

学 位 論 文 要 旨

氏 名

Thanankorn Jaiphong

題 目

Studies on characteristics of photosynthesis, growth and sugar accumulation in sugarcane under drought and flood condition

(乾燥および湛水条件下におけるサトウキビの光合成特性, 成長および糖蓄積に関する研究)

Sugarcane (*Saccharum* spp.) is an economic crop in tropical and subtropical countries. In Thailand, sugarcane production has increased as a result of governmental zoning policy from and high domestic price encourage farmer switching land from for rice to sugarcane. However, due to the climate changes, drought and flooding are often observed and cause negative effect to sugarcane in Thailand. These studies consist of two experiments as 1) Effects of duration and combination of drought and flood condition on leaf photosynthesis, growth and sugar content in sugarcane, which objective was to investigate the effects of various combinations of drought and flood of varying duration on sugarcane growth and yield during the grand growth phase, and 2) Changes in photosynthesis, growth and sugar content of commercial sugarcane cultivars and *Erianthus* under long-term flood condition.

In Exp. 1, six-months-old sugarcane cv. NiF8 was examine in glasshouse with 6 treatments as drought 15 days, prolonged drought 30 days, flood 15 days, prolonged flood 30 days, flood followed by prolonged drought and prolonged flood followed by prolonged drought. The result demonstrated that CO₂ assimilation was reduced dramatically in plants which were exposed to drought and prolonged drought but recovered once when plants were re-irrigated. By contrast, the flood did not affect CO₂ assimilation, while those of combination treatments with prolonged drought were reduced. During flood, adventitious roots with well-developed aerenchyma were emerged and help plants to offset the losses of growth by flood. Leaf area, stem dry weight and total dry weight were interrupted by drought and remained at a lower level even after re-irrigation. At harvesting, there were no significant differences in stem fresh weight, sucrose content and sugar yield.

In Exp. 2, the effects of floods on six-months-old plants of Thai sugarcane cultivars (UT6, UT9) and *Erianthus* spp. were examined under two treatment of control and 60-days flood followed by 30 days of normal conditions. The results revealed, during flooding, *Erianthus* showed greatly decreased CO₂ assimilation, whereas those of sugarcanes were slightly declined. Growth was less affected by flood while sucrose content was not affected except in UT6. During flood, plants produced adventitious roots to offset the negative effects of root death, with different characteristics of each cultivar. However, 30 days after draining, underground roots remained damaged, resulting in the less growth and sucrose content in all the cultivars. Especially NiF8 tended to grow better due to the maintenance of root dry weight after flood.

In conclusion, the extent of damage by drought and flooding on sugarcane differs between the cultivars and durations of stress. Drought rapidly causes the reduction of growth, whereas flooding had less effects because of the development of adventitious root. However, roots were remained damaged even after drained, and which resulted in reduction of growth and sucrose content at harvest. Thus, flooded plants required time to develop new roots to support and recover their growth.