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PRODUCTIVITY OF SUGARCANE APPLIED WITH DIFFERENT QUANTITIES OF NPK AT CENTRAL PHILIPPINES

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Abstract:

Sugarcane is a valuable crop in the Philippines. It is planted in different soil types at different climatic conditions and cultural management practices.

The study was conducted in two locations to determine the effect of different levels of nitrogen, phosphorus, and potassium on the productivity of sugarcane (Phil 99-1793). It was laid out in two sugarcane locations in the Central portion of the Philippines. The different combinations of NPK levels significantly affected sugarcane tonnage and sugar yield in the two locations.

In location 1, increasing the quantity of nitrogen, the tonnage per hectare, and sugar yield had also increased. Increasing levels of phosphorus fertilization also resulted in increasing tons of cane per hectare and sugar yield. The NPK recommended rate on the other hand had produced significantly lower cane tonnage and sugar yield as compared to higher nitrogen rates at constant phosphorus and potassium. In location 2, different levels of NPK fertilization significantly influenced cane tonnage and sugar yield at harvest. The significantly highest cane tonnage and sugar yield were observed in T5 (140 kg N/ha-0 P-240 kg K_2O/ha) which was statistically comparable with the recommended rate (175-0-240). The soils laboratory recommended NPK rates of fertilization produced the highest sugar yields (LKG/TC) in both locations. The heaviest tonnage was observed in location 2 when the nitrogen fertilizer rate was higher as compared to the recommended rate of nitrogen fertilizer at constant phosphorus and potassium.

More studies should be conducted related to this subject to contribute to the knowledge related to this study.

Keywords: Productivity, Sugarcane, Fertilization, Liming, Pollution

1. INTRODUCTION

1.1. Background

In the Philippines, sugarcane is a valuable crop grown in approximately 250,000 hectares in the Visayas alone. World Bank (2021) had reported that sugarcane had been declining in the 15 regions in the Philippines, except for Region VI (Western Visayas). The data suggests the increase of the specialization for the crop. The report further shows that the share value of the output of sugarcane in the region is 16.1 percent [1].

Back to the crop, the sugarcane is planted in different soil types at different climatic conditions and cultural management practices.

Fertilizer management is an important aspect of sugarcane growing. Nutrients in the soil removed by the sugarcane must be replenished to produce high cane tonnage and sugar yields. The soils laboratory usually recommends that the amount of fertilizer to be applied is determined from the soil analysis of the farmers' fields.

The current average fertilizer recommendation of 200-200-600 (Kg of N/ha, kg of P_2O_5/ha, kg K_2O/ha). The established fertilizer recommendation was based on yield data obtained from fertilizer experiments conducted throughout the sugarcane growing areas in the Philippines and correlated with soil testing procedures. Sugarcane being an annual crop removes around 83 kg of N, 37 kg P_2O_5 and 168 kg of K_2O [2].

The current production environment includes new high-yielding sugarcane varieties planted on various soil types under different climatic conditions and cultural management which may need more amount of nutrients than

what is recommended by soils laboratories. The possibility that the fertilizer recommendation is too high. The excess fertilizers that the sugarcane plant cannot utilize go to our water table, rivers, seas, and streams that pollute the environment and pose a danger to humans and animal health.

We should produce more sugar at the lowest possible expense. One way to do this is to apply the right amount and kind of fertilizer that is recommended based on the result of soil analysis to achieve an optimum yield [3]. It is therefore imperative that sugarcane farmers know the right levels of NPK fertilizers to be applied to their sugarcane soils under the current production environment.

1.2. Objectives

1.2.1 The general objective of this research is to evaluate the effect of different levels of NPK on the growth and yield of sugarcane.

1.2.2 Specific objectives

1.2.1.a. Determine the importance of liming

1.2.1.b. Determine the effectiveness of fertilizers recommendation of soil laboratories

1.2.1.c. Determine the productivity of sugarcane at different locations

1.3. Statement of the Problem

The sugarcane industry is one of the major dollar income industries in the Philippines. The suitable soil type, favorable environment, and the exact quantity of NPK however differ at different locations. Relatively, recommendations of the soils laboratories may not be a perfect guide for farmers and the needs of the soils hence wastage can occur both in fertilizers applied and financial resources.

2. MATERIALS AND METHODS

2.1. Research Method

1. Composite soil samples were taken before the lay-out and after harvest of the experiment and were analyzed for the following:
    a. % Organic Matter (Walkley and Black)
    b. Available P (Modified Truog)
    c. Exchangeable K (Peech and English)
    d. Exchangeable Ca
    e. Exchangeable Mg
    f. Lime Requirement
    g. Physical Analysis (Hydrometer Method)
2. The fertilizer recommendation for each location was determined through the results of the soil analysis.
3. The experiment was laid out in Randomized Complete Block Design (RCBD) with seven treatments and four replications.
4. Lime was applied as required which was based on the result of soil analysis.
5. The traditional method of land preparation, planting, cultivation, weeding, and ratooning were followed.
6. Three-eyed seed pieces of Phil variety were prepared and used as planting materials. The rate of planting was 40,000 seed pieces per hectare.
7. Application of fertilizers were as follows: Full dosage of P and one-half of N & K were mixed and applied 3 weeks after planting. The remaining half of N and K were side-dressed three months after planting.
8. The area was close at both locations, 3 months after planting.
9. The canes were harvested 12 months after planting.

2.2. Research Environment

The experiment was laid out in two locations in the Central area of the Philippines.

2.3. Data Gathering Procedure

The following data were gathered during harvest time:

1. Millable stalks were weighed within 24 hours after harvest.
2. Twelve stalks from each plot were selected randomly for juice analysis.
3. The Ton Cane/Hectare and 50-kilo bag sugar (LKG)/Hectare were computed from the sugar analysis and weight of stalks/plot.

2.4. Statistical Tool

1. Yield parameters gathered were treated statistically.
2. Comparison of treatment means was treated on data that turned out to be significant.
3. Parameters gathered:
    a. Soil analysis before lay-out of the experiment
    b. Yield in Tons Cane/Hectare, sugar in 50-kilo bag (LKG)/Ton Cane, sugar in 50-kilo bag (LKG)/Hectare
    c. Incidence of pests and diseases

3. RESULTS AND DISCUSSION

The yield of Phil 99-1793 at varying levels of NPK fertilization at location 1

Statistically significant differences were observed among tonnage treatment means at varying levels of NPK fertilization. The significantly highest tonnage was found in Treatment 3 (175-70-0) which received the highest level of nitrogen fertilizer. Increasing amounts of N fertilizer levels produced also a significant increase in tons cane per hectare and sugar yields/hectare. Noticeably, the soils laboratory recommended rate resulted in significantly lower tonnage and sugar yield as compared to Treatment 2 (140-70-0) and Treatment 3 (175-70-0)

Highly significant differences in LKG/hectare were observed among means at different NPK levels in location 1 soil. These two (2) treatments (T2 and T3) produced the highly significant highest treatment means (307 and 309 kg/ha) respectively. The LKG/Ton Cane was not significantly affected by the different levels of NPK fertilization.

Chohan, et al (2013) observed the significant differences for cane yield (tons/hectare) and sugar yield among fertilizers treatments. They further observed that N has a dominant role in increasing cane yield and sugar. The P, on the other hand, has a greater role in increasing cane yield (tons cane/hectare) and K had contributed more for sugar increase [2].

TABLE 1. Mean yields of Phil 99-1793 at varying levels of NPK fertilization at location 1.

	Treatments, Kg/ha N	P_2O_5	K_2O	Tons Cane/ha	Lkg/TC	Lkg/Ha
T1*	105 -	70 -	0	117 bc	2.15	249 c
T2	140 -	70 -	0	145 a	2.11	307 a
T3	175 -	70 -	0	146 a	2.10	309 a
T4	105 -	35 -	0	116 bc	2.04	233 d
T5	105 -	105 -	0	124 ab	2.12	264 b
T6	105 -	70 -	40	109 bc	2.10	227 d
T7	105 -	70 -	80	122 ab	2.14	262 b
	F - value			3.88*	0.35 n.s.	5.76 **
	cv (%)			11.66	4.74	10.28

**Recommended Rate*

The yields of Phil 99-1793 at varying levels of NPK fertilization at location 2

Different levels of NPK fertilization significantly influenced sugar yields at harvest at location 2. The significantly highest tonnage was observed in Treatment 5 (140-0-240. This was statistically comparable to Treatment 1 which was the Recommended Rate, Treatment 2 (175-70-240), Treatment 3 (175-105-240), Treatment 4 (200-0-240), and Treatment 7 (175-0-280). The significantly higher sugar yield was also found in Treatment 5 which was statistically comparable with T1 (Recommended Rate), T2, T3, and T4.

For corn, increase in grain yield with optimal fertilization of 240 kg of N, 120 kg of P, and 100 kg of K per hectare [4].

TABLE 2. Mean yields of Phil 99-1793 at varying levels of NPK fertilization at location 2.

	Treatments, Kg/ha N	P_2O_5	K_2O	Tons Cane/ha	Lkg/TC	Lkg/Ha
T1*	175 -	0 -	240	65 ab	2.08	137 a
T2	175 -	70 -	240	68 ab	1.92	129 a
T3	175 -	105 -	240	73 ab	1.65	121 a
T4	200 -	0 -	240	60 ab	1.89	113 ab
T5	140 -	0 -	240	75 a	1.89	140 a
T6	175 -	0 -	200	56 b	1.88	104 bc
T7	175 -	0 -	280	57 ab	1.57	89 c
	F - value			3.97*	0.06 n.s.	3.08*
	cv (%)			10.20	12.86	15.33

**Recommended Rate*

CONCLUSIONS

1. Significant differences among treatment means that received varying fertilizer rates were observed in both locations.
2. In location 1, increasing amounts of nitrogen fertilization produced increasing tons of cane per hectare and sugar yield. Increasing levels of phosphorus fertilization also resulted in increasing tons of cane per hectare and sugar yield.

3. In location 2, different levels of NPK fertilization significantly influenced cane tonnage and sugar yield at harvest. The significantly highest cane tonnage and sugar yield were observed in T5 (140 kg N/ha-0 P-240 kg K_2O/ha) which was statistically comparable with the recommended rate (175-0-240).
4. The laboratory recommended NPK rates of fertilization produced the highest sugar yields (LKG/TC) in location 1.
5. Location 1 soils also responded to increased phosphorus fertilization.

RECOMMENDATIONS

1. Different soils show different responses to varying levels of NPK fertilization. It is recommended that further field fertilizer experiments be conducted in major sugarcane soils to provide farmers with the basis for their fertilizer management practices.
2. Further studies should be conducted on appropriate soils laboratory procedures to closely estimate the available P and K soil and the optimum P_2O_5 and K_2O requirement of the sugarcane plant.

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REFERENCES

1. World Bank (2021). Realizing scale in smallholder-based Agriculture: Policy option for the Philippines. pp. 28-29.
2. Chohan, M., Talpur, U. A., Pahnwar, R. N. and Talpur, S. (2013). Effect of inorganic NPK different levels on yield and quality of sugarcane plant and ratoon crop. International Journal of Agronomy and Plant Production 4 (S), 3668-3674. Retrieved February 2022.
3. Kryzanowski, L. (nd). Soil test laboratory and analysis and fertilizer recommendations. Alberta Agriculture and Forestry. 54 slides. www1.agric.gov.ab.ca. Retrieved February 2022.
4. Ulmasovich, M. A. and Ibrahimovich, M. M. (2021). Yield of corn grain at various forms and rates of phosphorous fertilizers on the unwashed and washed off typical gray soils. European Journal of Agriculture and Rural Education, 2(2), 3-5. Retrieved from https://scholarzest.com/index.php/ejare/article/view/241.