

## Evaluation of Some Eco-Friendly Biorationals against Aphids, *Nasonovia ribisnigri* in Lettuce

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### ABSTRACT

Six biorationals viz. *Beauveria bassiana* (20 g/L), Neem oil (5 ml/L), Ginger rhizome extract (5%), Garlic bulb extract (2%), *Lantana camara* extract (5%) and Tobacco leaf extract (5%) were evaluated against lettuce aphids, *Nasonovia ribisnigri*. The study was conducted in Random Block Design with seven treatments having three replications each. In the six months study period, our study reported the highest aphid count reduction in plots treated with Neem oil and *B. bassiana* with a per cent reduction of 95% and 93.60% respectively.

**Keywords** Lettuce, Biorationals, Aphids, Eco friendly.

### INTRODUCTION

Lettuce (*Lactuca sativa*) is an annual leafy vegetable originating from the Middle East. Lettuce is mostly eaten raw in the form of salad and is used as the base of the salad and is considered as the most popular leafy vegetable amongst all salad vegetable crops (Squire *et al.* 1987). The salubrious climate in northeast region provides scope of lettuce cultivation from small scale kitchen garden for self consumption to large scale production for export purposes. As an annual crop, it can be easily grown nevertheless factors like insect pest limits its production and cultivation. *Nasonovia ribisnigri* (Mosley) is an important aphid pest of lettuce foliage (Blackman and Eastop 2000). Aphids have been recorded to be amongst the most notorious pest attacking the lettuce crop by sucking the sap of the leaves, causing deformation in the shoots, appearance of spots and ultimately leading to loss of the value of the crop. While managing aphids with chemicals has been found to be effective especially in a short span of time, issues like adverse effect on human health, ill effects on non target organisms like parasitoids and predators, effect on the environment has raise concerns. Lettuce is preferably consumed raw thereby increasing the likelihood of consuming pesticide residues. Plant extracts referred as bioicide or green pesticides can be an alternative good source of chemical pesticide due to their safe, eco-friendly and more compatible properties. Microbial formu-

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lations also form an integrative part of eco friendly pest management aspect (Rahman *et al.* 2016). *B. bassiana* have been reported by Vishal *et al.* (2019) effective against mustard aphid. An organic and eco friendly approach is therefore required to meet the growing needs of the consumers. Unattended aphid infestations or negligence to control *N. ribisnigri*, and other species of aphids, on lettuce can lead to the rejection of heads for processing and the fresh market. This study was carried out in order to evaluate some eco friendly approaches with the use of biorationals in lettuce for managing aphids whilst maintaining ecological benefits, health and economical benefits at the same time.

## MATERIALS AND METHODS

The present study was carried out in Upper Forest Colony, Kohima, Nagaland, situated at the coordinates 25.40°N latitude and 94.88° E longitude at an elevation of 1382 meters above sea level. The lettuce variety viz. Red Revolution was used for this study. A total of 21 numbers of plots measuring 40 x 25 cm each were laid out in Randomized Block Design (RBD) with a total of three replications for the study. All intercultural operations were done as and when necessary. Five numbers of plants was selected randomly from each plot and tagged. The incidence of insect pest was recorded from 7 days after transplanting up to harvest of the crop at weekly intervals. The number of aphids was counted from the underside of three leaves, one each from upper, middle and lower canopy per plant. There were two spraying schedules, 1<sup>st</sup> spray was initiated after the appearance of the insect pest population and the 2<sup>nd</sup> application was carried out after 15 days. Observation on the efficacy of different treatment was recorded as pre and post treatment. One day before the application of treatment the pest population was recorded to stress the exchange of implication before treatment and subsequently at 3, 5, 7 and 9 days after each spraying schedule to study the efficacy of the treatments. Thus, the percent (%) reduction in the pest infestation was worked out with the following formula.

$$\text{Percent reduction} = \frac{\text{Pre treatment count} - \text{post treatment count}}{\text{Pre treatment count}} \times 100$$

Treatments assigned are listed below

- T0: Control
- T1: Neem oil (5 %)
- T2: Tobacco leaf extracts (5%)
- T3: Garlic bulb extracts (2%)
- T4: Lantana leaf extracts (5%)
- T5: Ginger extract (5%)
- T6: Beauveria bassiana ( $1 \times 10^8$  CFU/ ml)

### Preparation of treatments

#### Preparation of Tobacco leaf extracts (5%)

Tobacco leaves weighing 50 grams was boiled in 1 liter water for 30 minutes. The mixture was subsequently filtered using a muslin cloth; the solution was further added with water to make a final volume of 1 liter. Before spraying one per cent soap was added for free tobacco release.

#### Preparation of Garlic bulb extracts (2%)

For the garlic bulb extract two to three large bulb of garlic was collected and made into a paste, 20gm of the paste was collected and added to 20 ml of kerosene and was allowed to sit overnight, the next day the mixture was stirred and 1% of detergent was added, the solution was then added with water to make a final volume 1litre garlic extract.

#### Preparation of lantana leaf extracts (5%)

Fresh *L. camara* leaves were collected and washed properly to remove any unwanted dirt; it was thereafter allowed to dry at room temperature. The dried leaves were grinded to form a texture of fine powder; 50 gram of the powder was collected and soaked in water overnight. Following day, the solution was filtered off using a muslin cloth and clean water was added to the solution to obtain 1 liter, 1% detergent was added to the solution before application.

#### Preparation of ginger rhizome extracts (5%)

50 gm of ginger rhizome was collected and grinded into a paste; water was added into the paste to make a 3 liter solution. The solution was allowed to stay overnight. After which 12 ml of detergent/soap was

added and stirred and then it was strained using a muslin cloth following the technique by Sridhar *et al.* 2002. Neem oil and *B. bassiana*, sold under the brand names Multineem and Baba, respectively, were the additional biorationals employed in the study. They were obtained from Agri Clinic in Kohima, Nagaland.

### Statistical analysis

The data collected for various observations was subjected to the statistical analysis of variance (Anova) by Random Block Design. "F test" was used to determine the significance and non significance of the variance due to the different treatments.

## RESULTS AND DISCUSSION

The observations on per cent reduction in aphid population count are presented in Table 1. The data collected on the population of aphids in lettuce 24 hours before the first spray was found to be non significant. 3 days after the first spray, it was apparent that all the treatments were significantly effective as compared to control. The highest percentage reduction in the population of aphids was observed from the plots treated with Neem oil (53.06%) followed by plots treated with *B. bassiana* (31.13%). After 5 days of application from the first spray, the highest

percentage reduction in the population of aphids was observed from the plots treated with *B. bassiana* (84.83%) followed by plots treated with Neem oil (84.72%) and tobacco leaf extract (75%). Seven days after the first spray, the treatments persisted to show its performance in reducing the aphid count. The highest percentage reduction in the population of aphids was observed from the plots treated with Neem oil (90.21%) with an average of 1.07 aphid population. *B. bassiana* recorded reduction of 89.70% with an average of 1.27 aphid count. After nine days of application of the first spray, the treatments continued to show satisfactory results except for *L. camara* extract and ginger extracts plots as the average aphid in these plots became higher than the untreated controlled plot. The highest percentage reduction in the population of aphids was observed from the plots treated with *B. bassiana* (84.35%) followed by plots treated with Neem oil (83.53%) and garlic bulb extract (76.57%) while the lowest percent reduction was observed in ginger extract (62.17%). 15 days after the first spray of the biorationals, the second spray of treatments was done. 24 hrs before the second spray, the average population of aphids showed significant difference amongst the different treatments. The average population count of aphids in all the treated plots ranging (2.60 - 4.40) was slightly lesser as compared to the controlled untreated plot (4.70). The 3<sup>rd</sup> day aphid

**Table 1.** Efficacy of different treatments against of aphids, *Nasonovia ribisnigri* during the period November 2020 to April 2021.

Treatments	Concentration	Pre treatment count 24 hrs	First spray (Percent reduction)			
			3 DAS	5 DAS	7 DAS	9 DAS
Neem oil	5ml/ lit	10.93	5.13 (53.06)	1.67 (84.72)	1.07 (90.21)	1.80 (83.53)
Tobacco leaf extract	5ml/ lit	8.00	6.07 (24.13)	2.00 (75.00)	1.67 (79.13)	2.07 (74.13)
Garlic bulb extract	2ml/ lit	10.80	10.07 (6.76)	5.73 (46.94)	2.60 (75.93)	2.53 (76.57)
Lantana leaf extract	5ml/ lit	12.47	11.33 (9.14)	6.73 (46.03)	3.33 (73.30)	3.07 (75.38)
Ginger extract	5ml/ lit	7.93	5.53 (30.26)	6.07 (23.46)	3.80 (52.08)	3.00 (62.17)
<i>Beauveria bassiana</i> 1×10 <sup>8</sup> CFU/ ml	1ml/ lit	12.33	8.47 (31.13)	1.87 (84.83)	1.27 (89.70)	1.93 (84.35)
Control		9.47	11.27 (-19.01)	9.40 (0.74)	6.80 (28.19)	2.67 (71.81)
SEM±		4.97	1.85	0.80	0.48	0.37
CD at 5%		NS	3.94	1.70	1.02	0.79

Table 1. Continued.

Treatments	Concentration	Pre treatment count 24 hrs	Second spray (Per cent reduction)				Mean
			3 DAS	5 DAS	7 DAS	9 DAS	
Neem oil	5ml/ lit	2.60	2.40 (78.04)	1.20 (89.02)	0.5 (95.00)	0.5 (95.00)	1.78 (83.57)
Tobacco leaf extract	5ml/ lit	2.80	3.80 (52.50)	1.40 (82.50)	0.9 (91.30)	0.8 (92.50)	2.33 (71.39)
Garlic bulb extract	2ml/ lit	4.00	4.13 (61.76)	2.47 (77.13)	1.00 (90.85)	0.9 (91.30)	3.67 (65.90)
Lantana leaf extract	5ml/ lit	4.33	4.20 (66.32)	2.73 (78.11)	1.13 (90.84)	1.00 (90.85)	4.19 (57.08)
Ginger extract	5ml/ lit	4.40	4.27 (46.15)	3.13 (60.53)	1.27 (89.84)	1.13 (90.84)	3.52 (56.91)
<i>Beauveria bassiana</i> 1×10 <sup>8</sup> CFU/ ml	1ml/ lit	2.67	2.67 (78.35)	1.67 (86.46)	0.7 (93.60)	0.7 (93.60)	2.41 (80.25)
Control		4.70	5.00 (47.20)	2.80 (70.43)	1.80 (83.53)	1.80 (85.53)	5.09 (49.00)
SEm±		0.49	0.31	3.06	0.32	0.29	-
CD at 5%		1.03	0.66	6.51	0.68	0.62	-

count in the plot treated with *B. Bassiana* and Neem oil gave the best per cent reduction in aphid count. After five days of application the average number of aphids ranged from 1.20 to 2.47 on the treated plants against 3.06 in untreated controlled plants. The highest percentage reduction in the population of aphids was observed from the plots treated with Neem oil (89.02%) followed by plots treated with *B. bassiana* (86.46%) and tobacco leaf extract (82.50%) while the lowest percent reduction was observed in ginger extract (60.53%). After the 7<sup>th</sup> and 9<sup>th</sup> day of the second spray, it can be seen from the table that the percentage reduction of the insect pest continued to increase on all the plots where Neem oil (95%) was observed to have the highest percentage reduction followed by *B. bassiana* (93.60%). From the above finding, it is clear that among the six different treatments applied the most effective treatment for aphids in lettuce is found on the plots treated with Neem oil. These finding are in accordance to the findings of Borkar *et al.* (2012) who also reported that, the application of Neem oil 1% emerged as the most effective treatment in recording the minimum population of aphids. Mandage and Yeole (2015) also observed lowest infestation of sucking pests like aphids, jassids and higher yield over control with Neem oil @ 1%. Bunker *et al.* (2006) have also

reported neem oil 2% and NSKE 10% was effective against aphid. Vishal *et al.* (2019) also recorded that treatment *B. bassiana* CFU 1×10<sup>8</sup> and Neem oil 2.0% proved effective against mustard aphid.

## CONCLUSION

Among the different treatments used in the study, Neem oil and *B. bassiana* gave good results 83.57 % and 80.25 % in reducing the overall aphid population count. The range and overall control efficacy of each biorational described here will aid pest management and organic farmers in selecting the most suitable product to control aphids.

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