quinua extrae una elevada cantidad de potasio, lo cual también concuerda con la relativa abundancia de este catión en la Cordillera Andina. Así mismo, la quinua extrae una buena cantidad de nitrógeno. Aunque sólo se dispone de la determinación de N-total, por conocimiento de otras áreas similares, el N intercambiable no debe ser abundante, lo cual indicaría que el descanso del suelo, y a partir de la llegada de los españoles, el cultivo de las habas, son prácticas tradicionales tendientes, entre otros efectos, a recuperar los niveles de nitrógeno.

La relación de N: P: K en una planta total de quinua es de 7,8: 1: 12,8. La práctica tradicional de remover íntegramente la planta de quinua del campo, aceptando para los cálculos la base de 10 000 kg de material vegetal/ha, equivale a la remoción del suelo de, por hectárea: 160 kg de nitrógeno, 20 kg de fósforo, y 260 kg de potasio, lo cual es un indicativo para el manejo de la fertilización y la rotación con otras plantas. Habida cuenta de cierta abundancia potásica en los suelos, la preocupación mayor en el ajuste de niveles debe incidir en el manejo del nitrógeno. Además se debe insistir en cambiar el hábito tradicional de arrancar las plantas por la siega, que permitiría devolver al suelo la raíz y parte del tallo (y el suelo que va pegado a la raíz), disminuyendo así la extracción de elementos nutritivos.

Resumen

Los datos preliminares obtenidos demuestran que la semilla de quinua contiene entre 10 y 18 por ciento de proteína, 4,5 por ciento de grasa y 63 por ciento de carbohidratos. La quinua es una planta extractora pobre de P, y la relación de N: P: K en la planta es 7,8: 1: 12,6. Utilizando el sistema tradicional de cosecha (arrancando toda la planta), la extracción de N: P: K del suelo por una cosecha normal equivale a 160: 20: 260 kg/ha.

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A study of the collection and maintainance of the germplasm of of wild cassavas, Manihot spp.*

Resumo. É preciso um esforço urgente para conservar os recursos genéticos de mandioca selvagem. As especies selvagens estão continuamente diminuindo nos habitats naturais. O autor colecionou várias especies selvagens e foram registradas as frequências destas especies nas seus habitats naturais.

Experimentou-se diferentes metodos de preservar as especies em coleção viva. Achou-se que o metodo de trasplantar plantas inteiras é mais eficiente. O metodo de enxertar ramas das especies selvagens sobre mandioca, foi encontrado com potencial na preservação do germoplasma selvagem numa coleção viva.

The interest in wild species and primitive cultivars has been strengthened in the last few decades through FAO's work on genetic resources of crop plants. However, a little effort to preseve wild cassava species was made. So far as the author is aware, virtually no efforts are being made to preserve wild cassava germplasm. Probably the only trial in this field was that carried out by the late A. Veiga at Instituto Agronomico, Campinas, Brazil in the 1950's which included preserving a limited number of wild *Manihot* species in a living collection (8).

Through our program of evaluation of wild *Manihot* species for further use in cassava breeding, we showed some of the investigated species to have valuable characters such as abundant tuber formation with high protein content (6), low HCN content (7), tolerance to stress conditions (5). Trials to collect these wild species and maintain them in living collection were carried out.

Materials and Methods

Localities of wild *Manihot* species in State of Goias, Brazil were determined from Rogers and Appan monograph (8). Trips were made to these localities two times per year. Replications of trips to the same locality were followed to assure finding the species, because the majority of wild *Manihot* species native to Central Brazil are shruby and have their vegetative parts die back to the ground surface in the dry season. Therefore, it is necessary to look for the species in both of the rainfall and the dry seasons. Seeds, cuttings or whole plants of wild *Manihot* species were planted in the germplasm collection land. Grafting scions of these species was performed onto stocks of cassava according to the technique of Mogilner *et al* (2). Twenty trials of grafting each wild species were made. The wild species maintained in the germplasm collection were hybridized with cassava. Hybrid seeds were planted in the following season.

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Table 1.—The occurence of Wild Manihot species in their natural habitats.

Species	Localities reported on the last 20 years	Occurence of the wild species in 1977-1978	Percentage of disappearance
M. sparcifolia Pohl	75 km N of Corumbá de Goias on road to Niquelândia (1968)	—	
	x 60 km N of Corumbá on road to Niquelândia (1968)	—	100%
M. falcata Rogers & Appan	Campo near Aparecida de Goiás *ca* 50 km W of Brasília (1968)	+	0 0%
M. violacea Pohl	*Circa* 35 km E of Brasília (1964)	—	
	x 1 km N Sobradinho (1965)	—	
	Summit of Chapada de Contagem, 10 km E of Brasília (1965)	—	
	x *Circa* 15 km E of Brasília on road to Paranoá (1965)	—	100%
	x 10 km E of Planaltina (1965)	—	
M. divergence Pohl	Cerrado, *circa* 20 km N of Cristalina (1966)	—	
	x 75 km N of Cristalina on road to Brasília (1965)	—	
	x Córrego Itaquera, 30 km N of Formosa (1966)	—	
	x near waterfall, 24 km NW of Veadeiros on road to Cavalcante (1965)	—	
	x Campo near Aparecida, circa 50 Km W of Brasília (1965)	—	100%
M. pentaphylla Pohl	20 km NW Corumbá near road to Niquelândia (1968)	+	
	x Cerrado, *circa* 30 km SE of Goiás Velho (1966)	+	0 0%
M. gracilis Pohl	Circa 14 km S Corumbá (1965)	+	
	Aeroporto, Anápolis (1956)	—	
	Circa 3 km S Sobradinho (1966)	+	
	Cerrado circa 12 km W of Taguatingá on road to Braslândia (1965)	+	
M. pariaefolia Pohl	*Circa* 20 km S of Brasília on road to Goiânia near Rio Melchoir (1965)	+	
	Circa 10 km NE of Brasília (1965)	—	
	Circa 20 km N Corumbá on road to Niquelândia (1968)	+	25%
	Circa 20 km NW of Corumbá de Goiás, near road to Niquelândia (1968)	+	
	x Summit of Serra Dourada, 20 km SE of Goiás Velho (1966)	+	
	Serra dos Pyreneos, municip Corumbá (1966)	+	0.0%
M. oligantha Pax	Campo and Cerrado *circa* 3 km N of Cristalina (1966)	—	
	x Cerrado *circa* 2 km N of Cristalina	+	50 0%
M. tomentosa Pohl	Cerrado *circa* 35 N of Formosa on road to São Gabriel (1966)	+	
	Córrego Itaquera, *circa* 30 km N of Formosa (1966)	—	0.0%
M. attenuata Muell	Chapada dos Veadeiros, *circa* 15 km W of Veadeiros (1966)	—	
	Circa 12 km NW of Veadeiros, road to Cavalcante (1965)	—	100 0%
M. peltata Pax	Cerrado *circa* 9 km S of Corumbá de Goiás	+	0.0%

Results and Discussion

Table 1 shows result of collecting different wild *Manihot* species from their natural habitats in state of Goiás. It is seen that some species such as *M. divergens, M. violacea* and *M. attenuata* are extremely rare and almost on the verge of extinction. The author failed in collecting any sample of these species from their natural habitats.

By experimenting with seed germination, no seeds germinated when 100 seeds from *M. tripartita, M. anomala, M. oligantha,* and *M. gracilis* were planted. Little information is available in the literature about the extreme dificulty of germination of wild *Manihot* species. The scattered and not well documented reports suggest that it is due to fisiological dormancy (1).

Whole plants of the above mentioned species have shown a little percentage of successfullness when they were transplanted from their natural habitats to the collection plots (Table 1). When scions from *M. pseudoglaziovii, M. dichotoma, M. tripartita, M. anomala* and *M. reptans* were grafted onto stocks of cassava, a number of successful plants were obtained, resulting in tuber-forming stocks and vegetative parts with wild habit shape (Fig. 1). The percentages of successfully grafted plants in these species were 55, 35, 25, 0.0 and 45 respectively. Trials of reproducing these species by cuttings failed completely in obtaining any plant.

Table 2.—Result of transplanting wild *Manihot* species

Species	Nº of transplanted plants	Successfull growing plants	Percentage of Sucessfullnes
M. falcata	200	6	3%
M. pentaphylla	200	9	4.5%
M. gracilis	200	15	7.5%
M. paviaefolia	200	7	3.5%
M. oligantha	200	19	8.5%
M. tomentosa	200	2	1%
M. peltata	200	3	1.5%

Crosses of wild *Manihot* species with cassava (Fig. 2) were fertile and gave a number of seeds (4). These seeds when planted gave a number of seedlings indicating a notable improvement of germination on wild cassava seeds. Hybrid seeds of cassava with *M. oligantha, M. anomala, M. tripartita* and *M. zenhtneri* gave germination percentages of 12, 5, 4 and 9 respectively. Poor germination of hybrid seeds, in comparison to complete non-germinating wild species

Fig. 1.—*On left, scion of* M. pseudoglaziovii *grafted onto stocks of cassava ct. 'Catelo', on right, ct. 'Catelo' of the same age: 4½ months.*

Fig. 2.—*On left, scion of* M. pseudoglaziovii *grafted onto stock of cassava ct. 'Catelo', on right a hybrid plant produced from interspecific cross between cassava ct. 'Catelo' and* M. oligantha *subsp. nesteli. Both of the same age: 4½ months.*

seeds, may be attributed to that seed germination in wild cassava is genetically controlled. Probably cassava cultivars have had their genetic factors of dormancy eliminated by breeders through the years.

From the above results it can be concluded that preservation of wild *Manihot* species germplasm can be achieved vegetatively through transplanting whole plants from their natural habitats to the germplasm collection plots or by grafting scions from these wild species onto stocks of cassava. Preservation of such germplasm of wild species may continue through introducing their genes into native cultivars known by easy reproduction by seeds. This technique can be realized by hybridizing the wild species with these cultivars, and maintaining the produced hybrids by common vegetative means.

Summary

An urgent effort to conserve genetic resources of wild cassava is badly needed. Occurence of wild cassava species in their natural habitats is dimininshing day after day and a number of species are on the verge of extinction. Trials of collecting these wild species from their natural habitats were carried out. Frequency of their occurence in these habitats is reported.

By experimenting with different ways of preserving these species, it was found that transplanting whole plants is the most efficient method of reproducing the sub-shruby species. Grafting scions of wild shruby species onto stocks of cassava was found to be another potential way of germplasm conservation.

Resumen

Es preciso un esfuerzo urgente para conservar los recursos genéticos de la yuca silvestre. Las especies silvestres están disminuyendo constantemente en sus habitats naturales, algunas de ellas en vía de extinción. Se coleccionaron varias de estas especies silvestres en sus habitats naturales y se registró la frecuencia en que ocurrían.

Se experimentó con diferentes métodos de preservar las especies en colección viva. Hallóse que el método de trasplantar plantas enteras es el más eficiente para reproducir las especies subarbustivas. El método de injertar ramas de especies silvestres arbustivas sobre la yuca se encontró con potencial en la conservación de germoplasma silvestre en una colección viva.

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Potentiel morphogénétique des entrenoeuds de Passiflora edulis var. flavicarpa Degener et P. mollissima Bailey en culture "in vitro"

Abstract. Morphogenetic potential of stem internodes from two passion flower plants, **P. edulis** var. **flavicarpa** and **P. mollissima** was proved when Nitsch's medium added with 2 mg/l of kinetin was used. Callus formation, starch accumulation, dedifferentiation and vessel formation are shown. Kinetin was the stimulating agent. This morphogenetic potential would be useful for vegetative multiplication in order to maintain the genetic characters of the mother plants.

Introduction

La culture de cellules et de tissus a été conçue originellement comme un moyen de comprendre les phénomènes morphogénétiques et physiologiques. Plusieurs auteurs (3, 5, 8) ont étudié les modes de différenciation et attiré l'attention sur l'utilisation de ces techniques pour la propagation des plantes.

Les espèces fruitières de l'Amérique tropical constituent un materiel auquel ces techniques pourraient être appliquées, en raison de l'intérêt croissant porté à ces espèces. Les techniques *in vitro* constitueraient un outil important pour résoudre les problèmes posés par leur propagation.

Notre but est d'explorer le potentiel morphogénétique des entrenoeuds de *Passiflora edulis* var. *flavicarpa* et de *P. mollissima* cultivés *in vitro*, en vue d'étudier la propagation végétative de plantes sélectionnées de ces espèces.