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## EFFICACY OF INSECTICIDES AND BOTANICALS AGAINST *BREVICORYNE BRASSICAE* POPULATION ON CABBAGE

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### ABSTRACT

The investigation was conducted on the “Efficacy of insecticides and botanicals against *Brevicoryne brassicae* population on cabbage” at field of Vegetable Research and Demonstration Block, College of Horticulture, VCSG UHF, Bharsar during 2018. Among the insecticides Imidacloprid 17.8% SL (0.0356%), Thiamethoxam 25% WG (0.0025%), Spinosad 45% SC (0.0144%) and Acetamiprid 20% SP (0.002%) were found effective against *B. brassicae* whereas, Novaluron 10% EC (0.0075%) was found least effective against the pest (i.e. 57.15 and 19.12 per cent change over control at the end of 1<sup>st</sup> and 2<sup>nd</sup> spray, respectively). In botanicals Neem leaf extract + Cow urine (5%) was observed highly effective (i.e. 32.29 and 8.59 per cent change over control at the end of 1<sup>st</sup> and 2<sup>nd</sup> spray, respectively) and Lantana leaf extract + Cow urine (5%) was observed least effective against *B. brassicae* (i.e. 22.08 and 6.02 per cent change over control at 15 days after both spray, respectively).

**Keywords:** Cabbage, *Brevicoryne brassicae*, Efficacy, Insecticides, Botanicals

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## INTRODUCTION

Cabbage (*Brassica oleracea* var *capitata*) is the most popular vegetable grown throughout the world which belongs to the family Cruciferae and genus Brassica. Cabbages are a highly nutritious food source and contain a high amount of minerals and vitamins like A, B1, B2 and C (Hasan and Solaiman., 2012). Cabbage covers about 4.3% of total area under vegetables in India (Vanitha *et al.*, 2013) and in cabbage production India is next to China.

In India, a total of 37 insect pests have been reported to feed on cabbage (Lal., 1975). The extent of damage due to these pests in India is known to range from 7 to 90 per cent with consequent reduction in yield from 20 to 80 per cent on cabbage (Prasad., 1963). Among these pests, Cabbage aphids (*Brevicoryne brassicae*) are one of the most important pests of cabbage. Aphids feed by sucking sap from their host plants and continued feeding by aphids causes yellowing wilting and stunting of plants (Opfer and Mcgrath., 2013). Aphids infested plants show slow growth, which results in 35-75% yield losses (Khan *et al.*, 2015).

## Methodology

The experiment was conducted in the Vegetable Research and Demonstration Block, Department of Vegetable Science, College of Horticulture, VCSG Uttarakhand University of Horticulture and Forestry, Bharsar, Pauri Garhwal with ten treatments and three replications in RCBD (Randomized Complete Block Design).

To reduce insect pest infestation, various insecticides are applied and those insecticides could lead to problem of the insect resistance, environmental and food contamination and reduced populations of natural enemies which may result in secondary pest outbreaks or pest resurgences (Garratt and Kennedy., 2006). Therefore use of alternatives including botanicals, bio pesticides and new insecticides is essential to reduce pest resurgences. Among the new insecticides Thiamethoxam, Imidacloprid and Acetamiprid are the important neonicotinoids insecticides (Maienfisch *et al.*, 1999). Iwasa *et al.* (2004) reported that Imidacloprid is a fastest acting neonicotinoid insecticide for controlling sucking insects. On the other hand several workers were reported on the use of plant extract and cow urine for the control of insect pests of field crops (Dubey *et al.*, 2004 and Sharma *et al.*, 2009). In botanical plant extracts *Azadirachta indica*, *Lantana camera* and *Eupatorium spp.* are found promising to manage cabbage aphid (Sood *et al.*, 2000). The efficacy of cow urine in combination with neem extract is found highly effective in aphid (Gupta., 2005).

The botanicals and insecticides of required concentration were prepared in water just before spraying during evening. All botanical leave extracts were prepared by soaking 100 g chopped leaves in 1 liter cow urine for 15 days before application and the insecticidal solution was prepared by using following formula:

$$V = \frac{C \times A}{\%a.i.}$$

Where,

V = Volume of the insecticide

C = Concentration required

A = Amount of spray solution needed

%a.i. = Per cent of active ingredient of the insecticide

The spraying was done by using hand sprayer fitted with hollow cone nozzle. The first spray was given on 03<sup>th</sup> June 2018 and the second spray was on 19<sup>th</sup> June 2018. Numbers of insects in cabbage field were recorded at 1 day before spray and 3, 7, 11 and 15 days after both spray. Percent reduction of insect over control

was recorded according to the following formula

$$\text{PROC\%} = \left(1 - \frac{T_a \times C_b}{T_b \times C_a}\right) \times 100$$

Where,

PROC = Population reduction over control

T<sub>a</sub> = Population of insects after treatment application

T<sub>b</sub> = Population of insects before treatment application

C<sub>a</sub> = Population of insects in control after treatment application

C<sub>b</sub> = Population of insects in control before treatment application

#### Treatments Details:

Nine treatments along with control were evaluated against cabbage aphids (*B. brassicae*) on cabbage. The details of treatment were given in Table 1.

**Table No 1: Details of different insecticides and botanicals evaluated against cabbage aphids.**

T.No.	Treatments	Dose (%)
T <sub>1</sub>	Control	-
T <sub>2</sub>	Neem leaf extract + Cow urine	5
T <sub>3</sub>	Lantana leaf extract + Cow urine	5
T <sub>4</sub>	Parthanium leaf extract + Cow urine	5
T <sub>5</sub>	Eupatorium leaf extract + Cow urine	5
T <sub>6</sub>	Novaluron 10% EC	0.0075
T <sub>7</sub>	Thiamethoxam 25% WG	0.0025
T <sub>8</sub>	Imidacloprid 17.8% SL	0.0356
T <sub>9</sub>	Spinosad 45% SC	0.0144
T <sub>10</sub>	Acetamiprid 20% SP	0.002

#### Impact of various treatments on cabbage aphid after first spray

The data obtained after first spray are presented in Table No 2 and Table No 3. After first spray all the treatments were

found effective against cabbage aphid compared with untreated control. Among the insecticides the minimum aphid population was recorded in plot treated with Imidacloprid 17.8% SL with 97.54,

82.26, 74.32 and 90.62 aphids per plant at 3, 7, 11 and 15 days after spray, respectively, followed by the plot treated with Thiamethoxam 25% WG and Acetamiprid 20% SP. The per cent changes in aphid population are also observed highest (i.e. 64.35, 70.78, 74.89 and 70.52 per cent reduction over control at 3, 7, 11 and 15 days after spray) in the plot treated with Imidacloprid 17.8% SL. Spinosad 45% SC was also found effective against aphid with 114.33, 98.32, 88.95 and 102.67 aphids per plant (i.e. 49.14, 57.48, 63.42

and 59.34 per cent reduction over control) at 3, 7, 11 and 15 days after spray, respectively. Neem leaf extract + Cow urine was found highly effective among the botanicals with 112.67, 125.92, 133.00 and 142.33 aphids per plant at 3, 7, 11 and 15 days after spray, respectively, and the per cent change was also found highest on it. Parthaniun leaf extract + Cow urine and Eupatorium leaf extract + Cow urine were observed quit effective against aphid compared with Lantana leaf extract + Cow urine.

**Table No. 2: Efficacy of different insecticides and botanicals against cabbage aphid after first spray**

T. No.	Treatments	Dose (%)	No. of cabbage aphid/ plant				
			Pre spray count	After 1 <sup>st</sup> application			
				3 DAS	7 DAS	11 DAS	15 DAS
T <sub>1</sub>	Control	-	225.67 (15.06)	231.67 (15.25)	238.31 (15.47)	250.56 (15.86)	260.19 (16.16)
T <sub>2</sub>	Neem leaf extract + Cow urine	5	182.33 (13.54)	112.67* (10.66)	125.92* (11.26)	133.00* (11.57)	142.33* (11.97)
T <sub>3</sub>	Lantana leaf extract + Cow urine	5	203.67 (14.29)	150.00* (12.28)	166.32* (12.93)	173.29* (13.20)	182.66* (13.55)
T <sub>4</sub>	Parthaniun leaf extract + Cow urine	5	215.00 (14.69)	147.67* (12.19)	165.08* (12.88)	171.67* (13.14)	181.25* (13.50)
T <sub>5</sub>	Eupatorium leaf extract + Cow urine	5	189.33 (13.79)	137.00* (11.74)	146.79* (12.15)	157.20* (12.57)	165.99* (12.92)
T <sub>6</sub>	Novaluron 10% EC	0.0075	210.00 (14.52)	116.67* (10.84)	100.43* (10.07)	90.28* (9.55)	103.75* (10.23)
T <sub>7</sub>	Thiamethoxam 25% WG	0.0025	251.33 (15.89)	97.74* (9.93)	80.74* (9.04)	78.19* (8.89)	92.50* (9.67)
T <sub>8</sub>	Imidacloprid 17.8% SL	0.0356	266.67 (16.36)	97.54* (9.92)	82.26* (9.12)	74.32* (8.67)	90.62* (9.57)
T <sub>9</sub>	Spinosad 45% SC	0.0144	219.00 (14.83)	114.33* (10.73)	98.32* (9.96)	88.95* (9.48)	102.67* (10.18)
T <sub>10</sub>	Acetamiprid 20% SP	0.002	238.67 (15.48)	109.60* (10.51)	97.93* (9.95)	86.17* (9.33)	99.42* (10.02)
	SE(d)	-	0.915	1.22	1.08	0.85	1.01
	C.D. <sub>(0.05)</sub>	-	1.93	2.58	2.28	1.80	2.12

DAS- days after spray, ( ) = Values in parentheses are square root transformed value, \*Significant at 5% level of significance compared with control

Table No. 3: Change in cabbage aphid population after first spray.

T.No.	Treatments	Dose (%)	Per cent change in aphid population after first spray			
			3 DAS	7 DAS	11 DAS	15 DAS
T <sub>1</sub>	Control	-	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
T <sub>2</sub>	Neem leaf extract + Cow urine	5	39.81* (39.10)	34.60* (36.01)	34.48* (35.94)	32.29* (34.61)
T <sub>3</sub>	Lantana leaf extract + Cow urine	5	28.14* (32.01)	22.53* (28.32)	23.24* (28.81)	22.08* (28.00)
T <sub>4</sub>	Parthaniun leaf extract + Cow urine	5	33.13* (35.12)	27.28* (31.47)	28.07* (31.98)	26.98* (31.28)
T <sub>5</sub>	Eupatorium leaf extract + Cow urine	5	29.50* (32.87)	26.56* (31.00)	25.21* (30.12)	23.95* (29.28)
T <sub>6</sub>	Novaluron 10% EC	0.0075	45.89* (42.62)	54.72* (47.68)	61.28* (51.49)	57.15* (49.09)
T <sub>7</sub>	Thiamethoxam 25% WG	0.0025	62.12* (51.99)	69.57* (56.50)	71.97* (58.01)	68.08* (55.57)
T <sub>8</sub>	Imidacloprid 17.8% SL	0.0356	64.35* (5332)	70.78* (57.25)	74.89* (59.90)	70.52* (57.09)
T <sub>9</sub>	Spinosad 45% SC	0.0144	49.14* (44.49)	57.48* (49.28)	63.42* (52.76)	59.34* (50.36)
T <sub>10</sub>	Acetamiprid 20% SP	0.002	55.26* (48.00)	61.14* (51.41)	67.48* (55.20)	63.87* (53.03)
	SE(d)	-	0.68	0.56	0.61	0.45
	C.D. <sub>(0.05)</sub>	-	1.43	1.19	1.28	0.95

DAS- days after spray, ( ) = Values in parentheses are angular transformed value

### Impact of various treatments on cabbage aphid after second spray

The data of second spray are presented in Table No 4 and Table No 5. After second spray among insecticides the highest efficacy was observed in the plot treated with Imidacloprid 17.8% SL *i.e.* 52.33, 32.92, 38.89 and 49.99 aphids per plant and the per cent reduction over control was 43.93, 66.23, 60.30 and 50.04 per cent at 3, 7, 11 and 15 days after second spray, respectively. Thiamethoxam 25% WG, Acetamiprid 20% SP and Spinosad 45% SC were also found effective against aphid population. In insecticides the lowest efficacy against cabbage aphid

was recorded in the plot treated with Novaluron 10% EC. Just like after first spray among the botanicals Neem leaf extract + Cow urine again observed highly effective against aphid *i.e.* 131.67, 137.33, 141.33 and 144.67 aphids per plant and the per cent change over control was 10.19, 10.3, 8.91 and 8.59 per cent at 3, 7, 11 and 15 days after second spray, respectively. Among all the treatments after control Lantana leaf extract + Cow urine was observed less effective (*i.e.* 175.00, 181.67, 185.00 and 188.67 aphids per plant at 3, 7, 11 and 15 days after spray, respectively) against cabbage aphid.

**Table No. 4: Efficacy of different insecticides and botanicals against cabbage aphid after second spray.**

T. No.	Treatments	Dose (%)	No. of cabbage aphid/ plant			
			After 2 <sup>nd</sup> application			
			3 DAS	7 DAS	11 DAS	15 DAS
T <sub>1</sub>	Control	-	268.00 (16.40)	280.00 (16.76)	283.67 (16.87)	287.33 (16.98)
T <sub>2</sub>	Neem leaf extract + Cow urine	5	131.67* (11.51)	137.33* (11.76)	141.33* (11.93)	144.67* (12.03)
T <sub>3</sub>	Lantana leaf extract + Cow urine	5	175.00* (13.27)	181.67* (13.51)	185.00* (13.63)	188.67* (13.77)
T <sub>4</sub>	Parthanium leaf extract + Cow urine	5	170.33* (13.08)	176.33* (13.31)	180.33* (13.46)	184.91* (13.63)
T <sub>5</sub>	Eupatorium leaf extract + Cow urine	5	157.67* (12.55)	163.78* (12.79)	165.78* (12.91)	168.00* (13.00)
T <sub>6</sub>	Novaluron 10% EC	0.0075	92.64* (9.67)	86.33* (9.34)	91.67* (9.62)	92.26* (9.65)
T <sub>7</sub>	Thiamethoxam 25% WG	0.0025	62.40* (7.96)	48.40* (7.02)	55.33* (7.51)	64.33* (8.08)
T <sub>8</sub>	Imidacloprid 17.8% SL	0.0356	52.33* (7.30)	32.92* (5.82)	38.89* (6.32)	49.99* (7.14)
T <sub>9</sub>	Spinosad 45% SC	0.0144	86.00* (9.32)	78.15* (8.89)	84.60* (9.25)	91.00* (9.59)
T <sub>10</sub>	Acetamiprid 20% SP	0.002	82.67* (9.14)	71.67* (8.52)	78.67* (8.92)	88.67* (9.47)
	SE(d)	-	1.20	1.14	0.87	1.01
	C.D. <sub>(0.05)</sub>	-	2.54	2.41	1.84	2.13

DAS- days after spray, ( ) = Values in parentheses are square root transformed value, \*Significant at 5% level of significance compared with control.

**Table No. 5: Change in cabbage aphid population after first spray after second spray.**

T.No.	Treatments	Dose (%)	Per cent change in aphid population after second spray			
			3 DAS	7 DAS	11 DAS	15 DAS
T <sub>1</sub>	Control	-	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
T <sub>2</sub>	Neem leaf extract + Cow urine	5	10.19* (18.60)	10.33* (18.74)	8.91* (17.36)	8.59* (17.02)
T <sub>3</sub>	Lantana leaf extract + Cow urine	5	6.63* (14.90)	7.56* (15.90)	7.08* (15.38)	6.02* (14.19)
T <sub>4</sub>	Parthanium leaf extract + Cow urine	5	08.59* (17.03)	9.30* (17.73)	8.57* (16.96)	7.63* (16.03)
T <sub>5</sub>	Eupatorium leaf extract + Cow urine	5	08.17* (16.58)	8.87* (17.31)	8.39* (16.80)	7.51* (15.88)
T <sub>6</sub>	Novaluron 10% EC	0.0075	13.30* (21.36)	22.67* (28.41)	19.14* (25.93)	19.12* (25.92)
T <sub>7</sub>	Thiamethoxam 25% WG	0.0025	34.47* (35.93)	51.34* (45.75)	44.47* (41.80)	37.02* (37.45)
T <sub>8</sub>	Imidacloprid 17.8% SL	0.0356	43.93* (41.49)	66.23* (54.45)	60.30* (50.93)	50.04* (45.01)
T <sub>9</sub>	Spinosad 45% SC	0.0144	18.67* (25.58)	29.26* (32.73)	24.39* (29.58)	19.36* (26.09)
T <sub>10</sub>	Acetamiprid 20% SP	0.002	19.27* (26.02)	33.02* (35.05)	27.45* (31.58)	19.37* (26.10)
	SE(d)	-	0.65	1.10	0.88	0.69
	C.D. <sub>(0.05)</sub>	-	1.39	2.32	1.85	1.46

DAS- days after spray, ( ) = Values in parentheses are angular transformed value

After both sprays the efficacy was recorded to be minimum in plots treated with Imidacloprid 17.8% SL followed by Thiamethoxam 25% WG, Acetamiprid 20% SP and Spinosad 45% SC. The present findings are also correlated with observation made by Ghosal *et al.* (2013) who reported that Imidacloprid to be the best effective insecticidal treatment against the aphids with 84.54 per cent protection over control followed by Thiamethoxam and Acetamiprid. The present investigation on neonicotinoid molecules against aphid also appeared similar to the finding of Mishra (2002) and Jafarpour *et al.*, (2011) who reported that

neonicotinoids have good ingestion toxicity in comparison with others. Jadhav *et al.* (2016) also observed that

Imidacloprid was best insecticide as compared to Thiamethoxam and sAcetamiprid. Varghese and Mathew (2012) concluded that Imidacloprid, Thiamethoxam and Acetamiprid were highly effective against aphid when compared with Spinosad.

Among the botanicals, after both sprays, Neem leaf extract + Cow urine caused maximum per cent reduction in aphid population followed by Parthanium leaf extract + Cow urine, Eupatorium leaf

extract + Cow urine and Lantana leaf extract + Cow urine. These results are similar to the findings of Sable and Kushwaha (2014) who reported that Neem leaf extract and Parthaniun leaf extract were more effective than Lantana leaf extract. Ali and Zedan (2015) also reported that Eupatorium leaf extract causes maximum mortality on *B. brassicae* than Lantana leaf extract.

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