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ECO-FRIENDLY MANAGEMENT OF YELLOW MOSAIC OF MUNG BEAN (*VIGNA RADIATA*)

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ABSTRACT

Green gram (*Vigna radiata* (L.) Wilczek) is the third most important pulse crop grown in India after chick pea and pigeon pea. Among all the diseases, mung bean yellowmosaic virus (MYMV) disease is the most destructive, which causes 0-100 per cent losses in yields in Indian subcontinent and adjacent areas of South-East Asia. The present investigations were carried out to test the effectiveness of neem oil extract @ 10%, garlic clove extract @ 10 %, onion bulb extract @ 10%, ginger rhizome extract @ 10%, Tulsi leaf extract @ 10%, Bel leaf extract @ 10%, Dhatura leaf extract @ 10% and bio-agents *viz, Bacillus thuringiensis* var. *kurstaki* @ 10% on the management of YMV mung bean. Minimum 18.80 per cent disease incidence was recorded in T1 (Foliar application of Neem oil @ 10 % concentration) followed by 19.70 in T7 (Foliar application of Tulsi leaf extract @ 10% concentration), 19.80 in T3 (Foliar application of *Bacillus thuringiensis* var. *kurstaki* @ 10 %concentration) after first spraying of the treatment application. Whereas maximum 26.80 per cent disease incidence was recorded in T4 (Foliar application of Bel extract @ 10 % concentration) while in case of control 30.75 per cent disease incidence was recoded after first spraying of the treatment application. After second application the minimum 21.25 per cent disease incidence was recorded in T1 (Foliar application of Neem oil @ 10 % concentration) followed by 24.80 in T7 (Foliar application of Tulsi leaf extract @ 10% concentration). In case of control 36.33per cent disease incidence was recorded after second spraying of the treatment application.

***Keywords*:** MYMV. disease incidence, Neem oil, Tulsi leaf extract and bio-agent.

Introduction

Mung bean (*Vigna radiata* (L.) Wilczek) also known as green gram, golden gram Chickasaw pea and Oregon pea is one of the thirteenth food legumes grown in India and third most important pulse crop after chickpea and pigeon pea. It belongs to the family Leguminosae. The crop is native to the Indian subcontinent and cultivated in other South East Asian countries such as Pakistan, Bangladesh, Sri Lanka, Philippines, Taiwan, Nepal, Thailand, Laos, Kampuchea, Vietnam, Indonesia, Eastern Malaysia, Southern China and Java (Singh, 1991).

The mung bean suffers from several diseases, especially *Cercospora* leaf spot (*C. canescens, C. cruenta*), powdery mildew (*Erysiphe polygoni*), root disease complex (*Pythium* spp., *Rhizoctonia solani*, *Fusarium* spp.), Anthracnose (*Colletotrichum lindemuthianum*), Bacterial leaf blight (*Xanthomonas phaseoli*), *Macrophomina* blight (*Macrophomina phaseolina*), Rust (*Uromyces phaseoli*) and the reniform (*Rotylenchulus reniformis*) and root knot (*Meloidogyne* spp.) nematodes. Moreover, mung bean harbours different viruses namely, alfalfa mosaic virus, bean common mosaic virus, cucumber mosaic virus, leaf crinkle virus, leaf curl virus, mosaic mottle virus and mung bean yellow mosaic virus.

Amongst all diseases, mungbean yellow mosaic disease caused by Mung bean Yellow Mosaic Virus (MYMV) is considered as a number one threat of mung bean, limiting the production and productivity. The virus is most destructive in Indian subcontinent and adjacent areas of South-East Asia causing 100 per cent yield losses (Nene 1972). It causes severe

disease and economic losses in mung bean by plummeting seed yield and quality (Kang *et al*., 2005).

Material and Methods

Experimental site and experimental setup

The present investigation was carried out in the premises of Institute of Agricultural Science, Department of Plant Pathology, situated in the main campus of the Bundelkhand University, Jhansi (U.P.) during *Kharif* season 2023.The Experiment was conducted in a randomized block design with 3 replications and 9 treatments using a variety PDM 139 (Samrat). Individual plot size was 3x2.5m^2 and spacing 30x10 cm respectively.

Preparation of plant extract

Extracts of plant were prepared by crushing leaves of neem oil, garlic cloves, ginger rhizome, bel leaf extract, dhatura leaf extract, tulsi leaf extract and onion bulb with sterilized distilled water. The material was dried at room temperature (23 ^{0}C) for 6 hours before extraction to remove the excess water. 100g plant leaves, cloves and bulb were crushed separately with 100 ml sterilized water. The extract was filtered through a muslin cloth and centrifuged for 5000 rpm at 30 min. The extracts were sterilized by passing them through a Whatman filter paper (0.22-micron pore size).

Study on management of yellow mosaic of Mung bean

The effectiveness of neem oil extract @ 10%, garlic clove extract @ 10 %, onion bulb extract @ 10%, ginger rhizome extract @ 10%, tulsi leaf extract @ 10%, bel leaf extract @ 10%, dhatura leaf extract @ 10% and bio-agents *viz, Bacillus thuringiensis* var. *kurstaki* @ 10% were taken. All the treatment *viz.,* botanicals and bioagents were applied as foliar spray. In control plot only water spray was given. Seven days after spraying, Plant Disease incidence was recorded in all the treatments and calculated the disease reduction in each treatment, per cent disease control.

Result and Discussion

Management of yellow mosaic of Mung bean

Results revealed that the minimum 18.80 per cent disease incidence was recorded in T1 (Foliar application of Neem oil @ 10 % concentration) followed by 19.70 in T7 (Foliar application of Tulsi leaf extract @ 10% concentration), 19.80 in T3 (Foliar application of *Bacillus thuringiensis* var. *kurstaki* @ 10 % concentration) after first spraying of the treatment application. Whereas maximum 26.80 per cent disease incidence was recorded in T4 (Foliar application of Bel extract @ 10 % concentration) while in case of control 30.75 per cent disease incidence was recoded after first spraying of the treatment application after second application the minimum 21.25 per cent disease incidence was recorded in T1 (Foliar application of Neem oil @ 10 % concentration) followed by 24.80 in T7 (Foliar application of Tulsi leaf extract @ 10% concentration), after second spraying of the treatment application. While in case of T6 (Foliar application of Onion bulb extract @ 10% concentration) 27.33 percent disease incidence was recorded. Similar result are also obtained by Sahiba saeed *et al*(2021) of Aligarh Muslim University studied that the efficacy of medicinal plants in subduing of yellow mosaic disease in urdbean *(Vigna Mungo)*. Whereas maximum 29.88 per cent disease incidence was recorded in T4 (Foliar application of Bel extract @ 10 % concentration) while in case of control 36.33 per cent disease incidence was recorded after second spraying of the treatment application. Sujatha and Bharpoda (2017) investigated that the bio-efficacy of biopesticides against sucking pest in green gram grown during kharif. Among the various biopesticides evaluated for their field efficacy against whitefly, tobacco decoction both hot water @ 2% (1.09 white flies/ 3 leaves) or cold water extraction @ 2% (1.14) as well as *B. bassiana* (1 × 1010 CFU/g) @ 0.1% (1.22) recorded significantly lower population and proved their higher effectiveness against whitefly. Neem oil @0.5% NSKE @5% and *Leanicillium lecani* (1x 1010CFU/g) @ 0.1% Recorded 2.36, 2.46 and 2.56 white flies per 3 leaves, respectively and also found comparatively effective. *Azadirachtin* 0.5 EC @ 0.0006% (3.99) recorded significantly the highest population and found to be less effective. Venkatesan *et al*. (2007) studied that the effect of biocontrol agent, plant extracts and safe chemicals for suppression of MYMV in black gram by conducting two field trials in summer season at TNAU, Coimbatore, India. In both the trials, all the treatments significantly reduced the incidence of the MYMV under natural disease pressure. Significant difference in suppression of MYMV by the different treatments was noticed. Foliar spray with *Pseudomonas fluorescens* recorded least disease incidence (38.61%), followed by *Mirabilis jalapa* (40.56%) and Actigard (56.66%).

Table 1 : Management of Yellow Mosaic of Mungbean by the application of Plant extracts and Bio-control agents

Treatments	Treatments details	Severity after first spray	% Control	Severity after second spray	% Control
T1	Foliar application of Neem oil @10 % concentration.	18.80	38.86	21.50	41..50
T2	Foliar application of Garlic bulbextract @ 10 % concentration	24.80	19.34	28.33	22.02
T3	Foliar application of *Bacillus thuringiensis* var. *kurstaki* @ 10 %concentration	19.80	35.60	26.33	27.52
T4	Foliar application of Bel extract @10 % concentration	26.80	12.84	29.88	17.77
T5	Foliar application of Gingerrizhome extract 10 % concentration	25.10	18.37	28;.33	22.02
T6	Foliar application of Onion Bulbextract @ 10% concentration	22.90	25.52	27.33	24.77
T7	Foliar application of Tulsi leafextract @ 10 % concentration	19.70	35.93	24.80	31.73
T8	Foliar application of Dhatura leafextract @ 10 % concentration	22.70	26.17	27.25	24.99
T9	Control	30.75		36.33	
CD@ 5% level		**2.42**			

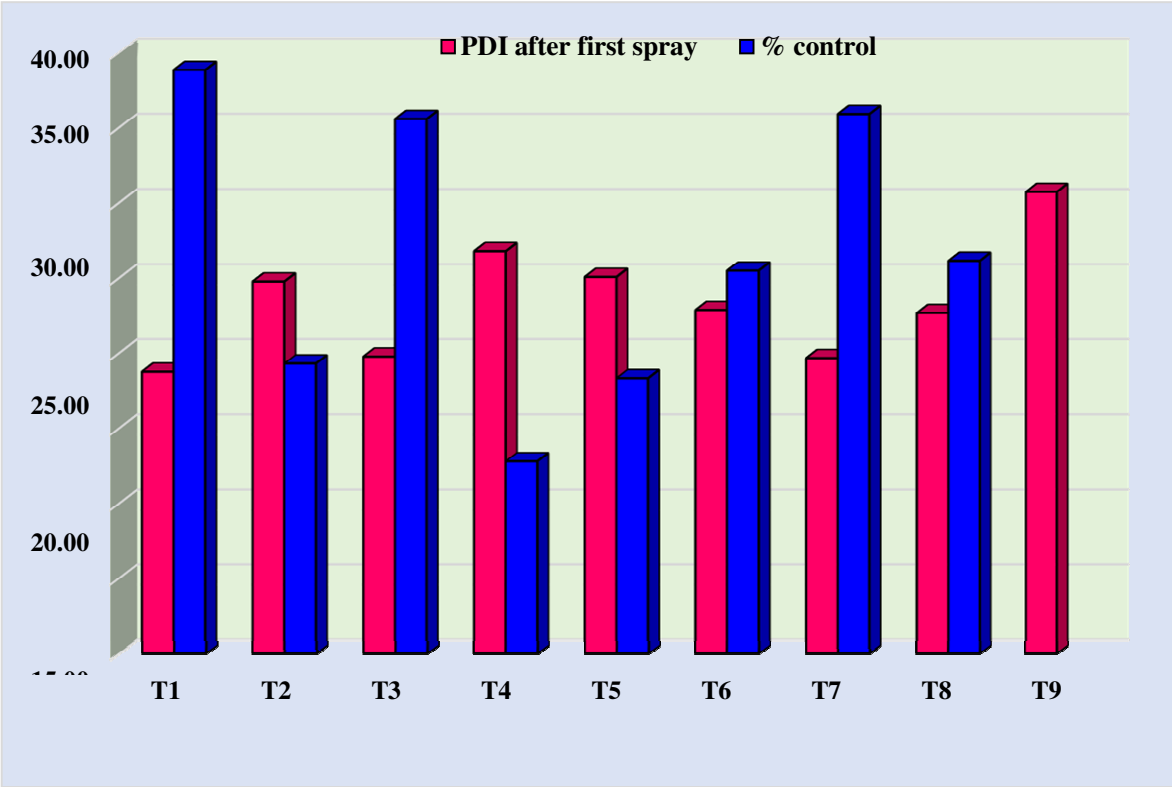

Fig. 1 : Effect of different treatment on per cent disease incidence after first spray

Effect of different treatments on yield of mung bean

All the botanicals and bioagents were significantly increase the crop yield as compare to control treatment. Results presented in table no 3.2. Maximum 13.90 q/ha yield was recorded in T1 (Foliar application of Neem oil @ 10 % concentration) followed by 13.55 in T7 (Foliar application of Tulsi leaf extract @ 10% concentration), 12.75 q/ha in T8 (Foliar application of Dhatura leaf extract @ 10% concentration) and 12.50 in T3 (Foliar application of *Bacillus thuringiensis* var. *kurstaki* @ 10 % concentration) at the time of harvesting. While in case of T6 (Foliar application of Onion bulb extract @ 10% concentration) 10.75 q/ha was recorded. Whereas minimum 9.78 q/ha was recorded case of control. Similar results was recorded by Basamma *et al.* (2015), reported that, among the biotic stresses mung bean yellow mosaic virus (MYMV) is the most serious disease on this crop with an estimated yield loss of 100% under severe

conditions in black gram. Biswas *et al.* (2015) estimated yield loss in susceptible mung bean cv. PS 16 was up to 61.1% over control for yellow mosaic disease (YMD) caused by Mung bean yellow mosaic India virus (MYMIV). Darai *et al.* (2016) reported that, yield losses up to 100%, 52.6% and 21% have been caused due to MYMV in black gram, mung bean and soybean, respectively. MYMV caused 100 per cent yield losses in mung bean and has become a challenge to scientists and growers both (Meti *et al.*, 2017). Mahalingam *et al.* (2018) stated that, mung bean yellow mosaic virus (MYMV)disease is one of the most devastating diseases of green gram causing 85-100 per cent yield lossand are transmitted by white fly, *Bemisia tabaci*.

Table 2 : Effect of plant extracts on crop yield.

Treatments	Treatments details	Yield in q/ha.	% Yield increased
T1	Foliar application of Neem oil @ 10 % concentration.	13.90	42.12
T2	Foliar application of Garlic bulb extract @10 % concentration	12.33	26.07
T3	Foliar application of *Bacillus thuringiensis* var. *kurstaki* @ 10 % concentration	12.50	27.81
T4	Foliar application of Bel extract @ 10 % concentration	11.88	21.47
T5	Foliar application of Ginger rizhome extract @ 10 % concentration	11.44	16.97
T6	Foliar application of Onion bulb extract @10 % concentration	10.75	9.91
T7	Foliar application of Tulsi leaf extract @10% concentration	13.55	38.54
T8	Foliar application of Dhatura leaf extract @10% concentration	12.75	30.36
T9	Control	9.78	
CD @ 5% level		1.21	

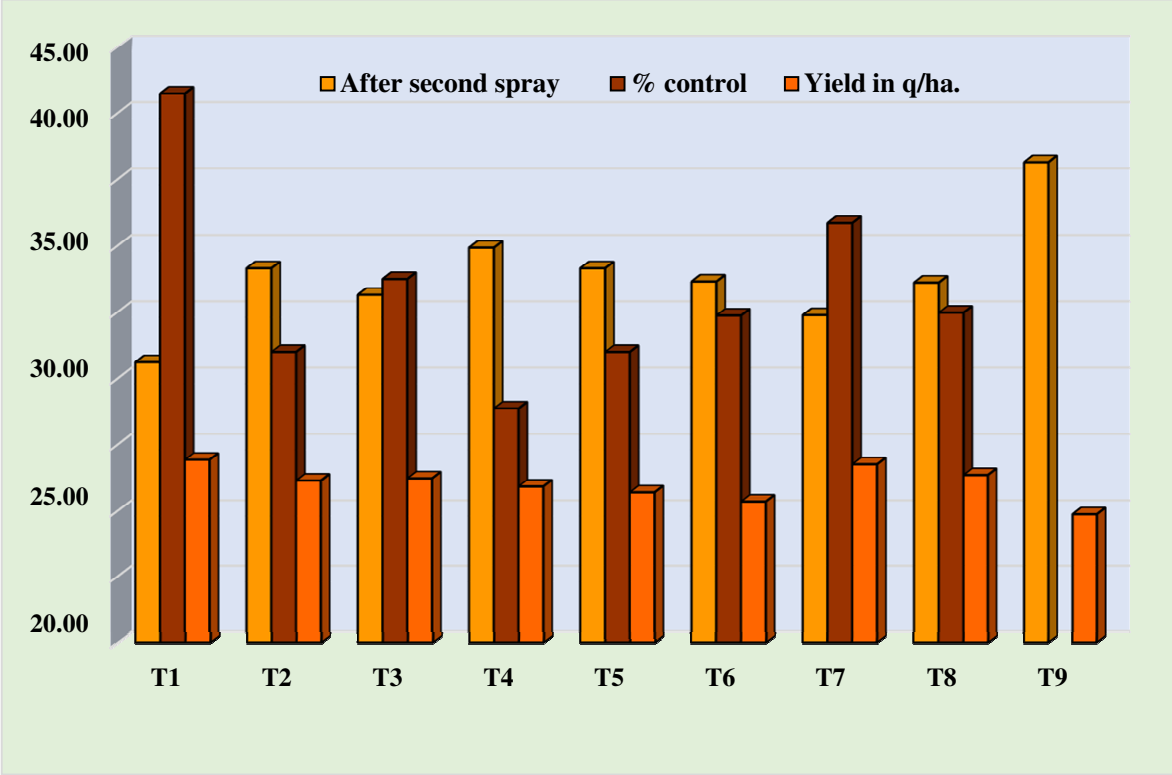

Fig. 2 : Effect of different treatment on per cent disease control and yield of mung bean

Conclusion

- Based on symptomatology, virus was confirmed as mung beanyellow mosaic virus (MYMV).
- The botanicals with Foliar application of Neem oil @ 10 % concentration and Tulsi leaf extract @ 10% concentration were the best botanicals against MYMV disease management and was economical.

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