EFFECT OF INSECTICIDES AND VEGETABLE OIL ON TOMATO YELLOW LEAF CURL VIRUS (TYLCV)

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Accepted for publication: 05 July 2006.

ABSTRACT

Muqit, A., Akanda, A. M. and Bari, M. A. 2006. *Effect of Insecticides and Vegetable Oil on Tomato Yellow Leaf Curl Virus*. Int. J. Sustain. Crop Prod. 1(1):21-23.

An experiment was conducted to evaluate the efficacy of different pesticides and vegetable oil on *Tomato yellow leaf curl virus* (TYLCV) in the field. All the chemicals reduced the disease significantly. Disease incidence was reduced by 1.7 to 3 times depending on chemicals. Yield was also increased except in oil. Efficiency of chemical insecticides were better than botanical pesticides or oil but was not significantly higher.

Key words: Tomato yellow leaf curl virus, insecticides and vegetables oil.

INTRODUCTION

Tomato is a popular vegetable in Bangladesh. Its production is seriously hampered by *Tomato yellow leaf curl virus* (TYLCV). The disease is transmitted by whitefly (*Bemisia tabaci*). Yield loss is reported to be 63-95% (Gupta, 2000).

Farmers use pesticides to control the vector whitefly for the management of TYLCV. But sole dependence on insecticides causes environmental pollution and pesticide resistance. Therefore, urgency in the search for ecofriendly alternative approaches for TYLCV management is constantly felt. Oils or botanical pesticides have been reported for the reduction of whitefly infestation (Sastry, 1989, Butler *et al*. 1991; Csizinsky *et al*., 1997). But no report is currently available on oil or botanicals for the management of virus diseases of crops in Bangladesh.

The present study was therefore conducted to evaluate one botanical pesticide (commercially available), soybean oil (used in cooking purpose) and two insecticides for the management of TYLCV of tomato in the field.

MATERIALS AND METHODS

The experiment was conducted at the research farm of Bangabandhu Sheikh Mujibur Rahman Agricultural University during winter 2003-04. Seedlings of the tomato variety 'Ratan' were raised in the seed bed and 28 day old plants were transplanted on December 4. The disease was identified mainly through visual observation of typical symptoms of TYLCV like upward curling and cupping, with or without marginal chlorosis, smaller leaflets and stunting of the plant (Green and Kalloo 1994 and Sinistera *et al*., 2000). Later on it was confirmed by commercially available TYLCV identification Kit by Neogen Europe Ltd. (UK). The protocol followed was according to the manufacturer's recommendation.
Disease incidence was calculated by the standard formula:

$$\text{Disease incidence (\%)} = \frac{\text{No. of infected plants}}{\text{Total plants in the plot}} \text{ X } 100$$

Whitefly was monitored by counting them on upper three leaves (Csizinsky *et al*., 1997). Three randomly selected plants were sampled. Counting was started at one week after transplanting and continued up to 6 weeks. Randomized complete block design (RCBD) was followed with 4 replications. Five treatments comprising T1 = Imidacloprid (Admire 0.1%, recently introduced in Bangladesh), T2 = Cypermethrin (Cymbush 0.1%, earlier introduced), T3 = Azadirachtin (Nimbicidin 0.4%, commercially available neem product recommended as botanical pesticide), T4 = Soybean oil (1.5%, used for cooking purpose) and T5 = Untreated Control were used in the experiment. Soybean oil emulsion was prepared by mixing 'Trix' (liquid detergent) with oil in equal volume. Five sprays were conducted at 10 day intervals. Spraying was initiated at 20 days after transplanting when disease symptom was observed in the field. Irrigation, staking and other cultural practices were performed as and when necessary. Data on disease incidence (%) were arcsine transformed before analysis.

RESULTS AND DISCUSSION

Incidence of TYLCV

Disease incidence was found to be significantly (P=0.05) reduced by all the chemicals (Fig.1). But there was no significant difference between pesticides or oil treatment. Lowest (13.31%) disease incidence was observed in Admire and highest (44.43%) in control. Insecticides performed better than botanical or oil formulation. Between two insecticides performance of Admire was better and Nimbicidin was more effective than oil.

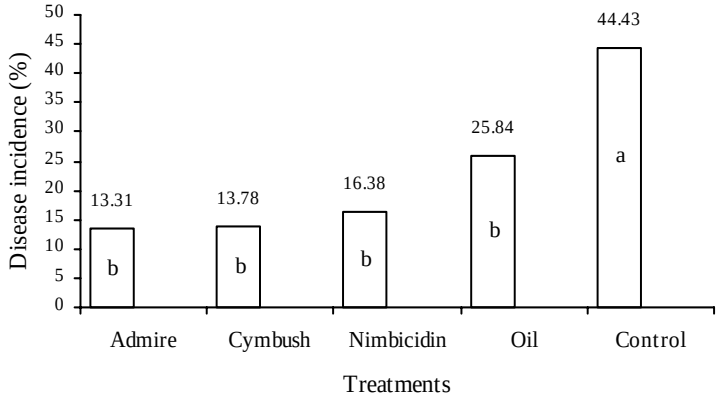

Figure 1. Efficacy of insecticides and vegetable oil on the incidence of TYLCV

Number of whitefly adults

Significant (P=0.01) reduction in number of whiteflies were found on treated plants (Table 1). Number of whitefly adults/plant was lowest (1.9) in Cymbush and highest (3.7) in control. Cymbush varied significantly with all treatments. But other treatments did not vary significantly among themselves.

Table 1. Number of whitefly adults/plant in chemical sprayed and non sprayed plots

Treatments	No. Whitefly
Cymbush	1.9 d
Nimbicidin	2.3 c
Oil	2.6 bc
Admire	2.7 b
Control	3.7 a

Means followed by same letter are not significantly different at 1% level by DMRT

Yield

Yield increase was highly significant (P=0.01) in all the treatments except oil (Table 2). Soybean oil treatment caused significant reduction of yield. Yield/plant was highest in Admire (1701.52 g) and lowest in oil (1236.35 g). There was no significant difference in yield among Admire, Cymbush and Nimbicidin. Similar trend was found in number of fruits/plant. Admire and Oil treatment gave the highest (42) and lowest (32) number of fruits/plant respectively. Average fruit weight did not vary significantly.

Table 2. Effect of insecticide and oil spray on the yield and yield attributes of tomato

Treatments	Yield		Fruit No.	Fruit Wt.
	(g/plant)	(t/ha)	(No./plant)	(g/fruit)
Admire	1701.52 a	56.72	42 a	43.59
Cymbush	1632.19 ab	54.41	39 ab	42.25
Nimbicidin	1652.40 a	55.08	40 ab	45.07
Oil	1236.35 c	41.21	32 c	40.30
Control	1544.67 b	51.49	35 bc	45.14

Means followed by same letter are not significantly different at 1% level by DMRT

Disease suppression and yield increase

Among the spray chemicals Admire caused highest reduction in disease incidence (70.04%), increase in yield/plant and number of fruits/plant (20.67%) (Table 3). Lowest reduction (41.83%) was found in oil treatment. Oil formulation caused decrease in yield (19.96%) and number of fruits/plant (9.17%).

Table 3. Percent change in disease incidence, yield and number of fruits due to chemical spray

Treatments	Characters		
	Dis. Inc	Yield	Fruit No.
Admire	- 70.04	+ 10.15	+ 20.67
Cymbush	- 68.99	+ 5.67	+ 12.43
Nimbicidin	- 63.14	+ 6.97	+ 13.61
Oil	- 41.83	- 19.96	- 9.17
Control	---	---	---

-: decrease; +: increase

Results of the current experiment confirmed the superior performance of insecticides to botanical pesticide or oil in terms of disease suppression and yield increase. But the difference was not significant. This indicated that botanicals or oils could be an alternative to insecticides which cause severe environmental pollution.

Effectiveness of oil spray in reducing incidence of TYLCV is well documented in the review by Green and Kalloo (1994). Though vegetable oil spray lowered TYLCV incidence, yield was not increased. The yield was significantly decreased in the oil sprayed plots. Scorching effect was observed in the oil sprayed plots i.e. it caused phytotoxicity. That might be the reason for low yield in the oil sprayed plots. Therefore, its dose and number of spray needs modification for future trial. There are many reports on successful application of oils against aphid or whitefly. But the exact mechanism of control is not clear. Oils seem to create a film around the surface of the sprayed area which creates problem for insects during probing. However effectiveness of oils depend on several parameters like type of oil, choice of emulsifier, type of spray nozzle and pressure (Sastry, 1989, Tomlinson , 1987).

Admire was found to be effective in reducing TYLCV incidence and yield increase. This is in agreement with the findings of Savary (2000) and Ahmed *et al*. (2001). Admire is currently recommended for the control of whitefly in many countries including the USA. Whiteflies are known to develop resistance against pesticides within a few years of introduction. Until now there is no report on resistance against Admire.

Present investigation proved that Admire is effective in reducing the incidence of TYLCV and increase of yield in tomato. Similarly Nimbicidin can also be used either singly or in rotation with Admire for the management of TYLCV. To the best of our knowledge this is the first report of vegetable oil used as disease suppressing chemical in Bangladesh.

REFERENCES

Ahmed, N.E., Kanan, H. O., Sugimoto, Y., Ma, Y.Q. and Inanaga, S. 2001. Effect of Imidacloprid on incidence of *Tomato yellow leaf curl virus*. Plant Disease 85:84-87.

Butler, G. D., Jr., and Henneberry, T.J. 1991. Sweet potato whitefly control: Effect of tomato cultivars and plant derived oils. Southwestern Entomologist 16(1):37-43.

Csizinsky, A. A., Schuster, D.J. and Kring, J.B. 1997. Evaluation of color mulches and oil spray for yield and for the control of silver leaf whitefly, *Bemisia argentifolii* (Bellows and Perring) on tomatoes. Crop Protection 16(5):475-481.

Green, S. K. and Kalloo, G. 1994. Leaf curl and yellowing viruses of pepper and tomato: an overview. Technical Bulletin No. 21. Asian Vegetable Research and Development Center, Taiwan. 51p.

Gupta, N.D. 2000. Occurrence of *Tomato yellow leaf curl virus* (TYLCV) and *Tomato purple vein virus* (TPVV) and their effect on growth and yield of tomato. An MS thesis submitted to the Department of Plant Pathology, BSMRAU, Salna, Gazipur, Bangladesh. 77p.

Sastry, K. S. 1989. Tomato leaf curl virus management by carbofuran plus oil combination. Journal of Turkish Phytopathology 18(1-2):11-16.

Savary, P. 2000. Effect of whitefly control on *Tomato yellow leaf curl virus* incidence for fresh market tomato. ARC-AVRDC Training Report 2000. 205p. (http: www.arc-avrdc.org/ pdf_files/027-savary-18th. Pdf).

Sinistera, X., Patte, C.P., Siewnath, S. and Polston, J. E. 2000. Identification of *Tomato yellow leaf curl virus*-Is in the Bahamas. Plant Disease 84(5):592.

Tomlinson, J. A. 1987. Epidemiology and Control of virus diseases of Vegetables. Ann. Appl. Biol 110:661-681