

A breeding index for improving the early growth of sugarcane

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Objectives

Sugarcane (*Saccharum* sp.) yield remains low compared to its photosynthetic ability. The slow growth of sugarcane at the early stages is one of the primary reasons for this low productivity. A high percentage of sunlight is lost to the soil at this stage. In order to increase sunlight absorption, the rapid expansion of leaf area in sugarcane is considered highly necessary. The delayed expansion of leaf area is attributed to the slow growth of individual plants as well as low density planting in sugarcane crops. Analysis of sugarcane growth at the early stage should be conducted with regard to plant growth as well as crop growth.

Results

The growth of sorghum (*Sorghum bicolor*) was compared to sugarcane during the early growth stages. The dry weight of the sorghum was five times greater 48 days after emergence (Fig. 1), and it was concluded that a higher increasing rate of leaf area enabled rapid growth in the sorghum. The net assimilation rate (NAR) implies the same photosynthetic ability in both species. The higher dry matter percentage of leaves suggests that dry matter partitioning to leaves is higher in sugarcane. Specific leaf area (SLA) is approximately double in sorghum. As relative growth rate correlates to SLA (Fig. 2), the smaller SLA is one of the main reasons for the slow growth of sugarcane at the early stage. Genetic diversity of SLA is observed as an aspect of sugarcane genetic resources (Fig. 3). Some native clones including *S. sinense* are considered suitable for the breeding of varieties having greater SLA values. Even when compared to one of the rapid-growing commercial varieties, a native variety 'Oshima' with greater SLA shows more rapid leaf area expansion and growth (Fig. 4). SLA can be employed as an index for improving the early growth of sugarcane.

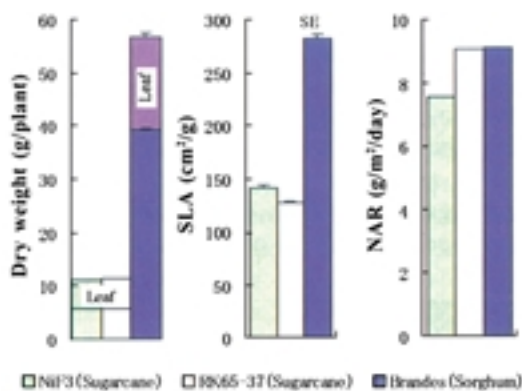


Fig. 1. Comparison of dry weight, specific leaf area (SLA) and net assimilation rate (NAR) between sugarcane and sorghum 48 days after emergence.

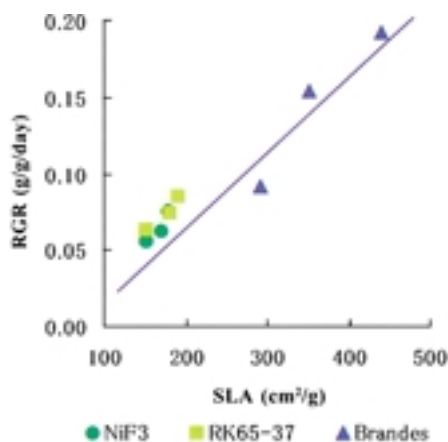


Fig. 2. Relationship between SLA and relative growth rate (RGR).

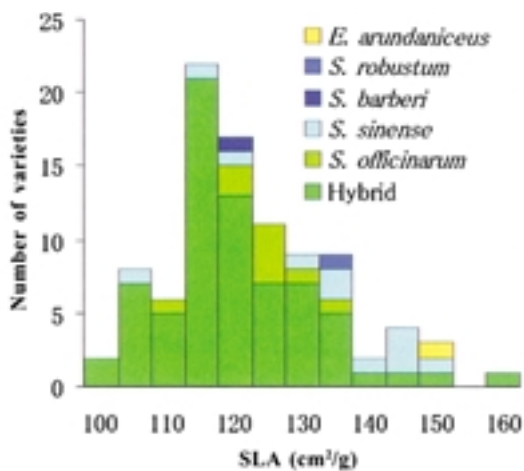


Fig. 3. SLA variation among sugarcane genetic resources.

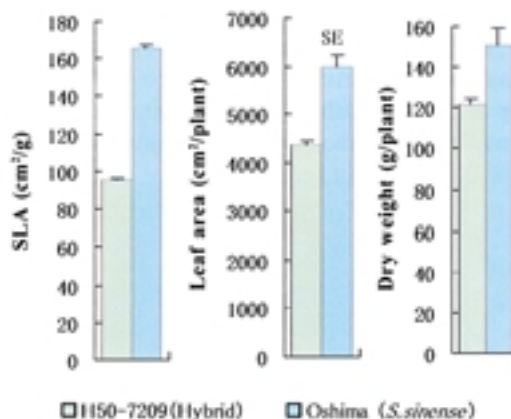


Fig. 4. Comparison of dry weight, leaf area and SLA among sugarcane varieties 84 days after emergence.

Reference

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