PAK Publishing Group
Growing Knowledge for Future

Proceedings Book of ICETSR, 2014, Malaysia
Handbook on the Emerging Trends in Scientific Research
ISBN: 978-969-9347-16-0

Bio N Fertilization on Corn

Clemencia L. Sumagaysay

Abstract

This study was conducted to evaluate the production of corn as affected by Bio – N inoculant with the different levels of fertilizers fertilization at Maglambing Tagbina, Surigao del Sur during wet/rainy season. Randomized Complete Block Design (RCBD) with five (5) treatments and three (3) replications was applied. The treatments were: T_1 Bio – N inoculant, T_2 Bio – N + Farmer's Practice, T_3 Bio N + ½ Recommended Rate (RR), T_4 Bio N + Recommended Rate (RR) + Organic Fertilizer, T_5 Bio N + Recommended Rate (RR). Results showed that treatment 3 or the application of Bio –N combined with half of the recommended rate of fertilizers obtained a significant result in terms of ear length, ear weight and grain yield of corn. Treatment 3 Bio – N + ½ Recommended Rate of fertilizer recorded the most promising combination of fertilizer as it optimized corn production during wet/rainy season.

Keywords: Inoculant, Fertilization, Organic fertilizer, Ear, Optimized yield.

1. Introduction

Corn is one of the most important crops in the country that has contributed 63% of the total Agricultural production, of which 70% is being utilized by the livestock sector for feed ingredients and 30% is being utilized for human food consumption. Processed starch, crystalline sugar (dextrose), dextrin, corn syrup and refine corn oil, which is about 4 percent of the annual total supply according to Gonzales (1999) can also come from corn.

Considering these economic contributions of corn, concerned authorities have realized to gear government programs to the attainment of food sufficiency, augmentation of farmers' income and generation of employment (GMA, 2003). Despite of the increasing effort extended hand-in-hand by the farmers and government authorities however, corn production is still far below the target yield of 5 tons per hectare to attain and sustain self-sufficiency level as DA (1993) projected. Nonetheless, the said low production of corn had still contributed about P 19,399 M of the country's value added (GVA,1999) and had ranked third among GVA RP's important agricultural crops (BAS, 2000).

To answer the pressing demands of corn in the locality of Tagbina, the DA – LGU and the Research Services of SSPSC Tagbina had collaboratively joined their respective resources and efforts to come up a unified research development and extension to help the municipality of Tagbina attain a sustainable production of corn.

Balanced fertilization technology as initiated and suggested by the Bureau of Soils and Water Management (BSWM) is seen to help solve the low production of corn. Balanced Fertilization refers to the optimum use of organic and inorganic fertilizers with proper grade and the amount that supply the correct ratio of plant nutrients. This procedure will be done to ensure that the soil will sustain high crop yields over long cropping periods. Picaza (2007) mentioned that Bio-N provides the nitrogen needed by plants without harming the environment and that the *Azospirillum* in Bio-N converts the nitrogen from the atmosphere into a form that can be readily used by the plant. Furthermore, since microorganisms, like bacteria, are natural components of the environment, Bio-N does not damage the soil instead allow rice and corn to grow robustly. Thus helping increase harvest.

Moreover, Bio –N has been proven not only to increase crop production by 30-50% and is found effective to high-value crops like rice , corn and vegetables but also has lessened farmer's dependence on chemical intervention that leaves harmful effect on the soil and its fertility ***(L. Lopez/PIA Kalinga). Hence, this study was conducted to evaluate the proper and the right combination of Bio-N with the different levels of fertilizers that supply the correct ratio of plant nutrients to produce optimum production of corn particularly in the municipality of Tagbina, Surigao del Sur.

Objectives:

This study was not only aimed at helping the locality find a sustainable corn production but also at finding information, through observations of the results the significant contributions of Bio-N to the growth of corn particularly in the area. Specifically, this study was aimed:

1. To evaluate the production of corn as affected by the Bio - N and different levels of fertilizers fertilization during the wet season.
2. To compare the treatment combinations of Bo - N and different levels of fertilizers application on crop production.

1.1. Significance of the Study

The study guides farmers in determining the quantity of inorganic fertilizers to be applied with Bio-N to consequently reduce the cost of fertilizers. Moreover, the use of Bio-N as a substitute or in combination with the optimum level of inorganic fertilizer will also prevent or slow down the acidic build-up of soil since Bio-N is a microbial-based fertilizer beneficial for corn, rice and other agricultural cops. Likewise, promising technology had a significant impact on the use of Bio-N, increases farm productivity of the farmers and could help in the dollar receive of the country by reducing the cost of imported fertilizers.

2. Methodology

This study was conducted at Demo Farm Area of DA-Local Government Unit of Maglambing, Tagbina, Surigao del Sur during the wet season. The treatments were the following:

2.1. Bio - N with Different Levels of Fertilizers

T_1 = Bio - N fertilization application
T_2 = Bio – N + Farmer's practice (basal application of complete fertilizer throughout the growing season) application
T_3 = Bio – N + ½ RR (Recommended Rate) application
T_4 = Bio – N + ½ RR + Organic Fertilizer application
T_5 = Bio – N + RR (Recommended Rate) application

The treatment was arranged in RCBD and replicated 3 times. A two-meter by three-meter was allocated in each treatment plots. Planting distance was seventy-five by twenty-five centimeter between rows and hills with 0ne (1) seed per hill of corn. Fertilizer application was done twice. Thus, half of the amount of the fertilizer recommended was applied in the band along the furrows following the given treatments during planting, and the remaining half was applied at 30 days after planting (DAP). Off barring and hilling-up was done at 14 - 30 DAP, respectively. Hand weeding was done before hilling up to control weeds. Harvesting was done when plants reached their physiological maturity that was indicated by the change in color of the leaves and husks the black appearance at the base of the corn kernels. The ears were husked, shelled, dried and weighed to determine the yield thereafter.

3. Results and Discussions

3.1. Corn Ear Length

Table 1.0 showed the data on average ear length of corn during the wet season as applied with Bio – N and different levels of fertilizers. Significant differences were observed among treatment means in this parameter. Tallest average ear length of 12.69 cm was observed with the application of Bio – N inoculant with ½ recommended rate (RR) of fertilizer (T_3). Likewise, corn plants with the

shortest average ear length of 9.81 cm were recorded in Treatment 1 applied with Bio – N inoculant only.

Analysis of Variance in Appendix Table 1.0 showed significance of Bio –N with the different levels of fertilizer interactions. This pointed out that there was an increase in average ear length of corn plants due to the influenced of Bio – N and the different levels of fertilizers applications. Observations told of the said significant effects on increased ear length of corn resulted in a bigger space for kernel development causing an increase of corn yield.

Table-1. Average Length of Corn Ear (cm) Applied with Bio – N and Different Levels of Fertilizers During Wet Season.

TREATMENT	**R E P L I C A T I O N**			**MEAN**
	R_I	R_{II}	R_{III}	
T_1 (Bio – N)	9.90	8.89	10.64	**9.81**
T_2 (Bio – N + Farmer's practice)	12.02	10.35	12.96	**11.78**
T_3 (Bio – N + ½ RR)	12.85	10.73	14.49	**12.69**
T_4 (Bio – N + ½ RR + Organic fert.)	12.27	11.40	11.40	**11.69**
T_5 (Bio – N + RR)	12.93	10.29	9.46	**10.89**
MEAN	**11.99**	**10.33**	**11.79**	

3.2. Corn Ear Weight

Table 2 explained the weight of ten (10) corn ears. Weight of ears varied significantly from 0.76 to 1.27 kilograms among Bio – N with different levels of fertilizers.

The researcher observed that the combination of Bio – N and the ½ recommended rate of fertilizer (T_3) produced the heaviest ear weight with a mean of 1.27 kilograms while plants applied with Bio – N inoculant recorded the lighter corn ear with a mean of 0.76 kilograms.

The corresponding increase in the weight of ears was attributed to the favorable effects of the right combination of Bio – N and the recommended rate (RR) of fertilizer.

Table-2. Average Weight of Ten (10) Corn Ears (kg) Applied with Bio –N and Different Levels of Fertilizers During Wet Season.

TREATMENT	**R E P L I C A T I O N**			**MEAN**
	R_I	R_{II}	R_{III}	
T_1 (Bio – N)	0.86	0.65	0.76	**0.76**
T_2 (Bio – N + Farmer's practice)	1.00	0.80	0.95	**0.92**
T_3 (Bio – N + ½ RR)	1.10	1.10	1.60	**1.27**
T_4 (Bio – N + ½ RR + Organic fert.)	1.15	1.0	0.85	**1.00**
T_5 (Bio – N + RR)	1.15	0.75	0.75	**0.88**
MEAN	**1.05**	**0.86**	**0.98**	

3.3. Corn Grain Yield

Table 3 showed the grain yield of corn in a ton per hectare. Appendix table 3.0 indicated a significant interaction effects among the different levels of fertilizer with Bio –N inoculant.

Result revealed that T_3 or Bio –N + ½ Recommended Rate of fertilizer produced the highest grain yield of 3.64 ton/ha while the application of Bio – N + Farmer's practice(T_2) produced the lowest grain yield of corn.

Furthermore, results favorably endorsed the findings of Tisdale and Nelson (1995) of the adequate nitrogen application to promote rapid growth of dry matter accumulation to hasten grain formation and increase the yield of plants improving the quality of corn kernels, and giving of high yield of corn.

Table-3. Grain Yield (ton/ha) of Corn Applied with Bio – N and Different Levels of Fertilizers During Wet Season.

TREATMENT	REPLICATION			MEAN
	R_I	R_{II}	R_{III}	
T_1 (Bio – N)	1.28	0.67	1.58	**1.18**
T_2 (Bio – N + Farmer's practice)	0.47	1.42	1.25	**1.05**
T_3 (Bio – N + ½ RR)	3.83	4.08	3.00	**3.64**
T_4 (Bio – N + ½ RR + Organic fert.)	1.42	2.67	0.72	**1.60**
T_5 (Bio – N + RR)	3.32	1.42	1.25	**2.00**
MEAN	**2.06**	**2.05**	**1.56**	

4. Conclusions and Recommendations

The application of Bio – N with different levels of fertilizers showed significant differences among treatment means.

There was a significant difference in the ear length, ear weight and grain yield of corn for plants applied with treatment 3 or Bio –N + ½ Recommended Rate of fertilizer.

Based on the observations and findings, T_3 most recommended as the appropriate combination to increase corn production during wet/rainy season.

Since this study was conducted during wet/rainy season, a comparative study during the dry season is also recommended. The researcher likewise recommends parallel study to be conducted to help the farmers.

References

Abalos, E. B. (2004). Bio-n inoculant; A sustainable and natural nitrogen resource for rice and corn. DMMMSU, Bacnotan, La Union, Philippines: Macmillan.

Brady, N. C. (1990). The nature and properties of soil. 8th Edn., New York: MacMillan Publishing Company.

Elmerich, C. W., Zimmer, D., & Vielle, C. (1992). G. Stcey, R.H. Burris and H.F. Evans (Eds.) Associative nitrogen-fixing bacteria. In biological nitrogen fixation. New York. USA: Chapman & Hall.

Garcia, M. V. (2000). Bio-n is an organic fertilizer for rice and corn. Available from http://www.upd.edu.ph/biotech/indus/bion.htm.

Karitoon. Available from com/xoops/modules/news/article.php?storyid=14 Cached.

Lopez, L. Available from *** /PIA Kalinga.

Css.cornell. Available from edu/../pub/BiolFertSoils 2006.

PCARRD, (1981). The philippines recommends for corn. Los Banos, Laguna.

Schnitzer, M. (1991). Soil organic matter the next 75 years. Journal of Soil Science, 151(1): 41-45.

Tisdale, S. L., and Nelson, W. L. (1995). Soil fertility and fertilizer. 4th Edn., New York: McMillan Publishing Co., Inc.

Picaza, A. R. (2007). Growth and yield of two corn (Zea mays, Linn.) Varieties applied with varying levels of nitrogen, phosphorus, potassium and bio-n. Ph.D. Dissertation. CMU, Musuan, Bukidnon.

2003. Profile and Prospects of corn.

Appendix Table-1. Analysis of Variance on the Average of Corn Ear Length (cm) Applied with Bio – N and Different Levels of Fertilizers

SOURCE OF VARIATION	df	SUM OF SQUARES	MEAN SQUARE	Fc	Ft	
					0.05	0.01
Replication	2	7.52	3.76	2.57^{ns}	4.46	8.65
Treatment	4	22.76	5.69	3.90^{*}	3.84	
Error	8	11.66	1.46			
TOTAL	**14**	**41.94**				

CV = 10.55 %
ns = not significant
* = significant

Appendix Table-2. Analysis of Variance on Average Weight of Ten Corn Ears (kg) Applied with Bio – N and Different Levels of Fertilizers

SOURCE OF VARIATION	df	SUM OF SQUARES	MEAN SQUARE	Fc	Ft	
					0.05	0.01
Replication	2	0.01	0.005	0.12^{ns}	4.46	8.65
Treatment	4	0.64	0.16	4.00^{*}	3.84	7.01
Error	8	0.29	0.04			
TOTAL	14	0.94				

CV = 10 %
ns = not significant
* = significant

Appendix Table-3. Analysis of Variance on the Grain Yield (ton/ha) of Corn Applied with Bio –N and Different Levels of Fertilizers

SOURCE OF VARIATION	df	SUM OF SQUARES	MEAN SQUARE	Fc	Ft	
					0.05	0.01
Replication	2	0.17	0.36	0.53^{ns}	4.46	8.65
Treatment	4	13.10	3.28	4.82^{*}	3.84	7.01
Error	8	5.47	0.68			
TOTAL	14					

CV = 16.23 %
ns = not significant
* = significant