** Wild cassava, *M. reptans*, natural hybrids, introgression, *M. alutacea*.

[Hybridization naturelle entre *M. reptans* Pax et *M. alutacea* Rogers & Appan]

Titre abrégé : Hybrides de *Manihot reptans* et *M. alutacea*.

Suit la description des hybrides naturels de *Manihot reptans* et *M. alutacea* découverts dans l'Etat de Goiás, au Brésil. L'hybridation est survenue dans des habitats perturbés où existait une distribution sympatrique des espèces parentales. Le matériel génétique de *Manihot reptans* montre l'existence d'une introgression progressive.

**Mots clés :** Manioc sauvage, *Manihot reptans*, hybridation naturelle, introgression *M. alutacea*.

The genus *Manihot*, which includes cassava, *M. esculenta* Crantz, exhibits a remarkable array of different growth habits and adaptations involving changes in tuber, stem and leaf forms as modified by varying conditions of soil and climate (Nassar 1978a-c, 1979). More than 30 species of *Manihot* have been collected, documented, evaluated for use in cassava breeding, and maintained in a living collection in Brazil (Nassar 1981).

Natural hybrids between *Manihot reptans* and *Manihot alutacea* were observed in 1977 (Nassar 1978c) in two localities in the state of Goiás where *Manihot reptans* grows near *M. alutacea* and where these species have a sympatric distribution. Since interspecific hybrids have long been of special interest to breeders because of their heterogeneity, this case has been investigated in further detail.

Seeds of *M. reptans*, *M. alutacea* and their natural hybrid were collected from two localities in the state of Goiás 10 and 12 Km east of the city of Goiás Velho and were planted in a living collection of *Manihot* at the Universidade de Brasília. Observations of the following characters were recorded: growth habit, young stem lamina texture and color, laminar veins, laminar lobes, bracteoles and fruit. Thirty bracteoles were measured on each of 10 plants of each species.

The morphology of *M. reptans*, *M. alutacea* and the hybrid are compared in Table 1. Taxonomically, *M. reptans* and *M. alutacea* have been separated on the basis of growth habit, leaf shape and color, plant height, laminar texture and fruit shape and color. The presumed hybrid is similar to one or the other parent for characters except bracteole size, in which case the bracteoles are much larger than in either parent. Morphological measurements of the presumed hybrid provide indirect evidence of interspecific hybridization. From the scatter diagram (see [Photo gallery](#) fig.42, see also fig.33), a distinction between bracteole length, range of the two species and their hybrid is seen. Many workers expect the hybrid to occur in areas where distribution of the two parent species adjoin each other and where hybridization between the two is likely to be occurring continuously (Anderson 1953; Baker 1951; Harlan and de Wet 1963; Heiser 1961; Levin 1963).

The presumed hybrids which were collected from a site 10 Km east of Goiás Velho occurred in the absence of *M. reptans*. This is probably due to a former *M. reptans* stand swamped by a large amount of pollen from the more abundant *M. alutacea*. Another possible hypothesis is that both species were present at this site at some early time and hybridized there; subsequently the environment changed and *M. reptans* disappeared since it was poorly adapted. Our observations show that *M. reptans* and *M. alutacea* will readily hybridize when grown sympatrically. Sympatric populations contain a large number of hybrids suggesting absence of barriers which may exclude the hybrids from the gene pool of the population. Nassar (1978c) referred to expansion of the *M. reptans* range in the last hundred years and attributed this to continuing introgression of genes of *Manihot* species. The hybrid of *M. reptans* with *M. alutacea* was identified by its bright red leaves, a characteristic of *M. alutacea* which served as a marker gene in the case.

**Table 1.** Comparison of morphological characters for *M. reptans*, *M. alutacea* and presumed hybrid.

Character	<i>M. reptans</i>	<i>M. alutacea</i>	Presumed Hybrid
Growth Habit	Procumbent weak stemme, ca 0.5m, numerous stems arise from a woody base	Erect shrubs, 1-1,5m	Erect shrubs, 2-2,5m
Young stem texture and color	Glabrous, purplish tinged	Glabrous, deep red	Glabrous, purplish tinged
Lamina texture	Membraneous to slightly coreaceous	Alutaceous	Membraneous
Laminar veins	Glabrous, bright green	Glabrous, bright red	Glabrous, bright red
Laminar lobes	Palmately 3-5 lobes, apex obtuse	Palmately 3-5 lobes, apex acute	Palmately 3-5 lobes, apex obtuse
Bracteoles	Setaceous 2-5x 0,5-1,6mm	Setaceous 7-9,5x 1,6-3,4 mm	Semifoliaceous 10-20x 4-10 mm
Fruits	Globose, without ribs, green, surface smooth	Globose, ribbed with bright red ribs, surface punctate	Globose, slightly ribbed, yellowish to reddish ribs, surface smooth

A population of *M. reptans*, characterized by erect vigorous stems and large ribbed fruits, two characteristics of cassava (*M. esculenta*) was found about 15 Km North of Corumbá de Goiás. Apparently, these two characteristics were acquired by *M. reptans* through introgressive hybridization with cassava. It seems that *M. reptans* became introgressed with germplasm from other species and was able to extend its ecotypic range and colonize new areas where the pure *M. reptans* had been previously unable to penetrate.

The hybrid type from Corumbá was collected from a disturbed habitat which may account for its weedy nature. It may be considered part of a weed-crop complex following the model described by Harlan and de Wet (1963) and others. Hawkes (1977) found these hybrids of great value in plant breeding programs because of their feasible crossability with cultigens. He stated that because of these hybrids nature has been lightening the plant breeders task for hundreds or perhaps thousand of years.

#### ACKNOWLEDGMENTS

This work is being carried out with the help of a grant from the "Conselho Nacional de Desenvolvimento Científico e Tecnológico —CNPq", Brasília, Brasil. The program was initiated in 1976 with support of the International Development Research Center, Ottawa, Ontario to whom I am very grateful.

#### REFERENCES

- ANDERSON, E. 1953. Introgressive hybridization. Biol. Rev. 28: 280-307.
- BAKER, H.G. 1951. Hybridization and natural gene flow between higher plants. Biol. Rev. 5: 302-336.
- HARLAN, J.R. and de WET, J.M. 1963. The compilospecies concept. Evol. 17: 497-501.
- HAWKES, J.G. 1977. The importance of wild germplasm in plant breeding. Euphytica. 26: 615-621.
- HEISER, C.B. 1961. Natural hybridization and introgression with particular reference to *Helianthus*. Rec. Adv. Bot. 1:874-877.
- LEVIN, D.A. 1963. Natural hybridization between *Phlox maculata* and *P. Glaberrima* and its evolutionary significance. Am. J. Bot. 50: 714-719.
- NASSAR, N.M.A. 1978a. Conservation of the genetic resources of cassava: Determination of wild species localities with emphasis on probable origin. Econ. Bot. 32: 311-320.
- NASSAR, N.M.A. 1978b. Wild *Manihot* species of Central Brazil for cassava breeding. Can. J. Plant Sci. 58: 257-261.
- NASSAR, N.M.A. 1978c. Some further wild *Manihot* species of potential value for cassava breeding. Can. J. Plant Sci. 58: 915-916.
- NASSAR, N.M.A. 1979. Three wild *Manihot* species of Central Brazil with tolerance to stress conditions. Can. J. Plant Sci. 59: 553-555.
- NASSAR, N.M.A. 1981. Collecting wild cassavas (*Manihot* spp.) in Brazil. Plant Genet. Res. Newsletter, FAO. 47: 14-23.

[Home](#)

[Photo  
Gallery](#)

[Articles](#)

[Germplasm  
Announcements](#)

[Excerpts](#)

[News](#)

[Biography](#)

[Contact](#)

[Links](#)