Population Dynamics of Cabbage Aphid, *Brevicoryne brassicae* L. on Major Cole Crops in Meghalaya

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Population dynamics of cabbage aphid (*Brevicoryne brassicae* L.) was studied during 2009-10 at Entomology Farm, ICAR Research Complex for NEH Region, Umiam, Meghalaya. Cabbage, cauliflower, knolkhol and broccoli were planted on two different dates at fifteen days interval to study the incidence pattern of cabbage aphid. Early planted crops were relatively safer than late planted crops in relation to aphid infestation. Mean aphid numbers per square inch leaf area were 1.63, 1.44, 2.79 and 1.14 on first plantings and 3.15, 1.39, 3.68 and 1.68 on second plantings cabbage, cauliflower, knolkhol and broccoli, respectively. Correlation study between weather parameters and aphid population showed negative influence of temperature, relative humidity and rainfall on population growth of aphid.

Key words: Cabbage, cauliflower, knolkhol, broccoli, *Brevicoryne brassicae*, population dynamics, correlation studies

Meghalaya state lies on the north eastern Himalayas and is famous for its biodiversity. The weather is very suitable for multiplication of insect pests and their natural enemies. Cole crops are the major vegetables grown in the region. Among various insect pests that attack cruciferous vegetable, aphids are the most common pests. The cabbage aphid, *Brevicoryne brassicae* L. (Aphididae: Hemiptera) is most abundant from November-December to March-April when it infests various cruciferous oil seed crops and vegetables (Atwal, 1976). It plays a prominent role in reducing the yield ranging from 50 to 80% (Khan and Munir, 1986; Ellis and Singh, 1993). Besides the direct damage, aphids deteriorate market potential by helping in colonization of phytophagous fungi. Since, the region is highly weather dynamic, assessment of population fluctuation is a prerequisite for implementation of control measure against this notorious pest. A lot of work has been done in the past at different parts of the country on different aphid species but information on cabbage aphid and weather relationship has not been studied till date in this region. Therefore, the present experiment was conducted to study the population dynamics of cabbage aphid on cruciferous crops on variable sowing dates.

Materials and Methods

The experiment was carried out at the Entomology Farm, ICAR Research Complex for North Eastern Hill Region, Umiam, Meghalaya, India during 2009-2010 crop seasons. Cabbage (Cultivar: Wonderball), cauliflower (Cultivar: Hybrid Megha),

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broccoli (Cultivar: Hybrid Pushpa) and knolkhol (Cultivar: Early White Vienna) were sown in nursery on two different dates at fifteen days interval and transplanted (as 27-30 days old seedlings) on 12th and 27th October, 2009 in 3mX3m plot size with 45cm X 45cm spacing. Crops were raised with proper agronomic management practices. Field experiment was laid out in Randomized Block Design with three replications for each crop. Aphids were counted from randomly selected ten plants from each replication. Observation was recorded from one square inch leaf area from two leaves/ plant by examining on both sides of leaf at weekly interval till maturity of crops using a template made of card board. 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 cruciferous crops is presented in Fig.1 to 2 and Table 1.

The population of aphids/$inch^2$ leaf area varied from 0.10 to 4.05 on cabbage, 0 to 3.90 on cauliflower, 0.65 to 5.35 on knolkhol and 0 to 3.25 on broccoli on early planted crops (Fig.1). Initially some crops were free from aphid incidence but later they were infested. Population of aphid increased gradually and reached its peak on different dates. Peak population was observed on 28th November, 2009 on cabbage (4.05 aphids/ $inch^2$), 2nd January, 2010 on cauliflower (3.90 aphids/ $inch^2$) and 9th January on both knolkhol and broccoli with 5.35 and 3.25 aphids /$inch^2$, respectively.

Table 1. Cabbage aphid population on variable dates of planting

Crop	Aphid numbers/inch^2 leaf area*	
	Early Planting (12.10.2009)	Late Planting (27.10.2009)
Cabbage	1.63	3.15
Cauliflower	1.44	1.39
Knolkhol	2.79	3.68
Broccoli	1.14	1.68

*Means of ten observations

In late planted crops, numbers of aphid varied from 0.70 to 4.95, 0.3 to 4.65, 0.5 to 5.60 and 0 to 3.70 aphids /inch^2 on cabbage, cauliflower, knolkhol and broccoli, respectively (Fig.2). Incidence of aphids started soon after transplanting except broccoli and peak population was noticed as the crop matured during early January, 2010. In cauliflower, peak population was recorded on 2nd January with 4.65 aphids /inch^2 whereas it was on 9th January on cabbage, knolkhol and broccoli with 4.95, 5.60 and 3.70 aphids/inch^2, respectively.

Mean population of aphid (Table 1) showed that early planted crops were less infested compared to late planted crops. Average aphid numbers in early planting were 1.63, 1.44, 2.79 and 1.14 aphids/inch^2 compared to 3.15, 1.39, 3.68 and 1.68 aphids/inch^2 in late planting on cabbage, cauliflower, knolkhol

Table 2. Meteorological data during crop season of 2009-2010

Date of observation	Mean Temperature (^{0}C)			Relative Humidity (%)			Rainfall (mm)
	Maximum	Minimum	Average	Maximum	Minimum	Average	
07.11.2009	26.89	14.33	20.61	84	60	72	0
14.11.2009	25.14	11.9	18.52	79.57	58	68.79	0
21.11.2009	23.24	12.29	17.76	82	63.86	72.93	0.1
28.11.2009	22.41	8.83	15.62	84.44	60.33	72.39	0
05.12.2009	23.09	10.27	16.68	81.86	78.14	80.00	0
12.12.2009	21.69	7.83	14.76	76.43	49.57	63.00	0
19.12.2009	21.57	7.97	14.77	87	54.43	70.72	0
26.12.2009	20.27	6.7	13.48	85.3	59.3	72.30	0
02.01.2010	20.83	4.89	12.86	82	53	67.50	0
09.01.2010	22.39	6.14	14.26	63.71	48.29	56.00	0

and broccoli, respectively. Broccoli and cauliflower were comparatively less infested with cabbage aphids on both planting dates compared to other crops.

Population dynamics of cabbage aphid was correlated with weather factors (Table 2) during the study period and presented in Table 3. Though correlation between aphid population and different weather factors (maximum, minimum and average temperature; maximum, minimum and average relative humidity and rainfall) was negative and it was also highly significant. Maximum temperature played significant negative role only in late planted cabbage and knolkhol where as minimum

**Table 3. Correlation coefficients (r) between aphid population and weather factors during crop season**

Crop	Mean Temperature (^{0}C)			Relative Humidity (%)			Rainfall (mm)
	Maximum	Minimum	Average	Maximum	Minimum	Average	
Early Planting							
Cabbage	-0.515	-0.699*	-0.643*	-0.333	-0.262	-0.344	-0.310
Cauliflower	-0.563	-0.819**	-0.737*	-0.593	-0.643*	-0.730*	-0.182
Knolkhol	-0.576	-0.859**	-0.767**	-0.448	-0.628	-0.645*	-0.453
Broccoli	-0.601	-0.847**	-0.770**	-0.418	-0.508	-0.550	-0.332
Late Planting							
Cabbage	-0.768**	-0.747*	-0.776**	-0.265	-0.166	-0.246	-0.068
Cauliflower	-0.417	-0.702*	-0.605	-0.569	-0.554	-0.658*	-0.134
Knolkhol	-0.691*	-0.873**	-0.823**	-0.231	-0.220	-0.264	-0.643*
Broccoli	-0.406	-0.635*	-0.559	-0.486	-0.162	-0.358	-0.283

*Significant at 0.05% level; **Significant at 0.01% level

temperature showed significantly negative role on aphid abundance for all cole crops. Average temperature had a negative influence on aphid population except in late planted cauliflower and broccoli. Both maximum and minimum relative humidity showed negative influence on population growth of aphid except in early planted cauliflower though not significant. Population of aphids on cauliflower and early planted knolkhol were negatively significant with average relative humidity. Effect of rainfall was highly negative and non significant on population growth of cabbage aphid in all crops for both plantings except in late planted knolkhol.

Present findings are similar to that of Younas et. al. (2004) who observed that aphid infestation

Fig.1. Trend of aphid incidence in early planted crops
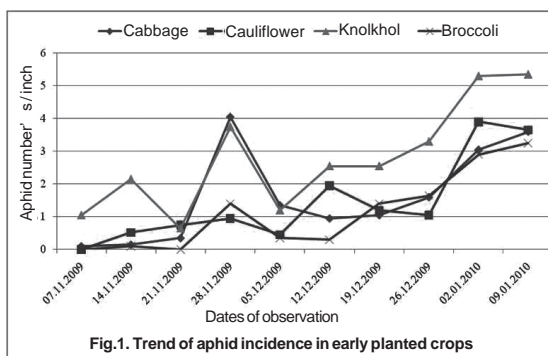
started at the last week of October with an average population density ranging from 0-13.33 aphids/cm^2 on five cauliflower cultivars and increased gradually whereas Aslam *et al* (2007) who reported incidence of cabbage aphids in early February in field, increasing gradually with the peak in the first week of March and thereafter declining in the middle of March. The findings regarding correlation

Fig.2. Trend of aphid incidence in late planted crops
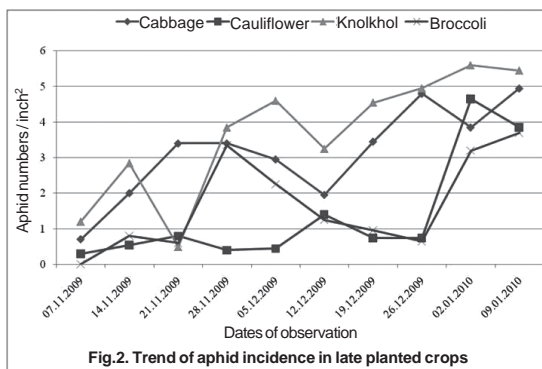
coefficients (r) disagreed with many workers who recorded positive correlation between minimum and maximum temperature and aphid population (Ashfaq *et. al.*, 2007; Nasir and Ahmad, 2001). The same authors observed negative influence of relative humidity and rainfall on wheat aphid population. Choudhury and Pal (2009) reported both positive and negative effects of maximum, minimum temperatures and rainfall on mustard aphid on different brassica cultivars and their results fully agreed with the finding of negative influence of maximum relative humidity but totally disagreed with correlation with minimum relative humidity. Findings are close to that of Chandra and Kushwaha (1986) who reported that temperature had negative effect whereas relative humidity was positively correlated to the abundance of aphids.

Comparison of two planting dates revealed that mean incidence of aphid was more on late planted cole crops compared to early planted except

cauliflower. Though there were no coccinellid predators in the field during study period, aphid population was not endemic on crops, it may be due to unfavorable weather factors to the pest. Although, these crops were planted on two different dates, both plantings were in October only. Therefore, it was due to early cropping in this region, all crops escaped from heavy infestation of cabbage aphid before harvesting. Broccoli and cauliflower were comparatively less infested to cabbage aphid and this may be attributed to crop morphology. It may be concluded that if cole crops are planted early to mid October in Meghalaya condition, there would be minimum chance of crop loss due to aphid infestation.

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