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Population Density of *Myzus persicae* Sulzer (Hemiptera: Aphididae) on Six Cabbage Varieties under New Alluvial Zone

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ABSTRACT

The present investigation on population density of Myzus persicae Sulzer (Hemiptera :Aphididae) on six varieties of cabbage (Pluto, NS 183, Green Express, Pan 1181, Mohar F_1, Rare Ball) were conducted at Central Research Farm, Gayeshpur, Bidhan Chandra Krishi Viswavidyalaya, Nadia, WB. Result from first year in first crop highest population 574.30aphid/plant was recorded during 6th standard week (SW) and second crop 380.80aphid/plant was recorded during 10th standard week. Second year observations, maximum population 548.37 and 448.57 aphid/plant were recorded from first and second crop during 6th and 12th standard week respectively. Minimum population 7.77 and 21.47aphid/plant observed during first standard week from both the years respectively and lowest population 87.83aphid/plant was observed during 16th standard week of first year and 110.73aphid/plant was recorded during 17th standard week of second year. From the above observation it can be said that all the varieties were highly susceptible in response to the aphid infestation. Among the varieties Pluto and Pan-1181 were more susceptible.

Key words: *Population density, Aphid, Myzus persicae, Cabbage.*

INTRODUCTION

India is mostly an agro based country and agriculture is a major component of the Indian economy, more than 75% of Indian people have their live hood as agriculture and agriculture oriented works Thenmozhi and Thilagavathi[6]. Among the cruciferous winter vegetables Cabbage (*Brassica oleracea* L. var. *capitata*) is the most popular and extensively grown throughout the country. But there are certain limiting factors for its quantitative and qualitative production. Insect pests, diseases and weeds are the major constraints limiting agricultural productivity growth. It is estimated that herbivorous insects eat about 26 percent of the potential food production Singh and Sharma[4]. The cabbage crop is attacked by several of insect pests, among them most destructive polyphagus sucking pest is cabbage aphid, *Myzus persicae* (Sulzer). The aphid suck the sap from the leaves throughout the season and when large colonies develop, the leaves become black tint spots and distorted and the plants are unable to developed a marketable card Frank[2].

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Besides, it is able to transmit more than 100 viral diseases on about 30 different families including major crops Van Emden *et al.*,[7]. The experiment on population density indicates that how, when and why the number of individual are fluctuate. A good perception of population density is necessary for explain survey data, predicting pest forecasting, and assess the effectiveness in management practices. Therefore up to date knowledge about the incidence pattern of major insect pests on particular crop is a requirement for accomplishment of an effective and successful management strategy against them. Keeping this view in mind, the present study was carried out to evaluate the population density of cabbage aphid on cabbage under new alluvial zone of west Bengal.

MATERIALS AND METHODS

Field experiments were conducted at the Central Research Farm, BCKV, Gayeshpur during rabi season of 2008-09 and 2009-10. The experiment was laid out in a randomized block designed with three replications. Six cabbage cultivars (Pluto, Cabbage- NS 183, Green Express, Pan 1181, Mohar F_1, Rare Ball) were transplanted twice on third week of December (First crop) and February (Second crop) in both the years in plot measuring 4m x 3m. The distance between rows and plant was 50cm. Standard agronomic practices were adopted for raising the crop. The crop was kept unsprayed throughout the crop season. Ten plants were randomly selected for taking observations. The aphid population was counted visually on whole plants from seedling to harvesting stage. The first observations was taken about 12-15 days after transplanting, just appearance of aphid and subsequent observations were taken at weekly interval. The data, thus obtained were computed to study their seasonal abundance and population dynamics.

The critical difference (CD) at 0.05% level of significance were worked out from the data of mean aphid count/plant. The data analysed in RBD were subjected to Duncan's Multiple Range Test (DMRT) at 5% level after making angular transformation.

RESULT AND DISCUSSION

The present investigation was taken up to find out the response of six selected cabbage varieties to the aphid, *Myzus persicae* (Sulzer) infestations as well as population dynamics. Weekly observations on population dynamics of aphid was taken, on two different dates of transplanting of 30 days old seedling of six popular cultivars of cabbage namely Pluto, NS-183, Green Express, Pan-1181, Mohar-F_1 and Rare Ball.

Response of six selected varieties of cabbage to *Myzus persicae* (Sulzer) showed significant differences among the varieties in between 1st to 9th SW. Aphid population was build up from 1st SW and the population increased from 4th to 6th SW, irrespective of varieties and it gradually decreased till harvest of crop (table-1). Based on the overall mean population of aphid recorded at different standard weeks, on all the varieties of cabbage ranged from 356.04 to 379.18 per plant which showed non significant differences among the varieties.

Table 1: Aphid on six different cabbage varieties (First year, first crop)

Varieties	Mean aphid counts/plant in different standard weeks									Mean
	1	2	3	4	5	6	7	8	9	
Pluto	7.77 (2.78)^{c}	80.87 (8.98)^{d}	271.67 (16.47)^{cd}	423.77 (20.58)^{b}	517.00 (22.73)^{a}	564.27 (23.75)^{a}	488.80 (22.10)^{ab}	471.47 (21.71)^{a}	401.83 (20.04)^{a}	358.60 (18.95)^{a}
NS - 183	15.17 (3.89)^{bc}	160.77 (12.68)^{bc}	337.30 (18.36)^{ab}	500.47 (22.37)^{a}	543.40 (23.31)^{a}	574.30 (23.96)^{a}	508.70 (22.55)^{a}	430.70 (20.74)^{ab}	341.83 (18.49)^{b}	379.18 (19.48)^{a}
Green Express	33.50 (5.74)^{a}	200.50 (14.15)^{a}	368.53 (19.19)^{a}	520.07 (22.80)^{a}	554.63 (23.55)^{a}	449.40 (21.18)^{b}	452.47 (21.26)^{b}	420.83 (20.50)^{ab}	299.00 (17.29)^{c}	366.55 (19.15)^{a}
Pan - 1181	8.93 (2.99)^{bc}	82.20 (9.04)^{d}	232.73 (15.23)^{d}	421.83 (20.54)^{b}	515.00 (22.68)^{a}	573.57 (23.94)^{a}	517.33 (22.74)^{a}	455.00 (21.32)^{a}	397.73 (19.94)^{a}	356.04 (18.88)^{a}
Mohar – F1	15.93 (3.94)^{b}	142.53 (11.93)^{c}	303.13 (17.40)^{bc}	488.40 (22.10)^{a}	525.13 (22.91)^{a}	540.20 (23.24)^{a}	520.00 (22.80)^{a}	392.73 (19.82)^{b}	301.47 (17.36)^{c}	358.84 (18.95)^{a}
Rare Ball	27.67 (5.26)^{a}	176.67 (13.27)^{ab}	300.00 (17.29)^{bc}	518.33 (22.77)^{a}	560.00 (23.66)^{a}	446.67 (21.12)^{b}	476.67 (21.83)^{ab}	435.00 (20.85)^{ab}	315.67 (17.77)^{bc}	361.85 (19.03)^{a}
SEm±	0.30	0.39	0.46	0.25	0.32	0.43	0.32	0.37	0.29	0.24
CD at 0.05%	0.92	1.21	1.43	0.77	NS	1.33	0.98	1.14	0.88	NS

* Figures within parentheses are square root transformed values.

* In a column, means followed by same alphabet are not significantly different (p=0.05) by DMRT.

During first year, on February planted (table-2) crop high degree of aphid population was noticed from 10th SW to 11th SW on all the varieties. Population of aphid showed significant differences among the varieties in 10th, 11th and 13th SW. Among the varieties, highest population of aphid (301.37 to 350.80 aphid/plant) was recorded on Pluto cultivar. After 11th SW population of aphid decreased on all the varieties.

On the basis of the overall mean population of aphid recorded at different standard weeks showed significant differences among the varieties (table-2). The lowest larval population (184.73 aphid/plant) was recorded on Rare Ball followed by 185.89 aphid/plant on Mohar F_1 but did not differ significantly from each other. But the highest population (211.18 aphid/plant) was recorded on Pluto followed by NS-183, Green Express and Pan 1181 and they were significantly at par with each other in response to infestation and population build up of aphid. These observation slightly changed as compared to the December planting (first year, first crop) cabbage.

Table 2: Aphid on six different cabbage varieties (First year, Second crop)

Varieties	Mean aphid counts/plant in different standard weeks							Mean
	10	11	12	13	14	15	16	
Pluto	350.80 (18.73)^{a}	301.37 (17.36)^{a}	236.07 (15.36)^{a}	221.73 (14.88)^{a}	158.47 (12.58)^{a}	116.73 (10.78)^{a}	93.13 (9.64)^{a}	211.18 (14.54)^{a}
NS - 183	318.73 (17.85)^{b}	270.63 (16.44)^{ab}	232.53 (15.24)^{a}	206.77 (14.37)^{a}	155.17 (12.45)^{a}	106.07 (10.29)^{a}	87.83 (9.33)^{a}	196.82 (14.04)^{ab}
Green Express	309.97 (17.60)^{b}	280.73 (16.75)^{a}	239.30 (15.46)^{a}	159.23 (12.59)^{b}	131.37 (11.43)^{a}	117.80 (10.82)^{a}	95.17 (9.68)^{a}	190.51 (13.81)^{ab}
Pan - 1181	311.40 (17.64)^{b}	279.87 (16.72)^{b}	234.50 (15.31)^{a}	196.53 (14.02)^{a}	148.07 (12.17)^{a}	104.27 (10.20)^{a}	88.87 (9.37)^{a}	194.79 (13.98)^{ab}
Mohar – F1	291.80 (17.08)^{b}	244.53 (15.64)^{b}	226.83 (15.05)^{a}	200.87 (14.17)^{a}	146.80 (12.12)^{a}	100.87 (10.04)^{a}	89.50 (9.42)^{a}	185.89 (13.65)^{b}
Rare Ball	303.67 (17.42)^{b}	270.60 (16.44)^{ab}	215.17 (14.67)^{a}	155.87 (12.47)^{b}	140.07 (11.83)^{a}	110.87 (10.52)^{a}	96.87 (9.81)^{a}	184.73 (13.61)^{b}
SEm±	0.24	0.32	0.31	0.37	0.34	0.43	0.64	0.26
CD at 0.05%	0.74	0.97	NS	1.15	NS	NS	NS	0.80

* Figures within parentheses are square root transformed values.

* In a column, means followed by same alphabet are not significantly different (p=0.05) by DMRT.

In summary, during first year, aphid population was in low degree from 1st and 2nd SW and it started increasing from 3rd SW and reached the maximum population on 5th and 6th SW, after that it started to decline on all the varieties. On the basis of the varietal response to the aphid infestation all the varieties were highly susceptible.

During second year, on December planted (second year, first crop) cabbage, infestation of aphid were recorded from 1st SW to 9th SW and on February planted (table-4) crop it was recorded from 10th SW to 17th SW, more or less similar trend in infestation of aphid and its population build up was recorded as compared to previous year.

Response of six selected varieties of cabbage, to aphid did not exhibited significant differences among the varieties in between 1st to 9th SW except 1st and 8th SW. Highest population (505.5 to 554.57 aphid/plant) was noticed in 6th SW in all the varieties. On the other hand lowest population (21.47 - 67.67 aphid/plant) was found in 1st SW. Infestation of aphid initiated from 1st SW and continued up to 6th SW to reach peak population *i.e.* three weeks before harvesting of the crop and maintained their population till harvest in respect of all the varieties (Table-3).

Table 3: Aphid on six different cabbage varieties (Second year, first crop)

Varieties	Mean aphid counts/plant in different standard weeks									Mean
	1	2	3	4	5	6	7	8	9	
Pluto	21.47 (4.62)^{c}	151.57 (12.31)^{a}	226.60 (15.05)^{a}	310.33 (17.61)^{a}	445.10 (21.09)^{a}	544.57 (23.32)^{a}	447.57 (21.14)^{a}	343.67 (18.53)^{b}	360.63 (18.98)^{a}	316.83 (17.80)^{a}
NS - 183	46.80 (6.81)^{b}	155.83 (12.48)^{a}	224.67 (14.98)^{a}	299.30 (17.30)^{a}	447.10 (21.13)^{a}	530.97 (23.04)^{a}	422.03 (20.52)^{a}	410.97 (20.19)^{ab}	296.13 (17.20)^{a}	314.87 (17.74)^{a}
Green Express	54.00 (7.31)^{ab}	155.00 (12.43)^{a}	230.47 (15.17)^{a}	322.23 (17.93)^{a}	477.07 (21.83)^{a}	505.50 (22.48)^{a}	428.43 (20.68)^{a}	443.37 (21.03)^{a}	286.67 (16.84)^{a}	322.53 (17.95)^{a}
Pan - 1181	23.53 (4.81)^{c}	135.13 (11.60)^{a}	220.03 (14.82)^{a}	258.57 (16.03)^{a}	442.07 (21.00)^{a}	548.37 (23.40)^{a}	450.63 (21.21)^{a}	338.90 (18.40)^{b}	346.70 (18.59)^{a}	307.10 (17.52)^{a}
Mohar – F1	39.37 (6.23)^{b}	135.10 (11.57)^{a}	219.03 (14.79)^{a}	298.90 (17.28)^{a}	451.73 (21.23)^{a}	512.03 (22.61)^{a}	423.53 (20.57)^{a}	427.30 (20.64)^{ab}	302.07 (17.38)^{a}	312.12 (17.66)^{a}
Rare Ball	67.67 (8.23)^{ab}	166.67 (12.90)^{a}	245.00 (15.65)^{a}	296.00 (17.15)^{a}	512.33 (22.64)^{a}	523.33 (22.88)^{a}	460.00 (21.45)^{a}	467.33 (21.62)^{a}	330.33 (18.18)^{a}	340.96 (18.48)^{a}
SEm±	0.41	0.49	0.36	0.64	0.56	0.46	0.56	0.74	0.65	0.47
CD at 0.05%	1.26	NS	NS	NS	NS	NS	NS	2.28	NS	NS

* Figures within parentheses are square root transformed values.

* In a column, means followed by same alphabet are not significantly different (p=0.05) by DMRT.

Based on the overall mean population of the aphid recorded at different standard weeks, on all the varieties ranged from 307.10 to 340.96 aphid/plant which did not show significant differences among the varieties in second year, first crop. Where as in February planted crop, higher population of aphid was observed from the beginning of the crop cultivation (10th SW) and reached its maximum population between 14th to15th SW on all the varieties and there after it was in a decreasing trend till harvest (17th SW) of the crop.

On the basis of the overall mean population of aphid recorded at different standard weeks, on all the varieties of cabbage, ranged from 332.36-356.50 aphid/plant which showed no significant differences among the tested varieties (table- 4).

Table 4: Aphid on six different cabbage varieties (Second year, Second crop)

Varieties	Mean aphid counts/plant in different standard weeks								Mean
	10	11	12	13	14	15	16	17	
Pluto	398.03 (19.94)^{ab}	342.07 (18.48)^{b}	370.57 (19.24)^{c}	396.23 (19.90)^{a}	407.60 (20.19)^{a}	437.83 (20.92)^{a}	317.37 (17.81)^{a}	180.73 (13.43)^{a}	356.30 (18.88)^{a}
NS - 183	346.37 (18.60)^{b}	397.10 (19.92)^{a}	445.73 (21.11)^{a}	432.80 (20.80)^{a}	386.23 (19.65)^{a}	364.83 (19.08)^{ab}	237.10 (15.36)^{ab}	155.43 (12.45)^{ab}	345.70 (18.59)^{a}
Green Express	339.03 (18.40)^{b}	368.87 (19.19)^{ab}	436.37 (20.88)^{a}	402.37 (20.05)^{a}	434.73 (20.84)^{a}	348.90 (18.67)^{ab}	195.37 (13.97)^{b}	133.27 (11.52)^{ab}	332.36 (18.24)^{a}
Pan - 1181	398.23 (19.95)^{ab}	341.73 (18.48)^{b}	375.03 (19.36)^{bc}	395.40 (19.88)^{a}	389.80 (19.73)^{a}	424.73 (20.59)^{a}	290.03 (17.01)^{a}	156.87 (12.49)^{ab}	346.48 (18.62)^{a}
Mohar – F1	355.07 (18.83)^{ab}	401.70 (20.03)^{a}	448.53 (21.17)^{a}	423.07 (20.56)^{a}	373.47 (19.30)^{a}	358.03 (18.88)^{a}	231.73 (15.09)^{ab}	147.37 (11.96)^{ab}	342.37 (18.49)^{a}
Rare Ball	482.23 (21.79)^{a}	399.10 (19.98)^{a}	431.40 (20.75)^{ab}	403.70 (20.07)^{a}	422.03 (20.52)^{a}	327.40 (18.04)^{ab}	176.80 (13.16)^{b}	110.73 (10.43)^{b}	344.17 (18.53)^{a}
SEm±	0.91	0.39	0.46	0.43	0.54	0.69	0.91	0.84	0.54
CD at 0.05%	2.80	1.21	1.41	NS	NS	2.14	2.81	2.58	NS

* Figures within parentheses are square root transformed values.

* In a column, means followed by same alphabet are not significantly different (p=0.05) by DMRT.

In summary, during second year, aphid population was found in low tune from 1st to 2nd SW and from 3rd SW its population increased. Maximum population was recorded in the 6th SW, after that it started declining in all the varieties. From the above observation it can be said that all the varieties were highly susceptible in response to the aphid infestation. Among the varieties Pluto and Pan-1181 were more susceptible.

Observations on the population density of aphid for two years on six cabbage varieties revealed that the pest remained active on the crops for a long period (1st SW to 17th SW) and maximum population of aphid were found during 5th to 6th SW, but maintaining higher population till 16th SW. The results obtained in the present investigation are in agreement with the observations of Bhavani and Punnaiah[1],as they observed the highest population of aphid on cabbage during the second week of February *i.e* 7th standard week and minimum population during last week of March *i.e* 14th standard week in Baptla, Andhra Pradesh. The aphid population declined fast during March-April since the crop reached its maturity Prashant *et al.*,[3], but Singh and Sidhu[5],recorded maximum activity of aphid during the months of January to March on cabbage.

CONCLUSION

From the above observation it can be concluded that the population density of aphid for two years on six cabbage varieties revealed that the pest remained active on the crops for a long period (1st SW to 17th SW) and maximum population of aphid were found during 5th to 6th SW, but maintaining higher population till 16th SW and all the cabbage varieties were highly susceptible in response to the aphid infestation. Among the varieties Pluto and Pan-1181 were more susceptible.

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