International Journal of Applied Science and Engineering
2011. 9, 1: 19-23

Combination of Garlic Extract and Some Organophosphate Insecticides in Controlling Thrips (*Thrips palmi*) Pest in Watermelon Management

W. Burubai*, G. W. Etekpe, B. Ambah, P. E. Angaye

Department of Agricultural Engineering, Faculty of Engineering, Rivers State University of Science and Technology, P.M.B 5080, Port Harcourt, Rivers State, Nigeria

Abstract: The efficacy of Dimethoate 30EC and Kartodim 315EC and their combinations with garlic extract were evaluated for the control of thrips (*thrips palmi*) in watermelon cultivation. Field experiments were conducted in a randomized block design with three replications at Ebiburn Farms, Nigeria in 2009 and 2010. Results show that Dimethoate 30EC + garlic solution with an average percent infestation of 4.0 and Kartodim 315EC + garlic solution with 5.8 were most effective as they differed significantly from other treatments and control plots. The individual mean percent infestation of Dimathoate 30EC, Kartodim 315EC, garlic solution and control were 11.8, 13.1, 20.0 and 40.7 respectively. Similarly, yield data was also maximum with Dimethoate 30EC + garlic solution(87.85t/ha) and Kartodim 315EC + garlic solution (78.3t/ha) which differed significantly from garlic solution alone (43 t/ha) and control (6.1t/ha). These results conclude that a combination of garlic extracts with organophosphate insecticides could prove better in thrips control.

Keywords: Garlic extract; thrips, insecticides; watermelon.

1. Introduction

Watermelon (*Citrullus lanatus*) belonging to cucurbitaceae family is one of the most popular desert vegetables with year round availability. It is indigenous to tropical Africa [1] and thrives well in soils that are well drained, high in organic matter and good moisture retaining capacity. The fruit is eaten raw and contains about 95 percent water. It also contains carbohydrate (5mg), calcium (8mg), phosphorus (9mg), ascorbic acid (8mg) and vitamins (0.64g)per 100g of edible portion [5]. The reddish internal colour is attributed to an anti-cancer agent called lycopene which could also be found in tomatoes and the fruit is relished by many as the juice is an alternative to drinking water in desert areas.

However, in Nigeria, 98% of the watermelons consumed are cultivated in the Northern part of the country (Jos Plateau, Zaria etc) and transported to the Southern region. This perhaps, is due to the acclaimed favourable environmental requirements in the north. Against this backdrop, Ebiburu farms cultivated a hectare of watermelons in the southern part of the county (Rivers State) to ascertain the causes militating against the successful cultivation of this viable vegetable. It was observed that, watermelon could thrive better in this region if pests and their atten-

* Corresponding author; e-mail: ebiburu@yahoo.com
Accepted for Publication: March 21, 2011

dant diseases are adequately and economically controlled. The most common and dangerous pest which caused severe yield loss was thrips (*thrips palmi*) and it is known for transmitting watermelon bud necrosis virus (WBNV) to the crops [6]. For control of this pest, neurotoxic and organo-phosphate insecticides such as Dimethoate, Karate 2.5 EC, Karto 2.5 EC, Uppercott, Bestaction etc had been applied for a long time in Nigeria [2], and their continued use has led to some resistance by this pests. Also continued use of these organo-phosphate insecticides could result to residual toxicity and environmental pollution [7-8].

Therefore, in a bid to have a cost-effective and yet more environmentally friendly approach to pest control, scientist has discovered various plant-based pesticides. These plant extracts work as repellants, antifeedants and oviposition deterrents. However, they are not as effective and fast acting as synthetic chemicals can be, but are safer for the environment and consumers. Hence combing the two could be better approach for economic reasons and the environment. Against this backdrop, the purpose of this paper is to evaluate the efficacy and compatibility of a mixture of incubated garlic- based solution and some synthetic insecticides in controlling thrips in watermelon cultivation.

2. Materials and Methods

Field experiments were conducted in 2009 and 2010 at Ebiburu farms in Ahoada West Local Government Area of Rivers State, Nigeria to evaluate the efficacy and compatibility of a mixture of incubated garlic-based solution and some insecticides. The Kaolack variety of treated (Thiram + Malathion) watermelon seeds was planted at each plot size of 1m x 3m at a planning distance of 1m. To avoid edge effect, the entire experiment was bordered with a row of Sugar Baby variety watermelons. Five treatments with three replications and untreated control in a Randomized Block design were used. The crops were raised following standard agronomic practices of irrigation, weeding, and fertilization. The garlic solution was prepared by blending 3kg of garlic in a Philips blender (M-24P) and mixed with 20 litres of water. This mixture was tightly sealed and allowed to incubate for 15 days under the sun before use. The organophosphate insecticides used were Kartodim 315EC(a.i.= lambda cyhalothrin; manufactured by Shenzhen Baocheng Chemical Industry Co.,ltd China) and Dimethoate 30 EC (a.i.=dimethoate 40% ; manufactured by King Quenson Industry Group ltd,China).

Insecticides and their rate of application are as follows:

S/N	Treatments	Recommended dose ml/litre of water	Dose used in ml/litre of water
T_1	Dimethoate 30 EC	1.7	1.7
T_2	Kartodim 315 EC	0.5	0.5
T_3	Garlic-based solution	-	5%
T_4	Dimethoate+ Garlic-base solution	-	0.85 + 5%
T_5	Kartodim + Garlic-based solution	-	0.25 + 5%
T_6	Untreated control	-	-

Spraying was done with a 16L tank-capacity Knapsack sprayer on the 15th, 45th and 65th days after sowing and post-treatment observations were then made at regular intervals by direct counting of thrips population using magnifying lens. Two days after the last spraying, percent disease incidence was recorded. Also melon num-

bers and weights were recorded at time of harvest (75 days). The infestation and yield data were then statistically analyzed using analysis of variance and means were compared by Duncan's multiple range tests at 5% level of probability.

3. Results and Discussion

Data on mean percent values of thrips population as affected by the different treatments at three spraying periods is indicated in Table 1. It was observed that, 5 days after first spray, all the insecticides and their combinations gave significant reduction in thrips infestation as compared to control. However, Dimethoate 30EC + garlic-based solution with an average percent infestation of 6.3 and Kartodim 315EC + garlic-based solution with an average percent infestation of 8.1 were significantly different from garlic-based solution (15.9) and control(47.1) but never differed from Dimethoate 30EC (9.6) and Kartodim 10EC (11.5) alone. A similar trend was also noticed 10 days after the first spray (Table 1). These results reveal that all the insecticides and their combinations were effective in controlling thrips infestation in watermelon management.

Results based on 5 and 10 days after second spaying shows (Table 1) that all insecticides were effective in reducing thrips attack as compared to control. However, Dimethoate 30EC + garlic-based solution with average percent value of 3.6 and Kartodim 315EC + garlic-based solution with average percent value of 4.3 were most effective. This was followed by Dimethoate 10EC (6.9) and Kartodim 315EC (7.7). Data from 2nd and 3rd spaying reveals that Dimethoate 10EC + garlic-based solution and Kartodm 315EC + garlic-base solution were considered the best in controlling thrips population. This discovery is an indication that, using half the recommended dose of the above organophosphate insecticides (Dimethoate 10EC and Kartodim 315EC) and 5% of incubated garlic solution is more effective in thrips management in watermelon cultivation. It is cost effective and more environmentally friendly as lesser doses of the insecticides are used in the mixture.

As evident in Table 2, percent disease incidence was lower in all insecticide treated plots as compared to control. In 2009, control of watermelon diseases was best with Dimethoate 10EC + garlic solution and Kartodim 315EC + garlic solution with average percent disease incidences of 10.4 and 12.6 respectively. They were significantly different from garlic solution only (31.6) and control (59.3), but never differed from Dimethoate 10EC (14.2) and Kartodim 315EC (16.3). A similar trend of data was recorded in 2010, as percent disease incidence was highest in control (64.7) and lowest in Dimethoate 10 EC + garlic solution (11.2).
Considering the yield information shown in Table 3, maximum yields of 91.4t/ha and 84.3t/ha were recorded for Dimethoate 30EC + garlic solution for 2009 and 2010 respectively. This was followed by Kartodim 315EC + garlic solution with 81.5t/ha and 75.1t/ha for the respective years. However, untreated control recorded the lowest yields of 7.3t/ha and 4.7t/ha for both years, and was followed by garlic-based solution with 46.2t/ha and 39.8t/ha for 2009 and 2010 respectively. The results achieved in this work are in concordance with those cited in literature [3-4] that insecticides gave better protection and yield to crops.

Table 1. Effect (mean percent) of different insecticides on Thrips Population in Watermelon

S/No	Treatment	1st spray		2nd spray		3rd spray	
		5 DAS	10 DAS	5 DAS	10 DAS	5 DAS	10 DAS
1.	Dimethoate 30EC	9.6c	11.3c	6.9b	7.0b	7.9b	11.8b
2.	Kartodim 315EC	11.5c	13.6c	7.7b	7.3b	8.6b	13.1b
3.	Garlic-based soln.	15.9b	19.2b	10.9b	11.5b	13.9b	20.0b
4.	Dimathoate + Garlic-based soln.	6.3c	7.7c	3.6c	3.1c	3.9b	4.0c
5.	Kartodim + Garlic-based soln	8.1c	9.2c	4.3c	4.8c	5.6c	5.8c
6.	Untreated control	47.1a	39.1a	65.9a	67.7a	59.6a	40.7a

Means followed by same letter in a column are not significantly different by DMRT (P<0.05).
DAS – Days after spraying.

Table 2. Effectiveness of the various insecticides in the control of watermelon diseases

S/No	Treatment	Percent diseases incidence		
		2009	2010	Mean
1.	Dimethoate 30EC	14.2c	15.7c	14.95
2.	Kartodim 315EC	16.3c	16.9c	16.60
3.	Garlic-based soln.	31.6b	38.5b	35.05
4.	Dimethoate + Garlic soln.	10.4c	11.2c	10.80
5.	Kartodim + Garlic soln.	12.6c	13.8c	13.20
6.	Untreated control	59.3a	47.7a	62.00

Means followed by same letter in a column are not significantly different by DMRT (P<0.05).

Table 3. Effect of insecticidal sprays on yield of watermelon

S/No	Treatment	Mean no. if melons/9m^2	Yield (t/ha)		
			2009	2010	Mean
1.	Dimethoate 30EC	48	78.1	72.6	75.35
2.	Kartodim 315EC	42	66.6	60.5	63.55
3.	Garlic-based soln.	33	46.2	39.8	43.00
4.	Dimethoate + Garlic soln.	60	91.4	84.3	87.85
5.	Kartodim + Grlic soln.	54	81.5	75.1	78.30
6.	Untreated control	15	7.3	4.9	6.10

4. Conclusion

In this work, the efficacy of organophosphate insecticides and their combinations with garlic extract was tested on thrips population and yield in watermelon cultivation. It was observed that applying half the recommended doses of Dimethoate 30EC and Kartodim 315 EC with 5% of a 15 days incubated garlic solution were the most effective combinations in significantly reducing thrips infestation and getting higher yields in watermelon management. From results obtained, it is obvious that the use of chemicals to control pest is

useful, but a combination of garlic extracts and organophosphate chemicals at tested proportions could prove better.

References

[1] Anonymous. 2007. "Improved Cultivation Practices for Horticultural Crops". Univ. Agric. Science, Dharwad,India.

[2] Dugje, I., Ekeleme, F., and Kamara, A. 2008. "*Guide to safe and effective use of pesticides for crop production in Borno State*". IITA, Nigeria.

[3] Igbal, J. 1993. "*Cultural and Chemical Control of Insect Pests of Maize in Swabi*". M. Sc. Thesis, Dept. of Entom. NWFP Agric. University Peshawar. 52p.

[4] Mathur, Y., Sattyder, K., and Kishoe, P. 1992. Evaluation of Some Important Insecticides against *Chilo partelus* and *Marasmia trapezelis*, infesting Maize Crop. *Journal of Entomological Research*, 16, 4: 15-19.

[5] Rai, N. and Yadav. D. 2005. "*Advances in Vegetable Production*". Research Book Centre, New Delhi, India.

[6] Reddy, S. and Reddy M. 2007. "*Essentials of Virology*". Scientific, Publishers Jodhpr.

[7] Tahir, H. M. and But, A. 2009. Predatory Potentials of three Hunting Spiders inhibiting the rice ecosystem. *Journal of Pest Science*, 82: 217-225.

[8] Wilson, C. and Tisdell, C. 2001. Analysis, why farmers continue to use pesticides despite environmental, health and sustainability costs. *Ecological Economics*, 39: 449-462.