Reaction of Potato Varieties against Subterranean Pests

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Abstract

Ten potato varieties, viz. *Kufri chandramukhi*, *Kufri jyoti*, *Kufri chipsona-I*, *Kufri chipsona-II*, *Kufri chipsona-III*, *Kufri anand*, *Kufri pukhraj*, *Kufri badshah*, *Kufri bahar* and *Kufri sindhuri* were screened for their resistance/susceptibility against red ant, cutworm and wireworm at the Instructional-cum-Research Farm, School of Agricultural Sciences and Rural Development (SASRD), Nagaland University, Medziphema campus during 2005-07. The tuber damage by red ant ranged between 28.77 and 46.92% and yield loss ranged from 30.98 to 49.39%. The tuber damage by cutworm ranged from 8.42 to 18.87% and yield loss varied between 13.07 and 23.50%. *Kufri sindhuri* and *Kufri badshah* were the most resistant varieties against red ant and cutworm, while *Kufri anand* and *Kufri chipsona-II* were revealed as the most susceptible ones. *Kufri chipsona-II* recorded the lowest tuber damage by wireworm with 0.86% as well as with 3.85% yield loss, whereas the highest was recorded in *Kufri pukhraj* with 3.17% and 8.62%, respectively.

1. Introduction

The potato, *Solanum tuberosum* L. is a native of high Andean region of South America which is being cultivated in Nagaland for many years. However, the pests and diseases are becoming a major setback in its production. Potato suffers from infestation of a number of subterranean insect pests, viz. red ant, *Dorylus orientalis* Westwood; cutworm, *Agrotis ipsilon* Hufnagel and wireworm, *Agrotis* sp. which directly affect its quality as well as quantity. The present study was therefore undertaken to study the response of different potato varieties against these three major subterranean pests and to identify the resistant varieties so that the findings could be used as a management component in combating the insect pest problem and minimize the use of toxic insecticides.

2. Materials and Methods

Ten potato varieties, viz. *Kufri chandramukhi*, *Kufri jyoti*, *Kufri chipsona-I*, *Kufri chipsona-II*, *Kufri chipsona-III*, *Kufri anand*, *Kufri pukhraj*, *Kufri badshah*, *Kufri bahar* and *Kufri sindhuri* were procured from Central Potato Research Institute, Modipuram campus, Uttar Pradesh, India. Field experiment was carried out at the Instructional-cum-Research Farm, School of Agricultural Sciences and Rural Development (SASRD), Nagaland University, Medziphema campus during the consecutive Rabi seasons of 2005-06 and 2006-07. The experiment was laid out in a randomized block design with three replications. The planting was done on 1st October in a plot size of 2.5 x 0.6 m^2 with a standard spacing of 50 x 15 cm^2. Recommended agronomic practices were followed while raising the crop. The maturity period of the varieties *Kufri chandramukhi*, *Kufri jyoti*, *Kufri chipsona-I*, *Kufri chipsona-II*, *Kufri chipsona-III*, *Kufri anand*, *Kufri pukhraj*, *Kufri badshah*, *Kufri bahar* and *Kufri sindhuri* were 75, 110-130, 110-130, 110-130, 110-130, 110-130, 75, 100-120, 90-100 and 120-135 days, respectively. The tubers of the different varieties were harvested as per duration of the crops. To study the per cent tuber damage by the pests, the data on number of damaged tubers, weight of damaged tubers and the total tubers per plant were recorded at the time of harvesting. The potato tubers infested by red ant, cutworm and wireworm were sorted out by examining the tubers which was recognized from their typical mode of infestation and nature of damage. The per cent tuber damage and yield loss were determined by using the following formula:

$$\% \text{ tuber damage} = \frac{\text{Number of infested tubers}}{\text{Total number of tubers}} \times 100$$

$$\% \text{ yield loss} = \frac{\text{Weight of infested tubers}}{\text{Total weight of tubers}} \text{ X } 100$$

3. Results and Discussion

The tuber damage caused by red ants, cutworms and wireworms ranged from 26.00 to 46.92%, 8.42 to 18.87% and 0.86 to 3.17%, respectively. Data presented in Table 1 clearly indicates that at the time of harvest *Kufri anand* suffered the maximum tuber damage by red ant (46.92%) as well as by cutworm (18.87%) followed by *Kufri chipsona-II* with 43.49 and 17.92% tuber damage by red ant and cutworm, respectively.

Kufri sindhuri exhibited the most resistance against the two pests with lowest tuber damage of 26.00 and 8.42%, respectively followed by *Kufri badshah* (28.77 and 9.27%, respectively). The maximum tuber damage by wireworm was recorded in *Kufri pukhraj* (3.17%), followed by *Kufri anand* (2.79%), while the minimum tuber damage (0.86 and 0.96%) was recorded in *Kufri chipsona-II* and *Kufri bahar*, respectively. Gulab et al. (2002) reported maximum tuber damage by *D. orientalis* in *Kufri chandramukhi* and minimum tuber damage in *Kufri sindhuri*. *Kufri anand* and *Kufri chipsona-II* exhibited the highest yield loss (49.39 and 47.77%) due to red ant and cut worm (23.50 and 22.90%) infestation, respectively. The lowest yield losses by both the pests were observed in *Kufri sindhuri* with respective yield loss of 30.98 and 13.07% followed by *Kufri badshah* with 33.42 and 13.79%. The minimum yield loss due to wireworm was recorded in *Kufri chipsona-II* with 3.85% followed by *Kufri bahar* with 4.37%, while *Kufri pukhraj* and *Kufri anand* exhibited the highest yield loss of 8.62 and 8.38%, respectively. The yield loss caused by red ant on potato tubers varied between 30.98 to 49.39% in the present investigation. Yien (1984) also reported between 29.29 to 37.56% yield loss due to red ant. Similarly, Borah (1994) reported tuber damage ranging from 11.70 to 41.05% from Assam (India). The results on the influence of varietal resistance to cutworm infestation have shown that none were resistant to the pest. Parihar and Singh (1998) screened 12 varieties of potato for resistance to cutworm and they had also stated that none of the varieties were resistant to the pests. The tuber damage ranged from 8.42 to 18.87% and yield loss ranged from 13.07 to 23.50% in which *Kufri anand* followed by *Kufri chipsona-II* ranked the highest and *Kufri sindhuri* followed by *Kufri badshah* ranked the lowest tuber damage. The findings of Shankarappa and Bhushan (2009) and Sharanappa et al. (2010) could relate with the present findings who stated that *Kufri chipsona-II* was considered the susceptible variety, while *Kufri chandramukhi* and *Kufri jyoti* were the resistant varieties against cutworm. Study on the influence of potato varieties on per cent tuber damage and yield loss caused by wireworm, *Kufri chipsona-II* followed by *Kufri bahar* were recorded more resistant, whereas *Kufri pukhraj* followed by *Kufri anand* recorded as the susceptible varieties. The per cent yield loss caused by wireworm varied between 3.85 and 8.62% in the present investigation which is similar to the findings by Parihar et al. (1994) who reported 0.1-14.2% yield loss. However, Kuhar et al. (2008) recorded as high as 45% yield loss by wireworm in United States which resulted in substantial economic loss in potato.

Table 1: Influence of potato varieties on tuber damage (%) and yield loss (q ha-*1*) caused by subterranean insect pests (pooled over 2005-06 and 2006-07)

Varieties	Tuber damage (%)			Yield loss (%)		
	Red ant	Cutworm	Wireworm	Red ant	Cutworm	Wireworm
Kufri chandramukhi	34.95 (36.24)	12.69 (20.86)	1.47 (6.96)	39.27 (38.80)	17.88 (25.01)	6.12 (14.32)
Kufri jyoti	32.15 (34.55)	11.90 (20.17)	1.45 (6.92)	37.65 (37.85)	16.47 (24.02)	5.70 (13.82)
Kufri chipsona-I	39.40 (38.88)	15.44 (23.13)	1.74 (7.56)	43.25 (41.13)	19.99 (26.55)	6.75 (15.06)
Kufri chipsona-II	43.49 (41.26)	17.92 (25.04)	0.86 (5.19)	47.77 (43.72)	22.90 (28.59)	3.85 (11.32)
Kufri chipsona-III	39.47 (38.92)	16.79 (24.18)	2.30 (8.72)	44.79 (42.01)	20.77 (27.11)	7.89 (16.31)
Kufri anand	46.92 (43.23)	18.87 (25.74)	2.79 (9.60)	49.39 (44.65)	23.50 (29.00)	8.38 (16.83)
Kufri pukhraj	37.12 (37.54)	13.47 (21.53)	3.17 (10.25)	40.97 (39.80)	19.12 (25.92)	8.62 (17.07)
Kufri badshah	28.77 (32.44)	9.27 (17.72)	1.97 (8.06)	33.42 (35.30)	13.79 (21.79)	7.12 (15.47)
Kufri bahar	30.90 (33.77)	10.69 (19.08)	0.96 (5.61)	33.99 (35.66)	15.03 (22.81)	4.37 (12.06)
Kufri sindhuri	26.00 (30.68)	8.42 (16.86)	1.22 (6.34)	30.98 (33.81)	13.07 (21.19)	5.39 (13.42)
SEm±	0.16	0.18	0.09	0.16	0.14	0.09
CD (*p*=0.05)	0.34	0.37	0.19	0.34	0.29	0.19

Figures in parenthesis are angular transformed values

4. Conclusion

Potato occupies an important position in the region, though it is not a traditional crop. The major concern is the alarming yield gap in its production and attack of insect pests is one of the important aspects. Thus, use of insect pest resistant varieties will definitely provide an eco-friendly pest management approach at no additional cost to the growers.

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