学 位 論 文 要 旨

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題　目	Studies on an improvement of sugarcane quality through fertilizer management and cultivar selection （施肥管理および品種選択を通じたサトウキビの糖度向上に関する研究）

Sugarcane is a sugar crop grown in almost all the tropical and subtropical countries. In Japan, however, its production and harvested area are currently decreasing as well as low yield and variable quality. To solve these problems, the research to improve sugarcane quality through fertilizer management and cultivar selection was conducted.

Foliar diagnosis is widely used for nutrient managements; yet, for sugarcane, using juice containing the final product, sucrose, could be more effective. To develop the method, factors which affect sugarcane quality were first identified. In sugarcane juice, K^+ and Cl^- were the most abundant cation and anion and they negatively correlated with sugar content, indicating these ions are influential in sugar synthesis and accumulation. Pot experiments were then conducted to investigate whether they reduce sugar content, changing types and levels of KCl and K_2SO_4. KCl significantly reduced sugar content, while K_2SO_4 had no adverse effects on quality. It was also revealed through another experiment that increasing amount of Cl^- salts without K^+ inhibited Cl^- accumulation in juice as compared to KCl application and sugar content was not reduced by the treatments. These suggest that the overdose of KCl reduces sugar content but the primary factor is Cl^- and K^+ is indirectly related to this phenomenon by enhancing Cl^- accumulation.

A field experiment was also conducted by using KCl and K_2SO_4. Under the field condition, a negative relationship between K^+ in juice and sugar content was found in the K_2SO_4 plot as well and Cl^- content was increased as K^+ content in juice was increased, indicating a possibility of Cl^- sources other than fertilizer. Salts in irrigation water is one of the factors affecting nutrient composition of sugarcane juice. Surveys of irrigation waters from several sugarcane producing areas revealed salt concentrations varied widely and the maximum was over 2000 mg L^{-1}, which is thought to be a source of Cl^-.

To reveal the cultivar differences in K^+ and Cl^- contents, 37 cultivars were investigated and the minimum and the maximum were obtained in RK97-14 and Ni27. When standard cultivars, NiF8 and NCo310, were treated with a high dose of KCl, the reduction of sugar contents were seen in both of the cultivars, but NiF8 was affected more severely. Yet, RK97-14 showed the highest yield and sugar content in both of the control and KCl treatments, it is effective to introduce the cultivar into fields where K^+ and Cl^- are excessively accumulated. Since electrical conductivity of juice was highly correlated with K^+ and Cl^-, decreasing KCl application or use of cultivars such as RK97-14 can contribute to lessen the reduction of sugar content in a year following one in which the conductivity of juice is found to be high.