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Effect of planting time on aphid incidence and yield in different varieties of Capsicum

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ABSTRACT: Studies on standardization of planting time and the status of aphid incidence *vis a vis* planting time were conducted at Kullu valley, Himachal Pradesh, in three varieties *viz.*, California wonder, Yolo wonder and PRC-I under open field conditions. Among the different planting dates, transplantation in the II fort night of April (Yolo wonder (18.84 ± 2.43 aphid/plant; F=51.01; P<0.0001; CD=3.45), California Wonder (19.88 ± 1.67 aphid/plant; F=39.078; P<0.0001; CD=4.37)) and in I fort night of May(PRC-1 (16.12 ± 0.85 aphid/plant; F=80.62; P<0.0001;CD=2.68)) recorded more aphids in all the three varieties. Despite, the presence of more pest incidence, maximum yield was observed in all three varieties of capsicum at II fortnight of April than the other planting dates. Frequent spells during the late May-June not only kept the pest multiplication rate low, but also affected the crop yield which was planted in late May-June. Similar trend was observed in the varieties, CW and YW except PRC-I. The results from the experiments revealed that II fortnight of April is the best time to plant California Wonder and YoloWonder varieties of capsicum at Kullu Valley of Himachal Pradesh under open field conditions.

Keywords: Aphid, capsicum, planting time

INTRODUCTION

Capsicum (*Capsicum annuum* L. var. grossum Sendt) also known as bell pepper or sweet pepper, is one of the most popular and highly remunerative annual herbaceous vegetable crops (Russo,1996). The sweet pepper is either used green or red and may be eaten as cooked or raw, as well as in salad (Andrews,1984). It is cultivated in most parts of the world, especially in temperate regions of Central and South America and European countries, tropical and subtropical regions of Asian continent mainly in India and China(Islam *et al*., 2010). Capsicum is extensively cultivated in India in the states such as Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Himachal Pradesh, and hilly areas of Uttar Pradesh. In Himachal Pradesh, this crop is grown in an area about 2.07 thousand ha with a production and productivity of 34.13 t and 16.49t/ha, respectively (NHB, 2013). Capsicum production depends on several factors, of which sowing date is one of the most important. Optimum sowing time brings about proper growth and development of plants resulting in maximum yield of the crop and economic use of land (Islam *et al*., 2010). Maximum yield can be expected if this crop is grown under polyhouse. Much of the foreign exchange can also be earned from exportation of this crop to other countries of the world (Verroens *et al*., 2006). However, open field grown crop is very much sensitive to weather changes and incidence of insect pests. The crop is known to harbour more than 50 insect pests, aphid (*Myzus persicae*) is the prominent sucking pest which causes severe yield loss in both field and polyhouse cultivation. Weather parameters are dynamic at Kullu valley as it is located in mid hills of the Himalayas and touching to snow line. Under varying weather conditions realizing maximum yield is quite challenging. Hence, standardization of planting time in order to achieve targeted yields is the need of the hour for hilly areas of Himachal Pradesh. Besides, due to variation in the agro-climatic conditions and crop habitat diversification, insects show varying trends in their incidence and extent of damage to the crop. Some known and unknown factors also play a key role in determining the incidence and dominance of a particular pest or pest complex. Keeping these facts in view, a study was carried at Katrain, Kullu Valley, Himachal Pradesh to identify the best suitable planting time and to predict the incidence of aphid on capsicum.

MATERIALS AND METHODS

The experiment was carried at Nagar farm of the Indian Agricultural Research Institute, Regional Station, Katrain, Kullu Valley, Himachal Pradesh, India. Three popular capsicum varieties *viz.*, California wonder, Yolo wonder and PRC-1 of the regions were planted during

summer, 2013. Seven different dates of planting were considered with one week interval between them *i.e.* the first three planting dateswere prior to normal planting date, *i.e.* 17-5-2013, and the last three were after the normal date. A total of 132 m^2 area was divided into 21 plots, each measuring 2.5 x 2.5 m^2 to accommodate a replication. Each planting time was replicated thrice, so that seven treatments with three replications were laidout in Randomized Complete Block Design (RCBD). All the agronomic practices were carried out at regular intervals as per the package of practice. Data on incidence of aphid was recorded at weekly intervals from three top, middle and bottom leaves of five randomly selected plants in each replication. On the other hand, plant parameters such as plant height (cm) and yield was also recorded. Mean aphid data and plant parameters were subjected to two way ANOVA.

RESULTS AND DISCUSSION

Seven dates of planting were tried on three capsicum varieties, Yolo wonder, California Wonder and PRC-1 (Table 1). The results revealed that, first two dates of planting (DAT) recorded more aphids in all the three varieties; Yolo wonder (18.84 ± 2.43 aphid/plant; F=51.01; P<0.0001;CD=3.45), California Wonder (19.88 ± 1.67 aphid/plant; F=39.078; P<0.0001;CD=4.37) and PRC-1 (16.12 ± 0.85 aphid/plant; F=80.62; P<0.0001; CD=2.68) (Table 1) and differed significantly with the other five dates of planting. Reduced aphid incidence was observed from I fortnight of May to I fortnight of June. As the planting time advanced, the incidence of the pest was also reduced with a minimum peak mean infestation of 0.35± 0.09, 0.35± 0.08 and 0.3 ± 0.1 aphid/plant in the varieties YW, CW and PRC-1 respectively, during I fortnight of June.

On the other hand, significantly maximum plant height was observed in the crop planted at the II fortnight of April (IDAT) (Table 2). Postponement of planting time resulted in stunted plant growth, found in all the varieties. Similarly, highest yield was also recorded during first two DAT and significant reduction in yield was found across the planting time in the varieties,Yolo wonder (F=11.93; P<0.0001; CD=7.35) and California Wonder (F=9.74; P=0.001; CD=9.75) (Table 3). Highest yield was found in CW (31.62 ± 6.15at/ha) planting at I DAT, whereas, lowest in YW (1.78 ± 0.33 t/ha) planted during June.

In general, farmers practice to transplant capsicum crop during the II fortnight of May in the valley. Since the crop is grown under open and polyhouse conditions and frequent weather fluctuations in the valley resulted in hampering yield realization. Hence, to overcome these bottlenecks, standardization of cropping time is the need of the hour at the valley. Likewise, the pest incidence will also change *vis a vis* cropping system. Therefore, different management strategies have to be developed for keeping the pest in check and stabilizing the productivity of capsicum. Standardization of time is one of the crop habitat diversifications that are to be looked into, to minimize the incidence of aphid on capsicum and then that its output can be realised.

Results from the experiment revealed that maximum incidence of aphids recorded during first two dates of planting in all the three varieties of capsicum. On the other hand, the negligible aphid incidence was found in the crop planted in the months of May-June. This might be due to the hot weather conditions prevailed during April than May where there were more frequent rains which might have affected the survival and multiplication of the pests.

Table 1. Influence of planting time on peak mean incidence aphid in each planting date of three varieties of capsicumduring summer 2013 at Katrain, Kullu, Himachal Pradesh.

Planting time	YW	CW	PRC-I
26-04-2013	18.84 ± 2.43[a]	19.88 ± 1.67[a]	16.12 ± 0.85[b]
03-05-2013	14.8 ± 0.62[b]	18.03 ± 2.93[b]	17.10 ± 2.13[a]
10-05-2013	14.80 ± 1.51[b]	14.87 ± 1.18[b]	13.54 ± 0.56[b]
17-5-2013	2.71 ± 0.12[c]	3.03 ± 0.54[c]	1.77 ± 0.24[c]
24-05-2013	2.23 ± 0.14[c]	1.15 ± 0.16[c]	2.09 ± 0.49[c]
31-05-2013	0.58 ± 0.19[c]	0.68 ± 0.17[c]	0.53 ± 0.02[c]
07-06-2013	0.35 ± 0.09[c]	0.35 ± 0.08[c]	0.3 ± 0.10[c]
F	51.01	39.078	80.62
P	<0.0001	<0.0001	<0.0001
CD	3.45	4.37	2.68

Table 2. Influence of planting time on plant height (cm) in three varieties of capsicum during summer 2013 at Katrain, Kullu, Himachal Pradesh.

	Plant height (cm)		
Planting time	**YW**	**CW**	**PRC-1**
26-04-2013	52.47± 4.11[a]	62.67 ± 6.74[a]	58.77 ± 5.97[a]
03-05-2013	44 ± 4.20[ab]	50.83 ± 2.17[ab]	46.13 ± 4.28[ab]
10-05-2013	41.23 ± 0.96[b]	50.13 ± 1.79[ab]	38.2 ± 3.6[b]
10-17-2013	42.87 ± 0.98[b]	47.57 ± 2.60[ab]	27.9 ± 14.15[b]
24-05-2013	42.2 ± 2.67[b]	47.2 ± 1.46[ab]	41.57 ± 0.87[ab]
31-05-2013	38.98 ± 1.69[b]	45.77 ± 3.38[b]	35.15 ± 2.7[b]
07-06-2013	29.33 ± 4.06[c]	25 ± 10.66[c]	26.17 ± 2.74[b]
F	4.90	4.22	2.93
P	0.01	0.02	0.05
CD	9.57	16.84	20.15

Table 3. Influence of planting time on yield (t/ha) in three varieties of capsicum during summer 2013 at Katrain, Kullu, Himachal Pradesh.

	Yield t/ha		
Planting time	**YW**	**CW**	**PRC**
26-04-2013	26.57± 0.48[a]	31.62 ± 6.15[a]	15.22 ± 3.41
03-05-2013	23.13 ± 5.54[ab]	21.92 ± 1.29[ab]	8.08± 3.69
10-05-2013	14.13 ± 0.97[c]	11.96 ± 2.86 [dc]	5.22 ± 1.88
10-17-2013	15.85 ± 2.07[bc]	17.4 ± 2.79[bc]	4.3 ± 2.21
24-05-2013	13.59 ± 1.21[c]	13.82 ± 1.38 [bcd]	6.96 ± 0.57
31-05-2013	9.63 ± 0.57[c]	6.16 ± 2.39[de]	8.8 ± 6.85
07-06-2013	1.78 ± 0.33[d]	2.14 ± 0.12[e]	6.1 ± 4.46
F	11.93	9.74	0.79
P	0.000189	0.000501	0.5938
CD	7.35	9.75	NS

Despite of more incidence of aphid during first two dates of planting, more yield recorded compared to normal date of planting. Delayed planting resulted in stunted plant growth, reduced flowering and fruiting attributed to frequent spells and fluctuations of the temperature. Planting dates and spacing has been observed as some of the factors that affect the growth and development of a crop. Islam *et al.*, (2010) and Hamma *et al.*, (2012), reported that optimum sowing dates of a crop ensure proper growth, development and maximises the yield of the crop. Similarly, plant height, number of branches, number of leaves per plant, internodal length, leaf area and leaf area index were influenced by the growing environment (Rajasekar *et al.*, 2013). The present findings are in agreement with the general principle that capsicum crop successfully grown under polyhouse conditions due to controlled temperature and humidity (Reddy *et al.*, 1999). Fluctuation in temperature during May-June resulted from frequent rains in the valley witnessed reduced plant growth and yield under open field conditions. Similar results were found by Anon (2004) that weather parameters like precipitation, sunlight and relative humidity have been reported to be optimum for transplanting of Byadagi chilli during July in the plains, leading to better rooting and establishment. From the present study it is found that II fortnight of April is the best time for capsicum planting to get more yield under open conditions in the Kullu valley.

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REFERENCES

Anonymous, 2004. Improved Cultivation Practices for Field Crops, Univ. Agric. Sci., Dharwad, pp. 227-234.

Andrews, J. 1984. Pepper *The Domesticated Capsicum*. University of Texas Press, Austin. 321p.

Hamma, I. L., Ibrahim, U. and Haruna, M. 2012. Effect of planting date and spacing on the growth and yield of sweet pepper (*capsicum annuum* l.) in samaru area of Zaria in Nigeria. *Nigerian Journal of Agriculture Food and Environment*, **8**(1): 63-66.

Islam, S. M., Akand, S. and Rahim, H. 2010. Efffect of sowing date on the growth and yield of sweet pepper *(Capsicum annuum* L.) *Agronomski Glasnik* 1/2010.

National Horticulture Board (NHB). 2013. Third Advance Estimates for Horticulture Crops for 2013 2014.

Rajasekar, M., Arumugam,T. and Ramesh Kumar, S. 2013. Influence of weather and growing environment on vegetable growth and yield. *Journal of Horticulture and Forest*, **5**(10): 160-167.

Reddy, M. T., Ismail, S. and Reddy, Y. N.1999. Shade and allelopathic effects of ber on growth, productivity and quality of radish (*Raphanus sativus* L.) under pot culture. *South Indian Horticulture*, **47**: 77-80.

Russo, V. M. 1996. Planting date, fertilizer rate and harvest time affect yield of Jalapeno and Banana peppers. *American Society of Horticultural Sciences*, **31**(7): 107 – 1118.

Verroens, P.,Verlinden, B. E., Sauviller, C., Lammertyn, J., De Ketelaere, B. and Nicolai, B.M. 2006. Time series analysis of *Capsicum annuum* fruit production cultivated in greenhouse. ISHS Acta Horticulture 718: III International Symposium on Models for plant growth, Environmental control and farm management in protected cultivation.

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