



Short communication

Validation of Bio-intensive modules towards the Management of Viral and Phytoplasma Diseases of Brinjal, *Solanum melongena* L.

P Thilagam, D Dinakaran¹ and S Nanthakumar

Agricultural Research Station, TamilNadu Agricultural University,
Virinjipuram, Vellore, Tamil Nadu, India

ABSTRACT

Development of bio-intensive module was carried out at Agricultural Research Station (ARS), Virinjipuram for a period of two years during 2017-19 in *kharif* and *rabi* against viral and phytoplasma diseases of brinjal. The module thus developed was tested in two locations viz., ARS farm, Virinjipuram and at farmers' field to assess the performance of Bio-intensive Integrated Disease Management (BIDM) module against the mosaic, little leaf disease and whitefly during *Kharif* 2020. The results revealed that the BIDM was found superior in minimising the mosaic incidence in both locations tested and recorded 5.16 and 6.12 per cent also with lowest little leaf incidence. The lowest whitefly population was also recorded in bio-intensive module adopted plots when compared to farmers' practice at all stages of crop growth. At 30 days after transplanting (DAT), the whitefly population of 4.45 and 3.77 number per plant was recorded at ARS, Virinjipuram and at farmers' field. With respect to fruit yield, an adoption of bio-intensive module registered a significantly higher yield both at ARS farm (34.02 t/ha) and at farmers' field (30.36 t/ha) coupled with higher benefit cost ratio of 5.84 and 5.18 where as in farmers' practice the lowest fruit yield of 31.71 t/ha with BC ratio of 5.57 at ARS farm and 25.68 t/ha of fruit yield with CB ratio of 1:4.43 in farmers' field were recorded.

Key Words: BIDM module, Validation, Brinjal, mosaic disease, Vector population.

INTRODUCTION

Brinjal (*Solanum melongena* L.) is an important solanaceous crop of sub-tropics and tropics. In India, it is one of the most common, popular and principal vegetable crops grown throughout the country except higher altitudes. It is highly preferred crop upon fruit colour, size and shape. The brinjal little leaf disease was first described by Thomas and Krishnaswami (1939) in India with 100% yield loss in epidemics Rao and Kumar (2017). Several approaches were suggested for the management of virus and phytoplasma diseases and their insect vectors but still management could not be done successfully.

Hence, an integrated approach might be the most viable and sustainable option with an integration of cultural, physical, biological, resistance and chemical applications. However, an indiscriminate use of chemical leads to number of problems like development of resistance, contamination of food, soil, groundwater and also causes toxic effect on non-target and other organisms. One of the biggest challenges of developing and implementing integrated disease management (IDM) module is to successfully balance the goals of reducing pesticide use while maintaining the crop quality demanded by the producer as well as the consumer. Keeping this

Corresponding Author's Email: pthilagam@rediffmail.com

¹Department of Crop Protection, Agricultural College and Research Institute, Vazhavachanur, Tiruvannamalai, Tamil Nadu, India

Table 1. Components of BIDM module and farmers' practice.

Bio-intensive module	Farmers' practice
<ul style="list-style-type: none"> <input type="checkbox"/> Seed treatment with <i>Trichoderma viride</i> @ 4 g /kg or <i>Bacillus subtilis</i> @ 10 g / kg nursery application of neem cake @ 1.0 kg sq.m⁻¹ <input type="checkbox"/> Growing of maize as border crop <input type="checkbox"/> Roguing out of early diseased plants <input type="checkbox"/> Installation of yellow sticky traps @ 12 /ha <input type="checkbox"/> Foliar spraying of neem oil formulation @ 3 ml/ litre or NSKE 5 % <input type="checkbox"/> One application of spiromesifen 240 SC @ 1.0 ml and thiacloprid 240 SC @ 1.0 ml per litre of water 	<ul style="list-style-type: none"> <input type="checkbox"/> Two application of imidacloprid 17.8 SL @ 5ml per litre of water at 30 & 45 DAT. <input type="checkbox"/> One application of acephate 75 SP @ 1.5 g per litre of water at 60 DAT

$$\text{Mosaic and little leaf disease (\%)} = \frac{\text{Number of affected plant in a plot}}{\text{Total number of plants in a plot}} \times 100$$

in mind, the bio-intensive module thus developed was validated at farmers' field for its performance and economic impact.

MATERIALS AND METHODS

Bio-intensive integrated disease management module was developed at Agricultural Research Station (ARS), Virinjipuram after two consecutive years (2017-2019) of study in *kharif* and *rabi*. In order to assess the performance to validate the findings, two field experiments were conducted simultaneously at different locations one at Agricultural Research Station, Virinjipuram, Vellore District, Tamil Nadu and second at farmers' holding field at K. V. Kuppam block of Vellore district to assess the performance of Bio-intensive Integrated Disease Management (BIDM) module against the mosaic, little leaf disease and whitefly, *Bemisia tabaci* Gennadius during *Kharif* 2020 with two components of management *viz.*, Bio-intensive Integrated disease management (BIDM) and Farmers' practice (Table 1). Brinjal (Variety: VRM 1) seedlings (25d old) were transplanted in an area of 25 cents with a spacing of 60x45 cm (RxP) under each management modules. The

recommended agronomic package of practices was followed to raise a good crop. The need-based spray and insecticides were sprayed with the help of a knapsack sprayer using 500 L of spray per hectare. Observations on the disease incidence of mosaic and little leaf were taken using the given formula in each module. Likewise, the whitefly population counts were also taken at 30, 60 and 90 days after transplanting (DAT) from three leaves, one each at the top, middle and bottom of the each plant also recorded and expressed as population per plant. The disease incidence was worked out using the formula given below. The fruit yield, thus obtained per plot has been converted in terms of fruit yield per hectare and Cost: Benefit ratio was also worked out for different management modules. Thus, the data obtained on the population, mosaic disease incidence and fruit yield in different treatments were analyzed statistically using AGRES (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The results (Tables 2 and 3) revealed that there was a remarkable decrease in the disease incidence and whitefly population. Observations

Management of Viral and Phytoplasma Diseases of Brinjal

Table 2. Bio-intensive management of viral and phytoplasma diseases of brinjal.

Treatment	Whitefly population (No/ plant)				Disease incidence (%)		Fruit yield (t/ha)	C:B
	30 DAT	60 DAT	90 DAT	120 DAT	Mosaic	Little leaf		
Bio-intensive module	4.45 (2.11) ^a	3.11 (1.76) ^a	0.71 (0.84) ^a	0.89 (0.94) ^a	5.16 (13.09)	2.59 (9.17)	34.02	1: 5.84
Farmers' practice	5.98 (2.44) ^b	4.32 (2.08) ^b	1.95 (1.40) ^b	1.79 (1.34) ^b	11.46 (19.74)	5.90 (13.96)	31.72	1: 5.57
S. Ed.	0.02	0.01	0.01	0.02	0.68	0.65	0.50	
C. D (p=0.05)	0.05	0.03	0.03	0.05	1.49	1.42	1.08	

on disease incidence and vector population were recorded at regular intervals at ARS farm and also in farmers' holding. Among the three treatments, the bio-intensive management was found superior in minimising the mosaic (5.16%) and little leaf diseases (2.59%) and whitefly population (0.89 No./ plant) with increased fruit yield (34.02 t/ha) and higher Cost: Benefit (1:5.84). The untreated check recorded the highest incidence of mosaic (18.50%) and little leaf (8.24%) and whitefly population coupled with lowest fruit yield (27.58 t/ha) and C:B (1:4.07).

Adoption of bio-intensive management module by the farmer also resulted in minimising the mosaic (6.12%) and little leaf diseases (3.06%) and whitefly population (1.62 Nos/plant) with increased fruit yield (30.36 t/ha) and higher C:B (1:5.18). The untreated check recorded the highest

incidence of mosaic (12.54%) and little leaf (7.31%) diseases and whitefly population (6.32 Nos/plant) coupled with lowest fruit yield (25.68 t/ha) and Cost: Benefit (1:4.43). The present finding on the use of integrated pest management package over conventional methods was also studied by Sandeep *et al* (2017). They found that seedling root treatment for 3 hr with imidacloprid (1ml/l) + Soil application of *Trichoderma* + installation of pheromone traps @ 35 /ha + Mechanical removal of infected shoots and fruits + spraying of NSKE 4 % recorded the lowest shoot and fruit infestation and wilt incidence. In case of Chillies, IDM was found effective to check the powdery mildew, anthracnose and die back diseases and increase fruit yields. Yadav *et al* (2017) also reported that the per cent disease incidence of powdery mildew, anthracnose on leaves, fruit infection and plant mortality in chillies were recorded 3.6, 17.7, 23.0

Table 3. Bio-intensive management of viral and phytoplasma diseases of brinjal.

Treatment	Whitefly population (Nos/plant)				Disease incidence (%)		Fruit yield (t/ha)	C:B
	30 DAT	60 DAT	90 DAT	120 DAT	Mosaic	Little leaf		
Bio-intensive module	3.77 (1.94) ^a	5.91 (2.43) ^a	4.74 (2.18) ^a	1.62 (1.27) ^a	6.12 (14.32)	3.06 (9.98)	30.36	1: 5.18
Farmers' practice	6.17 (2.48) ^b	11.67 (3.42) ^b	10.86 (3.30) ^b	6.32 (2.51) ^b	12.54 (20.67)	7.31 (15.59)	25.68	1: 4.43
S. Ed.	0.01	0.04	0.01	0.06	1.28	1.34	1.25	
C. D (p=0.05)	0.02	0.09	0.02	0.13	2.79	3.12	2.71	