Response of Tomato *(Solanum lycopersicum L.)* to Different Rates of Insecticidal Spray (Cypermethrin 10% E.C) on the Growth and Yield at Bagauda, Bebeji Local Government Area, Kano State

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Abstract
The field experiment was conducted during the 2017 dry season atNational Horticultural Research Institute (NIHORT). Located at Bagauda in Bebeji Local Government Area of Kano State (Latitude 11^0 33^1 N and longitude 8^0 23^1 E with altitude of 481m above sea level) in the Sudan Savannah of Nigeria. The objective of the study was to determine the best rate of insecticide on Tomato production. The treatments comprised of four (4) different rate of (cypermethrin 10% E.C.) on the growth and yield performance of Tomato (Solanum lycopersicum (L.) Kaix) variety (Roma VF). Zero (0) was the control, A and B = single spray, C was double spray, and D was triple spray which were factorially combined and laid out in a Randomized Complete Block Design (RCBD) with three (3) replications. The triple application of cypermethrin in treatment D produced the highest mean value (7.84 tons of fresh fruits) and also it produced the highest growth parameters. While the lowest mean value was obtained from the control or zero spray of (2.04 tons per hectare).
Key Words Tomato, Roma, Transplanting, Cypermethrin and insecticides.

INTRODUCTION

Tomato (*Solanum lycopersicum L.*) belongs to the family Solanaceae, genus *Solanum*, Subfamily Solanoideae and tribe Solanaceae. (Taylor, 1986). The crop is very rich in vitamins, minerals,essential amino acids, sugars and dietary fibres. Tomato contains a high level of lycopene, an antioxidant that reduces risks related to several cancers and neurodegenerative diseases (Srinivasam, et al., 2010). The tomato plant is a native of Central and South America brought to the Mediterranean region by the early explorers. It was first cultivated as a decorative fruits than being edible and it was known then as the love apple (Fayemi, 1999). Tomato is the second most important vegetable after potato. Tomato is grown for its edible fruits which can be eaten raw or processed into salads, cooked, peeled or made into puree, ketchup, soup and powder in canning industries, (Denton and Olufolaji, 2000).

Tindal (1988) reported that temperature above 29^0C tend to inhibit fruiting and night temperatures of 10-20^0C give best yields. J. T. et al., (1984) reported that the period of night temperature over most of the northern parts of the countries of West Africa are 12ºC and 18ºC as the Harmattan winds below between December to early February of the year in Nigeria the most popular varieties are Ibadan local and Bonny best, but the recommended varieties are; Ife I, Havestet, Roma, and Marzanino. Thomas, (2013) reported that there are around 7,500 tomato varieties grown for various purposes. The cultivation of tomato depends on the

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selection of the different characteristics of the fruits which depend on the different growing condition of the area. In Nigeria especially in the North-West region, the type of tomato cultivars usually grownare Roma, UC 82Band Jubaili. (Denton and Olufolaji, 2000).

Insect pests are the most limiting factor in tomato production and hence the use of chemical insecticide spray is the most common method of insect pests control in tomato production. Hussain and Bilal (2007) had reported that insecticidal chemical spray helps to removed infestation of pests on leaves thereby increasing the rate of photosynthesis and promote successful growth of the crops. It is commonly used by farmers to protect their crops against insect pests. However, most farmers due to their illiteracy and lack of exposure coupled with inadequate extension services that could render assistance, do not adhered to the rates strict recommended dosage rates required to protect their crop from the obnoxious insects pest attack and thus cause more harm to themselves and environment. Hence the need to carry out a comparative study for tomato production using three (3) different levels of insecticides spray become necessary in order to highlight and educate the tomato producers on the best recommended rates of insecticides

The study was therefore, carried out to provide a recommended insecticidal rates for controlling insects, pests of tomato during its production. It is hoped the results will be of importance to tomato producers. Interms of adhering to recommendations for optimal input utilization to tomato production and it will be of importance to extension workers for dissemination of the results tolocal farmers.

MATERIALS AND METHODS.

The field experiment was conducted during the 2017 dry season atNational Horticultural Research Institute (NIHORT), located at Bagauda in Bebeji Local Government Area of Kano State (Latitude 11^0 33^1 N and longitude 8^0 23^1 E with altitude of 481m above sea level) in the Sudan Savannah of Nigeria, (Manga et al., 2004).The treatments consist of four different spray methods using *Cypermethrin* as A (control or no spray) single spray B, double spray C and triple spray D. the treatments were laid out in a randomized complete block design (RCBD) and replicated three times. Soil sample of the experimental plots was collected randomly at the depth of 0 - 15cm and 15 – 30cm before conducting the experiment. The soil was analyzed to determine the physico chemical properties.

Tomato variety Roma VF was first cultural practices to ascertain a study growth of the plant was carried out for 5 weeks in the nursery before transplanted. Tomato seedlings were transplanted on beds of 1.5 by 1.5 m with total area 2.23 m^2 containning36 plants. Transplanting ofData collected was on Plant height, number of leaf. Number of branches, leaf area, stand count and yield component. Was done 4 weeks after planting (WAP) at 30 by 30 cm apart, NPK compound fertilizer 15:15:15 was applied two weeks after (WAT) and 6 weeks after transplanting at the rate of 360g/plot using broadcasting methods.

The experimental site was prepared 01/10/2017. Pegs were used during the plot layout establishment. After making out beds were constructed 02/10/2017. Transplanting of seedlings was done on the 04/10/2017. Hoe weeding was carried out at 3 and 6 weeks after transplanting (WAT) to control weeds. Cypermethrin and rodenticides were used to control insects and rodents pests.

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Data collected was on plant height, number of leaf, leaf area, number of branches, stand count and yield components.

Data collected were subjected to analysis of variance (ANOVA)using SAS package (SAS, 2000) described by Snedechor and Cohran (1997) and significance differences between means were separated using (Duncan, 1955) LSD at 5% level of probability.

Treatment with different levels of Cypermethrin 10 % E. C. at the rate of 3 different levels as

- 1st SPRAY 27.8 ml chemical (i.e. Cypermethrin 10 % E.C.) was diluted with 6.7 liters of water and sprayed all over the treatment B, C, and D.
- 2nd SPRAY 18.5 ml of chemical (i.e. Cypermethrin 10 % E.C.) was diluted with 4.5 liters of water and sprayed all over the treatment C. and D.
- 3rd SPRAY 9.3 ml of chemical (i.e. Cypermethrin 10 % E.C.) were diluted with 2.2 liters of water and sprayed all over the treatment D only.

Harvesting was done 4 times at 7 days interval of irrigation. The fruits have matured 4 months after planting i.e. from the date of planting 04/09/2017 to the first harvesting date 27/12/2017

Results and Discussion

Table 1 shows the physico chemical properties of the soil in the study area. The soil was sandy. The organic carbon, total nitrogen and available phosphorus were generally low.

Table 2 and 3 Shows the effect of insecticide spray (Cypermethrin 10 % EC) on plant height and number of leaf respectively at 2, 4, 6, 8, and 10 weeks after transplanting (WAT), the result shows that the more the spray the taller the plant, the more number of leaves and the less the insects attacked. The application of cypermethrin three times gave the higher mean value (34.22) at 2 week, follows the same pattern up to 10 weeks while 0 spray produced the least mean value (20.33) throughout the period. Therefore, the result on plant height shows significant different statistically at both 1% and 5% level of probability at 2, 4, 6, 8, and10 weeks respectively, although from 6 and 8 weeks there was no significant difference.

Table 4 shows the number of branches at 4, 6, 8 and 10 weeks after transplanting (WAT) the result indicated non-significant differences at 4 and 6 weeks at 8 and 10 weeks the means values obtained in 0,1 and 2 spray regime were statistically at par (6.67 and 6.68 respectively). Treatment D produces the highest mean of 6.00 and 8.45 for both 8 and 10 weeks respectively.

Table 6. Shows number of marketable fresh fruits per plot of Tomato at 1st and 2nd harvest. The result indicated significant difference at both harvest. The treatment D produced the highest mean value of 85.68 and 204.04 for the 1st and 2nd harvest respectively. While the least mean value was obtained at control or 0 application. Therefore, this indicated that application of cypermethrin responded to the treatment in which the highest application produced the highest number of marketable fresh fruits.

Conclusion

According to the results obtained, it can be concluded that the use of cypermethrin 10% EC insecticide responded significantly in the growth and yield of Tomato (Solanum lycopersicum) in the study area.

Recommendation

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Base on the results obtained it should be suggested that farmers in the savannah ecological zone should adopt the use of cypermethrin 10 % EC insecticide at three different spray regime for maximum yield in tomato production.

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Table 1. Chemical and physical properties of soil

MECHANICAL ANALYSIS	PERCENT (%)
Sand	71.40
Silt	19.20
Clay	9.40
Total N	0.90
Organic Carbon	0.58
pH	6.10
soil texture	sandy loam

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Table 2. Effect of insecticides spray (Cypermethrin 10% EC) on plant height on the growth and yield of Tomato (Solanum lycopersicumin) for 2016 dry season.

Number of weeks after transplanting					
Treatments	2	4	6	8	10
A	20.33 c	35.78 b	49.6	62.22	119.96 c
B	24.44 bc	39.56 ab	48.0	63.42	124.44 bc
C	29.22 ab	45.82 a	51.8	69.11	130.71 b
D	34.22 a	47.89 a	61.8	69.221	34.92 a
S.E ±	1.11	1.56	5.47	3.24	1.92

Means followed by the same letter (s) are not significantly different at 5 % level of probability using Duncan multiple range test.

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Table 3: Effect of insecticides spray (Cypermethrin 10% EC) on Number of leaves on the growth and yield of Tomato (Solanum lycopersicum) in 2016 dry season.

Number of weeks after transplanting					
Treatments	2	4	6	8	10
A	4.74 d	10.56 b	12.50 ab	12.56 c	19.45 b
B	6.11 c	11.34 b	12.41 b	14.12 c	20.41 b
C	7.97 b	12.56 b	13.71 ab	15.53 b	23.22 b
D	9.89 a	14.77 a	15.74 a	17.33 a	28.00 a
SE ±	0.210	0.400	0.600	0.470	0.820

Means followed by the same letter (s) are not significantly different at 5 % level of probability using Duncan multiple range test.

Table 4: Effect of insecticides spray (Cypermethrin 10% EC) on Number of branches on the growth and yield of Tomato (Solanum lycopersicumin) 2016 dry season.

Number of weeks after transplanting				
Treatments	4	6	8	10
A	2.0	3.34	4.16 c	6.67 b
B	1.55	4.08	5.11 ab	6.78 b
C	1.33	2.78	5.00 ab	6.78 b
D	4.24	4.78	6.00 a	8.45 a
S.E ±	0.550	0.690	0.220	0.230

Means followed by the same letter (s) are not significantly different at 5 % level of probability using Duncan multiple range test.

Table 5. Effect of insecticides spray (Cypermethrin 10% EC) on Total Number of marketable fresh fruits on the growth and yield (tons/ha) of Tomato (Solanum lycopersicum) in 2016 dry season.

	Number of harvest			
Treatments	1	2	3	4
A	0.87 b	4.32 d	18.0 b	78.84
B	1.75 b	4.93 c	36.0 b	96.2
C	1.83 b	5.25	51.84 ab	160.2
D	2.95 a	8.5 a	85.68 a	204.04
SE ±	7.76	23.7	0.180	1.110

Means followed by the same letter (s) are not significantly different at 5 % level of probability using Duncan multiple range test.

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