Yield Performance of Sweet Corn (Zea Mays Var. Saccharata) Using Vermicompost as a Component of Balanced Fertilization Strategy

Samuel R. Simon, and Fermina P. Balabbo

***Abstract*—** The peoples' increasing consciousness to healthy foods like sweet corn causes demand for this food to increase. There is then a need to explore alternative organic fertilizers like vermicompost that could be effectively combined with inorganic fertilizer to produce quality product and reduce production cost. This study was conducted to evaluate the effect of different balance fertilization strategy on the growth and yield of sweet corn and asses its profitability using the following treatments laid-out in Randomized Complete Block Design with three replication: T1- Pure Inorganic fertilizer; T2- 25% Inorganic fertilizer + 75% Vermicompost; T3- 50% Inorganic fertilizer + 50% Vermicompost; T4- 75% Inorganic fertilizer + 25% Vermicompost; T5- Pure Vermicompost; and T6- Control (No fertilizer). A total area 378 square meters was used in the study consisting of eighteen (18) experimental plot equally spaced at one and a half meter between block and plots.

Result of the study revealed that the use of the different inorganic fertilizer and vermicompost combinations showed positive and significant effect on the growth and yield performance of sweet corn.

***Keywords*—** Balanced fertilization strategy, vermicompost, sweet corn production, organic fertilizer

I. Introduction

SWEET corn (Zea mays var. saccharata*)* also called sugar corn and pole corn is a variety of maize with a high sugar content. It is the result of a naturally occurring recessive mutation in the genes which control conversion of sugar to starch inside the endosperm of the corn kernel. Unlike field corn varieties, which are harvested when the kernels are dry and mature, sweet corn is picked when immature (milk stage) and prepared and eaten as a vegetable, rather than as a grain[1].

Sweet corn is favourable for fresh consumption because of its delicious taste, soft and sugary texture compared to other corn varieties. Sweet corn has been widely spread in the world. At optimum market maturity stage, sweet corn contains 5% to 6% of sugar, 10% to 11% of starch, 3% of water soluble polysaccharides, 70% water, moderate levels of protein, vitamin A and potassium [2]. Sweet corn is a fairly heavy feeder, and proper soil fertility is critical for high yield [3] and could be harvested as early as 65-90 days depending on the cultivar type.

The demand for sweet corn slowly increases as human become health conscious. Sweet corn is a starchy vegetable that is high in carbohydrate content and it has multiple nutrients that can bring benefits to the body [4] (healthyeating.sfgate.com). The increasing for it therefore necessitates the need to increase production.

Current production practices for sweet corn in the Philippines requires very high level of inputs like fertilizer that causes significant increase in production cost. This study was therefore conducted to develop a cost-effective nutrient management strategy on sweet corn by combining organic fertilizer (vermicompost) with inorganic fertilizer at varying rates.

II. Methodology

The experiment was conducted at the Laboratory Farm of the Isabela State University at Cabagan Campus from October 2014 to January 2015. Yellow Sweet F1 sweet corn variety with 75-90 days maturity was used in the experiment.

A total area of 378 square meters was usedin the study laid-out in three equal blocks, equally spaced at one and a half meter (1.5m) between blocks. Each block was subdivided into six plots, each plot measuring 3m x 4m with spacing of one and a half meter (1.5m). The following treatments were allocated following the randomization procedure for Randomized Complete Block Design (RCBD): T_1 – Pure inorganic fertilizer; T_2 – 25% Inorganic fertilizer + 75%Vermicompost; T_3 –50% Inorganic fertilizer + 50% Vermicompost; T_4 –75% Inorganic fertilizer + 25% Vermicompost; T_5–Pure Vermicompost; and T_6-Control (no fertilizer).

The area was thoroughly prepared prior to planting. Initial plowing was done by a tractor for a deeper cultivation and left idle for two weeks to allow weeds to decay and suppress its germination afterwhich second plowing and harrowing at a week interval was done. Soil analysis was alsodone prior to planting to determine the required rate of fertilizer to be applied.

Basal application of complete and vermicompost was done prior to planting. At 20 days after sowing, application of ammonium phosphate fertilizer was done before off-barring (20 days after planting) and side dressing of urea was also

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done at 35 days after sowing or before hilling-up. One seed per hill was planted after application of basal fertilizers at 30 centimeters apart and 75 centimeters between rows. The seeds were covered with thin soil and foot-pressed, so that there will be direct contact of seeds with the soil for better and uniform germination. Manual weeding was done to prevent the growth of weeds especially between hills.

Crop protection activities were employed by strictly following integrated pest management approach for corn. Destructive insects and diseases were appropriately applied with pesticide. Clean culture through spot weeding and brushing of weeds surrounding the area was implemented to eliminate host of insect pest and diseases.

Corn ears were harvested 89 days after planting and placed in properly labelled plastic sacks. Parameters gathered were weekly plant height, length of ear, diameter of ear, green corn yield per hectare and return on investment. Ten representative sample plants per plot were chosen from which data were gathered.

III. Results and Discussion

A. Plant Height

Figure 1 presents the mean height of corn in centimeters at weekly interval as affected by application of varying combinations vermicompost and inorganic fertilizers.

Generally, the treatment that exhibited the highest plant height was T1 while T5 consistently obtained the lowest plant height. However, statistical analysis in 2nd, 3rd, 4th, 5th, 6th, 7th, 9th weeks after emergence (WAE) showed no significant differences among the treatments. While on 8th, 10th, 11th weeks after emergence, statistical analysis showed thattreatments were significantly different. Inorganic fertilizers are known to have the peculiarity of fast release of their nutrient contents; however, balance fertilization strategy (BFS) treatments seemed enough to have plants not significantly shorter than plants treated with pure inorganic fertilizer application although organic fertilizers are known to have the characteristic nature of slow release of nutrients.

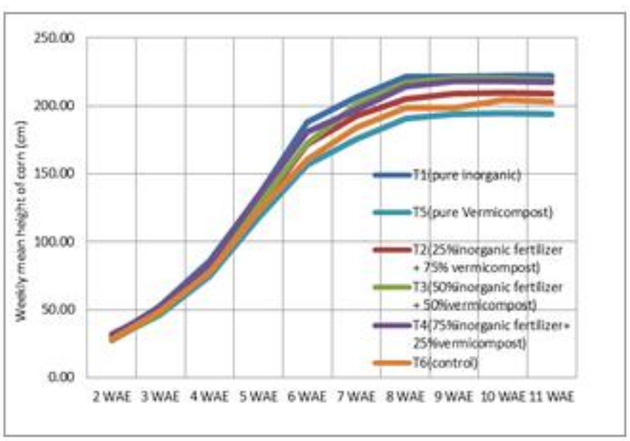


Fig. 1. Mean weekly plant height (cm).

B. Ear Height

Figure 2 shows the ear height of corn. Before harvesting, data on ear height were gathered. The treatment that obtained the highest ear height mean was T1 with an average of 82.03 cm, followed by T3 (80.63cm); T4 (76.20 cm); T2 (73.93 cm); T6 (70.60 cm) and the least was T5 with 64.90 cm. However, statistical analysis as shown in Appendix Table 11b revealed that the different treatments did not show any significant difference in terms of ear height.

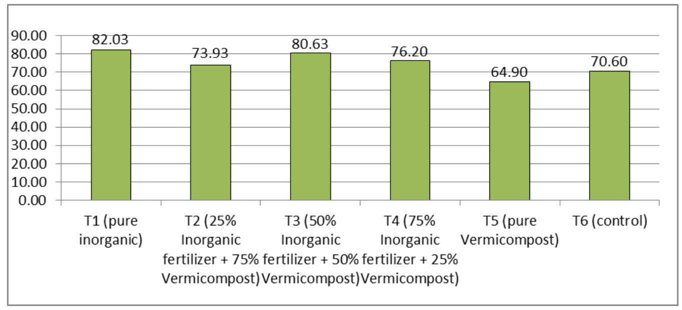


Fig. 2. Mean ear height (cm)

C. Length of Ear

Figure 3 shows the mean length of corn ear without husk as affected by the application of vermicompost and inorganic fertilizers. The treatment that obtained the longest mean length of ear without husk was T2 (197.17 cm), followed by T1 (193.73 cm); T3 (193.33 cm); and T4 (193.03 cm); T6 (186.20 cm), and the least was T5 (185.47 cm). However, the effects of the different treatment did not show any significant differences on ear length without husk as revealed by the analysis of variance (ANOVA).

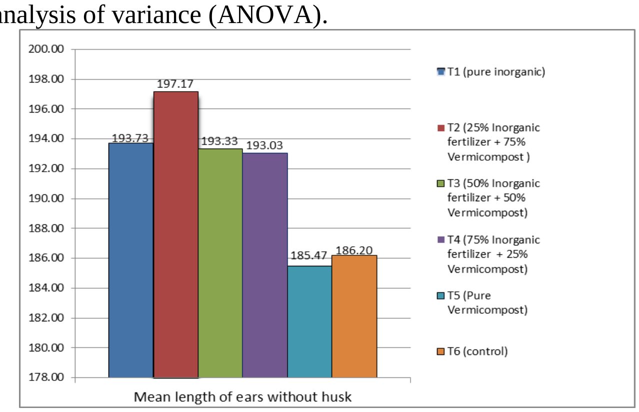


Fig. 3. Length of ear without husk (cm)

D. Ear Diameter

After harvesting, diameters of corn ears without husk were measured using Vernier caliper at the middle portion of the corn ear. Figure 4 shows the mean ear diameter of corn without husk as influenced by the application of different levels of vermicompost and inorganic fertilizers. Based on data gathered, the treatment that obtained the highest treatment mean was T1 (5.30 cm), followed by T4 (5.26 cm); T3 (5.22 cm); T5 (5.15 cm); T2 (5.08 cm) and the least was T6 with 4.95 cm. Result of the analysis of variance, however, revealed that the effect of the treatments on the diameter of ears are not significantly.

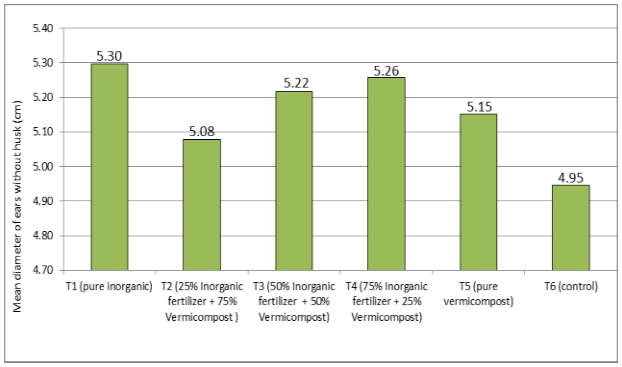
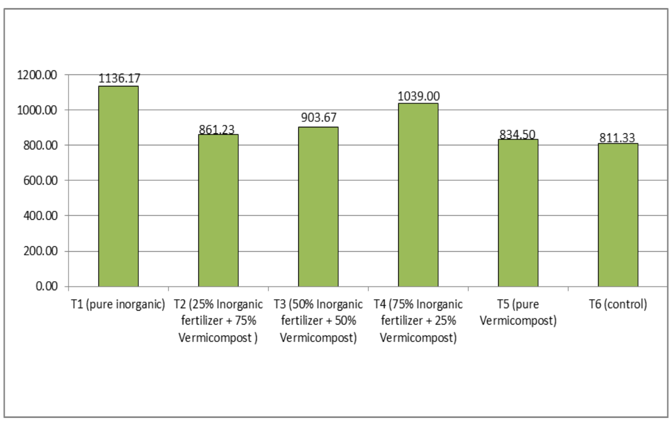


Fig. 4 Mean ear diameter (cm)

E. *Biomass*

Biomass weight was obtained during harvesting. Plants that obtained the heaviest mean weight was T1 with 1,136.17 grams, followed by T4 with of 1,039 grams; T3 with 903.67 grams; T2 with of 861.23 grams, and T5 with a mean weight of 834.5 grams and the lightest was T6 which gained a mean weight of 811.33 grams. Statistical analysis showed that the treatments were significantly different from each other in terms of biomass weight.



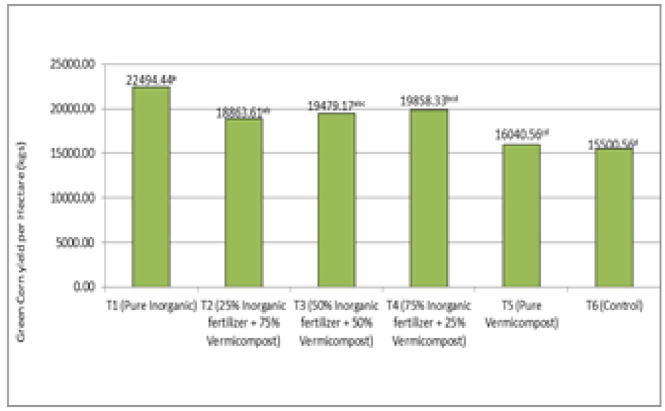
Note: Means not sharing letter in common differ significantly by Duncan's Multiple Range Test

Fig. 5. Biomass (grams)

Sweet corn biomass can be used in many ways including as animal feed that can be beneficial to small-scale farmers, who strive to become more sustainable and to increase their income. Fresh biomass data gathered indicated that application of pure inorganic fertilizer (T1)and in the different BFS significantly affected the fresh biomass of sweet corn. Data revealed that higher values for fresh biomass (1,136.17 grams) was recorded in application of pure inorganic which was statistically at par with the value recorded by BFS treatments. Lower fresh biomass (811.33 grams) was recoded in control. Overall data represents that inorganic fertilizer is effective in increasing the fresh biomass of maize.

F. *Green Corn Yield*

Figure 6 shows the green corn yield as affected by the application of vermicompost and inorganic fertilizers. T1 gained the highest yield with a mean weight of 22,494 kgs/ha, followed by T4 with mean weight of 19,858 kgs/ha, then by T3 which gained a mean weight of 19,479 kgs/ha; T2 with mean weight of 18,863 kgs/ha and T5 with mean weight of 16,040 kgs/ha and the least was T6 (15,500 kgs/ha). Statistical analysis showed significant difference on the yield of corn.



Note: Means not sharing letter in common differ significantly by Duncan's Multiple Range Test

Fig. 6 Green corn yield (kgs/ha)

G. *Return on Investment*

Simple cost and return analysis was done to determine the profitability of the application of the different treatments. Projected cost and return analysis showed that yields from pure inorganic (T1) obtained the highest net income and ROI with 1242.38%, followed by T6 with 1140.71%; T4 with 964.78%; T3 with 848.16%; T2 with 740.69% and the least is T5 (Pure Vermicompost). T1 gained highest because of the lesser cost of inputs in terms of fertilizer while the control treatment ranks next because of zero fertilizer cost. The BFS treatments ranks 3rd, 4th, and 5th because of low input cost while pure vermicompost gained the lowest ROI because of the high very quantity of vermicompost needed per hectare. However, in totality, the ROI of all the treatments indicates promising profits when venturing in sweet corn production.

IV. Conclusion and Recommendation

Since the result of the study revealed positive effect of the different levels of balance fertilization strategies on the productivity of sweet corn, the use of balance fertilization strategy particularly T2 and T3 is recommended. However, similar study should be conducted during dry season to validate findings of this study. Moreover, the exploration of other organic fertilizers as a component of balance fertilization strategies is also recommended.

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