

## **Effect of Vermicompost with Different Leguminous Crops as Nitrogen Source on the Pest Occurrence and Performance of Onion (*Allium cepa*)**

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### **Abstract**

The occurrence of pest affects the growth and yield of plants. The use of various leguminous crops as nitrogen source was experimented to evaluate the effectiveness as bio-fertilizer and pest repellent. A field experiment was conducted at the Organic Agriculture Project of CapSU Burias, Mambusao, Capiz to determine the effect of vermicast from various leguminous crops as N source on the pest occurrence and performance of onion. It was a two cropping study which was laid out in 2x4 factorial experiment using Randomized Complete Block Design 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 vermicast from various leguminous crops as N source which comprised of B1 –Azolla, B1 –Trichanthera, B1 –Kakawate, and B1 –Mixed (Azolla, Trichanthera, and Kakawate). All the data gathered were subjected to Analysis of Variance using STAR software. Differences among treatment means were compared using the Least Significant Difference (LSD) test and Duncan Multiple Range Test (DMRT). All growth and yield parameters of onion were not affected by the vermicompost with different leguminous crops as N source. Onion applied with vermicompost with Kakawate had the bigger fruit which was comparable to those onions applied with vermicompost with azolla and vermicompost with trichanthera. Parameters of onions such as the number of leaves, diameter of leaves, length of roots, biomass, survival rate, diameter of bulb, length of bulb, weight of marketable part and non-marketable part were affected by the cropping seasons. Onions grown and harvested in the first cropping January to March had the taller plant, most number of leaves, bigger leaves, longer roots, greater biomass, bigger bulb and gained higher marketable part than second cropping while on the other hand, onions grown and harvested in the months of May to July (second cropping) increased the length of roots and longer survival rate than first cropping. Onions applied with vermicompost with kakawate yielded the highest net profit with the total amount of (Php 221.40).

Keyword: Onion, Vermicompost, Nitrogen source, Azolla, Trichanthera, Kakawate

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## Introduction

Onions are part of the allium family of vegetables and herbs, which also includes chives, garlic, scallions, and leeks. Allium vegetables have been cultivated for centuries for their characteristic, pungent flavors and for their medicinal properties. (Megan Ware, RDN, LD)

Many studies have suggested that increasing consumption of plant foods like onions decreases the risk of overall mortality, diabetes, and heart disease. Onions also helps to lower the risk of several types of cancer, improving mood, and maintaining the health of skin and hair. They are high in vitamins, minerals, and antioxidants. Incorporating onions into a diet is very simple, with a versatile range of ways they can be prepared and cooked in regular foods (Ware, 2017)

The antibacterial properties of onion include extensive antifungal applications, which have made it a household name in antifungal relief. Onion plants can be grown in well-drained and moist soil. You can even grow it in your backyard or garden to reap its health benefits. Onions form an important part of many culinary preparations in cuisines around the world and they are also known as 'companion plants', which means that they grow well around other vegetables and plants (Patil, 2019).

Organic farming is "a form of agriculture that uses fertilizers and pesticides (which include herbicides, insecticides and fungicides) if they are considered natural (such as bone meal from animals), but it excludes or strictly limits the use of various methods, including synthetic petrochemical fertilizers and pesticides; plant growth regulators such as hormones; antibiotic use in livestock; genetically modified organisms etc.". As a result, it relies on techniques such as crop rotation, green manure, compost, and biological pest control. (Elpiniki Skoufogianni et al., 2015)

Organic systems for food production can contribute substantially for feeding the fast growing human population on the current agricultural land base, while maintaining soil structure and fertility. The so-called conservation agriculture is being widely promoted in many areas mostly for the recovery of degraded soils. (Badgley, et al., 2007)

Leguminous cover crops could fix enough nitrogen, allowing replacement of the necessary amount of synthetic fertilizer. Conversion from conventional to organic management systems requires a transition period which is needed for adaptation of the soil ecosystems to the new conditions. (Badgley, et al., 2007)

Vermicompost is being a stable fine granular organic matter, when added to soil, it loosens the soil and improves the passage to the entry of air. The mucus associated with the cast being hydroscopic absorbs water and prevents water logging and improves water holding capacity. The organic carbon in vermicompost releases the nutrients slowly and steadily into the system and enables the plant to absorb nutrients. The soil enriched with vermicompost provides additional substances that

are not found in chemical fertilizers. (Gandhi A, Sundar, 2012)

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

## **Materials and Methods**

A two-cropping study was conducted at the Organic Agriculture Project of CapSU Burias, Mambusao, Capiz. The study was laid out in 2x4 factorial experiment using Randomized Complete Block Design with three replications. Factor A was the cropping seasons such as A1 –first cropping (January-March) and A2 –second cropping (June-August). Factor B was the vermicompost from various leguminous crops as N source which comprised of B1 –Azolla, B2 –Trichanthera, B3 –Kakawate, and B4 –Mixed (Azolla, Trichanthera, and Kakawate). Data collected included plant height, stem girth, number of leaves, diameter of leaves, length of roots, biomass, survival rate, diameters of bulb, length of bulb, weight of marketable part and weight of non-marketable part. All sets of data gathered were subjected to Analysis of Variance using STAR software. Differences among treatment means were compared using the Least Significant Difference (LSD) test and Duncan Multiple Range Test (DMRT).

## **Results and Discussion**

### **Growth and Yield Parameters**

Growth and yield parameters of onion such as the plant height, stem girth, number of leaves, diameter of bulb, length of roots, biomass, diameter of bulb, length of bulb, weight of marketable part and weight of non-marketable part were significantly differ with the two croppings. Onions grown and harvested in the first cropping which fall on the months of January to March had a taller plant, most number of leaves, bigger leaves, heavier biomass, bigger and longer bulb, greater weight of marketable part and non-marketable part. Plants that were grown and harvested in the second cropping which fall on the months of May to July had increased the length of roots and survival rate of the plant.

Effect of vermicast with various leguminous crops as N source. Vermicompost with various leguminous crops as N source significantly affected the mass and growth of onion. It was observed that onions applied with vermicompost with kakawate had

the bigger biomass in the first cropping with the mean of (79.70 kg) had compared to onion applied with azolla (76.82 kg) Mixed (70.60 kg.) and Tricanthera (67.12 kg.) in the first cropping but the mass of onions decreased on second cropping.

Effect of the cropping seasons. Growth and yield parameters of onion such as plant height, stem girth, length of root, length of fruit, diameter of fruit, and number of marketable fruit were affected by the cropping seasons.

## **Result of Different Parameters**

### **Plant height**

Onions that were grown and harvested in the first cropping obtained the mean of 46.10 cm while those onions that were grown and harvested in the second cropping had the smaller plant height which had the mean of 30.96 cm.

### **Stem girth**

Onions that were grown and harvested in the first cropping obtained the bigger stem girth which had the mean of 9.32 cm. compared those onions that were grown and harvested in the second cropping with had the mean of 5.98 cm.

### **Number of leaves**

Onions that were grown and harvested in the first cropping produced the most number of leaves with mean of 7.06 while those onions that were grown and harvested in the second cropping produced the number of leaves with the mean of 5.20.

### **Diameter of leaves**

Onions that were grown and harvested in the first cropping had the bigger leaves which obtained the mean of 8.65 cm. while those onions that were grown and harvested in the second cropping had the mean of 5.88 cm.

### **Length of roots**

Onions that were grown and harvested in the first cropping produced longer roots which had the mean of 5.74 cm. while those onions that were grown and harvested in the second cropping which had the mean of 5.33 cm.

### **Biomass**

Onions that were grown and harvested in the first cropping produced heavier mass of onions which obtained the mean of 73.56 kg. While those onions that were grown and harvested in the second cropping fluctuated which had the mean of 29.48

kg.

### **Diameter of bulb**

Onions that were grown and harvested in the first cropping had the bigger bulb which had the mean of 46.83 cm. while those onions that were grown and harvested in the second cropping had the mean of 32.92 cm.

### **Length of bulb**

Onions that were grown and harvested in the first cropping had a longer length of bulb which had the mean of 6.20 cm. while those onions that were grown and harvested in the second cropping had the mean of 4.24 cm.

### **Weight of marketable part**

Onions that were grown and harvested in the first cropping had the heavier weight of marketable part with the mean of 54.41 kg. While those onion that were grown and harvested in the second cropping had the mean of 19.22 kg.

### **Weight of non-marketable part**

Onions that were grown and harvested in the first cropping had the heavier weight of non-marketable part which had the mean of 18.71 kg compared to onions that were grown and harvested in the second cropping which had the mean of 6.9 kg.

### **Plant over plant food supplement cost of Onion**

Among the different leguminous crops used as Nitrogen source for vermicompost, kakawate gave the highest net profit amounting of (Php 221.4). Vermicompost with azolla obtained a net profit of (Php 183.00), while vermicompost with mixed Azolla, Tricanthera and kakawate as N source had the net income of (Php 143.8.00). On the other hand, vermicompost with tricanthera gave the lowest net profit (Php 121.40).

### **Prevalent of Pest**

The total number of pest that infested the onion plants were not affected by the various leguminous crops as N source in vermicompost. The different pests observed on the onion were grasshopper, white flies and army worm.

## **Conclusions**

Based on the result of the study, the following conclusions are drawn: 1. Vermicompost with various leguminous crops as nitrogen source were comparable

growth and yield parameters to onion; 2. Cropping season which falls from the months of January to March is applicable in growing and production of carrots; 3. There is no interaction effect between cropping season with different leguminous crops as nitrogen source; 4. The different pest infested the onion was not affected by the different vermicompost. Different pest observed were grasshopper, white flies and army worm ; 5. Onion applied with vermicompost with kakawate gave the highest net profit (Php 221.4).

### **Recommendations**

Based on the result of the study, the following recommendations are forwarded: 1. Use any of the leguminous crops as Nitrogen source for vermicomposting; 2. Cropping season which falls from the months of January to March is appropriate in growing onion; 3. To obtain greater mass apply onions with vermicompost from various leguminous crops as N source in the first cropping; 4. The application of the various leguminous crops as N source to obtain tall plant, long stem girth, most number of leaves, heavy and bigger bulb and weight of marketable part in the first cropping; 5. Apply onions with vermicompost made of kakawate to obtain a high net income; 6. Conduct more relevant studies to further explore the effect of radish as affected of vermicompost with different leguminous crops as N source. Use the following modifications: a. Use other root and leafy and fruit crops, b. Utilize higher cost of vermicompost with leguminous crops as N source, c. Apply vermicompost with leguminous crops as N source

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