

GENETIC AND PHYSIOLOGICAL BASIS FOR BREEDING
AND IMPROVING THE SWEET POTATO

*Bases Physiologiques et Génétiques de Sélection et d'Amélioration
de la Patate*

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SUMMARY

Sweet potato is a trailing vine of the tropics and of temperate summers that produces an edible storage root. In this review the physiological and genetic basis for improving the sweet potato are discussed. The sweet potato is daylength sensitive, and flowers chiefly during short days. The species is self incompatible, and in addition partially sterile. It is a hexaploid probably of origin from two or more species. Pedigree methods of plant breeding have been useful but are labor intensive. Mass selection is described as the technique of choice. It consists of selecting 20 or more individuals with the best expressions of the characteristic desired, stimulating them to flower in a polycross block and crossing by honeybees. Seeds produced are germinated for the next round of selection, and the process is repeated. This results in rapid accumulation of major dominant genes, and slower accumulation of others.

RESUME

La Patate est une liane rampante des tropiques et des saisons estivales tempérées qui produit un tubercule comestible. Dans cet article de synthèse les bases génétiques et physiologiques de l'amélioration de la Patate sont discutées. La Patate est sensible à la durée du jour et fleurit surtout en jour court. L'espèce est autoincompatible et de plus partiellement stérile. C'est un hexaploïde probablement issue de deux espèces au moins. Les méthodes de sélection pédigrées ont été utiles mais sont fastidieuses. La sélection massale est présentée comme la méthode par excellence. Elle consiste à sélectionner 20 individus ou davantage possédant la meilleure expression de la caractéristique désirée, à stimuler leur floraison en polycross avec pollinisation par des abeilles. Les graines obtenues sont mises en germination pour le cycle de sélection suivant, et le processus se répète. Il s'en suit une

accumulation des gènes majeurs dominants et l'accumulation plus lente des autres.

INTRODUCTION

The sweet potato is 6th or 7th in food production among all food of the world (FAO, 1980). However, about 2/3 of the world production is utilized in one country, China (Villareal, 1982). Sweet potato is a staple food only in Papua New Guinea where daily consumption of several kilograms is not unusual (Garrett, 1974), and in a few isolated areas of the tropics. Although the sweet potato is well distributed throughout the tropics and warmer parts of the temperate zone. However it is seldom a daily food and is often replaced at the table with other foods when family income rises.

Reluctance to eating of sweet potato may be due to several factors (Tsou and Villareal, 1982), not only interest in a variet diet, but also disdain, the attitude that sweet potato is a poor man's food (this reflects the fact that sweet potato is easy to produce). Sweetness itself may be a deterrent. A sweet dish is hardly likely to become a staple one. Sweet potatoes often have distinct flavors that do not appeal to everyone. Finally, sweet potatoes produce gas (flatulence) in some persons, and this may be painful as well as socially distressing.

Development of better sweet potatoes is important to the improvement of their image and utilization. The taste and preference for currently existing varieties varies tremendously (Lin, et al., 1983). There appears to be a growing interest in non-sweet or low-sweet sweet potatoes, types that now can be considered only in the experimental stage (Villareal, 1982). Futhermore, there is considerable promise in sweet potato as an industrial substrate, especially for alcohol production.

Improvement of the sweet potato requires an understanding of what the sweet potato is and what it can be. There is both a physiological and a genetic basis for this understanding.

PHYSIOLOGY OF THE SWEET POTATO

The sweet potato, *Ipomoea batatas* (L.) Lam., is a trailing vine of the morning glory family (Convolvulaceae) characterized by its succulent, edible tuberous storage roots. Sweet potatoes are propagated principally from cuttings obtained from sprouted roots of from established vines. Plants are seldom more than 0.5 meters in height but if given space may cover several square meters with dense foliage. The cropping season is short, 3 to 6 months.

Sweet potato is tropical in origin and needs a hot