

| 学 位 論 文 要 旨 | |
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| 題 目 | Studies on Sustainable Sugarcane Production through Effective Use of Varietal Diversity (品種多様性の有効活用による持続可能なサトウキビ生産に関する研究) |
| <p>Technological innovation leading to labor-saving, ecofriendly, and high and stable yield is needed to achieve sustainable sugarcane production. Although breeding is one of promising options and triggers, effective utilization of varieties after released have merely been discussed so far. The objective of the present study was to discuss and suggest varietal diversity and its effective use.</p> <p>Firstly, it was attempted to grasp the current status of use of varietal diversity. Japanese varietal diversity was defined and its current and potential issues were identified. Current status of Japanese varietal diversity was dependent on administrative divisions (Kagoshima and Okinawa prefectures) which have different policies for registration and use of variety. Current issue of variety use was revealed to be the trend of dependence on a few specific varieties in a few regions, difficult selection from many varieties, and chronicity of inactive varietal mixture.</p> <p>As the example of the important functional traits for sugarcane productivity, quantitative evaluation method for plant type (index), which have been evaluated only qualitatively, was developed by analyzing leaf features, suggesting varietal diversity of plant type. Monitoring long-term performance of variety after released suggested that ability of variety itself seemed not to change though apparent varietal yield reduction due to accumulation of pathogen and climate disaster could be possible. Comparing with monoculture of one old variety which keeps high productivity with no trend of deterioration, growing diversified varieties has improved the regional productivity, especially in ratoon cropping.</p> <p>Secondly, the present study suggested systematically and aggressively mixed-planting of different varieties (i.e. varietal mixture) as the new and unique growing method and attempted to reveal the ideal combination of varieties for mixture. Varietal mixture with different plant types improved canopy light use because horizontal-leafed variety may have captured radiation transmitted through erect-leafed variety, resulting in reduction of light yield loss during early growth while erect-leafed variety improved the light condition at lower canopy layer. Such habitat segregation may have improved number of millable stalks at harvest period under field condition due to improved its radiation use efficiency. Effects of varietal mixture with different tillering and ratooning abilities were highly dependent on pattern of mixture and growing season. Varietal mixture with different rooting abilities induced habitat segregation for rooting zone. Under mixed-planting, lodging resistant variety exhibited the role of supporter and windbreak to mitigate the damage of lodging sensitive variety by frequent typhoons.</p> <p>From these findings, it was suggested that mixture-induced plasticity would bring out the ability of habitat segregation and compensation in varieties. Although mixture index sometimes surpassed 1.0, mixture merely exhibited surpassing growth and yield over both monocultures of mixture components. The attempts to create database of varietal characteristics, to mixed-plant many promising combinations in many regions, and to reconsider many rejected varieties and genotypes to keep functional diversity among recommended varieties are suggested to be the first basic steps to success mixed-planting.</p> | |