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Population Dynamics of Cabbage aphid, *Brevicoryne brassicae* L. on Five Brassicae species *viz.* Cabbage, Cauliflower, Broccoli, Chinese cabbage and Radish

Jesonkere Sutnga, H. Shila Devi*, Imtinaro L., Damitre Lytan, Waluniba, Susanta Banik and Sabbithi Pavan
Department of Entomology, School of Agricultural Sciences,
Nagaland University, Medzipnema campus (Nagaland), India.

(Corresponding author: H. Shila Devi)*
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ABSTRACT: A field experiment was carried out in Randomized Block Design (RBD) having four replication with five treatment at Experimental Research Farm, Department of Entomology, School of Agricultural Sciences and Rural Development (SASRD), Nagaland University, Medziphema campus during November, 2021 to March, 2022 to study the population dynamics of Cabbage aphid, *Brevicoryne brassicae* L. on five brassicae species *viz.*, cabbage, cauliflower, broccoli, chinese cabbage and radish and their correlation with abiotic factors. The aphid attacked all the five brassicae crop *viz.*, cabbage, chinese cabbage, cauliflower, broccoli and radish. The population was low in the beginning but gradually increased and reached its highest peak in the first week (cauliflower and broccoli) and second week of March (cabbage, chinese cabbage and radish) and found till the harvesting of the crop. The aphid was found to be most prevalent on cabbage (3.80 aphids/plant) followed by broccoli (2.78 aphids/plant), cauliflower (2.58 aphids/plant), chinese cabbage (0.93 aphids/plant), and radish (0.93 aphids/plant). Correlation analysis indicated that aphid population had positive significant correlation to temperature (°C), negatively significant to relative humidity (%) but non-significant to rainfall in cabbage and chinese cabbage. While, in Cauliflower and broccoli, it was found to have positive significant correlation with maximum temperature, negative with minimum relative humidity and non-significant with other weather parameters. In radish, the aphid population was significantly positive correlated with maximum temperature and negative with relative humidity.

Keywords: Population dynamics, *Brevicoryne brassicae*, cabbage, chinese cabbage, cauliflower, broccoli, radish.

INTRODUCTION

Brassicaceae are considered as "cool season" vegetables because they can withstand light freezing temperatures. Most cole crops thrive best at temperatures between 60 and 65 °F. The species and genus from wild species prevalent in the Mediterranean region, *Brassica oleracea* was developed throughout western and central Europe. Although they are similar, they are not the same. Each group has had many variations created, varying in terms of insect susceptibility, temperature tolerance, form, colour, and growing season (Maynard and Hochmuth 1997). The most frequent pests among the many insect species that attack cruciferous vegetables are aphids. Although it originated in Europe (Sharma *et al*., 2022), the cabbage aphid, *B. brassicae* is now widespread across the temperate and warm temperate zones of the world (Blackman and Eastop 2000). This aphid is a severe pest of cabbage and a specialist of plants in the Brassicaceae family (Gabrys *et al*., 1997). *B. brassicae* reduces cabbage output from 70% to 80% when there is a strong infestation (Khattak *et al*., 2002; Rustamani *et al*., 1988). The infected plants grow slowly, losing 9–77% of their seed production and 11% of their seed oil content (Kelm and Gadomski 1995). Numerous studies on various aphid species have been conducted in the past across the nation, but the information on the relationship between the five brassicae crops (cabbage, chinese cabbage, broccoli, cauliflower, and radish) and the weather in the area has been relatively scarce. Therefore, the present experiment was conducted to study the population dynamics of cabbage aphid on brassicae crops.

MATERIALS AND MATHOD

A. Location of the experiment

The experiment was conducted at the experimental farm as well as in the Department laboratory, SASRD, NU, Medziphema Campus, under Chumukedima district, Nagaland during 2021-2022 crop seasons which lies at 21° 45′43″ North latitude and 93°C 52′04″ East longitudes at an elevation of 310 meters above sea level (MSL). The climate of this region was sub-humid with an average annual rainfall ranges from 2000-3000 mm. The moderate mean temperature ranges from 21 to 32°C during summer and winter from 10-15°C that rarely goes below 8°C with a relative humidity of 70 to 80%. The soil was sandy loam, acidic in nature with a pH ranging from 4.5-6.5.

B. Experimental details

Cabbage (Fire Ball), Cauliflower (Candid Charm), Broccoli (Green Magic), and Chinese cabbage (Melody) were sown in nursery on 15th November, 2021 and one month old seedlings were transplanted at a spacing of 45cm × 60cm and Radish (Japani White) radish were planted at 30cm × 10cm. Field experiment was carried out in Randomized Block Design (RBD) having four replication on each crop with five treatment. Aphids were counted from five randomly selected and tagged plant from each replication of all crops. Observation of the cabbage aphid population began two weeks after transplanting and was conducted by counting the population from one square inch of leaf area from two leaves per plant (top and bottom leave), by examining on both sides of the leaf at five randomly selected plants in each plot of five brassiace crops, and both nymph and adult were taken into consideration at weekly intervals until the crops were matured. Meteorological parameters *viz*., temperature, relative humidity and rainfall were collected and correlated with aphid population.

RESULTS AND DISCUSSION

Population dynamics of cabbage aphid (*Brevicoryne brassicae* L.) on different brassicae crops is presented in Fig. 1 and Table 1.

As evidence from Table 1 and Fig. 1 the population of cabbage aphid, *B. brassicae* on cabbage was observed throughout the cropping period. The weekly observation on cabbage aphid population showed that first appearance of cabbage aphid population was started from 3rd week of January, 2022 with a mean population of 0.63 aphids per plant. It was low at the beginning but gradually started to increase and reached its highest peak in the second week of March with a mean population of 3.80 aphids/plant. The second highest population was observed in the following week with a mean population of 3.53 aphids/plant (Table 1).

Present findings are similar with Aslam *et al*. (2007) who reported that the population of *B. brassicae* was highest during early to mid-March. However, Bhavani and Punnaiah (2006) reported that the highest population of cabbage aphid was observed during the second week of February while the minimum population was observed during last week of March which is contradictory with the present findings. The differences may be due to the variation in environmental conditions.

On Chinese cabbage the population started appearing from the end of January onwards. There was a marginal increase in aphid population and reached its highest population on chinese cabbage in the second week (0.93 aphids/plant) followed by third week on the month of March (0.83 aphids/plant) when the maximum and minimum temperature (°C), relative humidity (%) and rainfall (mm) were 33.50°C, 12.20°C, 92%, 37% and no rainfall respectively. The population was found till the harvesting of the crop. The result are in accordance with Indira *et al.* (2001) who found that *B. brassicae* had its peak population in the second week of March.

Table 1: Population dynamics of cabbage aphid (*Brevicoryne brassicae* L.) on different brassicae crops.

Date of observation	Aphid numbers/inch² leaf area				
	Cabbage	Chinese cabbage	Cauliflower	Broccoli	Radish
15 Jan 22	0.63	0.00	0.00	0.00	0.00
22 Jan 22	0.78	0.00	0.78	0.55	0.00
29 Jan 22	0.98	0.15	0.80	0.45	0.13
05 Feb 22	1.20	0.18	1.05	1.18	0.10
12 Feb 22	1.43	0.23	1.35	1.30	0.13
19 Feb 22	1.95	0.30	1.88	1.80	0.20
26 Feb 22	2.33	0.38	2.13	2.18	0.53
5 March 22	2.85	0.60	2.58	2.78	0.83
12 March 22	3.80	0.93	2.55	2.40	0.93
19 March 22	3.53	0.83	2.23	2.25	0.80

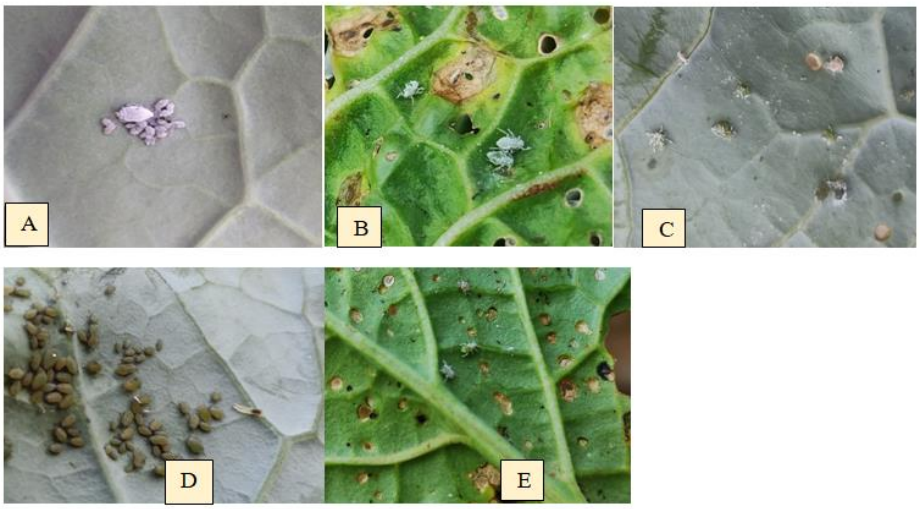

Fig. 1. [A] Cabbage; [B] Chinese cabbage; [C] Cauliflower; [D] Broccoli; [E] Radish.

In contrast to the present study, Raj and Sharma (1991) observed the maximum population of aphid during the first week of April. The variation could be due to prevailing climatic conditions.

There was no population of *B. brassicae* on cauliflower in the mid of January. The population started appearing on cauliflower on the last week of January and a significant increase was observed in the last part of February and reached its maximum population in the first week of March with a mean population of 2.58 aphids/plant. During this period the maximum and minimum temperature (°C), relative humidity (%) and rainfall (mm) were 31.00°C, 12.40°C, 94%, 37% and no rainfall respectively. The population was found till harvesting of the crop. Younas *et al.* (2004) observed that the aphid infestation was started at the last week of October with an average population density ranging from 0-11.33 aphids/cm^2 on five cauliflower cultivars and increased gradually and remained at the peak from 1st week of November to mid of November with an average population density of 0.00-31.76 aphids/cm^2 and 0.00-26.67/cm^2 on five cultivar which is at variation to the present study as the incidence of aphid in Nagaland appear slightly late. Bhat *et al*. (2012) reported two peak population of the aphid during October and June which is in contradictory with the present findings. The variation could be due to prevailing climatic conditions. However, Dogra *et al.* (2001) recorded the peak population of *B. brassicae* during the second week of March which corroborate with the present study.

The population of *B. brassicae* in broccoli revealed that its infestation initiated in the third week of January (0.55 aphids/plant). The population was low in the beginning but increased considerably by the last of February with a mean population of 2.18 aphids/plant. It reached its highest peak during the first week of March with a mean population of 2.78 aphids/plant. The population was high till the harvesting of the crop. During this period the maximum and minimum temperature (°C), relative humidity (%) and rainfall (mm) were 31.00°C, 12.4°C, 94%, 37% and no rainfall respectively. In contrast to the present study Bhevani and Punnaiah (2006) reported that the highest aphid population was observed on second week of February while the lowest was on the last week of March. Jahan *et al.* (2013) also found that the aphid population reached its peak infestation during the first half of November and later reduced from the second half of November. The variations could be due to different climate conditions.

No population was found at the beginning of growing period of radish. The population started to appear from 4th week of January, 2022 with a mean population of 0.13 aphids/plant which gradually increased and reached its highest population with0.93 aphids/plant in the 2nd week of March, 2022. Lowest population was found on radish as compared to other crops. Indira *et al*. (2001) found that the peak population of *B. brassicae* during second week of March. However, Jahan *et al.* (2013) studied on the population density of *B. brassicae* and found that aphid population reached peak infestation during the first half of November which are in contradictory with the present study. During the study period presented on Table 3, the correlation data between *B. brassicae* population and weather parameters on cabbage revealed that the aphid population was significant and positively correlated with the maximum and minimum temperature and negatively significant with the maximum and minimum relative humidity and non-significant with rainfall.

Table 2: Meteorological observations during the period of study (January 2022 to March 2022).

Standard Mean week	Date of observation	Temperature (ºC)		Relative humidity (%)		Rainfall (mm)
		Max.	Min.	Max.	Min.	
3	15 Jan 22	22.40	10.60	94.00	55.00	3.40
4	22 Jan 22	20.70	11.40	97.00	67.00	16.40
5	29 Jan 22	19.80	9.50	95.00	58.00	2.10
6	05 Feb 22	21.50	9.70	96.00	51.00	30.20
7	12 Feb 22	24.70	7.20	95.00	39.00	0.00
8	19 Feb 22	24.10	10.60	95.00	47.00	18.90
9	26 Feb 22	26.90	12.70	95.00	44.00	5.40
10	5 March 22	31.00	12.40	94.00	37.00	0.00
11	12 March 22	33.50	12.20	92.00	37.00	0.00
12	19 March 22	35.50	17.50	87.00	32.00	2.00

Table 3: Correlation coefficient (r) of cabbage aphid, *B. brassicae* with weather parameters recorded during January 2022 to March 2022.

Crops	Pearson's correlation coefficient				
	Temperature (ºC)		Relative humidity (%)		Rainfall (mm)
	Max.	Min.	Max.	Min.	
Cabbage	0.959**	0.678*	-0.728*	-0.843*	-0.402^{NS}
Chinese cabbage	0.953**	0.650*	-0.762*	-0.840*	-0.428^{NS}
Cauliflower	0.824**	0.510^{NS}	-0.463^{NS}	-0.795**	-0.278^{NS}
Broccoli	0.829**	0.515^{NS}	-0.458^{NS}	-0.827**	-0.237^{NS}
Radish	0.941**	0.678^{NS}	-0.677*	-0.799**	-0.495^{NS}

The computed results showed that the population of *B. brassicae* was substantially related with maximum and minimum temperature, maximum and minimum relative humidity, respectively. Similar finding was reported by Pal and Singh (2012) who found that the population build-up of *B. brassicae* was positively correlated to maximum temperature, minimum temperature and negatively correlated to relative humidity. In contrast, Kumar *et al.* (2009) observed that the aphid population exhibited non-significant negative correlation with maximum and minimum temperature, maximum and minimum relative humidity, rainfall and sunshine hours. Patra *et al.* (2012) also reported that correlation study between weather parameters and aphid population showed negative influence of temperature, relative humidity and rainfall on population growth of aphid.

On chinese cabbage the correlation showed that the aphid population had significant positive correlation with the maximum and minimum temperature but negatively with maximum and minimum relative humidity but non-significant with rainfall. Shalini and Kamal (2016) observed that the population of *B. brassicae* had significant positive influence of maximum and minimum temperature but there was no influence of rainfall in the population which corroborate the present findings. Bhavani and Punnaiah (2006) observed significant positive correlation between relative humidity and aphid population which is at variation to the present findings.

Correlation analysis on cauliflower showed that the aphid population was significantly and positively correlated with the maximum temperature and negatively significant with minimum relative humidity while non-significant with relative minimum temperature, maximum relative humidity and rainfall. Pal and Singh (2012) also recorded that the population build-up of *B. brassicae* was positively correlated to maximum temperature minimum temperature and negatively correlated to relative humidity and total rainfall. Patra *et al.* (2012) also reported that correlation study between weather parameters and aphid population showed negative influence of temperature, relative humidity and rainfall on population growth of aphid.

From correlation analysis of *B. brassicae* population on broccoli with weather parameters, there was significant positive correlation between aphid population and maximum temperature but negative with minimum relative humidity while non-significant with minimum temperature maximum relative humidity and rainfall. Similar finding was observed by Pal and Singh (2012) who reported that the population of *B. brassicae* was positively correlated to maximum temperature and negatively correlated with relative humidity and Shalini and Kamal (2016) who reported that the aphid population had significant positive influence of maximum temperature and negative influence of humidity. In contrast, Amini *et al.* (2012) observed that there was no significant relationship between weather values recorded and aphid population observed in the field. Patra *et al.* (2012) reported that aphid population showed negative influence of temperature, relative humidity and rainfall on population growth of aphid which is similar to the present findings.

Correlation analysis on radish indicated that the aphid population had significant positive correlation with the maximum temperature but found to have negative significant correlation with maximum and minimum relative humidity while non-significant with minimum temperature and rainfall. The result is supported by Shalini and Kamal (2016) who observed that the aphid population had significant positive correlation with maximum temperature and negative correlation with relative humidity and non-significant with rainfall. However, Raj and Sharma (1991) showed that temperature and relative humidity had no significant impact on the population build-up of *B. brassicae* and rainfall caused a reduction in the population which is at variation with the present findings.

Table 4: Extent of parasitization on *B. brassicae* in field condition on Cabbage, Chinese cabbage, Cauliflower, Broccoli and Radish during January, 2022 to March, 2022.

SMW	Date	% Parasitization of *B. brassicae*				
		Cabbage	Chinese cabbage	Cauliflower	Broccoli	Radish
3	15 Jan. 22	0	0	0	0	0
4	22 Jan. 22	0	0	0	0	0
5	29 Jan. 22	0	0	0	0	0
6	05 Feb. 22	0	0	0	0	0
7	12 Feb. 22	6.93	0	0	0	0
8	19 Feb. 22	7.45	0	4.15	3.25	0
9	26 Feb. 22	11.35	0	4.08	4.90	0
10	5 March 22	9.88	4.00	4.50	3.45	4.00
11	12 March 22	12.10	11.60	12.60	9.50	9.34
12	19 March 22	10.00	5.04	11.90	10.20	6.13

The presence of natural enemies and extent of parasitization which was recorded at weekly intervals from each plots of five (5) brassicae crops to maintain at natural condition. A total of five (5) natural enemies have been recorded in which all were predators [two (2) species of Coccinellids, Syrphids fly, Spider and Earwigs] were observed in the cabbage, chinese cabbage, cauliflower, broccoli and radish ecosystem.

As depicted in Table 4, the first parasitized aphid in cabbage was recorded on 12 February, 2022 (7th SMW). The highest aphid parasitization (12.10%) was recorded on 12 March, 2022 (11th SMW), and the lowest (6.93%)

was recorded on 12th February, 2022 (7th SMW). Dochovskiene *et al.* (2012) observed *Diaretiella rapae* reduced the population of cabbage aphid, *B. brassicae* by 15.5% in manure fertilized and 12.90% in synthetically fertilized plants which are more or less similar to the present findings. Sable *et al*. (2008) reported maximum parasitization of cabbage aphid by *Aphidius* spp. with 76.4 and 82.3% in 2002-03 and 2003-04 respectively. Shah *et al.* (2013) conducted studies on the seasonal dynamics of insect pest and their natural enemies in cabbage and cauliflower ecosystems and recorded high rate of parasitization of *Myzus persicae* by *Aphididus colemani* (90.2±5.6%) and *Brevicoryne brassicae* by *Diaeretiella rapae* (80.5±6.8%) by end of November. Chandra and Kushwaha (1987) reported that *Aphidius* spp. was a minor parasitoid which was effective from August to December, parasitizing upto 22.4% of aphids on mustard, cabbage and cauliflower which is at variation with the present findings. The differences may be attributed to differences in prevailing climatic conditions and cultivars.

There was no parasitization on chinese cabbage in the month of January and February, 2022. Parasitized aphid was started to observed in the first week of March but there was significant increase in the following week reaching its maximum parasitization on 12th March with 11.60% and found till harvesting of the crop. Amini *et al.* (2012) found the parasitization rate of *B. brassicae* in flood irrigated fields ranged from 1% to 11.99% which coincides the present findings. However, Sharma *et al.* (2020) found that among the parasitoids, *D. rapae* parasitized 43.80 and 24.20 per cent on cabbage aphid, *B. brassicae* (L) during 2017 and 2018, respectively. Duchovskiene and Raudonis (2008) studied the rate of parasitism of *B. brassicae* by *D. rapae* and recorded that *D. rapae* reduced the population of *B. brassicae* by 23.9 to 26.2%.

Bayhan *et al*. (2007) studied parasitization rate of *D. rapae* on *B. brassicae* on different brassicae cultivar and observed the highest parasitism of *B. brassicae* by *D. rapae* was found on cabbage (40.20%) and lowest on turnip (32.64%). The lower parasitization in the present study as compared to the above author may be due to differences in cultivar and weather parameters.

The first parasitized aphid in cauliflower was recorded in the mid of February (Table 4). The extent of parasitization ranged from 4.08% to 12.60%. The highest aphid parasitization was recorded on 12th March, 2022 (12.60%) and the lowest (4.08%) was recorded on 26th Febuuary, 2022. Similar findings was also reported by Duchovskiene *et al.* (2012) who observed that the *D. rapae* reduced the population of cabbage aphid, *B. brassicae* by 15.50% in manured fertilized and 12.90% in synthetically fertilized plants. The parasitization in the present study was found to be lower as compared to that reported by Chandra and Kushwaha (1987) who found that *Aphidius* spp. was a minor parasitoid which was effective from August to December, parasitizing upto 22.4% of aphids on mustard, cabbage and cauliflower.

The highest aphid parasitization (10.20%) on broccoli was recorded on 19th March 2022 (12th SMW), and the lowest (3.25%) was recorded on 19th February 2022 (8th SMW). Similar finding was reported by Amini *et al.* (2012) who recorded parasitism rate of *B. brassicae* ranged from 1.0 to 11.9% which is similar to the present findings. Sable *et al*. (2008) reported maximum parasitization of cabbage aphid by *Aphidius* spp. with 76.4 and 82.3% in 2002-03 and 2003-04 respectively. Chandra and Kushwaha (1987) reported that *Aphidius* spp. was a minor parasitoid which was effective from August to December, parasitizing upto 22.4% of aphids on mustard, cabbage and cauliflower which is at variation the present findings.

As shown in Table 4, no aphid parasitization was observed in the month of January and February, 2022. The parasitized population of aphid was started to appear in the first week of March and gradually increased and reached its maximum parasitization on radish on 12th March with 9.34%. The present findings is supported by Amini *et al*. (2012). Dochovskiene and Raudonis (2008) observed that *D. rapae* reduced the population of *B. brassicae* by 23.9-26.2% which is contradictory with the present study.

CONCLUSIONS

The finding of the present study indicate that Cabbage aphid, *Brevicoryne brassicae* attacked all the five brassicae crop. The Cabbage aphid population was recorded highest on cabbage crops followed by broccoli, cauliflower, Chinese cabbage and radish. Cabbage and Chinese cabbage were found to be positively significant correlation to temperature (°C), negatively significant to relative humidity (%) but non-significant to rainfall. Where as in Cauliflower and broccoli had shown positive significant correlation with maximum temperature, negative with minimum relative humidity and non-significant with other weather parameters. While in radish, the aphid population was significantly positive correlated with maximum temperature and negative with relative humidity.

FUTURE SCOPE

The weather has a significant impact on the pest's population dynamics. The study offers details on the timing of the initial infestation as well as the temperature-dependent peak activity of that specific insect. As a result, the population timing in this study is helpful for planning cabbage aphid management strategies during a critical infestation period.

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Conflict of Interest. None.

REFERENCES

Amini, B., Madad, H., Nicolas, D. and Lotfalizadeh, H. A. (2012). Impact of Irrigation Systems on Seasonal Occurrence of *Brevicoryne brassicae* and Its Parasitism by *Diaeretiella rapae* on Canola. *Journal of Entomological Research Society*,*14*(2), 15-26.

Aslam, M., Razaq, M., Ahmad, F. and Mirza, Y. H. (2007). Population abundance of aphids (*Brevicoryne brassicae* L. and *Lipaphis erysimi* Kalt.) on Indian

mustard (*Brassica juncea* L.). *African Crop Science Society*, *8*, 935-938.

Bayhan, S. O., Ulusoy, M. R. and Bayhan, E. (2007). Is the parasitization rate of *Diaeretiella rapae* influenced when *Brevicoryne brassicae* feeds on brassica plants. *Phytoparasitica*, *35*, 146-149.

Bhat, M. A., Hussain, B. and Dar, M. H. (2012). Population Dynamics and Infestation Index of Cabbage Aphid, *Brevicoryne brassicae* [Homopetera: Aphididae] in Kashmir Valley. *Trends in Biosciences*, *5*(4), 284-286.

Bhavani, B. and Punnaiah, K. C. (2006). Population dynamics of cabbage aphid, *Lipaphis erysimi* (Kalt) and its control with selected insecticides in the cabbage. *Pestology*, *28*(8), 20-27.

Blackman, R. L. and Eastop, V. F. (2000). Aphids on the world crops. *An Identification and Information Guide*. 2nd edition (Revised), Chichesler, U.K.: John wiley and sons Limited. pp 39.

Chandra, S. and Kushwaha, K. S. (1987). Impact of environmental resistance on aphid complex of cruciferous crop under the agro climatic conditions of Udaipur Ⅱ. Biotic component. *Indian Journal of Entomology*, *49*(1), 86-113.

Duchovskiene, L. and Raudonis, L. (2008). Seasonal abundance of *Brevicoryne brassicae* L. and *Diaeretiella rapae* (M'Intosh) under different cabbage growing systems. *Ekologija*, *54*, 260–264.

Dochovskiene, L., Surviliene, E., Valiuskaite, A. and Karkleliene, R. (2012). Effects of organic and conventional fertilization on the occurrence of *Brevicoryne brassicae* L. and its natural enemies in white cabbage. *Original Articles*, *62*(1), 16-22.

Dogra, I., Devi, N. and Raj, D. (2001). Population buildup of aphid complex (*Lipaphis erysimi* (Kalt.), *Brevicoyne brassicae* (Linn.) and *Myzusp ersicae* (Sulzer) on rapeseed, *Brassica campestris* var. brown sarson vis-à-vis impact of abiotic factors. *Journal of Entomological Research*, *25*(1), 21-25.

Gabrys, B. J., Gadomski, H. J., Klukowski, Z., Pickett, J. A., Sobota, G. T., Wadhams, L. J. and Woodcock, C. M. (1997). Sex pheromone on cabbage aphid, *Brevicoryne brassicae*: Identification and Field Trapping of male aphids and parasitiods. *Journal of Chemical Ecology*, *23*, 1881-1890.

Indira, D., Nirmala, D., and Desh, R. (2001). Population buildup of aphids complex (*Lipaphis erisimi* Kalt. *Brevicoryne brassicae* Linn. and *Myzus persicae* Sulzer) on rapeseed, *Brassica Compestris* var. brown sarsonvis-a-vis impact of abiotic factors. *Journal of Entomological Research*, *25*(1), 21-25.

Jahan, F., Abbasipour, H., Askarianzadeh, A., Hassanshahi, G. and Ayatallah, S. A. (2013). Effect of eight cauliflower cultivars on biological parameters of the cabbage aphid, *Brevicoryne brassicae* (L.) (Hem: Aphididae) in laboratory conditions. *Archieves of Phytopathology and Plant Protection*, *46*(6), 636-642.

Kelm, M. and Gadomski, H. (1995). Occurrence and harmfulness of the cabbage aphid (*Brevicoryne brassicae* L.) on winter rape. *Materially Sesji Instytutu Ochrony Roslin*, *35*, 101-103.

Khattak, S. U., Hameed, A. U., Khan, A. Z. and Farid, A. (2002). Pesticidal control of rapeseed aphid, *Brevicoryne brassicae* (L.). *Pakistan Journal of Zoology*, *35*, 222-228.

Kumar, P. G., Anandhi, P., Verma, S. and Elamathi, S. (2009). Seasonal occurrence of *Brevicoryne brassicae* and natural enemies on cabbage. *Annals of Plant Protection Sciences*, *17*(2), 476-78.

Maynard, D. N., and Hochmuth, G. J. (1997). Knott's Handbook for Vegetable growers, 4th edition. John Wiley & Sons Inc., Hoboken, New Jersey, pp1–pp 54.

Pal, M. and Singh, R. (2012). Seasonal history of cabbage aphid, *Brevicoryne brassicae* (Linn.) (Homoptera: Aphididae). *Journal of Aphidology*, *25*, 69-74.

Patra, S., Thakur, N. S. A., Saikia, K. and Firake, D. M. (2012). Population dynamics of cabbage aphid *Brevicoryne brassicae* L. on major cole crops in Meghalaya. *Madras Agricultural Journal*, *8*(7-9), 573-575.

Raj, D. and Sharma, G. D. (1991). Population build-up of aphid complex (*Lipaphis erysimi* Kalt. and *Brevicoyne brassicae* Linn.) on rapeseed at Palampur, Himachal Pradesh (India). *Journal of Entomological Research*, *15*(2), 93-98.

Rustamani, M. A., Qamikhani, U. F., Munshi, G. H. and Chutto, A. B. (1988). Efficacy of different insecticides against mustard aphid. *Sarhad journal of Agriculture*, *4*, 659-664.

Sable, Y. R., Sarkate, M. B., Sarode, P. V., Sangle, P. D. and Shinde, B. D. (2008). Studies on parasitoids associated with cabbage aphid, *Brevicoryne brassicae* and diamond back moth, *Plutella xylostella* on cauliflower. *Journal of Biopesticides*, *1*(2), 148-151.

Shah, R., Shakeel, A. and Ashraf, P. (2013). Population dynamics of insect pests, parasitiods and predators in cabbage and cauliflower agroecosystems. *Journal of Entomological Research*, *37*(2), 129-137.

Shalini, V. M. and Kamal, S. (2016). Seasonal incidence of *Brevicoryne brassicae* and *Plutella xylostella* on *Brassicae oleraceae* in Rohtak District. *Annals of Plant Protection Sciences*, *24*(2), 319-323.

Sharma, B., Chaudhary, A. K., Gangwar, B. and Sharma, N. R. (2022). Seasonal incidence of cabbage insect pest. *The Pharma Innovation Journal*, *11*(8), 116-119.

Sharma, S., Verma, S. C., Sharma, P. L. and Chandel, R. S. (2020). Diversity of inset-pests and their natural enemies in cauliflower under mid hills of Himachal Pradesh. *Journal of Entomology and Zoology Studies*, *8*(2), 1204-1209.

Younas, M., Naeem, M., Raqib, A. and Masud, S. (2004). Population dynamics of cabbage butterfly (*Pieris brassicae*) and cabbage aphid (*Brevicoryne brassicae*) on five cultivars of cauliflower at Peshawar. *Asian Journal of Plant Science*, *3*, 391-393.

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