Effect of Vermicompost with Different Leguminous Crops as Nitrogen Source on the Pest Occurrence and Performance of Cucumber (Cucumis sativus)

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Abstract

The study was conducted to determine the potential of vermicompost of different leguminous crops as nitrogen source on the pest occurrence and performance of cucumber. The parameters data were gathered in a two-cropping seasons which was conducted at the Organic Agriculture Project of Capiz State University, Burias Campus, Mambusao, Capiz. The study was laid out in 2×4 factorial experiment using Randomized Complete Block Design (RCBD) with three replications. Factor A was the cropping seasons such as A1- first cropping (January- March) and A2- second cropping (May-July). Factor B was the vermicompost using different leguminous crops as N source which comprised of B1 – Azolla, B2 – Trichantera, B3 – Kakawate, and B4 – Mixed (Azolla, Trichantera, and Kakawate). The data gathered were analyzed using STAR software and LSD test for mean comparisons. The growth and yield parameters of cucumber were comparable on the use of the different leguminous crops as nitrogen source. The above study reveals that cropping seasons significantly affected the plant height, stem girth, number of lateral branches, weight of roots, biomass, length and diameter of fruit, and number of marketable fruit. Cucumber grown and harvested in the first cropping which falls on January to March had the bigger stems, heavier roots and biomass, longer fruit, and most number of marketable fruit. While most number of lateral branches and bigger fruit were recorded in the cucumber grown and harvested in the months of May to July (second cropping). The different pest infested the cucumber was not affected by the vermicompost with different leguminous crops as N source. The data collected reveals the variation of growth and yield of cucumber. Cucumber applied with vermicompost with trichanthera gave the highest net profit amounting of Php 558.50.

Keyword: Cucumber, Nitrogen content, Azolla, Trichanthera, Kakawate

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ISSN 1908-2843 Print

Introduction

Cucumber, scientifically known as Cucumis sativus Linn, is a widely cultivated fruit vegetable from the gourd family (Cucurbitaceae), which includes squash, and in the same genus as the muskmelon and cantaloupe. The crop likely originated in India. Hundreds of cultivars of varying sizes and colors are now grown in warm areas worldwide, commercially and in home gardens.

Cucumber is one of the most important market vegetables in the tropics and it is also the basis of an extensive pickling industry. They were already used in ancient times to dissolve stones caused by uric acid. Their cleansing effect on the intestines, kidneys, lung and skins was also known. People suffering from stomach or liver diseases also benefit from the consumption of cucumbers. They have been known to cure some headaches, bleeding, dizziness, and pale skin (http://www.natureandmore.com/products/cucumber).

At present, there are several cultural practices involved in raising the crop. It could be grown using other highly conventional chemical-dependent method or natural farming. However, chemical-based farming had many hazardous effects to human health and to the environment. On the other hand, natural farming system does not use any chemicals and chemical based implements for mass production of crops (http://herbanext.com).

Vermicompost stimulates to influence the microbial activity of soil, increases the availability of oxygen, maintains normal soil temperature, increases soil porosity and infiltration of water, improves nutrients content and increases growth, yield and quality of plant (Arora et.al 2011 as cited by Elumalai et. al 2018).

Vermicompost is an ideal organic manure for better growth and yield of many plants. It can increase the production of crops and prevent them from harmful pests without polluting the environment. (Singh, Jaswinder 2014).

Edward & Burrows (1988), as cited by Alemania & Llorico (2019), reported that vermicompost, especially those from animal waste sources, usually contained more mineral elements than commercial plant growth media, and many of these elements were changed to forms more that could be readily taken up by plants, such as nitrates, exchangeable phosphorus, and soluble potassium, calcium, and magnesium. The effect of humic substances is more prominent in stimulating root respiration, formation and growth. These result in increases efficiency of the rooting system which in turn improves upper growth, including the shoot, leaves, flowers, and fruit. The use of vermicompost which constitute greater amounts of humic substances has also produced significant improvements in germination rates. It has been hypothesized that the increases in growth, flowering, and crop yields are due to earthworms as they increase microbial populations that produce plant growth hormones (Lee, Edwards, Arancon & Metzger, 2002, as cited by Alemania &Llorico, 2019).

The study was conducted to determine the effect of vermicompost using different leguminous crops as nitrogen source on the pest occurrence and performance of cucumber in two-cropping seasons. It specifically aimed to: 1. Determine the growth and yield of cucumber as affected by the vermicompost with various leguminous crops as source of nitrogen; 2. Evaluate which among the leguminous crops as source of N for vermicompost would gave the best growth and yield to cucumber; 3. Determine the best cropping in growing cucumber using the vermicompost made from various leguminous crops as N source; 4. Find out if there is interaction effect between the vermicompost applied and different croppings; 5. Identify and quantify the different pests that would occur on cucumber applied with vermicompost with various leguminous crops as N source; 6. Determine the profitability of growing cucumber using vermicast made from leguminous crops as nitrogen source.

Materials and Methods

A two-cropping study was conducted at the Organic Agriculture Project of Capiz State University, Burias Campus, Mambusao, Capiz. The study was laid out in 2×4 factorial experiment using Randomized Complete Block Design (RCBD) with three replications. Factor A was the cropping seasons such as A1- first cropping (January-March) and A2- second cropping (May-July). Factor B was the vermicompost using different leguminous crops as nitrogen source which comprised of B1 – Azolla, B2 – Trichantera, B3 – Kakawate, and B4 – Mixed (Azolla, Trichantera, and Kakawate). The data on the growth and yield included plant height, stem girth, number of productive branches, number of lateral branches, length of roots, weight of roots, biomass, length of fruit, diameter of fruit, weight of marketable part, weight of non-marketable part, and umber of marketable were gathered and analyzed using the STAR software. Differences among treatment means were compared using the Duncan Multiple Range Test (DMRT).

Results and Discussion

Growth and Yield Parameters

Growth and yield parameters of cucumber such as stem girth, number of lateral branches, weight of roots, biomass, length of fruit, diameter of fruit, and number of marketable fruit significantly differ from the two croppings. Plants grown during the first cropping which falls on January to March had the biggest stem, heaviest roots and biomass, longest fruit, and most number of marketable fruit. Those plants planted in the second cropping (May- July) produced the most number of lateral branches, and biggest fruit. On the other hand, vermicompost made from various leguminous crops as nitrogen source did not significantly influenced the growth and yield of cucumber.

Plant height

The analysis of variance revealed that cucumbers grown and harvested in the

first cropping obtained the mean of 130.31 cm. while those cucumbers grown and harvested in the second cropping had the mean of 118.93 cm. On the other hand Tricanthera was determined as an effective source of nitrogen in the first cropping and Azolla in second cropping.

Stem girth

The analysis of variance revealed that cucumbers grown and harvested in the first cropping had the bigger stem girth with mean of 6.60 cm compared to cucumbers grown and harvested in the second cropping which had the mean of 5.83cm. On the other hand Tricanthera was determined as an effective N source in two croppings.

Number of productive branches

Cucumber grown and harvested in the first cropping had the mean of 1.56 while those cucumber grown and harvested in the second cropping obtained the mean of 1.73. . On the other hand Tricanthera was determined as an effective N source in two croppings.

Number of lateral branches

The analysis of variance revealed that cucumbers grown and harvested in the first cropping had the mean of 0.92 while cucumbers grown and harvested in the second cropping had the mean of 2.25. On the other hand vermicompost made from various leguminous crops was determined as an effective N source in two croppings.

Length of roots

The analysis of variance revealed that cucumbers grown and harvested in the first cropping had longer length of roots with the mean of 18.14 cm compared to cucumbers grown and harvested in the second cropping which obtained the mean of 15.94 cm. On the other hand Tricanthera was determined as an effective N source in two croppings.

Weight of roots

The analysis of variance revealed that cucumbers grown and harvested in the first cropping had the mean of 6.88 kg while cucumbers grown and harvested in the second cropping had the mean of 5 kg. On the other hand, Azolla was determined as an effective N source in two croppings.

Biomass

The analysis of variance revealed that cucumbers grown and harvested in the first cropping obtained heavier biomass with the mean of 894.50 kg compared

to cucumbers grown and harvested in the second cropping which had the mean of 394.69 kg. On the other hand Tricanthera was determined as an effective N source in first cropping and Azolla in second cropping.

Length of fruit

The analysis of variance revealed that cucumbers grown and harvested in the first cropping had a longer length of fruit with the mean of 15.08 cm. While those cucumbers grown and harvested in the second cropping had the mean of 14.08 cm. On the other hand, vermicompost made from mixed Azolla, Tricanthera and Kakawate was determined as an effective N source in first cropping and Kakawate in second cropping.

Diameter of fruit

The analysis of variance revealed that cucumbers grown and harvested in the first cropping had the mean of 37.50 cm. While those cucumbers grown and harvested in the second cropping obtained the mean of 40.34 cm. On the other hand Tricanthera was determined as an effective N source in first cropping and Kakawate in second cropping.

Weight of marketable fruit

The analysis of variance revealed that cucumbers grown and harvested in the first cropping had the mean of 149.59 kg. On the other hand cucumbers grown and harvested in the second cropping obtained the mean of 145.89 kg. On the other hand, vermicompost made from mixed Azolla, Tricanthera and Kakawate was determined as an effective N source in first cropping and Tricanthera in second cropping.

Number of marketable fruit

The analysis of variance revealed that cucumbers grown and harvested in the first cropping obtained the mean value of 1.04 compared to cucumbers grown and harvested in the second cropping which had the mean value of 1.00. On the other hand, vermicompost made from mixed Azolla, Tricanthera and Kakawate was determined as an effective N source in two croppings.

Plant over vermicompost cost of Cucumber

Cucumber applied with vermicompost with trichanthera gave the highest net profit amounting of Php 558.50. While cucumber applied with vermicompost with kakawate gave a net profit of Php 542.00 and vermicompost with mixed azolla, trichanthera, and kakawate (Php 498.25). On the other hand, cucumber applied with vermicompost with azolla had the lowest net profit amounting of Php 483.25.

Prevalence of Pest

The total number of insect pests which infested the cucumber plants was not affected by the application of vermicast made from various leguminous crops as nitrogen source for two cropping seasons. The most prevalent insect pests observed were: grasshopper, leaf folder, flies, lady beetle, and orange beetle.

Conclusions

Based on the results of the study, the following conclusions were drawn: 1. Different vermicompost made from various leguminous crops as nitrogen source manifested a comparable responses in all growth and yield of cucumber; 2. Cropping seasons significantly affects the growth and yield of cucumber such as stem girth, number of lateral branches, weight of roots, biomass, length and diameter of fruit, and number of marketable fruit; 3. Cucumber grown and harvested in the first cropping which falls on January to March had the bigger stems, heavier roots and biomass, longer fruit, and most number of marketable fruit; 4. There was no significant interaction effect between the different vermicompost and cropping seasons in affecting the growth and yield parameters of cucumber; 5. The different pests infested the cucumber were not affected by the different vermicompost. Different pests observed were grasshopper, leaf folder, flies, lady beetle, and orange beetle; 6. Cucumber applied with vermicompost with trichanthera gave the highest net profit amounting of Php 558.50.

Recommendations

Based on the results of the study, the following recommendations are forwarded: 1. Use any of the different leguminous crop as N source in vermicompost; 2. Plant cucumber with vermicompost with different leguminous crops as N source as plant food supplement during the months of January to March for better growth and yield; 3. Application of vermicompost made from mixed azolla, tricanthera and kakawate as N source to produce a high marketable fruit in the first cropping; 4. To obtain bigger fruit grow cucumber on the months of May to July; 5. Cropping seasons which fall from the months January to March is convenient for production and growing cucumber; 6. Application of Tricanthera to cucumber plant as Nitrogen source to for heavier fruit in the first cropping.

References

Alemania, R. C. & L. L. Llorico. (2019). Growth and Yield of Hot Pepper (Capsicum annuum) Applied with Different Levels of Vermicast (Unpublished Undergraduate Thesis), CapSU Burias, Mambusao, Capiz.

Arancon, N. Q.& Edwards, C. A. (2005). Effects of vermicompost on plant growth. (Soil Ecology Laboratory the Ohio State University, Columbus, OH 43210 USA.

Chong, S.K. Klubek, B. P. Masabni, J.G. Walters, A. S. Zucco, M. A. 2015. Effect of soil type and vermicompost applications on tomato growth. (Soil Ecology Laboratory the Ohio State University, Columbus, OH 43210 USA.

Philippine Statistics Authority. (2018). CUCUMBER: Supply Utilization Accounts, Philippines, 2015 – 2017. Retrieved from SUA_2015-2017.pdf on September 20, 2019.

Singh, Jaswinder. (2014). Vermicompost as an effective organic fertilizer and bio control agent: effect on growth, yield and quality of plants. Review in Environmental Science and Biotechnology. 14.