

石垣島のサトウキビ栽培では基肥窒素半量でも収量を維持し溶脱量を削減できる

Nitrogen leaching and growth of sugarcane under different nitrogen fertilization levels in a subtropical island

透水性の高い石灰岩が分布する熱帯・亜熱帯島嶼地域では、肥料由来の窒素が容易に地下に溶脱し、地下水の硝酸態窒素汚染を引き起こす。そこで、熱帯・島嶼研究拠点にある排水型ライシメーターを用いて、異なる施肥条件下でサトウキビを栽培すると同時に窒素溶脱観測を行い、サトウキビ収量を維持しつつ地下への窒素負荷量を削減する肥培管理法の開発を行う。

現行の施肥基準における窒素施肥量を15%削減(35 kg ha⁻¹相当)しても、収量は同レベルを維持しつつ、肥料由来の窒素の溶脱は5割程度削減(12 kg ha⁻¹)できる。この成果は、沖縄県のサトウキビ栽培における施肥基準を改訂する際の基礎データとなる。

In tropical and subtropical islands where highly permeable limestone rocks are distributed, rainfall causes nitrogen (N) from chemical fertilizer to readily leach underground. This study aimed to develop a fertilizer application technique that reduces N load to groundwater while maintaining sugarcane yield by using a drainage lysimeter. With a 15% reduction in the conventional fertilizer application rate (35 kg ha⁻¹), N leaching from fertilizer could be reduced by about 50% (12 kg ha⁻¹) while maintaining the same level of sugarcane yield. The results will provide basic information for the revision of the standard fertilization for sugarcane cultivation in Okinawa Prefecture.

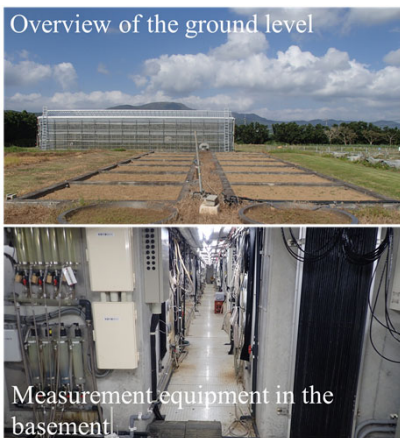


図1 熱帯島嶼拠点のライシメーター
Fig. 1. Drainage lysimeters at the Tropical Agricultural Research Front (JIRCAS-TARF)

表1 各施肥窒素処理区のサトウキビ収量ならびに葉面積

Table 1. Sugarcane yield and leaf area in each N treatment

No.	Treatments		Harvest survey			Growth survey	
	Basal N (kg ha ⁻¹)	Supplementary N	Cane yield per plot (t ha ⁻¹)	Cane yield per stalk (kg)	Stalk density (stalks m ⁻²)	Leaf area in April (cm ²)	Leaf area in August
T1	70	160	91.0	1.13 a	8.4 a	83.3 a	295 a
T2	35	160	88.8	1.11 a	7.9 a	84.5 a	275 a
T3	0	160	76.8	1.03 a	8.4 a	87.4 a	272 a
T4	70	80	83.0	1.01 a	8.4 a	98.3 a	270 a
T5	35	80	74.5	1.07 a	6.8 a	86.3 a	250 ab
T6	0	80	72.3	1.06 a	7.1 a	82.3 a	241 b
T7	0	0	39.8	0.75 b	7.9 a	91.3 a	215 b

T1 からT7 は施肥窒素処理区を示す。収量は2反復の調査結果の平均値。施肥窒素処理間で、Tukey法により異なるアルファベット間には有意差があることを示す(p<0.05)。Treatments (T1-T7) refer to different N application rates. There is a significant difference between different alphabets among N treatments by Tukey method (p<0.05).

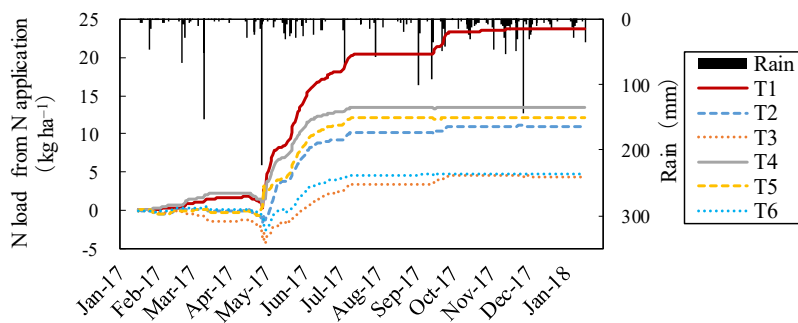


図2 施肥窒素に対する積算窒素溶脱量
T1 からT6 は表1の処理区を示す。施肥窒素に対する積算窒素溶脱量は、T1 からT6の硝酸態窒素溶脱量をT7(無施肥区)のNO₃-N溶脱量で差し引いた値の積算量を示す。

Fig. 2. N load from N application
Treatments (T1-T6) refer to different N application rates. N load from N application refers to the accumulated N loads in T1 to T6 minus that in T7.