

Calcium and Magnesium Fertilization of Sugarcane

S. B. M. F. Rahman, A.B.M.M. Rahman, M.A.A. Sarkar and S.C. Saha

Sugarcane Research and Training Institute,
Ishurdi, Pabna, Bangladesh.

Calcium and magnesium fertilization results in the changes of physical, chemical and biological properties of soil and increases crop production (Buckman & Brady, 1970). Numerous experiments conducted in different countries of the world have shown that calcium and magnesium have some significant effects on sugarcane yield (Turner, 1935; Landraw & Samuels, 1956; Wang *et. al.*, 1959; Davidson, 1965 and Humbert, 1968). Shahjahan (1980) reported that calcium and magnesium fertilization increases cane yield in North Queensland, Australia. Bonnet (1965) observed that levels of sulphur increased simultaneously with increased level of magnesium, resulting significant increase of sugarcane yield. Evans (1959) obtained responses of magnesium application in British Guyana. Saha *et. al.* (1984) reported significant yield increase of sugarcane in acid soils of Bangladesh due to use of calcium oxide. Hence, an experiment with different doses of calcium and magnesium were conducted during the cropping year 1984-85 in the PSM Farm to study the single and combined effects of different doses and sources of calcium and magnesium on the yield and percent recovery of sugarcane.

The experiment was laid out in a randomized complete block design with four replications with the variety Isd-16. The following twelve treatments were used.

- T₀ – No lime,
- T₁ – 2.0 ton CaO/ha,
- T₂ – 3.0 ton CaO/ha,
- T₃ – 4.0 ton CaO/ha,
- T₄ – 2.0 ton CaSO₄/ha,
- T₅ – 3.0 ton CaSO₄/ha,
- T₆ – 4.0 ton CaSO₄/ha,
- T₇ – 150 kg Mg SO₄/ha,
- T₈ – 200 kg Mg SO₄/ha,
- T₉ – 250 kg Mg SO₄/ha,
- T₁₀ – 2.0 ton CaO + 150 kg Mg SO₄/ha,
- T₁₁ – 2.0 ton CaSO₄ + 150kg Mg SO₄/ha.

Recommended doses of fertilizers i. e., 125 kg N/ha, 45 kg P₂O₅/ha and 110 kg K₂O/ha were also used. The plants were grown under normal field conditions. The size of each plot was 10m×10m. Prior to planting the three-budded cane sets were treated by Aretan-6. Soil of the trenches were treated with Heptachlor.

Full quantity of TSP and half of urea and MP were applied as basal dose. The remaining half of urea and MP were applied after 120 days of planting. To ensure germination the experimental plots were irrigated after planting. All cultural practices

were performed as and when necessary to provide right conditions for growth and development of plants.

Germination data were recorded at 45 and 60 days after plantation. Tillering data were taken 150 days after plantation. Number of millable cane and yield per hectare were recorded at harvest. The chemical analysis for percent available sugar of the harvested cane was done following Horne's Dry Lead Method (Meade, 1963). The collected data were statistically analysed and the significance of mean difference were adjusted as per LSD (Steel and Torrie, 1960).

The results of the experiment is presented in Table 1. The table indicates that there was no significant difference in germination due to different treatments.

Table 1. Effect of calcium and magnesium on different growth parameters of sugarcane.

Treatment	Germination (%)	No. of tillers/ ($\times 10^3$ /ha)	No. of millable cane ($\times 10^3$ /ha)	Yield TCH	Recovery (%)	Yield TSH
T ₀	36.15	110.23	58.79	45.34	10.80	4.89
T ₁	36.40	117.18	68.81	58.08	10.50	6.09
T ₂	36.30	132.05	72.50	68.53	10.76	7.37
T ₃	36.42	124.05	71.38	68.09	10.47	7.12
T ₄	36.19	116.23	66.20	56.35	10.26	5.77
T ₅	35.89	122.89	70.02	67.89	10.47	7.10
T ₆	36.16	142.30	75.01	72.00	10.55	7.59
T ₇	36.02	119.95	65.30	55.68	10.20	5.67
T ₈	36.21	113.70	64.66	56.24	10.32	5.80
T ₉	35.70	119.67	69.54	60.34	10.23	6.17
T ₁₀	36.27	148.19	80.78	76.19	10.55	8.04
T ₁₁	36.26	135.00	74.16	70.90	10.54	7.47
L.S.D. (0.05)	-	15.31	13.36	0.97	0.54	0.66

The number of tillers/ha varied considerably in different treatments. Significantly higher no. of tiller (148.19 thousand) was produced by the treatment T₁₀ (2.0 ton CaO/ha + 150 kg MgSO₄/ha) followed by T₆ (4.0 ton CaSO₄/ha) and T₁₁ (2.0 ton CaSO₄/ha + 150 kg Mg SO₄/ha).

Highest no. of millable cane was obtained in the treatment T₁₀ (80.78 thousand), which was followed by the treatments T₆ (75.01 thousand) and T₁₁ (74.16 thousand). However, there was no significant difference among the treatments.

The yield of cane differed to a considerable extent due to different treatments. The treatment T₁₀ produced highest ton cane/ha (76.19), which was followed by T₆ (72.00) and T₁₁ (70.90). This difference of Yield is in conformity with those of Saha *et al.* (1984) and Davidson (1965). The increase of yield might be due to the increased mineralization of soil N following the application of the liming materials, leading to increased N-uptake by the plant (Anon, 1976-77).

There was no significant difference in percent available sugar among the treatments. However, highest percent available sugar (10.80 %) was recorded in the treatment T_0 , where no calcium & magnesium fertilizer was added. This result also agrees with that of Saha *et. al* (1984) and Landraw and Samuels (1956).

The treatment T_{10} produced highest ton sugar/ha (8.04) followed closely by T_6 (7.59) and T_{11} (7.47.)

It may be suggested from the results of the experiment that application of (2.0 ton $CaO \cdot 150$ kg $MgSO_4$ /ha) before plantation in addition to the normal recommended doses of NPK fertilizers would produce higher cane and sugar yield in the Himalayan Piedmont Plains of Bangladesh.

ACKNOWLEDGEMENT

The authors are very grateful to Dr. M.A.S. Miah, Mr. M.A. Jabber, Mr. M.A. Ghafur and Mr. M.J. Haque for their help at different stages of this work. The authors also acknowledge the service of Mr. M.A. Majid, CDO (Agronomy), PSM.

REFERENCES

- Anonymous, 1976-77. Liming and nitrogen release in the midlands, Annual Report 1976-77. Expt. Stn., South African Sugar Assoc. p. 34.
- Bonnet, J.A. 1965. sulphur deficiency in the sheath related to sugarcane yield decline in a Puerto Rico Soil. *Proc. ISSCT*, 12 : 244-233.
- Buckman, H.O. and Brady, N.C. 1970. Lime and its soil plant relationship. Nature and Properties of soils. The Macmillan Company. New York. p. 426.
- Davidson, L.G. 1965. The effect of lime on yield of sugarcane and on acid soils in Louisiana. *Proc. ISSCT*, 12 : 473-508.
- Evans, H. 1959. Elements other than N, P & K in the Mineral nutrition of Sugarcane. *Proc. ISSCT*, 10 : 473 - 508.
- Humbert, R.P. 1968. The growing of sugarcane. Elsevier Publishing Company, Amsterdam. p. 216.
- Landraw, P.J. and Samuels, G., 1956. Results, of lime and minor element fertilizer research in Puerto Rico. *J. Agric. Univ., Puerto Rico*, 40 : 224-234.
- Meade, G.P. 1963. Polarimetry in Sugar Analysis. Cane Sugar Handbook. 9th edition. John Wiley Sons. Inc. New York. pp. 401-441.
- Saha, S.C. ; Rahman, S.B.M.F. ; Paul, G.C. ; Sarkar, M.A.A. and Hoque, M.J. 1984. Effect of liming on the productivity of sugarcane. *Bangladesh J. Sugarcane*, 7 : 37-41.
- Shahjahan, M. 1980. A Report on the visit to Australia. SRTI, Ishurdi, Pabna p. 20.
- Steel, R.G.D. and Torrie, J.H., 1960. The least significant difference. Principles and Procedures of Statistics. McGraw Hill-New York. pp. 106-107.
- Turner, P.E. 1935. Effect of manurial treatment on growht of sugarcane. *Tropical Agr.*, 12 : 179-186.
- Wang, S.C. ; Lai, T.M. and Yang, C.C. 1959. Liming as a means to increase sugarcane Yield in Taiwan. *Proc. ISSCT*, 10 : 556-565.