Environment and Ecology 43 (2) : 468—474, April—June 2025
Article DOI: https://doi.org/10.60151/envec/QLNU5420
ISSN 0970-0420

Efficacy of Some Insecticides against Major Insect Pests of Knolkhol (*Brassica oleracea* var. *gongylodes*)

Kevikiesa Khezhie, Waluniba, Sabbithi Pavan

Received 28 March 2024, Accepted 24 April 2025, Published on 17 May 2025

ABSTRACT

Knolkhol (*Brassica oleracea* var. *gongylodes*) belongs to the family Cruciferae and is an excellent source of various nutrients. It can be consumed raw as salad or as cooked, but throughout the growing period it is attacked by several pests which reduces the quality and quantity of the crop. Keeping in mind the damages caused by the pests, a field study was conducted during the *rabi* season of 2022-23 to study efficacy of some insecticides against major insect pests of knolkhol. The study was performed using Randomized Block Design with 6 treatments including one control and 3 replications. Twelve species of insects were found to attack knolkhol out of which green peach aphid (*Myzus persicae*) and cabbage butterfly (*Pieris canidia*) were the major pests. Six chemicals were used for evaluation viz., emamectin benzoate, spinosad, chlorantriniprole, pongamia oil, imidacloprid, neem oil. Imidacloprid recorded the highest population reduction of *Myzus persicae* and *Pieris canidia* with 91.89% and 87.61% respectively followed by neem oil (83.46%) for *Myzus persicae* and emamectin benzoate (74.55%) for *Pieris canidia.*The highest benefit cost ratio was obtained from imidacloprid 17.8 SL (2.29:1) followed by spinosad (1.94:1). Based on the overall findings, imidacloprid 17.8 SL proved to be the most effective in controlling the pest populations of knolkhol at same time giving the highest benefit cost ratio.

Keywords Knolkhol, Efficacy, Insect pests, Insecticides, Management.

INTRODUCTION

Knolkhol (*Brassica oleracea* var. *gongylodes*) is a winter season crop that belong to the family Cruciferae. In India knolkhol is widely grown in Northern part of India such as Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh and some in the South, but commercial cultivation is not practiced. It is commonly known as Kholrabi or GanthGobhi in India and is cultivated for its knobs which are consumed raw as salad or cooked.

Knolkhol can be cultivated in a wide range of soil with ideal pH ranging from 6.0 to 7.0. It requires a cool and moist climatic condition with temperatures ranging from 15^0C to 18^0C for knob formation. It is

Kevikiesa Khezhie[1]*, Dr Waluniba[2], Sabbithi Pavan[3]

[2,3]Assistant Professor

[1,2,3]Department of Entomology, School of Agricultural Sciences, Nagaland University, Medziphema Campus, Nagaland 707106, India

Email: kevikhez@gmail.com
*Corresponding author

very sensitive to high temperatures and can cause a significant alteration in the physical and biochemical function of the plant. It has a chromosome number of 2n=18 and is a cross pollinated crop. The crop has tremendous medicinal properties in treating diseases such as acidosis, asthma, cancer, cholesterol level, heart problems, indigestion, muscle and nerve functions, prostate and colon cancer, skin problems, weight loss (Chauhan *et al.* 2016).

Throughout the growing period, knolkhol is attacked by several insect pest right from the seedling stage till harvest which reduces the quantity and quality of the product to a great extent. Some of the commonly occurring pest of knolkhol includes aphids, cabbage caterpillar, diamond back moth, flea beetle the natural enemies such as coccinellids, syphrids and parasitoids regulates the pest population. The diamond back moth is reported to be a serious pest in the states of Punjab, Haryana, Maharashtra, Bihar, Himachal Pradesh and Uttar Pradesh (Gaikwad *et al.* 2018). Cabbage butterfly (*Pieris brassicae*), green peach aphid (*Myzus persicae*) and tobacco caterpillar (*Spodoptera litura*) are reported to be the most devastating pest of cole crops in the North Eastern region of India (Sharma *et al.* 2019).

Keeping in mind the amount of damage caused by these insects, it is necessary to develop proper management strategies and reduce the damages caused by these pests. Hence the research on the topic "Efficacy of some insecticides against major insect pests of knolkhol" was done.

MATERIALS AND METHODS

The field experiment entitled "Efficacy of some insecticides against major insect pests of knolkhol" was carried out in the Experimental farm, Department of Entomology, SAS Medziphema campus, during *rabi* season of 2022-23.

The experiment was carried out by using Randomized Block Design (RBD). It consisted of 7 treatments (6 chemical insecticides and 1 untreated) with 3 replications each using the variety green star. Evaluation was carried out using six chemiclas viz. emamectin benzoate 5% SG, Spinosad 45% SC, chlorantriniprole 18.5% SC, pongamia oil 3.18% karanjin, imidacloprid 17.8 SL and neem oil 0.03% azadirachitin.

Pre-treatment count was carried out one day before the application of treatments. The treatments were applied twice through foliar spays when the insect pest population was at the highest. Subsequent counting of pest population at 3, 5 and 7 days was followed. The data collected during the observation period was subjected to statistical analysis of variance (ANOVA) by Randomized Block Design (RBD) using one way analysis of variance.

RESULTS AND DISCUSSION

Efficacy of some insecticides against major insect pests of knolkhol

Study on the efficacy of some insecticides against *Myzus persicae* and *Pieris canidia,* six chemicals viz. emamectin benzoate 5% SG, spinosad 45% SC, chlorantriniliprole, pongamia oil, imidacloprid 17.8 SL, and neem oil were used. The results obtained are discussed below.

Efficacy against *Myzus persicae*

First spray

Pre-treatment population for *Myzus persicae* was recorded in the range of 44.62 to 69.86, which showed non-significant at 5% level of critical difference.

After 3 days of spraying, the highest percent reduction was found in the plot treated with Imidacloprid (80.27%), followed by emamectin benzoate (66.46%), spinosad (64.10%), neem oil (62.50%), chlorantriniprole (59.46%). Pongamia oil showed the lowest reduction of aphids with 55.54% reduction.

After 5 days of spraying, the highest percent reduction was observed in Imidacloprid (92.76%) followed by neem oil (88.45%), emamectin benzoate (82.43%), spinosad (79.43%), chlorantriniprole (66.40%), while the lowest percent reduction was recorded from plots treated with pongamia oil (62.90%).

After 7 days of spraying, the results showed the highest percent reduction was observed in imidacloprid with 96.78% reduction which was followed by neem oil (93.93%), emamectin benzoate (93.30%), spinosad (90.17%) and chlorantriniprole (79.23%). Pongamia oil recorded the lowest reduction with 71.30% reduction. However, all the treatments proved to be more effective in controlling the aphid population as compared to the untreated plot. The mean reduction after the first spray are as follows, imidacloprid (89.93%), neem oil (81.62%), emamectin benzoate (80.73%), spinosad (77.90%), chlorantriniprole (68.30%) and pongamia oil (63.20%).

Second spray

The second application of the treatments were carried out 15 days after the first spraying when the aphid population increased. Pre-treatment population recorded was in the range of 12.75 to 18.80.

After 3 days of second spraying, it showed a significant reduction in the aphid population over the controlled plot. The highest per cent reduction was found in the plots treated with imidacloprid (88.78%), followed by neem oil (76.88%), spinosad (66.67%), emamectin benzoate (62.82%), and chlorantriniprole (52.65%), while pongamia oil (50.66%) recorded the least percent reduction.

After 5 days of spraying, the highest per cent reduction was observed in imidacloprid (95.59%), followed by neem oil (83.92%), spinosad (80.79%), emamectin benzoate (78.38%), chlorantriniprole (64.49%) and pongamia oil (62.75%) respectively.

After 7 days of spraying, imidacloprid recorded the highest reduction at 97.16% reduction, followed by neem oil (95.10%), emamectin benzoate (86.00%), spinosad (84.39%), chlorantriniprole (72.23%) and pongamia oil (69.94%) respectively.

As per the data recorded, all the treatments were superior to control in reducing the population of aphids than the controlled plots. After computing the data of the different treatments (Table 1), the mean data revealed that the highest mean percent reduction was observed in imidacloprid (91.89%), followed by neem oil (83.46%). Pongamia oil (62.18%) recorded the lowest reduction of the aphid population. Workers like Dotasara *et al.* (2017) revealed that imidacloprid 17.8 SL @0.2 g/L proved to be the best in checking the population of aphids, neem oil 2% @2.0 ml/L was also found to be effective in controlling the aphid population. The data and chart for *Myzus persicae* are shown in Table 1 and Fig. 1 respectively.

Table 1. Effect of some insecticides against *Myzus persicae* on knolkhol during October 2022- February 2023.

Treatments	Pre-treatment count	First spray Percent reduction 3 DAS	5 DAS	7 DAS	Percent reduction mean after 1st spray
Emamectin benzoate: T_1	58.22	66.46 (54.63)	82.43 (65.22)	93.30 (75.09)	80.73
Spinosad: T_2	46.42	64.10 (53.22)	79.43 (63.03)	90.17 (71.73)	77.90
Chlorantriniprole: T_3	44.62	59.46 (50.45)	66.40 (54.58)	79.23 (63.02)	68.36
Pongamia oil: T_4	69.86	55.54 (48.19)	62.90 (52.50)	71.30 (57.61)	63.24
Imidacloprid: T_5	46.00	80.27 (65.08)	92.76 (74.44)	96.78 (79.74)	89.93
Neem oil: T_6	55.11	62.50 (52.32)	88.45 (70.41)	93.93 (75.80)	81.62
Control: T_7	56.26	(0.00)	(0.00)	(0.00)	(0.00)
SEm±	7.59	3.64	1.39	1.26	-
CD at 5%	NS	11.22	4.27	3.89	-

Table 1. Continued.

Treatments	Pre-treatment count	Second spray Percent reduction 3 DAS	5 DAS	7 DAS	Percent reduction mean after 2nd spray	Overall mean (Per cent reduction)
Emamectin benzoate: T_1	17.15	62.82 (52.64)	78.36 (62.42)	86.00 (68.41)	75.72	78.22
Spinosad: T_2	16.88	68.67 (56.06)	80.79 (64.13)	84.39 (66.91)	77.95	77.92
Chlorantriniprole: T_3	17.06	52.65 (46.52)	64.49 (53.45)	72.23 (58.77)	63.12	65.74
Pongamia oil: T_4	15.04	50.66 (45.38)	62.75 (52.40)	69.94 (56.83)	61.11	62.18
Imidacloprid: T_5	12.75	88.78 (70.86)	95.59 (59.35)	97.16 (80.88)	93.84	91.89
Neem oil: T_6	18.80	76.88 (61.35)	83.92 (66.46)	95.10 (77.80)	85.30	83.46
Control: T_7	21.49	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SEm±	2.07	4.65	2.61	3.75	-	-
CD at 5%	NS	14.33	8.04	11.55	-	-

Note: Figures in the table are mean values and those in parenthesis are angular transformed values.
NS: Non-significant at 5% level of significance.

Efficacy of some insecticides against *Pieris canidia* (cabbage butterfly)

Pre-treatment count for the population for *Pieris canidia* was recorded in the range of 1.40 to 2.47 and 1.07 to 1.67 (mean larval population) for 1st and 2nd spraying respectively.

First spray

After 3 days of spraying, it was evident that all the treatments had significant reduction in the pest population. The highest reduction was recorded from plots treated with imidacloprid (77.27%), followed by neem oil (68.25%), emamectin benzoate (66.89%), spinosad (65.33%), chlorantriniprole (52.38%) and pongamia oil (50.00%) respectively.

After 5 days of spraying, the highest percent reduction was observed in imidacloprid (90.30%), followed by spinosad (81.41%), neem oil (78.97%),

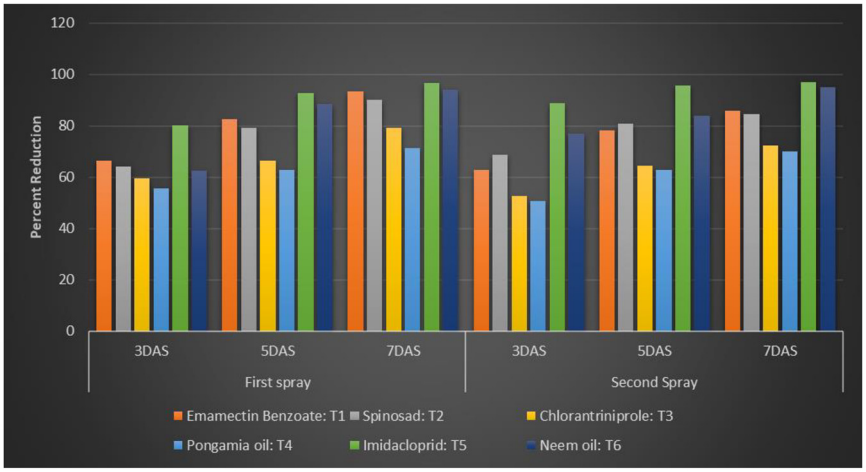

Fig. 1. Effect of some insecticides against *Myzus persicae* on knolkhol during October 2022- February 2023.

emamectin benzoate (77.73%), pongamia oil (61.57%), while chlorantriniprole (60.71%) recorded the lowest percent reduction in *Pieris canidia* population.

After 7 days of spraying, the results revealed the highest per cent reduction was observed in imidacloprid (100%) which was followed by spinosad (89.94%), emamectin benzoate (86.96%), neem oil (84.13%), chlorantriniprole (69.64%), while the lowest reduction was observed on plots treated with pongamia oil (67.36%) of all the treatments after the first spray, imidacloprids was found to be the most effective giving the highest per cent mean reduction of 89.19% and the least was observed in pongamia oil with 59.64%.

Second spray

The second application of treatments was carried out 15 days after the first spraying when the pest population increased. After 3 days of spraying, imidacloprid (62.86%) recorded the highest percentage reduction of *Pieris canidia,* which was followed by neem oil (56.67%), emamectin benzoate (56.02%), spinosad (52.78%), chlorantriniprole (35.00%) and pongamia oil (33.33%) respectively.

After 5 days of spraying, the plots treated with imidacloprid recorded the highest percentage reduction of 95.24%, which was followed by neem oil (78.33%), emamectin benzoate (71.76%), spinosad (68.06), chlorantraniprole (53.33%), while the lowest reduction was recorded from plots treated with pongamia oil (52.78%).

After 7 days of spraying, 100% reduction was recorded from plots treated with imidacloprid, which was followed by emamectin benzoate (87.96%), neem oil (78.33%), spinosad (77.78%), chlorantriniprole (60.00%) and pongamia oil (58.33%) respectively.

After computing the data of the different treatments (Table 2), the mean data revealed that the highest mean per cent reduction was observed in imidacloprid (87.61%), followed by emamectin benzoate (74.55%), neem oil (74.11%), spinosad (72.55%), chlorantriniprole (55.17%) and pongamia oil (53.89%) respectively. Thus, we can conclude that Imidacloprid 17.8 SL was the best treatment in reducing the population of *Pieris canidia*, while pongamia oil was the least effective with 53.89 %. Workers like Khan and Kumar (2017) reported that imidacloprid recorded a reduction of *Pieris* population by 93.33%. The data and chart for *Pieris canidia* are represented

Table 2. Effect of some insecticides against *Pieris canidia* on knolkhol of October 2022- February 2023.

Treatments	Pre-treatment count	First spray Percent reduction 3 DAS	5 DAS	7 DAS	Percent reduction mean after 1st spray
Emamectin benzoate: T_1	2.47	66.89 (54.92)	77.73 (62.04)	86.96 (69.30)	77.19
Spinosad: T_2	2.27	65.33 (54.27)	81.41 (64.74)	89.94 (74.83)	78.89
Chlorantriniprole: T_3	1.53	52.38 (46.37)	60.71 (51.37)	69.64 (57.33)	60.91
Pongamia oil: T_4	1.40	50.00 (45.00)	61.57 (51.72)	67.36 (55.16)	59.64
Imidacloprid: T_5	2.07	77.27 (61.66)	90.30 (71.86)	100.00 (90.00)	89.19
Neem oil: T_6	1.50	68.25 (55.72)	78.97 (62.78)	84.13 (66.53)	77.11
Untreated: T_7	1.87	(0.00)	(0.00)	(0.00)	(0.00)
SEm±	0.25	4.53	3.48	4.41	-
CD at 5%	NS	13.95	10.71	13.59	-

Table 2. Continued.

Treatments	Pre-treatment count	Second spray Percent reduction 3 DAS	5 DAS	7 DAS	Percent reduction mean after 2nd spray	Overall mean (Percent reduction)
Emamectin benzoate: T_1	1.67	56.02 (48.48)	71.76 (58.04)	87.96 (69.71)	7.91	74.55
Spinosad: T_2	1.47	52.78 (46.60)	68.06 (55.66)	77.78 (61.97)	66.20	72.55
Chlorantriniprole: T_3	1.07	35.00 (36.15)	53.33 (46.92)	60.00 (50.85)	49.44	55.17
Pongamia oil: T_4	1.13	33.33 (30.00)	52.78 (46.49)	58.33 (49.84)	48.14	53.89
Imidacloprid: T_5	1.27	62.86 (52.52)	95.24 (82.60)	100.00 (90.00)	86.03	87.61
Neem oil: T_6	1.07	56.67 (48.85)	78.33 (62.29)	78.33 (62.29)	71.11	74.11
Untreated: T_7	2.00	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SEm±	0.21	7.90	6.64	3.08	-	-
CD at 5%	NS	21.84	19.90	9.50	-	-

Note: Figures in the table are mean values and those in parenthesis are angular transformed values. NS: Non-significant at 5% level of significance.

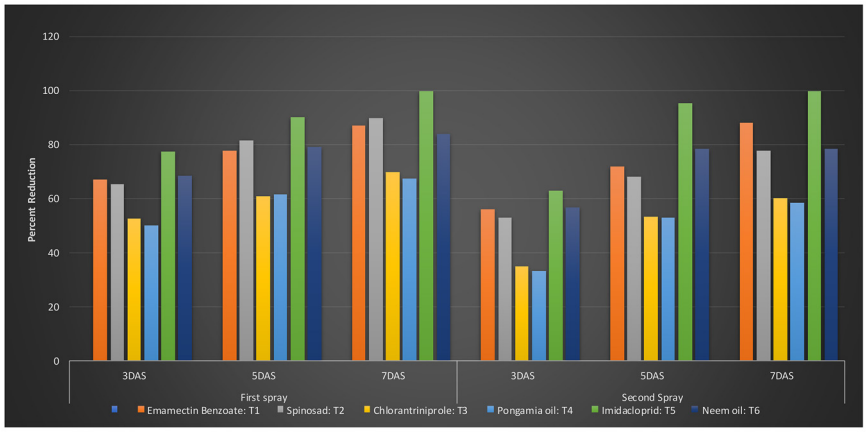

Fig. 2. Effect of some insecticides against *Pieris canidia* on knolkhol during October 2022- February 2023.

Table 3. Effect of different insecticides on benefit cost ratio of knolkhol.

Treatments	Dose (ml or gram /L)	Dose (ml or gram /ha)	No. of sprays	Cost of pesticides (₹)	Fixed cost (₹)	Total cost of cultivation (₹)	Gross yield (kg/ha)	Value of gross yield (₹)	Net profit (₹)	Benefit cost ratio
Emamectin benzoate: T_1	0.4 g	200 g	2	4280	103250	107530	10390.88	311726.4	204196.4	1.89:1
Spinosad: T_2	0.5 ml	250 ml	2	18144	103250	121394	11934.08	358022.4	236628.4	1.94:1
Chlorantriniprole: T_3	0.4 ml	200 ml	2	7300	103250	110550	9773.6	293208	182658	1.65:1
Pongamia oil: T_4	4.0 ml	2000 ml	2	40000	103250	143250	10185.12	305553.6	162303.6	1.13:1

Table 3. Continued.

Treatments	Dose (ml or gram /L)	Dose (ml or gram /ha)	No. of sprays	Cost of pesticides (₹)	Fixed cost (₹)	Total cost of cultivation (₹)	Gross yield (kg/ha)	Value of gross yield (₹)	Net profit (₹)	Benefit cost ration
Imidacloprid: T_5	0.25 ml	125 ml	2	570	103250	104390	11471.12	344133.6	239743.6	2.29:1
Neem oil: T_6	4.0 ml	2000 ml	2	7200	103250	110450	9825.04	294751.2	184301.2	1.67:1
Control						103250	3600.8	108024	4774	0.04:1

1. Cost of Emamectin benzoate- ₹ 107/10 g, Spinosad- ₹2268/75 ml, Chlorantriniprole- ₹365/20 ml, Pongamia oil- ₹200/100 ml. Imidacloprid- ₹570/250 ml, Neem oil- ₹180/100 ml.
2. Cost of knolkhol- ₹30/kg. 3. Fixed Cost- ₹103250.

in Table 2 and Fig. 2 respectively.

Benefit cost ratio

The data from Table 3 shows that the maximum Benefit cost ratio was obtained from imidacloprid 17.8 SL (2.29:1), followed by spinosad 45% SC (1.94:1), emamectin benzoate 5% SG (1.89:1), neem oil (1.67:1), chlorantraniprole (1.65:1), while the lowest benefit cost ratio was obtained from pongamia oil (1.13:1).

CONCLUSION

From the above findings we can conclude that for managing the major insect pests of knolkhol, imidacloprid 17.8 SL proved to be the most effective in controlling the pest populations at same time giving the highest Benefit cost ratio. It is well known that continuous use of synthetic pesticides causes significant hazards to human health and environment as well as the problem of pests becoming resistant to the pesticides. Hence, using the chemicals efficiently and in the required amount is necessary. The data of Benefit cost ratio is represented in Table 3.

ACKNOWLEDGMENT

I would like to take this opportunity to express my heartfelt gratitude to my eminent advisor Dr. Waluniba Assistant Professor, Department of Entomology, NU:SAS for his tireless guidance, supervision and contribution throughout the entire process of my research work.

I express my gratitude to Dr. Imtinaro L., Associate Professor and Head of Department, Department of Entomology and all the teaching and non-teaching staffs, for providing all the necessary facilities and kind cooperation during the course of study.

REFERENCES

Chauhan, E. S., Tiwari, A., & Singh, A. (2016). Phytochemical screening of Knol-Khol (*Brassica caulorapa*) owder and juice – A comparative study. *International Journal of Home Science*, 2,123–126.

Dotasara, S. K., Agrawal, N., Singh, N., & Swami, D. (2017). Efficacy of some newer insecticides against mustard aphid *Lipaphiserysim*i Kalt. in cauliflower. *Journal of Entomology and Zoology Studies,* 5 (2), 654-656.

Gaikwad, A. D., Bhede, B. V., Bokan, S. C., & Bhosle, B. B. (2018). Seasonal incidence of major insect pests, natural enemies on cauliflower and their correlation with weather parameters. *Journal of Entomology and Zoology Studies,* 6(5), 952-956.

Khan, H. H., & Kumar, A. (2017). Effect of certain chemicals and bio-pesticide on the 3rd instar larvae of the Ccbbage butterfly, *Pieris brassicae* (Linn.) (Lepidoptera: Pieridae). *Journal of Entomology and Zoology Studies,* 5(5), 753-755.

Sharma, B., Banerjee, A., Larinfeli, R., & Behere, G. (2019). Biodiversity of insect pests of cole crops in mid hills of Meghalaya. *The Pharma Innovation,* 8(6), 211-215.