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Research Article

The Effects of Different Fertilizer on the Resistance of Tomato in Tomato Yellow Leaf Curl Virus (TYLCV)

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ABSTRACT

The study aims to determine the resistance and evaluate the cost effectiveness of different organic fertilizer in tomato against Tomato Yellow Leaf Curl Virus (TYLCV). Four types of treatments were used, namely: Canaan Organic Fertilizer, Idol Organic Fertilizer, Synthetic Fertilizer and no fertilizer applied as control group. This study found that Treatment 4 (Synthetic Fertilizer) shows the highest height, least symptoms of TYLCV (yellowing and curling of leaves), and highest yield of tomatoes among the other treatments. Tomatoes applied with different fertilizers had no effect on the resistance against the Tomato yellow leaf curl virus. Once *B. tabaci* is present on the tomato host, there is a great chance of disease incidence.

Keywords: fertilizers, tomatoes, vector, whitefly

Introduction

Tomatoes are rich in vitamins A and C, folic acid, alpha-lipoic acid, lycopene, choline, beta carotene, and lutein. Once only in the eastern Mediterranean, it's now in the west, the Caribbean, Japan, and the southern U.S. The Philippines grow tomato (*Lycopersicon esculentum*) called "kamatis". It's used in numerous foods: sauces, cocktails, and salads. Each tomato petiole has five to nine leaflets. Tomato plants cup, chlorosis, stunt, and abscise.

Objectives of the study

The study aims to:

1. To determine the resistance of different organic fertilizers to TYLCV

2. To determine which of the various organic fertilizers contributes the most resistance to TYLCV in tomato.
3. To evaluate the cost-effectiveness of different organic fertilizers on tomatoes against TYLCV.

Materials and Methods

Location and Duration

The study was conducted at Barangay Lipawan, Dumingag, Zamboanga del Sur from March 2022- May 2022.

Materials:

Tomato Seeds
Seedling Tray
Plastic Mulch
Idol Fertilizer

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Canaan Organic Fertilizer**Synthetic Fertilizer**

- Calcium Nitrate
- Urea
- Ammonium Nitrate
- Complete Fertilizer
- Potash

Soil sterilization

Vermicast and garden soil were screened by the use of netbags to remove debris, stones and other large particles. Solar sterilization for 48 hours is employed.

Seeding

Hybrid tomatoes (Ramgo Seeds variety) were utilized in all the described experiments.

Fertilizer Application

Treatments	Amount of Fertilizer Applied
Treatment 1- Control	No Fertilizer
Treatment 2- Canaan Organic Fertilizer	100ml/16 liters of water
Treatment 3- Idol organic Fertilizer	100ml/16 liters of water 100grams/10
Treatment 4- Synthetic Fertilizer	liters of water

Whiteflies

B. tabaci specimens were originally collected from infested suprema squash variety, *Cucurbita pepo* L. cv. reticulata, in Barangay Dapiwak, Damingag, Zamboanga del Sur, dated 8th of March 2022. Whiteflies were collected early in the morning and were put inside a plastic container with a piece of squash leaf where they are attached. The collected whiteflies were directly released into the experimental area late in the afternoon in the same day. Each treatment has 20 whiteflies released in each representative plant per treatment. After 1 week, the second release of whitefly were released.

Research Design

The experimental area was laid out using Randomized Complete Block Design (RCBD) with Four treatments replicated five times. The Kruskal-Wallis H test was used in interpretation of data in determining the signs and symptoms of TYLCV. The treatments are different organic sources of nutrients applied at its

Tomato seeds were planted on plastic trays (60 holes). Seedlings were then transplanted into the experimental area 3 weeks after sowing.

Land Preparation

Plowing and harrowing were done to break the soil clods into smaller masses and incorporate plant residue. It is very important to level the experimental area so that it is easy to attach the plastic mulch to keep weeds down.

Transplantation

Seedlings were transplanted after 3 weeks from sowing. Transplanting was done late in the afternoon to reduce plant stress from sunlight exposure.

recommended rate of each treatment as follows: Treatment 1, Control; Treatment 2, Canaan Navo Fertilizer; Treatment 3, Idol; and Treatment 4, Synthetic Fertilizer.

Data Gathered

The following data were gathered:

1. Tomato Plant height (cm) at 15 days after transplanting
2. Number of days from planting and flowering
3. Number of yellow and curl leaves
4. The Average yield of fruits per plant per harvest

Results and Discussion

Table 1 presents the height of the plants at 15 days after transplanting. As presented in the table, Treatment 4 (synthetic fertilizer) obtained the highest mean of 10.47 cm followed by treatment 3 (Idol) with the mean of 8.15cm; Treatment 2 (Canaan Navo Fertilizer) with 7.55cm; and Treatment 1 (Control with 6.15cm). The findings imply that the use of

Fertilizer and Idol Organic Fertilizer yielded considerable differences in terms of the heights of tomato plant as compared to those plants

treated with Canaan Organic Fertilizer and those plants without any treatment or fertilizer.

Table 1. Plant Height (cm) of tomato at 15 days after transplanting as affected by Different Organic Fertilizer on the Resistance of Tomato in Tomato Yellow Leaf Curl Virus (TYLCV)

Data Summary					
Groups	N	Mean	Std. Dev	Std. error	
Group 1	4	6.15	0.3317	0.1658	
Group 2	4	7.575	0.05	0.025	
Group 3	4	8.15	0.1	0.05	
Group 4	4	10.475	0.263	0.01315	

ANOVA Summary					
Source	Degrees of Freedom (DF)	Sum of Squares (SS)	Mean Square (MS)	F-Stat	P-Value
Between groups	3	38.8825	12.9608	270.4485	0
Within Groups	12	0.5751	0.479		
Total	15	39.4576			

The ANOVA table further reinforced the descriptive Table 1. As indicated, the F-value of 270.4485 is significant at a p value of 0. This suggests that the null hypothesis is rejected. Hence, there is significant difference among the four groups of sample tomato plants after 15 days indicating further the differences in the

heights of tomato plants treated with different types of fertilizers and that without any treatment.

There is a significant difference among the four types of treatments in terms of plant height after 15 days in cm.

Table 2. Tests for Significant Difference Among the Four Types of Treatments in terms of Yellowing and Curling of Leaves

Variables	Kruskal – Wallis test value	p-value	CV	Decision
Yellowing and curling leaves (3, N = 28).	3.9437	.26761	7.815	Not Significant

In Table 2, the yellowing and curling of leaves of the different groups of tomato plants are tested using Kruskal-Wallis test. As shown in the table, the H-statistic of 3.9437 is below the critical value of 7.815 and is not significant at the p-value of 0.26761. Hence, there is no significant difference among the four types of treatments in terms of yellowing and curling of leaves. Yellowing and curling of leaves

happened whatever fertilizer is applied to tomato plants.

Table 3 show the average weight of tomato fruits from 1st to the 7th harvest. As reflected in the table, it shows that the Treatment 4, Synthetic Fertilizer has obtained the highest yield among all treatments followed by the treatment 3 with the use of Organic fertilizer.

Table 3. The average weight (g) of tomato fruits from 1st to the 7th harvest as affected by different rates of MRF compost

Tests for Significant Difference Among the Four Types of Treatments

Variables	Kruskal – Wallis test value	p-value	CV	Decision
Average weight	16.7227	0.00081	7.815	Significant

Ho : There is no significant difference among the four types of treatments.

Decision : The null hypothesis rejected.

The H-statistic of 16.7227 is significant at a 0 probability value. The same H-value exceeds the critical value of 7.815, hence, the null is rejected. As such, the four types of treatments

were significantly different in terms of the average weight in grams of tomato fruits from the 1st to 7th harvests.

Table 4. Test for Significant Difference Among the Four Types of Treatments in terms of Average Weight of Tomato Fruit

Data Summary				
Groups	N	Mean	Std. Dev	Std. Error
Group 1	7	38	3.7417	1.4142
Group 2	7	42	4.6904	1.7728
Group 3	7	46.7143	4.6803	1.769
Group 4	7	52.7143	6.4476	2.437

The Analysis of Variance was used with the SPSS to determine the significant difference among the samples tested.

ANOVA Summary					
Source	Degrees of Freedom (DF)	Sum of Squares (SS)	Mean Square (MS)	F-Stat	P-Value
Between groups	3	842.5734	280.8578	11.2934	0.0001
Within Groups	24	569.8615	24.8692		
Total	27	1439.4349			

The F-statistic value of 11.293 is significant at the p-value of 0.00008 which indicates that the null hypothesis is rejected. This implies that there is a significant difference among the four types of treatments in terms of the average weight of tomato fruits. Varying treatments resulted to different weighted of tomato fruits. The Idol

Conclusion

It was found that Treatment 4 (Synthetic Fertilizer) shows the highest height, least symptoms of TYLCV (yellowing and curling of leaves), and the highest yield of tomatoes among the other treatments.

Tomatoes applied with different fertilizers had no effect on the resistance against the tomato yellow leaf curl virus. Once B. Tabacci is

present on the tomato host, there is a great chance of disease incidence.

Prevention of the insect vector (B. tabacci) is a major control of TYLCV, hence this disease is systemic.

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