

Original Research Article

<https://doi.org/10.20546/ijcmas.2018.709.255>

## Comparative Evaluation of Botanicals and Chemical Insecticides and their Suitable Use for the Management of Yellow Mosaic Virus (YMV) of Mungbean

Dharnendra Reang<sup>1\*</sup>, M. Ranjana Devi<sup>1</sup>, Aparajita Dhar<sup>1</sup> and P.S. Nath<sup>2</sup>

<sup>1</sup>Department of Plant Pathology, Faculty of Agriculture, Uttarbanga Krishi Viswavidyalaya, Pundibari, Coochbehar-736165, India

<sup>2</sup>Bidhan Chandra Krishi Viswavidyalaya, West Bengal-741252, India

\*Corresponding author

### ABSTRACT

#### Keywords

Mungbean, YMV, Botanicals, Chemical insecticides

#### Article Info

##### Accepted:

16 August 2018

##### Available Online:

10 September 2018

Field experiment was conducted during 2011 and 2012 to evaluate the efficacy of chemical insecticides and plant botanicals for the management of Yellow Mosaic Virus of Mungbean transmitted by the vector whitefly (*Bemisia tabaci*). It was noted that disease incidence could not be escaped however, the percentage of incidence were different from each other over control plot. Among the five plant origin products with different doses tested for spraying, Neem @ 0.2% showed lowest incidence (10.49%) and severity (9.58%). Among three insecticides the significant lowest incidence (8.19%) and severity (6.61%) was recorded when Imidachloprid @ 1ml/3 litre of water was sprayed over the crop.

### Introduction

Mungbean or green gram *Vigna radiata* L. Wilezek is one of the important short duration pulse crop of Indian origin. In India it is cultivated throughout the year with an area and production of 3.77 mha and 1.52 mt, respectively (AICRP on Mullarp, 2009) of which the predominant states are Maharashtra, Andhra Pradesh, Odisha, Rajasthan, Tamil Nadu and Bihar. The major biotic constraints diseases that delimit the productivity of Mungbean consist of viruses, fungi, bacteria and nematodes. Of which whitefly (*Bemisia tabaci*) transmitted Mungbean yellow mosaic

virus (MYMV) is the major threat to successful production in India, Sri Lanka, Pakistan, Bangladesh, Papua New Guinea, Phillipines and Thailand (Honda *et al.*, 1983; Chenulu and Verma, 1998; Mallik and Bashir, 1992 and Jones, 2003). Considering the immense rampant and economic significance of 'Mungbean Mosaic Virus disease' investigations are being carried out both at the national and international levels of different aspects of this disease particularly on the management. The information is available on the management for the vector of the YMV using fungicides from different parts of the country (Borah, 1996; Singh and Sirohi, 1997;

Ganapathy and Karupiah, 2004; Ghosh *et al.*, 2009). But the dependency only on chemical insecticides for the management is bound to results in tremendous pressure on the environment, thereby adversely affecting threat to the environment and health hazard. So, considering this fact experiment was conducted to control the disease by alternative methods like spraying of eco-friendly botanical oils and chemicals.

### Materials and Methods

A field experiment was conducted in randomized block design for consecutive two years 2011-2012 at Instructional Farm, BCKV, Jaguli to study the effect of application of different botanical oils with different doses and chemical insecticides for controlling yellow mosaic disease of Mungbean. Sowing was done on 7-3-2011 and 7-3-2012 using the seeds of Samrat variety in 5m × 4m sized plots, following usual cultivation method; the row to row and plant to plant spacing was given 30 cm and 15 cm respectively. The land was fertilized with N: P: K @ 15:45:20 kg/ha. The nitrogen was applied in two split doses, half at the time of sowing and remaining half at 21 DAS, whereas, total phosphorus and potash were applied at the time of sowing. Regular weeding and application of irrigation was done as and when required. The botanical oils and chemical insecticides used for this purpose is given in Table 1. The botanical pesticides or, plant product oils was collected from Gayeshpur Farm, BCKV. These plant product oils were sprayed with the help of Knapsack Sprayer @ 0.05%, 0.1% and 0.2%.Sticker, 'Tween-80' was added to the oil.

Disease incidence and severity were calculated by the following formulas

$$\text{Disease Incidence} = \frac{\text{No. of plants infected in a plot}}{\text{Total no. of plants in that plot}} \times 100$$

$$\text{Disease severity} = \frac{\sum \text{Numerical Ratings}}{\text{No. of leaves observed} \times \text{Highest rating scale}} \times 100$$

### Scale

0:- No. of plants not showing any symptom.

1:- Less than 1 per cent plants showing symptoms.

3:- 1-10 per cent plants showing mottling of leaves.

5:- 11-20 per cent plants showing mottling and yellow discoloration of leaves.

7:- 21-50 per cent plants showing mottling and yellow discoloration of leaves and stunting of plants.

9:- 51 per cent or more plants affected, stunting of plants pronounced, flowers and fruits reduced and appearance of severe yellow mottling on the leaves.

The population of whitefly was also determined by counting on the mungbean plant and the mean of 3 replications was taken for population study of whitefly incidence and yield of the crop recorded at harvest and the data were statistically analyzed.

The spraying of botanical oils was started from 20 DAS followed by 30 DAS, 40 DAS and 50 DAS.

Observations on the incidence and severity of the disease and number of white fly per plant from five plants in each plot were recorded starting from 20 DAS at an interval of 10 days upto 50 DAS.

Data on yield was taken from each plot and the data were statistically analyzed. Disease incidence and severity were calculated by the formulas as stated earlier.

**Results and Discussion**

The perusal of data in Table 2 shows that significant lowest disease incidence and highest disease control was recorded when the spraying was done by Imidachloprid @ 1ml/3L of water and the disease incidence recorded was 8.19% and disease control was 82.78 %. This was followed by, neem oil @ 0.2% treated plots (T<sub>9</sub> plots), Dimethoate 1.5 ml/lit treated plots (T<sub>18</sub> plots), Neem oil @ 0.1% treated plots (T<sub>8</sub> plots), Neem oil @ 0.05% treated plots (T<sub>7</sub> plots), Clove oil @ 0.2% treated plots (T<sub>6</sub> plots).

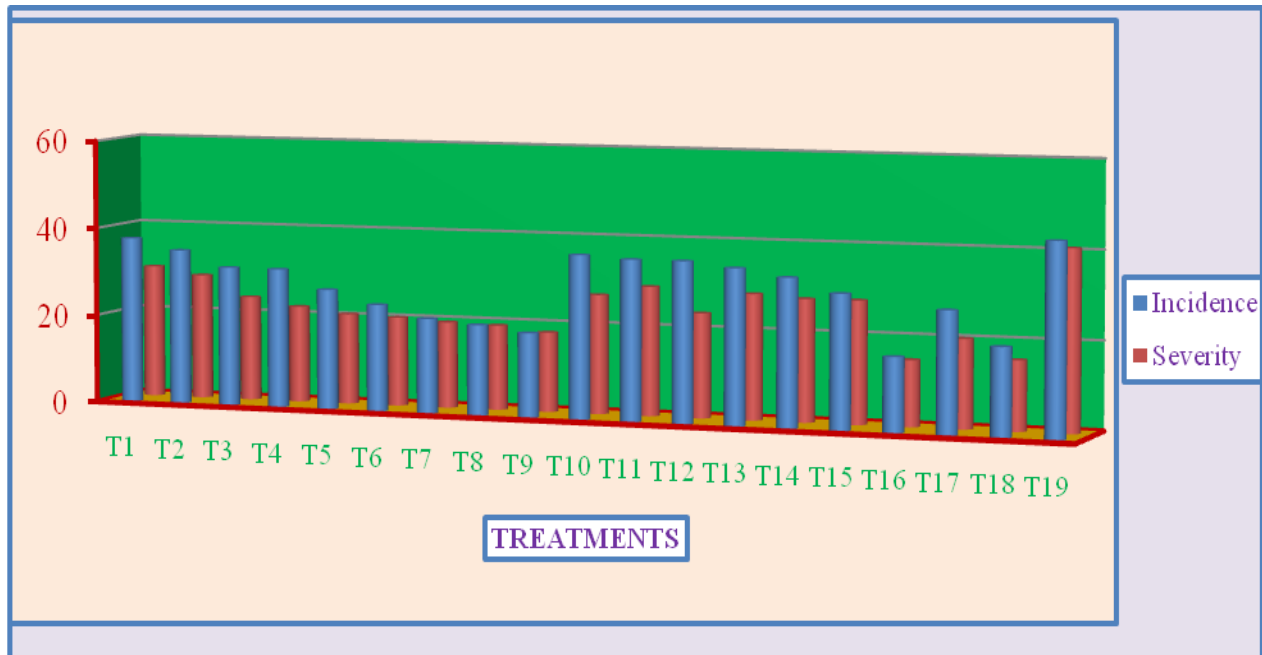
The incidence of disease and disease control were recorded 10.49%, 11.40%, 12.14%, 13.43%, 16.59% and 77.94%, 76.03%, 74.77%, 71.76%, 65.11% respectively.

Disease incidence of T<sub>16</sub> and T<sub>18</sub> were statistically at par. Highest incidence of the disease was found in check (T<sub>19</sub> plots) and the per cent of incidence was 47.55, followed by Lemon oil @ 0.05% treated plots (T<sub>1</sub> plots),

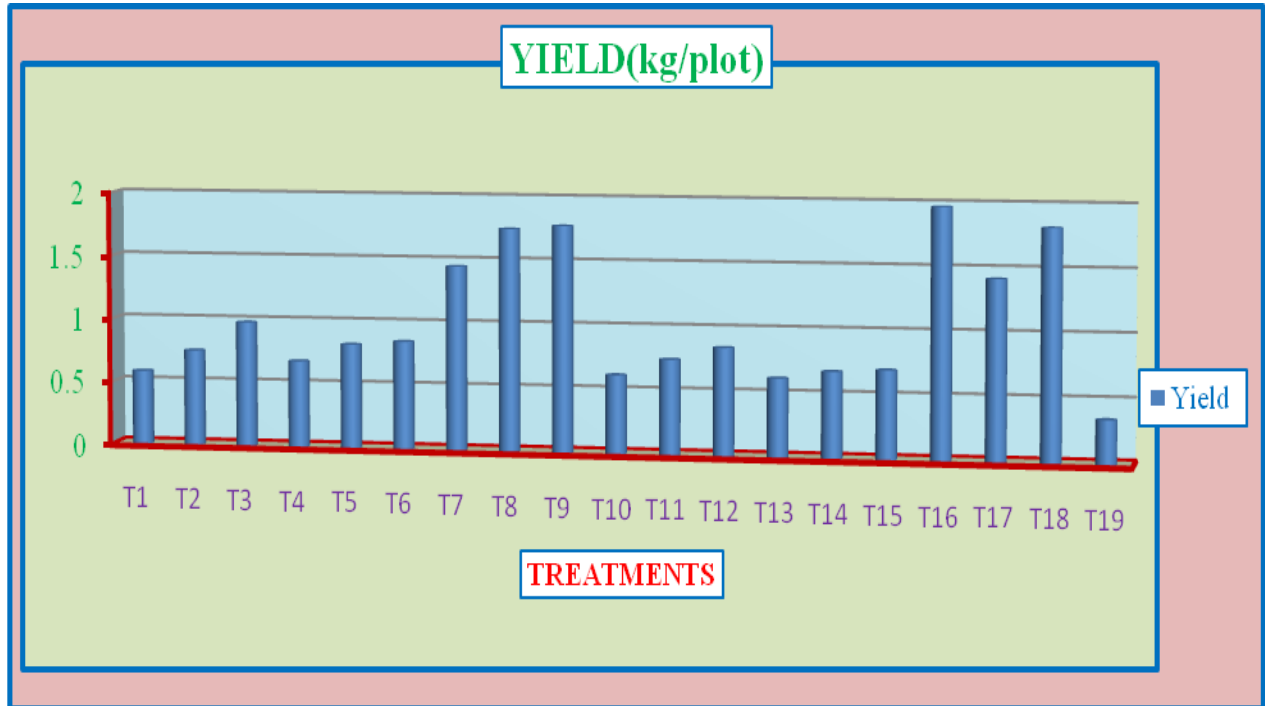
Pine oil @ 0.05% treated plots (T<sub>10</sub> plots). The per cent of incidence of disease and disease control were recorded 36.83, 35.86 and 22.54, 24.58 respectively.

Significant lowest disease severity was found in Imidachloprid @ 1ml/3L of water treated plots (T<sub>16</sub> plots), it was followed by Dimethoate 1.5 ml/lit of water treated plots (T<sub>18</sub> plots), Neem oil @ 0.2% treated plots (T<sub>9</sub> plots), Neem oil @ 0.1% treated plots (T<sub>8</sub> plots), the percentage of disease severity and disease control over check were 6.61, 7.41, 9.58, 10.79 and 84.51, 82.64, 77.55, 74.72 respectively. Disease severity of T<sub>16</sub>, T<sub>18</sub> and T<sub>9</sub> were statistically at par. The percentage of disease severity was highest in check (T<sub>19</sub> plots) and it was 42.68. It was followed by lemon oil @ 0.05% treated plots (T<sub>1</sub> plots), Pine oil @ 0.1% treated plots (T<sub>11</sub> plots), Garlic oil @ 0.05% treated plots (T<sub>13</sub> plots), the percentage of disease severity and disease control over check were 25.22, 23.77, 22.71 and 40.91, 44.31, 46.79 respectively (Table 2 and Fig. 1).

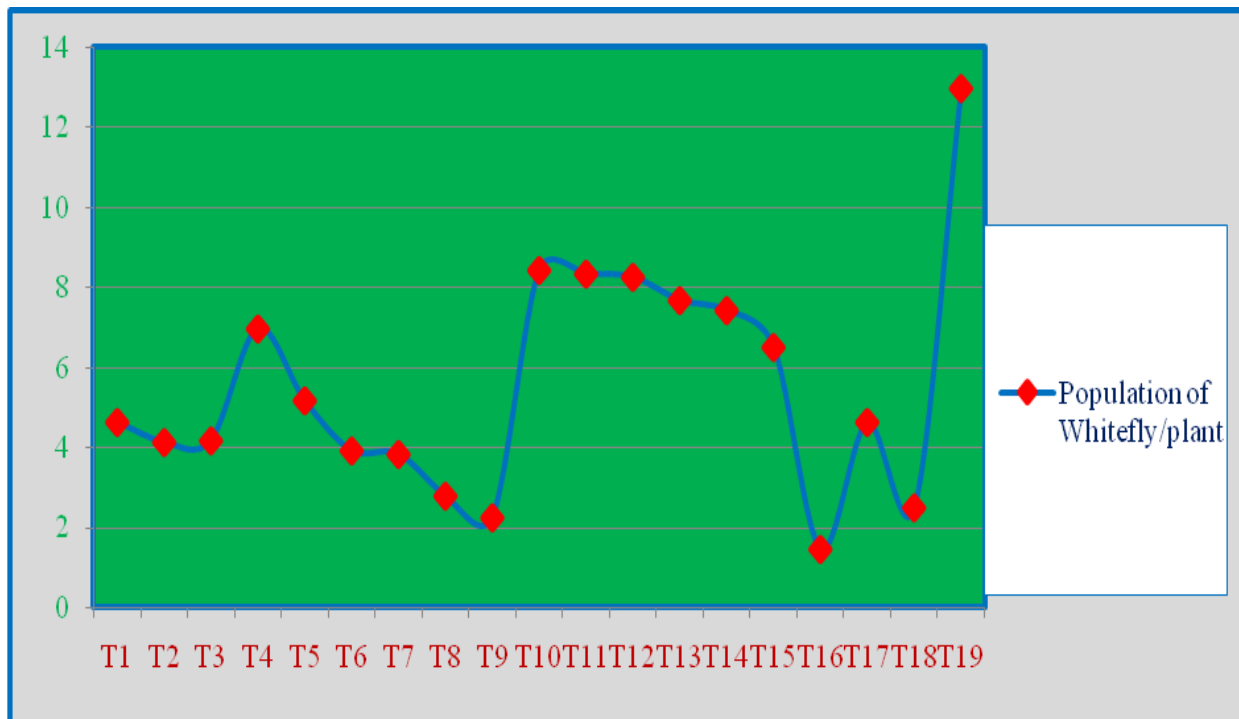
**Fig.1** Effect of spraying of botanical oils and chemical insecticides on the incidence and severity of Mungbean Yellow Mosaic Virus Disease (Pooled)



**Fig.2** Effect of spraying of different botanical oils and chemical insecticides on the yield of Mungbean Yellow Mosaic Virus Disease (Pooled)



**Fig.3** Population of Whitefly on Mungbean Plants treated with different botanical oils and chemical insecticides (Pooled)



**Table.1** Name of the botanical oil and chemical insecticides with doses

SL. No.	Treatment	Oil and insecticide used	Dose
1	T <sub>1</sub>	Lemon	0.05
2	T <sub>2</sub>	Lemon	0.1
3	T <sub>3</sub>	Lemon	0.2
4	T <sub>4</sub>	Clove	0.05
5	T <sub>5</sub>	Clove	0.1
6	T <sub>6</sub>	Clove	0.2
7	T <sub>7</sub>	Neem	0.05
8	T <sub>8</sub>	Neem	0.1
9	T <sub>9</sub>	Neem	0.2
10	T <sub>10</sub>	Pine	0.05
11	T <sub>11</sub>	Pine	0.1
12	T <sub>12</sub>	Pine	0.2
13	T <sub>13</sub>	Garlic	0.05
14	T <sub>14</sub>	Garlic	0.1
15	T <sub>15</sub>	Garlic	0.2
16	T <sub>16</sub>	Imidachloprid	1ml/3lit. of water
17	T <sub>17</sub>	Phorate	1.25 kg a.i./ha
18	T <sub>18</sub>	Dimethoate	1.5ml/lit. of water
19	T <sub>19</sub>	Check	Water spray

**Table.3** Population of Whitefly on Mungbean plant on different treatments of botanical oils and chemical insecticides (pooled)

SL. No.	Treatment	Population of whitefly/plant (DAS)				Average
		20	30	40	50	
1	T <sub>1</sub>	3.00	7.67	4.67	3.17	4.63
2	T <sub>2</sub>	3.67	7.33	3.00	2.50	4.13
3	T <sub>3</sub>	5.00	5.67	2.00	4.00	4.17
4	T <sub>4</sub>	5.00	9.33	8.17	5.33	6.96
5	T <sub>5</sub>	2.00	6.33	7.83	4.50	5.17
6	T <sub>6</sub>	5.67	1.67	2.67	5.67	3.92
7	T <sub>7</sub>	2.67	4.33	3.33	5.00	3.83
8	T <sub>8</sub>	2.00	3.50	4.00	1.67	2.79
9	T <sub>9</sub>	2.67	2.33	1.67	2.33	2.25
10	T <sub>10</sub>	6.00	9.67	10.33	7.67	8.42
11	T <sub>11</sub>	6.67	10.33	8.00	8.33	8.33
12	T <sub>12</sub>	6.00	12.00	9.33	5.67	8.25
13	T <sub>13</sub>	3.67	10.00	9.67	7.33	7.67
14	T <sub>14</sub>	1.33	9.33	12.33	6.67	7.42
15	T <sub>15</sub>	2.00	7.33	9.67	7.00	6.50
16	T <sub>16</sub>	1.33	1.67	1.33	1.50	1.46
17	T <sub>17</sub>	2.17	4.67	8.83	2.83	4.63
18	T <sub>18</sub>	2.67	2.00	3.83	1.50	2.50
19	T <sub>19</sub>	2.00	16.67	19.33	13.83	12.96

DAS = Days after sowing.

T<sub>1</sub>=Lemon 0.05%, T<sub>2</sub>=Lemon 0.1%, T<sub>3</sub>=Lemon 0.2%, T<sub>4</sub>=Clove 0.05%, T<sub>5</sub>=Clove 0.1%, T<sub>6</sub>=Clove 0.2%, T<sub>7</sub>=Neem 0.05%, T<sub>8</sub>=Neem 0.1%, T<sub>9</sub>=Neem 0.2%, T<sub>10</sub>=Pine 0.05%, T<sub>11</sub>=Pine 0.1%, T<sub>12</sub>=Pine 0.2%, T<sub>13</sub>=Garlic 0.05%, T<sub>14</sub>=Garlic 0.1%, T<sub>15</sub>=Garlic 0.2%, T<sub>16</sub>=Imidachloprid 1ml/3lit of water, T<sub>17</sub>=Phorate 1.25 kg a.i./ha, T<sub>18</sub>=Dimethoate 1.5ml/lit of water, T<sub>19</sub>=Check.

**Table.2** Effect of spraying of different botanical oils and chemicals on Yellow Mosaic Virus of Mungbean plant (pooled)

SL. No.	Treatment	Incidence of Disease (per cent)				Severity (per cent) (50 DAS)	Per cent of Disease control over check		Yield (kg/plot)
		20 DAS	30 DAS	40 DAS	50 DAS		Incidence	Severity	
1	T <sub>1</sub>	1.78(7.76)	16.11(23.66)	32.26(34.61)	36.83(37.36)	25.22(30.15)	22.54	40.91	0.58
2	T <sub>2</sub>	1.46(6.94)	14.29(22.21)	24.77(29.85)	32.73(34.90)	22.27(28.16)	31.17	47.82	0.75
3	T <sub>3</sub>	1.22(6.34)	12.67(20.85)	19.57(26.26)	27.29(31.49)	16.02(23.59)	42.61	62.46	0.98
4	T <sub>4</sub>	1.42(6.84)	15.33(23.05)	23.51(29.00)	26.93(31.26)	13.72(21.74)	43.36	67.85	0.68
5	T <sub>5</sub>	1.19(6.26)	12.11(20.36)	17.87(25.01)	21.14(27.37)	12.24(20.48)	55.54	71.32	0.82
6	T <sub>6</sub>	1.43(6.87)	10.26(18.68)	15.80(23.42)	16.59(24.04)	11.85(20.14)	65.11	72.24	0.85
7	T <sub>7</sub>	1.40(6.80)	10.48(18.89)	11.63(19.94)	13.43(21.50)	11.08(19.44)	71.76	74.04	1.45
8	T <sub>8</sub>	2.27(8.67)	9.57(18.02)	10.18(18.61)	12.14(20.39)	10.79(19.18)	74.47	74.72	1.75
9	T <sub>9</sub>	0.73(4.90)	9.15(17.61)	8.93(17.39)	10.49(18.90)	9.58(18.03)	77.94	77.55	1.78
10	T <sub>10</sub>	1.25(6.42)	14.74(22.58)	23.10(28.73)	35.86(36.79)	20.42(26.86)	24.58	52.16	0.62
11	T <sub>11</sub>	1.76(7.62)	13.27(21.36)	22.64(28.41)	35.16(36.37)	23.77(29.18)	26.06	44.31	0.75
12	T <sub>12</sub>	1.25(6.42)	12.32(20.55)	22.00(27.97)	34.78(36.14)	16.05(23.62)	26.86	62.39	0.85
13	T <sub>13</sub>	1.61(7.29)	13.10(21.22)	23.18(28.78)	33.19(35.18)	22.71(28.46)	30.20	46.79	0.62
14	T <sub>14</sub>	1.16(6.18)	12.60(20.79)	21.29(27.48)	30.56(33.56)	21.60(27.69)	35.73	49.39	0.68
15	T <sub>15</sub>	0.75(4.97)	12.21(20.45)	19.33(26.08)	25.47(30.31)	21.65(27.73)	46.44	49.27	0.70
16	T <sub>16</sub>	0.91(5.47)	4.50(12.25)	7.33(15.71)	8.19(16.63)	6.61(14.90)	82.78	84.51	1.97
17	T <sub>17</sub>	0.96(5.62)	8.91(17.37)	16.20(23.73)	21.36(27.53)	11.74(20.04)	55.08	72.49	1.42
18	T <sub>18</sub>	1.86(7.84)	9.03(17.49)	10.92(19.30)	11.40(19.73)	7.41(15.80)	76.03	82.64	1.82
19	T <sub>19</sub> (Check)	2.84(9.70)	26.03(30.68)	36.49(37.16)	47.55(43.60)	42.68(40.79)	-	-	0.35
	S.Em±	0.36	1.24	2.84	2.04	0.29	-	-	0.06
	CD at 0.05%	0.72	2.47	5.68	4.07	0.58	-	-	0.12

T<sub>1</sub>=Lemon 0.05%, T<sub>2</sub>=Lemon 0.1%, T<sub>3</sub>=Lemon 0.2%, T<sub>4</sub>=Clove 0.05%, T<sub>5</sub>=Clove 0.1%, T<sub>6</sub>=Clove 0.2%, T<sub>7</sub>=Neem 0.05%, T<sub>8</sub>=Neem 0.1%, T<sub>9</sub>=Neem 0.2%, T<sub>10</sub>=Pine 0.05%, T<sub>11</sub>=Pine 0.1%, T<sub>12</sub>=Pine 0.2%, T<sub>13</sub>=Garlic 0.05%, T<sub>14</sub>=Garlic 0.1%, T<sub>15</sub>=Garlic 0.2%, T<sub>16</sub>=Imidachloprid 1ml/3lt of water, T<sub>17</sub>=Phorate 1.25 kg a.i./ha, T<sub>18</sub>=Dimethoate 1.5ml/lit of water, T<sub>19</sub>=Check. Figures in parenthesis indicate angular transformed value, DAS=Days after Sowing.

Also it was found that the average number of whitefly (*Bemisia tabaci*) (Table 3 and Fig. 3) were found highest in check (T<sub>19</sub> plots), Pine oil at all different concentration of 0.1%, 0.2% and 0.05% respectively, treated plots (T<sub>10</sub>, T<sub>11</sub> and T<sub>12</sub> plots) and it was 12.96, 8.42, 8.33 and 8.25.

Lowest average number of whitefly were found in Imidachloprid @ 1ml/3L of water treated plots (T<sub>16</sub> plots), Neem oil @ 0.2% treated plots (T<sub>8</sub> plots) and Dimethoate 1.5 ml/lit treated plots (T<sub>18</sub> plots), it was 1.46, 2.25, 2.50 respectively.

Significant highest yield (Table 2 and Fig. 2) was recorded in all the treatments when compared with the check.

Highest yield was recorded (1.97 kg/plot) in Imidachloprid @ 1ml/3L of water treated plots (T<sub>16</sub> plots) followed by Dimethoate 1.5 ml/lit treated plots (T<sub>18</sub> plots), Neem oil @ 0.2% treated plots (T<sub>9</sub> plots), Neem oil @ 0.1% treated plots (T<sub>8</sub> plots) and yield recorded were 1.82, 1.78, 1.75 respectively. Yield of T<sub>16</sub> and T<sub>18</sub> were statistically at par.

Based on the investigations, it can be concluded that insecticide like Imidachloprid @ 1ml/3ltr of water and botanical oil like Neem @ 0.2% can be recommended as spray schedule for the control of the disease.

### Acknowledgements

The authors are thankful to the Gayeshpur Farm, BCKV, for providing with the necessary plant product oils/botanical pesticides without which it would have been impossible to conduct the experiment.

### References

Annual Report. 2009. AICRP on MULLaRP, IIPR, Kanpur 208 024.

- Borah, R.K., Nath, P.D. and Deka, M. 1996. Effect of insecticides and crop trap on the incidence of whitefly *Bemisia tabaci* (Genn.) and yellow mosaic virus in greengram *Vigna radiata* (L.) wilczek. *Indian J. Virol.*, 12 (1):75-77.
- Chenulu, V.V. and Verma, A. 1988. Virus and virus-like diseases of pulse crops commonly grown in India. In: Baldev, B., Ramajunam, S., Jain, H.K. (Eds.), *Pulse Crops*. Oxford and IBH, New Delhi, pp. 338-370.
- Ganapathy, T. and Karuppiah, R. 2004. Evaluation of new insecticides for the management of whitefly (*Bemisia tabaci* Genn.), mungbean yellow mosaic virus (MYMV) and urdbean leaf crinkle viruses (ULCV) diseases in mungbean (*Vigna radiata* (L.) Wilczek). *Indian J. Pl. Prot.*, 32 (1): 35 -38.
- Ghosh, D., Laha, S.K. and Biswas, N. K. 2009. Effect of different pesticides on incidence of mungbean yellow mosaic virus incidence. *Int. J. Pl. Prot.*, 2 (1): 67-70.
- Honda, Y., Iwaki, M. and Saito, Y. 1983. Mechanical transmission, purification and some properties of whitefly-borne mungbean yellow mosaic virus in Thailand. *Plant Dis.*, 67: 801-804.
- Jones, D.R. 2003. Plant viruses transmitted by whiteflies. *Eur. J. Plant Pathol.* 109:195- 219.
- Malik, B.A. and Bashir, M. 1992. Major diseases of food legume crops of Islamic countries, In: Jamil, F.F., Naqvi, S.H.M. (Eds.), *Proceedings of COMSTECH-NIAB International Workshop of Agroclimatology Pests and Disease and Their Control*, pp. 25-38.
- Singh, A. and Sirohi, A. 1997. Effect of various insecticides for the control of yellow mosaic of blackgram. *Pl. Disease Res.*, 12 (1): 37 - 38.

**How to cite this article:**

Dharnendra Reang, M. Ranjana Devi, Aparajita Dhar and Nath, P.S. 2018. Comparative Evaluation of Botanicals and Chemical Insecticides and their Suitable Use for the Management of Yellow Mosaic Virus (YMV) of Mungbean. *Int.J.Curr.Microbiol.App.Sci.* 7(09): 2094-2101. doi: <https://doi.org/10.20546/ijemas.2018.709.255>