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## Progress and apparent rate of infection of Viral diseases of potato in the plains of West Bengal

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Studies on the progress and apparent rate of infection of potato virus diseases were conducted for two successive (2006-07 & 2007-08) crop season on five potato varieties viz. K. Ashoka, K. Pukhraj, K. Pushkar, K. Surya and Atlantic. In all the varieties tested the per cent incidence of PVX, PVY and PLRV were found to be low at 45 days after planting thereafter the spread of the virus diseases increased gradually and reached at its maximum at 75 days after planting. Apparent rate of infection of PVX was highest in case of K. Ashoka followed by K. Pukhraj. In case of PVY the apparent rate of infection was highest in K. Surya followed by Atlantic. Apparent rate of infection of PLRV was highest in case of Atlantic followed by K. Surya.

**Key words:** Potato virus diseases, potato varieties, infection rate.

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### INTRODUCTION

Potato is one of the most important food crop in India next to cereals. India now ranks 4<sup>th</sup> in the area (1.3 million hectare) and 3<sup>rd</sup> in production (23.6 million tones). Thus there is a phenomenal increase in area, production and productivity of the crop.

Commercially potato is propagated through seed tubers. Due to vegetative propagation many disease agents are transmitted from one generation to next generation. Such degeneration is characterized by curling and chlorosis of foliage accompanied by small sized tubers and lesser potato yield. Potato is attacked by more than 30 viruses. Among 30 virus diseases only 9 virus diseases are responsible for significant yield loss (Shekhawat *et. al*, 1999). The losses due to viruses are usually quantitative but in some cases qualitative loss as well. Infections of PVY and PLRV cause 60-80% loss in yield while mild mosaic (PVX) causes 10-30% loss in yield. However, in West Bengal mild mosaic (PVX), severe mosaic (PVY) and leaf roll (PLRV) disease are more frequently observed and cause significant damage of the crop. In the present study attempts were made to determine the progress and apparent rate of infection of mild mosaic, severe mosaic and leaf roll of potato with respect to different varieties in the field condition.

### MATERIALS AND METHODS

Studies on progress and apparent rate of infection of mild mosaic (PVX), severe mosaic (PVY) and leaf roll (PLRV) disease of potato with respect to different varieties under natural field conditions were conducted in two successive crop season i.e. during 2006-07 & 2007-08 at Adisaptagram Block Seed Farm, Hooghly.

Five varieties viz. K. Ashoka, K. Pukhraj, K. Pushkar, K. Surya and Atlantic were selected for present investigation. Four replications were taken for each variety. The measurement of each plot and spacing were 3 m x 2.4 m and 60 cm x 20 cm respectively. The number of rows and plants per each plot were 4 and 60 respectively. The potato seed tubers were planted on 26<sup>th</sup> November, 2006 & 2007. The per cent incidence of viral diseases (PVX, PVY and PLRV) were recorded at 10 days interval on the basis of visible symptoms after the first appearance of symptoms due to infection of viruses. The first observation was taken 45 days after planting and this process of recording the disease incidence was continued up to 75 days after planting i.e. near the maturity stage. The percentage of disease incidence was calculated by using the following formula.



$$\text{Percentage of disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \times 100$$

The disease incidence on five different varieties K. Ashoka, K. Pukhraj, K. Pushkar, K. Surya and Atlantic were recorded carefully to record the first day of disease appearance and last day of maximum disease incidence. The apparent infection rate of the three diseases i.e. mild mosaic, severe mosaic and leaf roll were calculated by using the following formula developed by Vander Plank (1963).

$$(r) = \frac{2.3}{t_2 - t_1} \left[ \log \frac{x_2}{1 - x_2} - \log \frac{x_1}{1 - x_1} \right]$$

Where,

- $r$  = Apparent infection rate at exponential growth stage  
 $t_1$  = First day of observation of disease  
 $t_2$  = last day of observation of disease  
 $x_1$  = Percent incidence of disease at first day of observation  
 $x_2$  = Percent incidence of disease at last day of observation

## RESULTS AND DISCUSSION

The results of the progress of the different viral diseases viz, PVX, PVY and PLRV with respect to different varieties have been presented in Table-1. The data presented in Table 1 indicates that the per cent disease incidence of PVX, PVY and PLRV were 0.48, 1.44 and 1.44% respectively at first day of observation after planting and the per cent incidence of these diseases increased gradually and reached to 6.25, 5.80 and 6.25% respectively at 75 days after planting.

At this stage the per cent incidence of PVX and PLRV were higher than PVY though initially the percent incidence of both PLRV and PVY were same. In case of the variety K. Pukhraj the per cent incidence of PVX, PVY and PLRV were 0.51, 1.02 and 0.51% respectively at first day of observation and the per cent disease incidence gradually increased and reached to 4.60, 5.10 and 4.60% respectively at 75 days after planting. At this stage the incidence of PVY (5.10%) was higher than PVX (4.60%) and PLRV (4.60%) and initially also the

incidence of PVY (1.02%) was higher than PVX (0.51%) and PLRV (0.51%).

In case of the variety K. Pushkar no PVY and PLRV were observed at first day of observation i.e. 45 days after planting except PVX (0.63%). But at 2<sup>nd</sup> day of observation i.e. 55 days after planting both PVY (1.90%) and PLRV (1.90%) were observed. Thereafter, all the three diseases were gradually increased and reached at maximum i.e. PVX (3.80%), PVY (5.06%) and PLRV (5.60%) at 75 days after planting. The incidence of PLRV (5.60%) was higher than both PVX (3.80%) and PVY (5.06%) though initially PVX incidence was highest.

The data presented in Table 1 for K. Surya indicates that the incidence of PVX, PVY and PLRV were recorded 0.00, 0.53 & 1.07% respectively as on the initial stage of observation, thereafter, gradually increased in incidence and reached to 2.70, 4.30 and 8.06% respectively at 75 days after planting. PLRV incidence was higher than PVX and PVY and from initial to final stage of observation.

In case of the variety Atlantic the incidence of PVX, PVY and PLRV were recorded 0.00, 0.53 & 1.60% respectively as on the initial stage of observation and was reached to 2.70, 4.30 & 14.40% respectively as on final stage of observation. The per cent incidence of PLRV was higher than PVX and PVY and this trend was observed throughout the growth stage of the crop. The results presented in Table 1 also indicates that the per cent incidence of PVX was highest in variety K. Ashoka and lowest in the varieties K. Surya and Atlantic. The per cent incidence of PVY was highest in the variety K. Ashoka and lowest in the varieties K. Surya and Atlantic. The per cent incidence of PLRV was highest in the variety Atlantic and lowest in the variety K. Pukhraj.

Apparent rate of infection/day ( $r$ ) is presented in Table 2. From the Table 2 it is observed that apparent rate of infection of PVX was highest in case K. Ashoka (0.0874) followed by K. Pukhraj (0.0745) and lowest in case of the variety Atlantic (0.0404). Apparent rate of infection of PVY was highest in case of the variety K. Surya (0.0709) followed by Atlantic (0.0708) and lowest in case of the variety K. Pushkar (0.0444).

**Table 1 :** Progress of mild mosaic, severe mosaic and leaf roll disease incidence of potato

Varieties	Incidence of mild mosaic (PVX), severe mosaic (PVY) & leaf roll (PLRV) at different days interval															
	45 DAP				55 DAP				65 DAP				75 DAP			
	PVX	PVY	PLRV	PLRV	PVX	PVY	PLRV	PLRV	PVX	PVY	PLRV	PLRV	PVX	PVY	PLRV	
K. Ashoka	0.48	1.44	1.44	1.44	1.92	2.88	2.40	2.40	4.80	4.80	3.84	3.84	6.25	5.80	6.25	
K. Pukhraj	0.51	1.02	0.51	0.51	1.53	2.55	1.53	1.53	3.60	4.08	3.60	3.60	4.60	5.10	4.60	
K. Pushkar	0.63	0.00	0.00	0.00	1.90	1.90	1.90	1.90	3.16	4.43	5.06	5.06	3.80	5.06	5.60	
K. Surya	0.00	0.53	1.07	1.07	0.00	1.61	3.80	3.80	1.61	2.70	7.00	7.00	2.70	4.30	8.06	
Atlantic	0.00	0.53	1.60	1.60	1.06	1.61	5.90	5.90	2.12	2.70	12.23	12.23	2.70	4.30	14.40	

DAP = Days after planting

**Table 2 :** Apparent infection rate of mild mosaic (PVX), severe mosaic (PVY) and leaf roll (PLRV) with respect to different varieties\*

Varieties	Mild mosaic (PVX)						Severe mosaic (PVY)						Leaf roll (PLRV)					
	Percentage of infection at 1 <sup>st</sup> observation		Period taken to reach max. infection (days)		Apparent infection rate/day (r)		Percentage of infection at 1 <sup>st</sup> observation		Period taken to reach max. infection (days)		Apparent infection rate/day (r)		Percentage of infection at final observation		Period taken to reach max. infection (days)		Apparent infection rate/day (r)	
	of infection at 1 <sup>st</sup> observation	at final observation	reach max. infection	to reach max. infection	infection rate/day	(r)	of infection at 1 <sup>st</sup> observation	at final observation	reach max. infection	to reach max. infection	infection rate/day	(r)	of infection at final observation	at final observation	reach max. infection	to reach max. infection	infection rate/day	(r)
K. Ashoka	0.48	6.25	30	30	0.0874	0.0874	1.44	5.80	30	30	0.0476	0.0476	1.44	6.25	30	30	0.0505	
K. Pukhraj	0.51	4.60	30	30	0.0745	0.0745	1.02	5.10	30	30	0.0549	0.0549	0.51	4.60	30	30	0.0677	
K. Pushkar	0.63	3.80	30	30	0.0607	0.0607	1.90	5.06	20	20	0.0444	0.0444	1.90	5.60	20	20	0.0495	
K. Surya	1.61	2.70	10	10	0.0721	0.0721	0.53	4.30	30	30	0.0709	0.0709	1.07	8.06	30	30	0.0696	
Atlantic	1.06	2.70	20	20	0.0404	0.0404	0.53	4.30	30	30	0.0708	0.0708	1.60	14.40	30	30	0.0779	



Apparent rate of infection of PLRV was highest in case of the variety Atlantic (0.0779) followed by K. Surya (0.0696) and lowest in case of the variety K. Pushkar (0.0495).

**ACKNOWLEDGEMENT :**

The authors are thankful to the Department of Plant Pathology and AICRP on Potato, BCKV, Mohanpur /

Kalyani, Nadia, West Bengal for carrying out this experiment.

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(Accepted for publication December 09, 2010)