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Management of yellow mosaic disease in blackgram by non-chemical methods

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ABSTRACT
Field study was conducted to find out efficacy of plant products and bio control agent on yellow mosaic disease in black gram during 2001-2005. In the pooled mean analysis, neem seed kernel extract at 5% spray given at 25 and 50 days after sowing recorded lowest rate of yellow mosaic disease incidence and which was followed by neem oil spray at 3 % in the field trials conducted during 2001-05. The highest yield was recorded in seed treatment with *Pseudomonas fluorescens* at 10 g/ kg of seed and Soil application and foliar application at 1 kg / ha and which was followed by neem seed kernal extract and neem oil sprayed plots. The number of pods per plant was also higher in seed treatment with *P. fluorescens* applied plot and which was followed by neem oil treatment. However, neem oil 3 % spray at 25 and 50 days after sowing have significantly reduced white fly population and it is on par with the chemicals.

Key words : Yellow mosaic disease, Black gram, Plant products, Biocontrol.

INTRODUCTION

White fly transmitted gemini viruses (WTGs, genus Begomovirus, family Geminiviridae) have emerged as serious threat to the cultivation of crop plants in various parts of the world (Varma and Malathi, 2003). The yellow disease in black gram (Gemini virus) is most serious disease (Nene, 1972). The yield loss due to this virus have been calculated from 5- 100% (Nene, 1972). The virus could be transmitted by single whitefly. The initial symptoms of the yellow mosaic disease in black gram appear in the forms of irregular yellow patches of various sizes, which coalesce to form larger patches of bright yellow colour. This is accompanied with general stunting of plants. In severe cases almost entire leaves may turn yellow, plants bear few flowers and pods are smaller with immature seeds showing very poor germination. Synthetic pesticides have largely failed to address the problem of whitefly population in field. Several insecticides have been tested for the control of the vector, but following insecticides application, the vector had become tolerant to most insecticides (Cho *et al*., 1984; Ramakrishnan *et al*., 1984). In the present experiment attempts were made to control naturally occurring yellow mosaic virus in Black gram by plant extracts and bio control agents and compared with chemicals.

MATERIALS AND METHODS

The experiment was conducted in a randomized block design with four replications with a plot size of 4x 5 m using seeds of Co 5 black gram in rabi seasons during 2001-2005 at Agricultural Research Station, Kovilpatti under semiarid vertisols. The treatments adopted at 25 and 50 days after sowing (DAS) in the trails are as follows.

1. *Cyanodon dactylon* at 10 % leaf extract spray
2. *Prosopis juliflora* at 10% leaf extract spray
3. *Vitex negundo* at 10% leaf extract spray
4. *Pseudomonas fluorescens* as Seed treatment at 10 g/kg of seed and Soil application and foliar application @ 1 kg /ha
5. Neem oil at 3% spray
6. Neem seed kernel extract 5% spray
7. Methyl dematon at 200 ml /acre
8. Monocrotophos at 200 ml /acre
9. Control (water alone)

Preparation of plant extracts

For the preparation of plant extract in cold water, fresh leaf sample were collected and washed in tap water and sterile water. It was then processed with sterile distilled water at 1 ml per of tissue (1:1w/v) in a waring blender and filtered through a double layered cheese cloth. This formed standard solution (100 per cent). The extracts were further diluted for required concentration. Talc formulation of *P. fluorescens* pf1 strain was bought from Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore and used in the study.

Pre spraying counts of the vector (Whitefly) were made one day before each foliar spray and post treatments counts were made at 1, 3, 5 and 7 days after each spray by random collection of 25 plants. Observations were also recorded on reduction of disease incidence, pod formation and seed yield per ac for each treatment in the study.

RESULTS AND DISCUSSION

The losses due to virus disease can be avoided by some preventive measures. Use of plant products and bio control agents in plant protection is a recent and ecofriendly strategy. All the treatments were superior to untreated control, which recorded the highest score for yellow mosaic disease (Table 1). Among the treatments imposed, methyl dematon sprayed plots had lesser yellow mosaic disease incidence in all the three years (2002-05), they was on par with monocrotophos, neem oil and neem seed kernel extract in 2002-03, with monocrotophos and neem oil in 2003 -04 and with monocrotophos in 2004 -05. However, neem oil and neem seed kernel extract also found to be better in reducing the disease incidence during 2004-05.

The analysis of pooled data indicated that the chemicals viz., monocrotophos and methyl dematon were superior in reducing the disease incidence. However, neem seed kernel extract at 5% spray given at 25 DAS and 50 DAS was superior and registered lowest score for yellow mosaic disease and which was followed by neem oil applied at 25 DAS and 50 DAS as non chemical methods. These treatments were on par with seed treatment with *P. fluorescens* at 10 g per kg of seed and soil application and foliar application at 1 kg /ha sprayed plot and were significantly superior to other treatments. The least control was observed with the treatment involving 10% leaf extract spray of *P. juliflora*. Prevention of virus diseases of various crops, employing antiviral agents from non host plants has been described earlier (Verma *et al*., 1985). Saxena and Khan (1985) reported that neem (*Azadirachta indica*) seed oil at 50 % was found highly effective in reducing the survival of brown planthopper, *Nilaparvata lugens* and in suppressing transmission of grassy stunt and ragged stunt viral diseases of rice. *P. fluorescens* CHAO strain induced systemic protection against tobacco necrosis virus in tobacco (Maurhofer *et al.*, 1994).

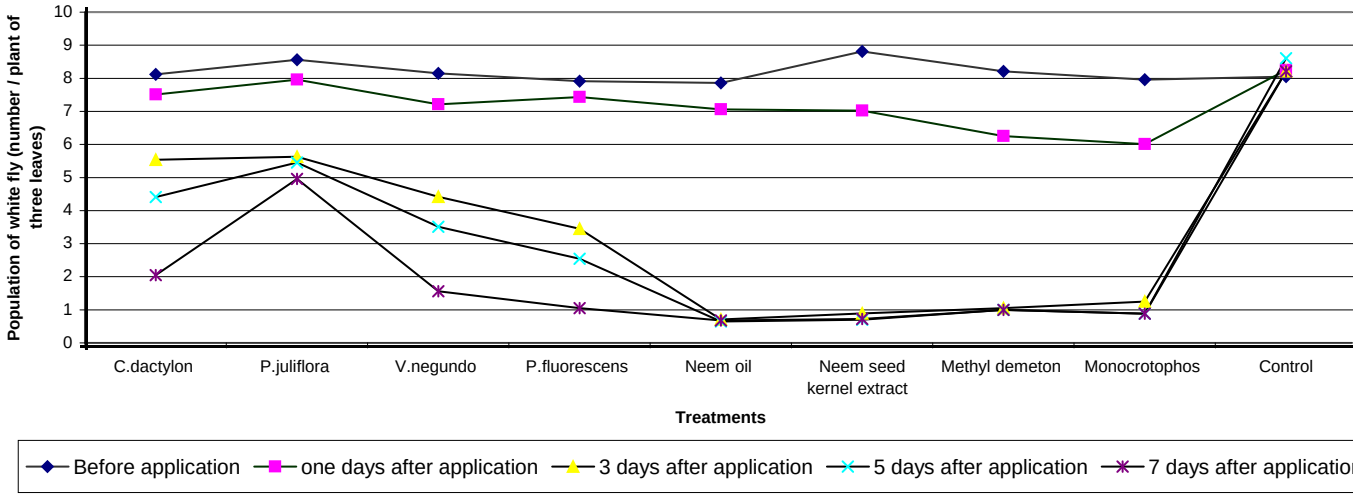
With respect to yield, highest yield was observed with seed treatment with *P. fluorescens* at 10 g per kg of seed and Soil application and foliar application at 1 kg /ha spray and was significantly ($P < 0.05$) superior to other treatments. This was followed by neem seed kernel extract 5% spray. The lowest yield among the treatments was recorded by *P. juliflora* at 10% leaf extract spray. However all the treatments were superior to the control uninoculated plot. The

Table 1 : Effect of plant products and bio control agent on yellow mosaic disease in black gram

Treatments	Per cent disease incidence (%)				Yield (kg/ ac)				Pods/ plant			
	2002-03	2003-04	2004-05	Pooled mean	2002-03	2003-04	2004-05	Pooled mean	2002-03	2003-04	2004-05	Pooled mean
Cyanodon dactylon at 10 % leaf extract spray	13.39 (21.45)^{e}	19.25 (26.05)^{d}	15.06 (22.83)^{d}	15.89 (23.49)^{e}	512.22^{cd}	475.42^{b}	496.80^{c}	494.82^{bc}	54.89^{d}	46.60^{e}	52.29^{f}	51.23^{c}
Prosopis juliflora at 10% leaf extract spray	14.71 (22.54)^{e}	22.65 (28.41)^{e}	18.07 (25.11)^{e}	18.46 (25.11)^{f}	486.01^{bc}	440.95^{a}	467.57^{b}	464.84^{ab}	46.22^{ab}	35.52^{b}	42.22^{b}	41.32^{f}
Vitex negundo at 10% leaf extract spray	6.95 (15.28)^{d}	7.14 (15.44)^{c}	8.82 (17.27)^{c}	7.63 (16.04)^{d}	471.17^{b}	526.67^{c}	485.75^{bc}	494.53^{bc}	47.58^{bc}	41.22^{c}	45.71c	44.83^{e}
Pseudomonas fluorescens Seed treatment at 10 g/ kg of seed and Soil application and Foliar application at 1 kg /ha	4.71 (12.52)^{c}	3.53 (10.82)^{a}	4.71 (12.53)^{b}	4.32 (11.99)^{c}	587.75^{e}	559.0^{de}	626.78^{fg}	591.18^{e}	60.47^{f}	52.25^{f}	58.60^{f}	55.55^{a}
Neem oil at 3% spray	4.44 (12.12)^{bc}	3.49 (10.76)^{a}	4.76 (12.59)^{b}	4.23 (11.86)^{c}	516.53^{d}	559.00^{e}	640.80^{g}	572.11^{de}	57.75^{e}	46.11^{e}	57.68^{f}	53.85^{b}
Neem seed kernel extract 5% spray	2.88 (9.73)^{a}	4.54 (12.29)^{b}	4.67 (12.47)^{b}	4.03 (11.56)^{bc}	575.5^{e}	552.00^{e}	602.25^{ef}	576.58^{e}	53.67^{d}	47.25^{e}	52.83^{d}	51.25^{c}
Methyl demeton	3.42 (10.65)^{ab}	3.62 (10.97)^{a}	3.44 (10.81)^{a}	3.49 (10.76)^{a}	507.33^{cd}	543.67^{cd} e	562.25^{d}	537.92^{d}	49.03^{c}	44.62^{d}	57.69^{f}	50.44^{c}
Monocrotophos	3.62 (10.96)^{abc}	3.69 (11.06)^{a}	3.77 (11.21)^{a}	3.69 (11.07)^{ab}	477.00^{b}	532.67^{cd}	591.67^{e}	533.78^{cd}	47.05^{bc}	41.85^{c}	55.08^{e}	47.85d
Control (water alone)	33.64 (35.42)^{f}	38.23 (38.19)^{f}	35.3 (36.49)^{f}	35.75 (36.72)^{g}	438.67^{a}	423.33^{a}	422.75^{a}	428.25^{a}	44.21^{a}	33.65^{a}	33.69^{a}	37.18^{g}
S. Ed	0.83	0.45	0.54	0.27	12.97	10.54	13.12	19.21	1.08	0.56	1.03	0.59
C.D (0.05%)	1.76	0.95	1.14	0.58	27.51	22.34	27.83	40.72	2.30	1.20	2.18	1.27
CV%	6.07	3.04	3.70	1.89	3.13	2.52	2.95	4.54	2.60	1.60	2.48	1.51

Values in parenthesis are arcsine transformed values
Mean followed by same letter are not significantly different at 5.00 % level

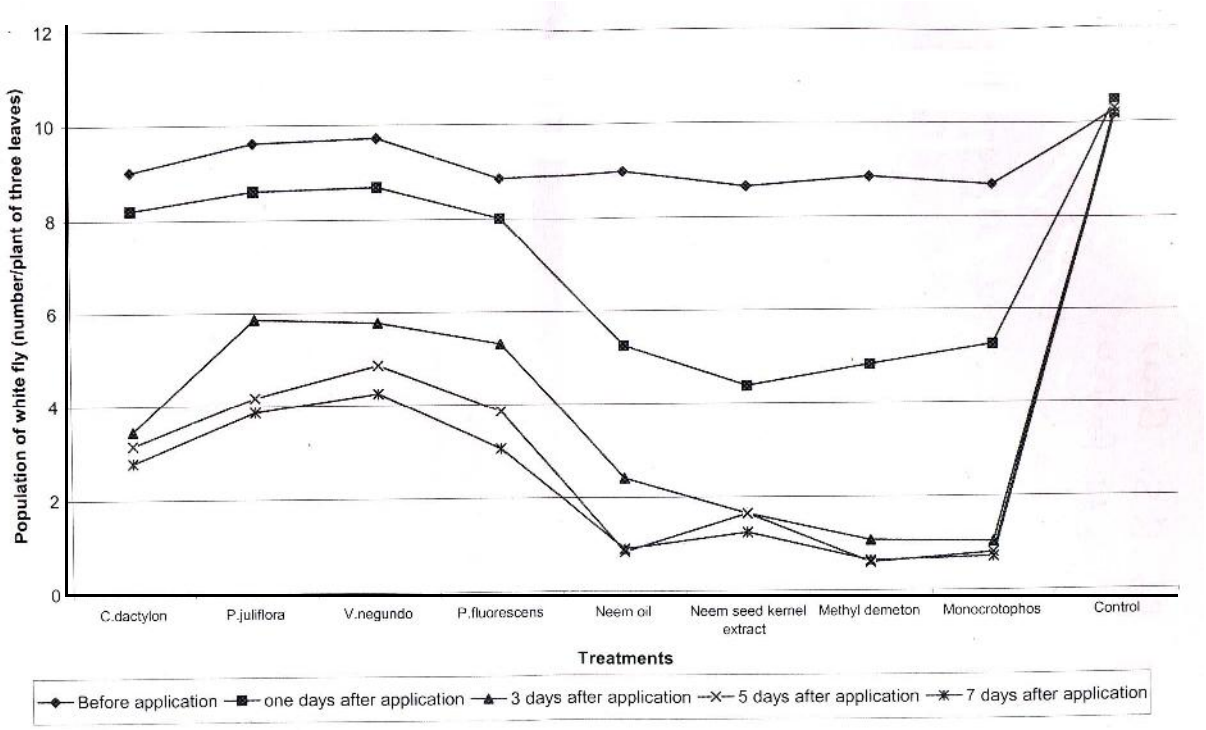
Fig. 1 : Effect of plant product and bio control agent on white fly population at 25 days after sowing (pooled data from three years experiments)



results revealed that the yield of black gram was significantly affected by yellow mosaic disease. The increase yield in *P. fluorescens* applied plot may be attributed due to presence of gibberellic like substance. The reports are available to point out the activity of *P. fluorescens* in plant growth simulation (Weller and Cook, 1986; Van Peer and Schippers, 1988).

Whitefly population was increased in 25 DAS before application of the treatments and found decreased when treatments applied. Monocrotophos was superior in reducing the white fly population and which was followed by neem oil at the end of seven days after application. Where as methyl dematon spraying was also found to be effective in reducing the whitefly population and which was followed by neem seed kernal applied plot (Fig 1 & 2). There was a sudden decrease in white fly population in neem oil, neem seed kernal extract, methyl dematon and monocrotophos applied plot from three days after application. At 50 DAS, white fly population was lower in monocrotophos, methyl dematon, neem oil at 3% and neem seed kernel extract. However other treatments also performed better in reducing the whitefly population. Saxena and Khan (1986) quoted that neem oil would disrupt the feeding behavior of the *Nephotettix virescens* in rice. Gahukar (2000) reported that neem products act both as systemic and as contact poisons and their effects are anti feedant, toxicological, repellent, sterility inducing or insect growth inhibiting. The action of neem oil on whitefly may be due to presence of repellent and antifeedant activity. It is concluded that neem oil at 3 % was found to be better in reducing the yellow mosaic disease and white fly population in black gram and *P. fluorescens* treatment also effective in reducing the disease incidence and increasing the yield.

Fig. 2 : Effect of plant products and bio control agent on white fly population at 50 days after sowing (pooled data from three years experiments)



REFERENCES

Cho, J.J., Mitchell, W.C., Yudin, L and Takayama, L. (1984) Ecology and epidemiology of tomato spotted wilt virus (TSWV) and its vector, *Franklinella occidentalis, Phytopathology*, **74:** 866

Gahukar, R. T. (2000). Use of neem products/pesticides in cotton pest management. *International J. Pest Management,* **46,** 149 - 160

Maurhofer, M., Hase, C., Meuwly, P., Metraux, J.P and Defago, G. (1994). Induction of systemic resistance of tobacco to tobacco necrosis virus by the root colonization *Pseudomonas fluorescens* strain CHAO: influence of the gac A gene and of pyoverdine production. *Phytopathology*, **84:** 139 -146

Nene, Y.L. (1972). A survey of viral diseases of pulse crops in Uttar Pradesh. Final. Tec. Report. Res. Bull.No:4, U.P. Agriculture University, Pantnagar, pp.1-91

Ramakrishnan, N., Saxena, V.S and Dhingra, S. (1984). Insecticide resistance in the population of *Spodopetra litura* (F) in Andhra Pradesh. *Pesticides,* **18 :** 23 - 24

Saxena, R. C and Khan, Z. R. (1985). Effect of neem oil on survival of the rice brown planthopper, *Nilaparvata lugens* (Stal) (Homoptera: Delphacidae) and on grassy stunt and ragged stunt virus transmission. *Philippine Phytopathology*, **21,** 80-87.

Saxena, R.C. and Khan, Z.R. (1986). Aberrations caused by neem oil odour in green leafhopper feeding on rice plants. *Entomologia Experimentalis et Applicata*, **42 :** 279 -284

Van Peer, R. and Schippers, B.(1988). Plant growth responses to bacterization with selected Pseudomonads spp. strains and rhizosphere microbial development in hydroponic culture. *Can. J. Microbiol.,* **35:** 456 -463

Varma, A and Malathi, V.G. (2003). Emerging geminivirus probelms, a serious threat to crop production. *Ann. Appl. Biol*., **142,** 145 -164

Verma, H.N., Rastogi, P., Prasad, V and Srivastava, R.S. (1985). A possible control of natural virus infection of *Vigna radiata* and *Vigna mungo* by plant extracts. *Indian J. Plant Path*., **3:** 21-24

Weller, D.M. and Cook, R.J. (1986). Increased growth of wheat by seed treatments with fluorescent pseudomonads and implications on Pythium control. *Can. J. Plant Pathol*., **8:** 328 -334

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