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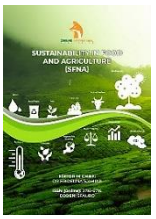

RESEARCH ARTICLE

INTEGRATED PEST MANAGEMENT OF MUSTARD APHID, LIAPHIS ERYSIMI (KALT.) ON RAPESEED CROPS IN GOKULESHWOR, BAITADI

Santoshi Malla*, Lal Bista, Yogesh Singh Dhanuk, Aasish Neupane

Institute of Agriculture and Animal Sciences, Tribhuwan University, Baitadi, Nepal.
****Corresponding Author e-mail: mallasantoshi77@gmail.com***

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ABSTRACT

An experiment was conducted at Gokuleshwor, Baitadi to evaluate the management practices of Lipaphiserysimi (Kalt.) during Rabi season in 2017/18.Field experiment was laid out in a randomized complete block design (RCBD) with 5 treatments and 3 replications. The treatments were:1) *jholmol @250 ml/litre of water*2) 2) Altineem @2.5ml/litre of water 3) Cow urine @250 ml/litre of water 4) Mustard cake @25kg/ha and 5) untreated (control). Each plot consists of 2m*2m ($4m^2$). Field experiment showed that the highest reduction of *Lipaphiserysimi* (Kalt.) was achieved in jholmol followed by *altineem* but these two treatments were statistically at per during almost all the spray times. Thus, jholmol might be the best option in eco-friendly management of *Lipaphiserysimi* (Kalt).

KEYWORDS

Mustard aphid, RCBD, Jholmol, Altineem, Ecofriendly

1. INTRODUCTION

Mustard (Brassicae juncea L.) is an annual crop which is mainly cultivated for its oil rich seeds. It has bright yellow flowers belonging to family Brassicaceae. It contains round 40-45% oils and 24% protein (Das, 2014). In Nepal, it is grown in 217867 ha with the annual production of around 208291 mt (MOALD 2019/20). The term rape derived from Latin word for turnip, rapum. According to the United States Department of Agriculture, rapeseed was the third leading source of vegetable oil in the world in 2000, after soyabean and palm oil. It is the world's second leading source of protein meal after soyabean (Heuze et al.,2000). Kular and Kumar reported that losses in seed yield due to attack of insects pests vary 6.5-26.4 percent on different Brassica crop species. Its production is affected by dozen of insects among which Mustard Aphid is the major one (Bakhetia and Sekhon, 1989).

It is found in most of the temperate to tropical areas of the world and attacks on the cruciferous plants. It lives in dense group on the underside of the leaves which sucks the sap causing yellowing and curling of leaves. Mustard aphid, Lipaphis erysimi (Kalt.) was the most serious insect-pest of rapeseed-mustard and responsible for causing the yield losses ranging from 35.4 to 96 percent depending upon weather condition. In Nepal, yield loss upto 35% was recorded in Brassica campestris var. toria by insects-pests (Kafle, 2015). It is the key pest of mustard-rapeseed which reduces the crop production both qualitatively and quantitatively varying from 35.4% to 73.3% under different agro climatic conditions and can be seen upto 80% in the case of severe infestation as well it also transmit plant viral diseases (Chowla and Baruah,1990; Bedford et al., 1997; Atwal, 1976). It is a soft-bodied greenish yellow minute pest whose both adult and the nymph sucks the sap from succulent leaves, stems, pods.

The antennae are dark, the legs are pale having dark joints and cornicles with plae color with dark tips. The body is fainted dusty with white powder on its body. Its length is aound 1.4-2.4 mm. It sucks the oil from the pods and seeds which leads to decline in mustard production. Aphid causes 35.4 % to 91.3 % decline in yield (Singh and Sachan, 1994). It also reduced 5-6% of oil content of rapeseed as well as mustard (Shylesha et al., 2006). For the Aphid infestation and multiplication, Temperature and relative humidity plays a vital role (Vekaria and Patel 2000). In high moisture area where relative humidity is high, the aphid infestation is also high and less in low moisture, dry areas. Now a day, mustard oil rate is high and one reason behind it is that the production declines too much which creates the shortage of mustard which leads to skyrocketing prices of mustard oils. Low yield has turned the country into edible oil importing country from an exporting one nowdays (Pradhan, 2008). To optimize and stabilize the mustard production, there is a need of consideration towards the effective aphid management practices. Management practices such as Cow urine, Mustard Cake, Neembicides, Wood Ash, Jholmol, use of Predators, are Ecofriendly rather than chemical ones.

Figure 1: Aphid Infestation in Mustard's Inflorescence recorded in our field

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2. Materials and Methods

A field experiment was carried out at Gokuleshwor Agriculture and Animal Science Collage, Gokuleshwor, Baitadi. Research site was located at Baitadi district, Gokuleshwor VDC. Baitadi district lies in high hills of Nepal at an elevation of 700m above mean sea level and lies between 27030' North latitude and 83027' East longitude. Previously rice cultivated land was selected for our research and longitudinal layout of field was facing with east-west direction. Research was done in plain field and our experimental site was at first covered with weeds and grasses. So, we clean the whole field and then ploughed on 2076/8/21 by power tiller and levelled with the help of spade and racker. The soil was pulverized in the fine particles for ensuring the better growth of the rapeseed.

FYM was applied @4 doko during land preparation and fertilizer was applied at recommended dose 60:30:30 NPK kg/ha for rapeseed. Urea @ 2.8 gm/plot, DAP @ 2.6gm/plot MOP @ 1gm/plot were applied as basal dose of plant nutrients. The experiment was laid out in randomized complete block design (RCBD) included five treatments and four replications. The plot size of each treatment was 2m×2m (4m2) and distance maintained between two plots was 0.5m and each replication was separated by 1m. Seed was used as a planting material for rapeseed. Local variety of rapeseed was broadcasted @ 3gm/plot on 2076/9/1. Germination was observed after 10 days of broadcasting. Thinning out, weeding and irrigation were carried out at regular interval to ensure better growth.Most of the time there are only 1 or 2 caterpillars in each whorl as they become cannibalistic where larger one will eat each other to reduce competition for food. The caterpillar excrement (Frass) can also be seen in leaf whorl upon drying it resembles as sawdust. If the plant has already developed cobs the caterpillar will eat its way through the protective leaf bracts into the side of the cob & starts feeding on developing young kernels(seeds). There might be 6-7 instars depending upon environment & food availability. Later instars increase food consumption rate & the final instars consume food even in greater quantity than all other previous instars combined (Luginbill, 1928). The larval development duration also varies accordingly, at 25 C larval development takes about 22 days.

Table 1: Treatment combination

Treatment number	Treatment used
T1	Jholmol
T2	Cow urine
T3	Mustard cake
T4	Neemicide
T5	Distilled water

Observations were taken from 10cm apical central shoot of inflorescence from 10 randomly selected plants of each plot and the both pre-treated and post-treated observation was taken for mustard aphid, lady bird beetle, and honeybee. First, the collected data were entered in excel sheet then it was analyzed with the help of statistics tool gen-stat. The output of analysis presented in forms of table and figures and intrepted finding with relevant literatures.

3. Results and Discussions

Table 2: Number of aphids population before and after treatments

Treatments	Before spray	2 DAFS	4 DAFS	6 DAFS
Neem (3ml/l of water)	16.450 a	13.7500 a	12.5425 b	10.2250 b
Cow urine (1:4 ratio)	12.050 a	11.3875 a	10.4550 b	10.2825 b
Jholmol (1:4 ratio)	20.225 a	10.0000 a	9.4450 b	7.6250 b
Mustard cake (25kg/ha)	14.900 a	15.7250 a	12.4050 b	11.0000 b
Controlled	17.425 a	13.6000 a	24.5000 a	24.8750 a
Mean	16.21	12.89	13.87	12.80
CV (%)	42.85	53.41	38.63	63.92
LSD(0.05)	10.70	10.61	8.25*	12.60.

DAFS: Days after first spray

The result was non-significant regarading to the aphids populations prior to treatment and population of aphids ranged from 12.05 to 20.22 aphids/plant. Observation recorded at 2 days after first spray(2DAFS), indicates no significant difference among different treatments with consider to the aphid population and the aphid population ranged from 10 to 15 aphids/plant.

The highest population was recorded from mustard cake pot (15.75 aphids/plant) which was statistically at par with all other treatments and the lowest aphid population was recorded from jholmol (10 aphids/plant). Observations recorded at 4 days after first spray (4DAFS) shows significant difference among the treated and untreated plots. Maximum aphid population (24.5 aphids/plant)was recorded on the untreated plot which significantly higher than the rest of the treatments. Observations recorded at 6 daysafter first spray (6DAFS) also shows significant difference among the treated and untreated plots having maximum aphid populations on untreated plot (24.87 aphids/plant) and all biologically treatments were statistically par with each other's.

Table 3: Number of aphids after second spray

Treatments	2 DASS	4 DASS	6 DASS
Neem (3ml/l of water)	8.4250 b	7.525 b	6.6000 b
Cow urine (1:4 ratio)	9.2250 b	8.325 b	9.6500 b
Jholmol (1:4 ratio)	4.7250 b	2.875 b	9.7250 ab
Mustard cake (25kg/ha)	12.8250 ab	9.000 b	7.4675 b
Controlled	23.7875 a	26.025 a	19.6800 a
Mean	11.79	10.75	10.62
CV (%)	62.09	59.38	61.13
LSD (0.05)	11.28*	9.83**	10.01.

DASS: Days of second spray

There was significant result found at 2 days after second spray (DASS) having highest population of aphids was recorded in the untreated plot (23.78) which was statistically as par with mustard cake (12.820) and the lowest population of aphids was recorded in jholmol (4.72) which was statistically as par with other biological treatments. On 4 days of second spray there was significant difference among treated plots and untreated pilot having highest population recorded in untreated plot (26.025) whereas all other biologically treated plots were statistically similar in aphid counts having lowest count on jholmol (2.85). Likewise, on 6 days after second spray, highest population was recorded in untreated plot (19.68) which seems statistically similar with jholmol (9.72) and lowest population was recorded in neem (6.60) which was statistically similar with cow urine and mustard cake.

Table 4: Number of aphid population after third spray

Treatments	2 DATS	4 DATS	6 DATS	Average
Neem (3ml/l of water)	5.8675 bc	4.9725 bc	4.1300 bc	9.04875 b
Cow urine (1:4 ratio)	8.1250 b	7.5575 b	7.1250 b	9.41825 b
Jholmol (1:4 ratio)	2.5350 c	2.1575 c	2.1525 c	7.14650 b
Mustard cake (25kg/ha)	6.7575 bc	5.5200 bc	5.5625 bc	10.11625 b
Controlled	16.3050 a	15.4500 a	12.7500 a	19.43975 a
Mean	7.92	7.13	6.34	11.03
CV (%)	39.59	34.66	48.94	26.62
LSD(0.05)	4.83***	3.81***	4.78**	4.52***

DATS: Days of third spray

There was highly significant aphid population recorded on 2 days after third spray (DATS) having highest population of aphid was recorded untreated plot (16.30 aphid/plant) whereas population on other

biological treatments were found significantly lower and lowest population of aphid was recorded in jholmol (2.53aphids/plant) which was statistically different from other biological treatments. Likewise, on 4 days of third spray and 6 days of third spray there was a high significant aphid population recorded having highest population recorded in untreated plot and lowest population was recorded in jholmol which was statistically different than other biological treatments. On average the number of aphid population in rapeseed was found significantly. The highest population was recorded in untreated plot (19.43aphids/plant) whereas all other biological treatments were statistically par with each other and lowest recorded in Jholmol (7.15 aphid/plant).

4. Conclusion

Mustard aphid, Lipaphiserysimi (Kalt.) was the most serious insect-pest of rapeseed-mustard, responsible for causing the yield losses ranging from 35.4 to 96 percent depending upon weather condition. Yield loss up to 35% was recorded in Brassica campestris var. toria by insect-pestsin the context of Nepal. Chemical pesticide has residual effects resulting toxicity and it kills the beneficial insects as well as chemical traces are accumulated in mustard seeds and enters in our body which oil extracted from these seeds are consumed. So, it is instructed to use chemical fertilizer as a last option. Farmers are attracted towards the other methods to control aphid havoc such as Cow urine, Mustard Cake, Neembicides, Wood Ash, Jholmol, use of Predators, rather than chemical ones. These methods are cost-effective, no residual effect and no any harm to applicators as well. Reduction in crop production due to various factors such as flood, landslide, late monsoon and infestation of major diseases and insect-pests in research area.

In Baitadi district about 426 ha area under rapeseed cultivation and the main reasons behind it are poor agricultural practices, only local innovation and majority of infestation by diseases and insects' pests. The aphid infestation is severe in research area as a result high yield loss in rapeseed production faced by the farmers and farmers are unaware of effective management of aphid on rapeseed. Thus, the study on Eco-friendly management of aphid on rapeseed allow to know the intensity of infestation of aphid on rapeseed and its extent of damage along with evaluating the effectiveness of control tactics. Locally available materials such as Artemesia vulgaris, cow urine, neem products etc. are considered as best option for the management of mustard aphids in rapeseed. Obtained result from our experiment shows jholmol was considered as most effective means for the management of mustard aphid in rapeseed but others biological treatments has also statistically similar effects on management of mustard aphids.

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