SCREENING SWEET POTATOES FOR LOW CO_2 COMPENSATION POINT

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SUMMARY

Sweet potato lines from four populations obtained from Japan, Puerto Rico and the United States were screened for low CO_2 compensation concentration. Some of the tested plants from each of the four populations appear to have lower CO_2 compensation points than others.

RESUME

Des lignées de patate douce apartement à quatre populations et obtenues du Japon, de Porto Rico et des Etats Unis ont été étudiées pour en dégager celles qui présentent une concentration de compensation basse en CO_2. Certaines des plantes tirées des quatre populations et soumises à l'essai paraissent avoir des points de compensation plus bas en CO_2.

RESUMEN

Se seleccionaron líneas de camote procedentes de cuatro poblaciones de Japón, Puerto Rico y los Estados Unidos por baja concentración de CO_2 en el punto de compensación. Algunas de las plantas probadas, de cada una de las cuatro poblaciones, parecen tener más bajos puntos de compensación de CO_2 que otras.

INTRODUCTION

Net photosynthetic rates of up to 60 mg CO_2 dm^{-2} hr^{-2} have been reported in maize, sorghum and sugarcane, and they are also known to occur in the Amaranthaceae and Chenopodiaceae.[3] These high rates are almost twice those of temperate zone grasses[3,4]. The lower net photosynthetic efficiency of the temperate species is associated with a higher rate of photo-respiration and high carbon dioxide compensation points[2].

Because of the established correlation over a number of plant species[1,6], between low carbon dioxide compensation concentration and high photosynthetic efficiency, the sweet potato germplasm collection at the International Institute of Tropical Agriculture (IITA) in Nigeria is being screened for low CO_2 compensation concentration with a view to using this characteristic in the breeding programme.

The method of screening is that of Menz *et al.*[6] and is based on the assumption that if plants possessing low and high CO_2 compensation concentration values ('efficient' and 'inefficient' respectively) are grown together in a continuously illuminated gas-tight chamber, then the CO_2 concentration within the chamber will decrease with time and eventually fall below the CO_2 compensation concentration of the 'inefficient' plants. At such low CO_2 concentration, 'inefficient' plants show a net efflux of CO_2 since they respire CO_2 at a rate faster than CO_2 fixation by photosynthesis, and ultimately die. 'Efficient' plants, on the other hand, remained green since they utilize the CO_2 respired by the 'inefficient' plants. Plants surviving in such a system would have low CO_2 compensation points.

MATERIALS AND METHODS

The sweet potato collection of IITA contains some 10,000 plants which were grown from seeds obtained from Japan, Puerto Rico and the United States. Five single-node leaf cuttings from each plant, each with one fully expanded leaf, were excised from sweet potato vines under water and potted immediately in coarse sand and then placed in a humid propagation box. Maize seedlings were planted at the same time in sand. Both maize seedlings and sweet potato cuttings were irrigated with Hoagland solution every two days. Two weeks after planting, the cuttings established good root systems. Axilliary shoots were removed in order to accelerate the screening test by reducing photosynthetic sources and to help overcome differential sink effects. The sweet potatoes and the maize seedlings were transferred to an airtight chamber built

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