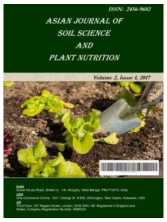

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Dry Matter Yield and NPK Uptake of Sweet Corn as Influenced by Fertilizer Application

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Field experiment was conducted to determine the impact of fertilizer on the dry matter and nutrient uptake of sweet corn (*Zea mays* L. *var Saccharata*) under conventional tillage operation at the research station in Central Mindanao University of the Institute of Plant Breeding-University of the Philippines, Los Baños (IPB-UPLB) at Bukidnon, Philippines on February 2016 to May 2016.

The application of full recommended rate of inorganic fertilizer has shown great consistency among the parameters undertaken being the greatest, however, post hoc analysis would say that the difference present was not significant from each other. The significant influence was executed by the application of fertilizers towards the dry matter yield of sweet corn in stover and in grains as well as on the nitrogen, phosphorus and potassium uptake. The application of full recommended rate of inorganic fertilizer may be consistently the highest, however, comparison of means declares that no significant difference was present between the full recommended rate alone (T_2) and that of the full recommended rate of inorganic fertilizer + 1-ton Vermicompost ha^{-1} (T_6). Soil pH was greatly affected by the application of inorganic fertilizer alone. Moreover, the application of ½ RRIF + 2 tons of Vermicompost ha^{-1} caused significant effects towards the organic matter content (%) of the soil at harvest.

The application of full recommended rate of inorganic fertilizer alone and the combination of the

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recommended rate of inorganic fertilizer plus Vermicompost are possible ways that may be undertaken in order to have great dry matter yield in stover and in grains along with the nitrogen, phosphorus and potassium uptake of sweet corn plants. Higher dry matter and nutrient uptake will give way towards higher efficiency being an indicator towards sweet corn productivity under Bukidnon condition along with the possibility of maintaining the quality of the soil of Bukidnon, Philippines.

Keywords: Nutrient; dry matter yield; uptake; vermicompost, tillage; sweet corn; fertilizer; Bukidnon.

1. INTRODUCTION

The province of Bukidnon is considered to be the food basket of Mindanao, is the primary producer of rice and corn in the region. Two types of climate prevail between the northern and southern sections of Bukidnon, the northern part is classified as belonging to Type III, that is, there is no pronounced rain period but relatively dry during the months of November to May. In the southern portion of the province, the climate is classified as Type IV with no dry season [1]. On the other hand, about ninety elements have been found in crops, all of which are not essential to them. Then the question arises which element should be considered as essential to crops [2]. Sixteen elements fulfil the criteria of essentiality of elements, where Nitrogen (N), Phosphorus (P) and Potassium (K) are part of the primary macronutrients.

Soil tillage is among the important factors affecting soil physical properties and crop yield. Among the crop production factors, tillage contributes up to 20% increase or decrease in yield [3]. Tillage method affects the sustainable use of soil resources through its influence on soil properties [4]. The proper use of tillage can improve soil related constrains, while improper tillage may cause a range of undesirable processes, e.g. destruction of soil structure, accelerated erosion, depletion of organic matter and fertility, and disruption in cycles of water, organic carbon and plant nutrient [5].

Conventional tillage decreases soil penetration resistance and soil bulk density [6]. This also improves porosity and water holding capacity of the soil. Continuity of the pore network is also interrupted by conventional tillage, which increases the tortuosity of soil. This all leads to a favourable environment for crop growth and nutrient [6].

Sweet corn is a variety of maize with a high sugar content. Sweet corn 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 (dent stage), sweet corn must be picked when immature (milk stage) and prepared and eaten as a vegetable, rather than a grain [7].

Fertilizers, natural or artificial are substances containing chemical elements that improve growth and productiveness of plants. Fertilizers enhance the natural fertility of the soil or replace the chemical elements taken from the soil by previous crops [8].

Many researches all over the globe were already undertaken with regards the influence of fertilizer materials toward the growth and ear yield of sweet corn. However, under Bukidnon condition lesser studies were conducted towards nutrient uptake of sweet corn plants and so this study was carried out. Dry matter yield and uptake of any crop will give way towards projecting the intensity of yield that it may bring. Thus, the amount of nutrients taken in by the plants are related to plant growth and yield.

2. MATERIALS AND METHODS

2.1 Location

The field experiment was conducted at the research station of the Institute Plant Breeding-University of the Philippines, Los Baños (IPB-UPLB) 7° 51' 31.788" N and 125° 3' 40.4568" E, Central Mindanao University, Musuan, Bukidnon, Philippines.

2.2 Collection, Preparation and Characterization of Soil Samples

Surface soil samples at 0-20 cm depth were collected randomly from the experimental area following a random direction prior to the land preparation. The collected soil samples were placed in cellophane bags and then brought to the Soil and Plant Analysis Laboratory (SPAL). Prior to analysis, the collected soil samples were air-dried at room temperature for about a week, and passed through a 2-mm sieve and were stored in a clean plastic container. Soil samples were also collected from each experimental plot after harvest of sweet corn. The chemical and physical properties of the soil were determined and analyzed at the Soil and Plant Analysis Laboratory (SPAL). The properties tested include; soil pH in 1:5 (soil:water) ratio [9]; organic matter content by the Walkley and Black method [10]; extractable P using the Bray 2 method [11] and exchangeable K using 1N NH_4OAc buffered at pH 7.0 using a Flame photometer [12].

2.3 Characteristics of Soil in the Experimental Area

Table 1 shows that the soil samples collected from the experimental area has a pH value of 5.52 and is classified as strongly acidic [13]. The soil has an organic matter content of 3.90% which is considered marginal [5]. For the extractable phosphorus, it has a value of 17.37 mg kg^{-1} and is classified as medium in the amount [11]. On the other hand, exchangeable potassium was found high in amount because of its value 1.11 cmol kg^{-1} [10]. Hence, the fertilizer recommendation for the experimental site was 70-50-0 kg ha^{-1} of N, P_2O_5 and K_2O. Particle size analysis through sedimentation using the hydrometer method revealed that the soil texture of the experimental area is Clay Loam consisting of 30% sand, 34% clay and 36% silt [12].

2.4 Experimental Design and Treatments

The field experiment was laid out in a Randomized Complete Block Design (RCBD) with six (6) treatments and replicated three (3) times. Treatments include: T_1- no fertilizer,T_2- Recommended rate of inorganic fertilizer (RRIF) based on soil analysis of the experimental area (70 – 50 – 0 N, P_2O_5, K_2O kg ha^{-1}), T_3- 2 tons ha^{-1} Vermicompost, T_4- ½ RRIF (35 – 25 – 0 N, P_2O_5, K_2O kg ha^{-1}) + 1 ton ha^{-1} Vermicompost, T_5- ½ RRIF (35 – 25 – 0 N, P_2O_5, K_2O kg ha^{-1}) + 2 tons ha^{-1} Vermicompost and T_6- RRIF (70 – 50 – 0 N, P_2O_5, K_2O kg ha^{-1}) + 1 ton Vermicompost.

2.5 Land Preparation and Lay-outing

The total land area used in the experiment was 463.75 m^2 (35 m x 13.25 m). It was divided into three (3) blocks and each block had a dimension of 131.25 m^2. A one-meter space was provided between blocks and experimental plots as alleyways. The field was plowed using an animal-drawn moldboard plow. Plowing was done twice at one-week interval to destroy the emerging weeds. Harrowing was done after plowing to further pulverize larger soil aggregates. Furrows were made at the time of planting at a distance of 75 cm between furrows and this was observed to all experimental plots.

2.6 Fertilizer Application

The Vermicompost was sourced out from one of the Vermi farms in Valencia City, Bukidnon, Philippines. The Vermicompost was applied in those plots assigned with organic fertilizer as treatment following the rate of two (2) tons ha^{-1}. It was carefully broadcasted within each plot before the seeding operation. While basal application of inorganic fertilizer was done in treatments assigned to inorganic fertilizer. Inorganic fertilizers were placed in a hole in the furrow covered with a thin layer of soil then followed by the sowing of seeds and then covered again with soil to have a close contact between the seed and the soil, thus, would facilitate uniform germination.

The chemical composition of Vermicompost used in the experiment includes: pH of 6.52 and organic matter content of 32.45%. For the nutrient content, total nitrogen of 2.82%, total phosphorus of 1.14% and total potassium of 0.45%.

Table 1. Chemical properties of soil in the experimental soil (0-20 cm)

Properties	Value	Methods
pH	5.52	Potentiometric (1:5 soil: water)
Organic Matter Content, %	3.90	Walkley-Black
Extractable Phosphorus, mg kg^{-1}	17.37	Bray P_2
Exchangeable Potassium, cmol kg^{-1}	1.11	1N NH_4OAc / Flame photometer

2.7 Care and Management and Tagging of Data Plants

Care and management immediately started right after seeding up to the harvesting period. Weed population was closely monitored to avoid possible competition of nutrients. Moreover, disease monitoring was also done. Application of pesticides was also employed due to the evident infestation of insect pests. Due to adverse climatic condition during the conduct of the experiment, irrigation at field capacity was done once a week to sustain the water need of the crop. Irrigation ceased when the experimental plants were about to be harvested at 70 DAS. The experiment conducted fell under an adverse condition known as El Niño. The maximum temperature in the experimental area was 33°C and a minimum of 17.4°C. The relative humidity was at 74% to 75.4% and a very minimal rainfall of 5.7 to 17.0 mm. Ten (10) sample plants were randomly selected from data rows in each experimental plot. A sheet of white paper was stapled to each data plants to serve as a marker and guide during data collection.

2.8 Harvesting of Data Plants, Tissue Sample Preparation and Analysis

The ten (10) tagged plants in every experimental plot were harvested. The ears were removed from the stover. The grains were grated from the corn cob. It was then air-dried for a week and then placed in the oven at 40°C. On the other hand, the stover was chopped into smaller pieces and air-dried also for a week, then placed in the oven at 40°C. Grains and stover were then grounded. The respective analysis was then undertaken. Total nitrogen (%) was estimated by Micro-Kjeldhal method [12], total phosphorus (%) using Dry Ashing Vanado-molybdate method [12] and total potassium using dry ashing/flame photometer method [12].

2.9 Statistical Analysis

Statistical analysis was done after tabulating the gathered data through the Statistical Tool for Agricultural Research (STAR) software. Moreover, some parameters were found significant as manifested in the F computed value, comparison of means then proceeded using Honestly Significance Difference (HSD) test as the Post hoc test undertaken [14].

3. RESULTS AND DISCUSSION

3.1 Dry Matter Yield of Sweet Corn as Affected by Fertilizer Applications

The mean values of the dry matter yield of sweet corn in plots treated with different fertilizers are presented and discussed in this section.

3.1.1 Dry matter yield (stover and grain) of sweet corn

The dry matter yield of corn is presented in Table 2. Results reveal that the dry matter yield of sweet corn both stover and grains were significantly affected by the fertilizer treatments. Highest dry matter yield in stover was observed among those sweet corn plants that were planted on plots treated with full recommended rate of inorganic fertilizer (T_2) with a value of 9046.55 kg ha^{-1} while the lowest was on experimental plots treated with no fertilizer, having a value of 6338.69 kg ha^{-1}. These results confirm the results reported by [15,16]. Wherein, according to the findings of [17] that no application of NPK fertilizer could lead into lower dry matter yield as these nutrients are the ones building blocks for a dry matter to accumulate among corn plants and to all plants in general. Post hoc test reveals in stover dry matter yield that the application of recommended rate of inorganic fertilizer in Treatment 2 (RRIF) was not significantly different with that of those applied with 2 tons Vermicompost ha^{-1} (T_3) and ½ RRIF + 2 tons Vermicompost ha^{-1} (T_5). However, significantly different from that of T_1, T_4 and T_6.

For the dry matter yield in grains, significant effects were also observed. Highest dry matter yield was observed in T_2 (RRIF) with a value of 2356.43 kg ha^{-1}. Moreover, significantly different from those treated with ½ RRIF + 1 ton Vermicompost ha^{-1} (T_4) but not significantly different with T_1, T_3, T_5, and T_6. These results were in conformity with the results of [16,17]. In order to achieve higher dry matter yields, a sufficient amount of available nutrients must be present in the soil. These nutrients later become part of the dry matter of the growing corn by way of converting these nutrients into other important compounds like carbohydrates, proteins, sugars, lignins, cellulose and the likes.

Table 2. Dry matter yield of sweet corn (stover and grains) as affected by fertilizer application

Treatments		Dry matter yield, kg ha^{-1}	
Code	**Description**	**Stover†**	**Grains†**
T_1	No fertilizer	6338.69 c	1722.85 ab
T_2	Full RRIF	9046.55 a	2356.43 a
T_3	2 tons Vermicompost ha^{-1}	8266.47 ab	1929.46 ab
T_4	½ RRIF + 1 ton Vermicompost ha^{-1}	6675.41 bc	1505.57 b
T_5	½ RRIF + 2 tons Vermicompost ha^{-1}	7648.57 abc	1572.77 ab
T_6	Full RRIF + 1 ton Vermicompost ha^{-1}	6695.23 bc	1566.73 ab

† Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD

3.2 Nutrient Uptake of Sweet Corn as Affected by Fertilizer Application

The mean values of the nitrogen, phosphorus and potassium uptake of sweet corn in plots treated with different fertilizers are presented and discussed in this section.

3.2.1 Nitrogen uptake of sweet corn as affected by fertilizer application

The nitrogen uptake of sweet corn was significantly affected by the application of fertilizer materials. Table 3 presents the nitrogen uptake of sweet corn in its stover. Results show that those sweet corn plants planted in those plots applied with the recommended rate of inorganic fertilizer (RRIF) (T_2) had significantly higher nitrogen uptake as compared with that of those planted with no fertilizer application (T_1). Significantly lowest nitrogen uptake was observed in those plots with no fertilizer application (T_1). Comparison of means revealed that nitrogen uptake among plants treated differently was significantly different. Plants in treatment 2 were not significantly higher with T_3, T_4, T_5 and T_6 but significantly different with T_1 (no fertilizer). Results observed confirms the findings reported by [16].

Higher nitrogen uptake of sweet corn plants was due to the available nutrients that are in the soil. The available nutrients are easily absorbed, thus, greater possibility of luxury consumption [16].

The nitrogen uptake of sweet corn in grains was also significantly influenced by the fertilizer materials. Highest nitrogen uptake in grains was noted in T_2 (Full RRIF) with a value of 75.66 kg ha^{-1}, this was followed by those sweet corn plants treated with full RRIF + 1 ton Vermicompost ha^{-1} (T_6) with a value of 66.44 kg ha^{-1}. Lowest nitrogen uptake was observed in treatment 1 where no fertilizer application was made. Post hoc test reveals that T_2 was not significantly different with T_6 but significantly different with T_1, T_3, T_4 and T_5.

These results confirm the reports of [18,19] that nitrogen uptake of corn plants are expected to be high in those plots treated with inorganic fertilizers. Nutrients present in inorganic fertilizers are readily available for plants. Thus, nutrients are easily absorbed and metabolized by plants [18,19]. Moreover, nutrients particularly nitrogen present in the vermicompost must have mineralized and absorbed by the plants causing no significant difference among those plots treated with inorganic fertilizers [20].

Table 3. Nitrogen uptake of sweet corn (stover and grains) as affected by fertilizer application

Treatments		N uptake, kg ha^{-1}	
Code	**Description**	**Stover†**	**Grains†**
T_1	No fertilizer	118.48 b	39.64 c
T_2	Full RRIF	207.27 a	75.66 a
T_3	2 tons Vermicompost ha^{-1}	166.00 ab	53.77 bc
T_4	½ RRIF + 1 ton Vermicompost ha^{-1}	160.21 ab	50.26 bc
T_5	½ RRIF + 2 tons Vermicompost ha^{-1}	139.21 ab	51.02 bc
T_6	Full RRIF + 1 ton Vermicompost ha^{-1}	199.72 ab	66.44 ab

† Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD

3.2.2 Phosphorus uptake of sweet corn as affected by fertilizer application

The phosphorus uptake of sweet corn in stover and in grains are presented in Table 4. Results had revealed that fertilizer application affected the phosphorus uptake of sweet corn in stover in those plants planted under conventional tillage. It was observed that sweet corn plants planted in those plots treated with full recommended rate inorganic fertilizer got the highest phosphorus uptake. Lowest phosphorus uptake was detected in those plots with no fertilizer application. The statistical analysis had revealed further that influence brought by the application of fertilizer was significant. Thus, comparison of means was carried out and revealed that T_2 (Full RRIF) was significantly different from that of T_1 and T_4 however, not significantly different from that of T_3, T_5 and T_6. These results reveal that in those plots with inorganic fertilizers, great is the accumulation of phosphorus elements in the stover of the sweet corn plants. Moreover, an insignificant difference was observed in sweet corn plants planted in those treated with vermicompost alone and the combination of both fertilizers [21,22,23].

Phosphorus uptake in grains (Table 4) revealed also a significant difference among treatments. Highest (12.18 kg ha^{-1}) was observed in the application of full recommended rate of inorganic fertilizer (T_2). But observed to be not significantly different with the combined application of full RRIF + 1 ton Vermicompost ha^{-1}. Comparing the result towards those no fertilizer application, phosphorus uptake was significantly different. This explains that native phosphorus is the only source of nutrition of the growing crop. Those with the application of inorganic fertilizer increase the pool of phosphorus supply towards the growing crop allowing the crop to increase in its uptake. According to the report of [21,22], phosphorus recovery from mineral fertilizer by sweet corn plants is maximized with the appropriate nitrogen supply that is also supplied by the same fertilizer material. These event promoted synergetic effects on the phosphorus absorption and on the dry matter yield [21,22,23].

3.2.3 Potassium uptake of sweet corn as affected by fertilizer application

Table 5 illustrates the potassium uptake of sweet corn in both stover and grains. Potassium uptake in stover was found greatest in those plots applied with a full recommended rate of inorganic fertilizer (T_2) with a value of 166.07 kg ha^{-1}. However, this value was not significantly different from those sweet corn plants treated with ½ RRIF + 2 tons Vermicompost ha^{-1} (T_5) and Full RRIF + 1 ton Vermicompost ha^{-1} (T_6). These results emphasize that nutrients that are in the inorganic fertilizer are all readily available for plant consumption, hence, no mineralization process is needed as nutrients are already in their available form [24].

Uptake of potassium in grains of sweet corn plants were found to be significantly affected by the application of fertilizer materials. Highest uptake was still observed in those plots treated with full recommended rate of inorganic fertilizers with a value of 32.93 kg ha^{-1} which was observed to be not significantly different with those plants treated with full RRIF + 1 ton Vermicompost ha^{-1}. Since nutrients are already available in mineral fertilizers, plants can hasten its metabolism that is, transforming nutrients into other forms leading to a greater uptake. Moreover, as reported by [25] that potassium works well in partnership with nitrogen, thus, leading to a greater yield. These results agree to the results reported by [26], that sweet corn has a potential to produce a high yield of grain on medium K fertile soil provided with potassium fertilizer and is supplied whenever needed.

Table 4. Phosphorus uptake of sweet corn (stover and grains) as affected by fertilizer application

Treatments		P uptake, kg ha^{-1}	
Code	**Description**	**Stover**	**Grains**
T_1	No fertilizer	12.43 c	5.84 c
T_2	Full RRIF	19.70 a	12.18 a
T_3	2 tons Vermicompost ha^{-1}	15.57 abc	7.98 bc
T_4	½ RRIF + 1 ton Vermicompost ha^{-1}	14.27 bc	8.20 bc
T_5	½ RRIF + 2 tons Vermicompost ha^{-1}	14.67 abc	8.77 b
T_6	Full RRIF + 1 ton Vermicompost ha^{-1}	18.05 ab	10.06 ab

[T] *Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD*

Table 5. Potassium uptake of sweet corn (stover and grains) as affected by fertilizer application

Treatments		K uptake, kg ha^{-1}	
Code	Description	Stover	Grains
T_1	No fertilizer	93.86 b	19.09 c
T_2	Full RRIF	166.07 a	32.93 a
T_3	2 tons Vermicompost ha^{-1}	110.84 b	23.54 bc
T_4	½ RRIF + 1 ton Vermicompost ha^{-1}	106.99 b	18.55 c
T_5	½ RRIF + 2 tons Vermicompost ha^{-1}	123.13 ab	21.49 bc
T_6	Full RRIF + 1 ton Vermicompost ha^{-1}	130.06 ab	29.43 ab

† Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD

3.3 Soil Chemical Properties at Harvest as Affected by Fertilizer Application

The mean values of soil pH, organic matter content (%), extractable P (mg ka^{-1}) and exchangeable K (cmol kg^{-1}) in plots treated with different fertilizers are presented and discussed in this section.

3.3.1 Soil chemical properties at harvest

The negative logarithm of hydrogen ions present in the soil or commonly known as pH was significantly affected by the imposed fertilizer treatment based on soil analysis conducted [9] after harvest as presented in Table 6. Plots with no fertilizer application (T_1) had the highest pH value of 5.85 which was significantly higher with those plots treated with Full RRIF + 1 ton Vermicompost ha^{-1} (T_6). However, post hoc analysis using HSD at 5% level of significance revealed that T_1 pH value has no significant difference with of T_2, T_3, T_4 and T_5. Results presented by [27] is opposite to the findings of the study. The reason is primarily due to the application of vermicompost as an organic fertilizer. Sweetcorn plants are harvested in less than 3 months which would cause incomplete reactions in the soil. Leading to a change in pH. Organic matter content of the soil was found significantly affected by the imposed treatments based on statistical analysis. Highest organic matter content was observed in plots applied with ½ RRIF + 2 tons Vermicompost ha^{-1} (T_5) followed by those plots treated with 2 tons Vermicompost ha^{-1} (T_3), ½ RRIF + 1 ton Vermicompost ha^{-1} (T_4), Full RRIF + 1 ton Vermicompost ha^{-1} (T_6) and lastly T_1 (no fertilizer) and T_2 (Full RRIF). Post hoc test reveals that T_5 value was not significantly different from that of T_3, T_4 and T_6. But significantly higher with that of T_1 and T_2. Application of organic fertilizer like Vermicompost can readily increase and improve the amount of organic matter in the soil as reported by [28].

The extractable P measured in mg kg^{-1} was not significantly affected by fertilizer treatments. However, the highest value was obtained by those plots applied with ½ RRIF + 2 tons Vermicompost ha^{-1} (T_5). Exchangeable K was also not significantly affected by the imposed treatments of fertilizer. The highest value was also obtained by those plots treated with ½ RRIF + 2 tons Vermicompost ha^{-1} (T_5). Treatment 5 got the highest values for extractable P and exchangeable K at harvest.

Table 6. pH, organic matter content, extractable P and exchangeable K of soil at harvest as affected by fertilizer application

Treatments		Some soil chemical properties at harvest			
Code	Description	pH †	Organic matter † content, %	Extractable P, mg kg^{-1}	Exchangeable K, cmol kg^{-1}
T_1	No fertilizer	5.85 a	3.93 b	11.00	1.24
T_2	Full RRIF	5.59 ab	3.93 b	14.33	1.20
T_3	2 tons Vermicompost ha^{-1}	5.84 a	4.11 ab	14.17	1.21
T_4	½ RRIF + 1 ton Vermicompost ha^{-1}	5.72 ab	4.05 ab	10.17	1.13
T_5	½ RRIF + 2 tons Vermicompost ha^{-1}	5.65 ab	4.15 a	16.33	1.26
T_6	Full RRIF + 1 ton Vermicompost ha^{-1}	5.54 b	4.00 ab	13.33	1.23

† Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD

4. CONCLUSION

Results of this study show that the application of inorganic fertilizer and Vermicompost would significantly affect the dry matter yield and nutrient uptake of sweet corn plants. Thus, application of inorganic fertilizer alone towards sweet corn plants increased significantly the dry matter yield of corn both in the stover and in the grains as well as the nitrogen, phosphorus and potassium uptake in kilograms per hectare, however, found not significantly differently with that of the combined application of organic and inorganic fertilizers. Consistent effects executed by inorganic fertilizer was observed all throughout the study among the parameters undertaken but found not significantly different with other treatments. This would mean that the application of full recommended rate of inorganic fertilizer would be very promising as it manifested favorable impacts towards the dry matter yield and nutrient uptake the sweet corn plants, however, the combination of the organic and inorganic fertilizers may be considered as they are not significantly different from each other under Bukidnon, Philippines condition. Further studies may be conducted to verify the results of the study.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Department of Tourism. Archived from the original on 21 March 2018. (Retrieved 1 May 2018) Available:tourism.gov.ph
2. Kolay AK. Basic concepts of soil science. Publ. by New Age International (P) Ltd.; 1993.
3. Khurshid K, Iqbal M, MSA, Nawaz A. Effect of tillage and mulch on soil physical properties and growth of maize. Int. J. Agric. Biol. 2006;8:593-596.
4. Hammel JE. Long-term tillage and crop rotation effects on bulk density and soil impedance in northern Idaho. Soil Sci. Soc. Amer. J. 1989;53:1515-1519.
5. Lal R. Tillage effects on soil degradation, soil resilience, soil quality and sustainability. Soil and Tillage Research. 1993;51:61-70.
6. Khan FUH, Tahir AR, Yule IJ. Impact of different tillage practices and temporal, factor on soil moisture content and soil bulk density. Int. J. Agric. Biol. 1999;3:163-166.
7. Erwin AT. Sweet corn—Mutant or historic species? Economic Botany. Springer New York. 1951;5(3):302.
   DOI: 10.1007/bf02985153
8. Scherer HW. “Fertilizers" in Ullmann's Encyclopedia of Industrial Chemistry. Wiley-VCH, Weinheim; 2000
   DOI: 10.1002/14356007.a10_323.pub3
9. Rayment GE, Higginson FR. Australian laboratory handbook of soil and water chemical methods. Inkata Press, Melbourne. (Australian Soil and Land Survey Handbook). 1992;3.
10. Nelson DW, Sommers LE. Organic carbon. In: Page AL, Miller RH, Keeney (eds). Methods of Soil Analysis, Part 2: Chemical and Microbiological Properties, 2^{nd} Edition. ASA, SSA, Madison, Wisconsin, USA; 1982.
11. Bray RH, Kurtz LK. Determination of total, organic and available forms of phosphorus in soil. Soil Science. 1945;59:39–45.
12. PCARRD. Standard method of analysis for soils, plants tissue, water and fertilizers. Los Baños, Laguna, Philippines; 1991.
13. USDA. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys; 1998.
14. STAR. Statistical Tool for Agricultural Research version 1.0. Available:http://bbi.irri.org/products
15. Landon JR. Booker tropical soil manual: A handbook for soil survey and agricultural land evaluation in the tropics and subtropics. (Booker Tate: Longman Scientific & Technical, Harlow, UK); 1984.
16. Pessarakli M, Huber JT, Tucker TC. Dry matter yield, nitrogen absorption, and

water uptake by sweet corn under salt stress. Journal of Plant Nutrition. 2008;12(3):279-290.
DOI: 10.1080/01904168909363952.
Available:https://www.tandfonline.com/doi/abs/10.1080/01904168909363952?Journal Code=lpla20.
(Date Accessed: May 31, 2018)

17. Shalini Kumari. Effect of nitrogen and phosphorus level on dry matter yield at different growth stages of popcorn in South Saurashtra Region of Gujarat, India. International Journal Current Microbiology Applied Science. 2017;6(8):547-553.
DOI:https://doi.org/10.20546/ijcmas.2017.608.071
Available:https://www.ijcmas.com/6-8-2017/Shalini%20Kumari,%20et%20al.pdf
(Date Accessed: May 31, 2018)

18. Maňásek J, Lošák T, Prokeš K, Hlušek J, Vítězová M, Škarpa P, Filipčík R. Effect of nitrogen and potassium fertilization on micronutrient content in grain maize (*Zea mays* L.). Acta Universitatis Agriculturae Et Silviculturae Mendelianae Brunensis. 2012;51:15.
DOI:http://dx.doi.org/10.11118/actaun201361010123
Available:https://acta.mendelu.cz/media/pdf/actaun2013061010123.pdf
(Date accessed: May 31, 2018)

19. Murmu K, Swain DK, Ghosh BC. Comparative assessment of conventional and organic nutrient management on crop growth and yield and soil fertility in tomato-sweet corn production system. Australia Journal of Crop Science. AJCS. 2013;7(11):1617-1626. ISSN: 1835-2707.
Available:http://www.cropj.com/murmu_7_11_2013_1617_1626.pdf
(Date Accessed: May 31, 2018)

20. Canatoy R. Effects of vermicompost on the growth and yield of sweet corn in Bukidnon, Philippines. Asian Journal of Soil Science and Plant Nutrition. 2018;3(2):1-8. ISSN: 2456-9682
DOI: 10.9734/AJSSPN/2018/42273
Available:http://www.journalrepository.org/media/journals/AJSSPN_60/2018/Jun/Canatoy322018AJSSPN42273.pdf

21. Cabral da Silva E, Muraoka T, Franzini VI, Villanueva FCA, Buzetti S and Moreti D. Phosphorus utilization by corn as affected by green manure, nitrogen and phosphorus fertilizers. Pesq. Agropec. Bras. Brasília, Ago. 2012;47(8):1150-1157.
Available:http://www.scielo.br/pdf/pab/v47n8/47n08a16.pdf
(Accessed: June 4, 2018)

22. Akinnifesi FK, Makumba W, Sileshi G, Ajayi OC, Mweta D. Synergistic effect of inorganic N and P fertilizers and organic inputs from *Gliricidia sepium* on productivity of intercropped maize in Southern Malawi. Plant and Soil. 2007;294:203-217.
Available:https://www.researchgate.net/publication/227003495_Synergistic_effect_of_inorganic_N_and_P_fertilizers_and_organic_inputs_from_Gliricidia_sepium_on_productivity_of_intercropped_maize_in_Southern_Malawi
(Accessed: June 4, 2018)

23. Oyeyiola YB, Omueti JAI. Phosphorus uptake and use efficiency by cowpea in phosphocompost and chemical fertilizer treated nutrient degraded acid soils. Agricultural Research & Technology: Open Access Journal. 2016;1(5):555578.
DOI: 10.19080/ARTOAJ.2016.01.555578
Available:https://juniperpublishers.com/artoaj/pdf/ARTOAJ.MS.ID.555578.pdf
(Accessed: June 4, 2018)

24. Adrienn VS, Janos N. Effects of nutrition and water supply on the yield and grain protein content of maize hybrids. Australian Journal of Crop Science. 2012;6(3):381-390.
Available:www.cropj.com/szeles_6_3_2012_381_390.pdf
(Accessed: June 4, 2018)

25. Leikam D. Nitrogen and potassium work together for higher yields; 2010.
Available:http://www.mosaicco.com/images/Nitrogen_and_Potassium_W.pdf

26. Szczepaniak W, Grzebisz WW, Potarzycki J. An assessment of the effect of potassium fertilizing systems on maize nutritional status in critical stages of growth by plant analysis. J. Elem. S. 533–548.
DOI: 10.5601/jelem.2014.19.1.576
Available:http://www.yadda.icm.edu.pl/yadda/element/bwmeta1.../533_548.pdf
(Accessed: June 4, 2018)

27. Arsova A. Effect of fertilizer application and soil ph on the acidic and sorption properties of maize leaves and stems. Bulgarian Journal of Plant Physiology. 1995;21(1):52–57.
Available:http://www.bio21.bas.bg/ipp/gapbfiles/v-21/95_1-52_57.pdf
(Accessed: 21 May 2018)

28. Canatoy R. Growth and yield response of sweet corn (*Zea mays* l. var. saccharata) as affected by tillage operations and fertilizer applications. International Journal of Education and Research. 2018;6(4). Available:http://www.ijern.com/journal/2018/April-2018/22.pdf (Accessed: 21 May 2018)

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