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Occurrence of potato pests in different dates of planting in Gangetic plains of West Bengal, India

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A B S T R A C T

An experiment on the incidence pattern of various insect pests of potato under five different planting dates (P1 to P5) was carried out for two consecutive years, 2006-07 and 2007-08 at Adisaptagram Block Seed Farm, Hooghly, West Bengal, India. Kufri Chandramukhi was planted in five dates of planting starting from 3rd week of November with one week interval upto 3rd week of December with a spacing of 60×20 cm. The trial was laid in Randomized Block Design (RBD) with four replications. The recommended practices for raising the crop in the field was maintained except the application of insecticides. It was observed that the crops of first planting (at 3rd week of November) harboured less pest infestation. However, the whitefly infestation was found lower in second and third plantings (at 4thweek of November and 1st week of December). The infestation of soil pests such as molecricket, cutworm and potato tuber moth were found minimum in crops of 1st date of sowing resulted in producing highest number of healthy tubers. The rat damage was not so influenced by different dates of planting. But, the total tuber yield was obtained maximum in second date (4th week of November) which was closely followed by 1st, 3rd, 4th and 5th dates of sowing.

Introduction

Nearly 90% of potatoes are grown in the vast Indo-Gangetic plains of North India during short winter days from October to March. But the yield of potato tubers is reduced due to attack of various insect pests. Among the insect pests aphids *Myzus persicae* (Sulzer) and *Aphis gossypii* Glover (Homoptera: Aphididae), whitefly, *Bemicia tabaci* {(Gennadius) (Aleyrodidae: Hemiptera)}and epilachna beetle, *Henosepilachna* spp. (Coccinellidae: Coleoptera) are some of the important pests infesting potato during the whole crop growing season. The soil pests such as Cutworm {*Agrotis* spp. (Noctuidae: Lepidoptera)}and mole cricket {*Gryllotalpa africana,* Palisot De Beauyoes (Gryllotalpidae: Orthoptera)} also reduce the production of the potato tubers. To minimize the crop damage by these insect pests, the growers use pesticides not only as control tactics, but as an assurance against uncertain pest attacks. As a result, the chances of health hazards increase as in many cases potato is used just after boiling. Therefore, a thorough study regarding the incidence pattern of different insect pests are very much essential for effective management of these pests. Hence, in the present investigation, the incidence pattern of different insect pests of potato in eastern gangetic plains of West Bengal, India was conducted on crop sown at different dates of sowing.

Materials and Methods

A field investigation was conducted during *rabi* season of 2006-07 and 2007-08 at Adisaptagram Block Seed Farm, Department of Agriculture, Government of West Bengal Hoogly, West Bengal to study the effect of different planting dates on the occurrence of important insect pests of potato. Kufri Chandramukhi was planted in five different dates (P_1 to P_5) starting from 3rd week of November with one-week interval up to 3rd week of December. The trial was laid in a Randomized Block Design (RBD) with four replications. Potato seed tubers were planted in 6×4 m plots with 60×20 cm spacing. The recommended agronomic practices except the

application of any insecticides were maintained. The incidence pattern and population build up of aphids were recorded from randomly selected 100 compound leaves in each plot at 7 days interval after the emergence of the crop and before its dehaulming. The weather parameters were also recorded from Agro-metrological station of the University.

Results and Discussion

The incidence pattern of aphids, whitefly and epilachna beetle on potato in 2006-07 and 2007-08 are shown in table 1. In case of aphids, the incidence pattern was not uniform during the whole season and it is clear from the table that the pests were prevalent in the field throughout the entire period of cropping season. The aphids appeared on the crop at third week of December, and in last two planting (P_4 and P_5) it occurred in first week of January and in case of third planting (P_3) it could be recorded in fourth week of January. The aphid population increased gradually and crossed the economic threshold level (i.e., 20 aphids/100 compound leaves) during first to second week of January on all the five planting dates and reached the peak of population in between second and fourth week of February. In first planting (P_1) the highest population was recorded in second week of February while second, third and fourth plantings (P_2, P_3 and P_4 respectively) in third week of February and fourth week of February for fifth planting (P5). It was also observed from the table that aphid infestation was recorded maximum in fifth plantings (305.25 per 100 compound leaves), followed by third (236.25), fourth (323.25), second (312.75) and first planting (297.50) respectively. The high level of aphid population on potato was observed on December planted crop by Bhadauria *et al* (1997) and Lakra (2005) as the aphid population build up was not associated with age of the plants, but were associated with climatic conditions. The results of present investigation confirmed earlier findings (Konar *et al*. 2001, Konar & Roy 2002). The incidence of whitefly *Bemisia tabaci* (Genn.) infestation started just after the emergence of crop, in between second week of December and first week of January in different dates of planting. In the first two planting (P_1 and P_2), the pest population reached the peak in fourth week of December and their population declined up to the middle of January and again attained the peak in fourth week of January and first week of February. But only one peak of population of the pest was observed during fourth week of January and first week of February and afterwards, the population gradually decreased in third dates of sowing fourth and fifth (P_3, P_4 and P_5). The table also shows that mean lowest whitefly population was obtained in P_3 and then gradually increased in P_2, P_1, P_4 and P_5 respectively and during peak period of population the whitefly number was highest on P_5 (25.50 per 45 compound leaves), followed by P_4 (23.00), P_3 (19.50), P_1 (19.00) and P_2 (13.75) respectively. Mogahed (2003) also recorded maximum population of whitefly on potato during December. However, the variations of whitefly number in different planting dates were insignificant among themselves.

The data presented in table 1 also indicated that in the first three planting dates, the appearance of epilachna beetle population on the crop, gradually increased up to fourth week of December and then the population slightly decreased during first week of January and thereafter, again started to increase till the full maturity of the crop. The maximum population of the pests was recorded at the time of dehaulming of the crop in all the plantings, except the fifth one, where it was found one week before dehaulming. The peak population of the

pests was highest in P_5 (41.50 per 15 plants) and then in P_4 (35.25), P_3 (35.00), P_2 (30.50) and P_1 (26.50) respectively and among these, P_3 and P_4 were at par. The mean population of the beetle was also maximum in P_5 (15.07), followed by P_4 (12.91), P_3 (12.75), P_2 (11.54) and P_1 (9.57), respectively. The incidence pattern of epilachna beetle on potato was studied by Konar and Mohasin (2002) and the results of the present investigation regarding the incidence pattern of the pest were more or less similar with the findings.

It was observed that the tuber yield of potato, both on number and weight basis, was significantly influenced by different dates of planting (Table 2). Highest number of healthy potato tubers (676.50) was obtained from the plot planted on third week of November (P_1) and then P_2 (642.25) P_3 (619.50), P_4 (592.75) and P_5 (578.75) respectively. Among these, the first two (P_1 and P_2) and the last two plantings were at par among themselves. Likewise, P_1 also yielded maximum potato tubers per plot on weight basis (27.86 kg), which was followed by P_2 (25.47 kg), P_3 (23.08 kg), P_4 (21.56 kg) and P_5 (18.68 kg) respectively but the yields of P_3 and P_4 were insignificantly different to each other. The damage caused by cutworm, both on number and weight (per plot) basis, was recorded maximum in P_5 (78.25 and 7.83 kg respectively) followed by P_4 (62.75 and 7.37 kg respectively), P_3 (47.25 and 6.28 kg respectively), P_2 (41.50 and 6.54 kg respectively) and P_1 (28.00 and 4.78 kg respectively), respectively. Similarly, the damage caused by mole cricket both on number and weight per plot was observed maximum in P_5 (29.25 and 3.16 kg respectively) followed by P_4 (21.75 and 2.78 kg respectively), P_3 (17.50 and 2.47 kg respectively), P_2 (13.50 and 2.21 kg respectively) and P_1 (7.75 and 1.29 kg respectively) respectively. However, the Potato Tuber Moth (PTM) damage was not observed in first two planting dates and it was found least in P_4 and then in P_3 and P_5, respectively on number basis (1.50, 1.75 and 2.50 per plot, respectively). But on weight basis, minimum damage was recorded in P_3 (0.10 kg/plot), followed by P_4 (0.12 kg/plot and P_5 (0.15 kg/plot), respectively. Rats also caused a considerable damage to the crop, but the different planting dates did not affect the number and weight of damaged tubers. Finally the total number and weight of damaged tuber per plot were found maximum in P_5 (131.25 and 12.44 kg, respectively) and minimum in P_1 (52.50 and 7.38 kg, respectively. Konar and Mohansin (2003) reported from the plains of West Bengal 2.50-16.50% and 6.63-9.00% tuber damage by cutworm and molecricket respectively. Chopra and Kapoor (1993) also found 3.53-9% yield loss of potato due to rat (*Bandicota bengalensis*) damage in Haryana. The PTM damage was mainly recorded in later planted crops and it gradually increased with delay in harvesting dates as it has been observed that the PTM population registered an upward trend of population with the increase in temperature and reached the peak in the beginning of March at the maturity stage of *rabi* crop (Raj 1998, Chandramohan 1995).

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Table 1.
Population dynamics of important pests of potato (pooled data of 2006-07 and 2007-08)

Week/Month	Population of different pests on different dates of planting														
	Aphids					Whitefly					Epilachna beetle				
	P_1	P_2	P_3	P_4	P_5	P_1	P_2	P_3	P_4	P_5	P_1	P_2	P_3	P_4	P_5
December I	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
II	0.00	0.00	0.00	0.00	0.00	5.75	0.00	0.00	0.00	0.00	3.25	1.75	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(13.58)	(0.00)	(0.00)	(0.00)	(0.00)	(10.10)	(6.56)	(0.00)	(0.00)	(0.00)
III	5.25	4.00	0.00	0.00	0.00	8.75	5.00	0.00	0.00	0.00	6.50	4.25	2.25	0.00	0.00
	(0.77)	(0.66)	(0.00)	(0.00)	(0.00)	(16.82)	(10.71)	(0.00)	(0.00)	(0.00)	(14.63)	(11.59)	(7.16)	(0.00)	(0.00)
IV	12.25	10.25	4.75	0.00	0.00	19.00	13.50	4.75	4.00	0.00	8.00	7.50	6.25	0.00	0.00
	(1.11)	(1.04)	(0.74)	(0.00)	(0.00)	(25.49)	(21.31)	(10.48)	(10.71)	(0.00)	(16.08)	(15.67)	(14.24)	(0.00)	(0.00)
January I	28.75	24.50	16.50	8.25	6.50	13.75	8.75	9.00	7.25	6.50	5.75	2.25	4.75	3.50	0.00
	(1.47)	(1.40)	(1.24	(0.94)	(0.85)	(21.34)	(17.01)	(16.72)	(15.43)	(14.40)	(13.67)	(13.10)	(12.25)	(10.49)	(0.00)
II	63.00	52.75	31.25	25.25	24.75	6.25	5.00	3.75	9.50	9.25	5.50	6.50	7.25	5.25	2.75
	(1.80)	(1.72)	(1.49)	(1.41)	(1.40)	(13.94)	(12.60)	(9.28)	(17.56)	(16.73)	(12.99)	(14.63)	(15.40)	(13.10)	(8.22)
III	113.50	91.75	68.50	66.25	52.75	8.75	6.75	6.25	13.25	12.25	12.25	12.75	8.75	8.50	6.00
	(2.05)	(1.96)	(1.83)	(1.83)	(1.72)	(16.67)	(14.70)	(12.86)	(20.93)	(19.83)	(20.41)	(20.82)	(17.01)	(16.88)	(14.06)
IV	169.75	146.50	115.25	112.00	83.25	16.50	10.25	19.50	23.00	19.75	16.25	15.50	11.75	12.75	9.25
	(2.23)	(2.16)	(2.06)	(2.05)	(1.92)	(23.77)	(18.34)	(25.92)	(28.41)	(26.01)	(23.52)	(22.94)	(20.19)	(20.85)	(17.59)
February I	223.50	192.25	172.25	165.50	138.00	12.00	13.75	14.00	15.25	25.50	21.25	18.75	17.25	13.50	8.50
	(2.35)	(2.28)	(2.24)	(2.22)	(2.14)	(19.97)	(21.45)	(21.62)	(22.53)	(29.98)	(27.37)	(25.58)	(24.36)	(21.44)	(16.75)
II	297.50	232.25	237.50	238.75	207.25	7.75	9.50	8.25	14.00	20.00	26.50	24.25	21.75	15.25	17.25
	(2.47)	(2.36)	(2.37)	(2.37)	(2.31)	(15.57)	(17.48)	(16.06)	(21.44)	(26.21)	(30.88)	(29.41)	(27.66)	(22.71)	(24.38)
III	0.00	312.75	326.25	323.25	284.50	0.00	7.50	6.25	9.50	12.50	0.00	30.50	25.25	20.75	19.75
	(0.00)	(2.49)	(2.51)	(2.51)	(2.45)	(0.00)	(15.28)	(14.24)	(17.67)	(20.33)	(0.00)	(33.43)	(30.12)	(27.03)	(26.33)
IV	0.00	0.00	264.00	274.50	350.25	0.00	0.00	5.50	7.00	9.50	0.00	0.00	35.00	27.25	29.50
	(0.00)	(0.00)	(2.42)	(2.44)	(2.54)	(0.00)	(0.00)	(11.15)	(15.06)	(16.92)	(0.00)	(0.00)	(36.20)	(31.37)	(32.85)
March I	0.00	0.00	0.00	225.75	292.25	0.00	0.00	0.00	4.25	5.00	0.00	0.00	0.00	35.25	41.50
	(0.00)	(0.00)	(0.00)	(2.35)	(2.46)	(0.00)	(0.00)	(0.00)	(11.40	(10.88)	(0.00)	(0.00)	(0.00)	(36.36)	(40.05)
II	0.00	0.00	0.00	0.00	244.50	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	31.25
	(0.00)	(0.00)	(0.00)	(0.00)	(2.39)	(0.00)	(0.00)	(0.00)	(0.00)	(9.83)	(0.00)	(0.00)	(0.00)	(0.00)	(33.95)
Mean	83.04	97.00	112.39	130.86	153.09	8.95	7.27	7.02	9.73	11.29	9.57	11.54	12.75	12.91	15.07

Figure in parenthesis on the population of aphids are logarithmic transformed values.
Figure in parenthesis on the population of whitefly and epilachna beetle are in angular transformed values.
P_1-1st planting, P_2-2nd planting, P_3-3rd-planting, P_4-4th planting and P_5-5th planting

Table 2.
Yield of healthy and damaged potato tubers in different planting dates during 2006-07 and 2007-08

Different plantings	Healthy tubers (per plot)		Damaged tubers (per plot)									
			Cutworm		Molecricket		PTM		Rat		Total	
	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)	Number	Weight (kg)
P_1	676.50 (2.82)	27.86	28.00 (1.44)	4.78	7.75 (0.91)	1.29	0.00 (0.00)	0.00	16.75 (1.24)	1.31	52.50 (1.72)	7.38
P_2	642.25 (2.81)	25.47	41.50 (1.62)	6.54	13.50 (1.14)	2.21	0.00 (0.00)	0.00	20.25 (1.32)	1.29		10.04
P_3	619.50 (2.79)	23.08	47.25 (1.67)	6.28	17.50 (1.25)	2.47	1.75 (0.43)	0.10	19.00 (1.30)	1.34	85.50 (1.93)	10.09
P_4	592.75 (2.77)	21.56	62.75 (1.80)	7.37	21.75 (1.34)	2.78	1.50 (0.39)	0.12	15.25 (1.20)	1.26	101.25 (2.00)	11.53
P_5	578.75 (2.76)	18.68	78.25 (1.88)	7.83	29.25 (1.47)	3.16	2.50 (0.52)	0.15	21.25 (1.34)	1.30	131.25 (2.11)	12.44
S. Em.(±)	0.01	0.61	0.02	0.15	0.02	0.08	0.04	0.01	0.04	0.01	0.01	0.13
C.D. 0.05	0.01	1.54	0.05	0.37	0.04	0.21	0.09	0.02	NS	NS	0.02	0.32

Figure in parenthesis are logarithmic transformed values.
Plot size = 12 sq.m