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INCIDENCE OF POTATO LEAFROLL LUTEOVIRUS AND ITS EFFECT ON GROWTH AND YIELD OF POTATO IN MANIPUR

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ABSTRACT

A survey of the farmers' potato fields at five different locations of Manipur valley was carried out during *rabi*, 1991-92 to find the natural incidence of potato leafroll luteovirus (PLRV). Field experiments were conducted during *rabi*, 1992-93 at the College of Agriculture, Imphal to assess the disease incidence of PLRV and its effect on growth and yield of potato var. Kufri jyoti under Imphal valley conditions. Among the farmers' fields surveyed the highest PLRV (83.33%) was observed at Iroisemba. PLRV markedly affected the plant growth showing the average linear shoot growth of the affected plants to be 13.54 cm as compared to that of 16.4 cm in healthy plants.

Potato leafroll luteovirus (PLRV) being a widely distributed disease had been reported to singly reduce the yields upto 60 to 70 per cent while mild ones like PV-X, S and M reduced upto 10 to 30 per cent (Nagaich etc. al, 1974). In India many reports are available on PLRV from different places (Choudhuri, 1957 and Singh, et. Al., 1982). In Manipur many viral diseases affected potato crop of which PLRV being an important one. Hence a study was taken up to examine the extent of disease incidence and the reduction in plant growth and to estimate losses in yield due to PLRV disease under the Manipur valley (790 m msl) conditions during *rabi*, 1992-93 to assess the disease problem.

MATERIALS AND METHODS

Field experiments were conducted in the farm of the College of Agriculture, Central Agricultural University, Iroisemba, Imphal, during *rabi*, 1992-93. Potato (*Solanum tuberosum* Linn.) variety Kufri Jyoti was used as test crop throughout the experiments.

For recording the natural incidence of viral diseases of potato, a survey was conducted in farmers' fields of five locations viz. Kongpal, Bishnupur, Thoubal, Kakching and Iroisemba. Observations were taken by random sampling in approximately 2x2 sq m area. Field experiment was conducted using five plots of 2.5 x 5 sq m each area. PLRV incidence was recorded by examining the plants showing the symptoms and per cent infection was calculated.

Experiment was carried out under field conditions in order to study the influence of PLRV on various aspects of plant growth and yield viz. linear growth of shoots, leaf length, tuber diameter, tuber number/plant and fresh tuber yield/plant. Plants showing distinct leaf roll symptoms as well as the healthy plants were tagged separately and harvested at maturity (Plates 1&2). Five infected plants were harvested and plant growths were compared with healthy ones. Linear growth parameters were measured through growth of the stem/shoot and length of leaf in cms.

Losses in yield due to PLRV infection was studied in field conditions. To estimate the loss in yield, infected and healthy plants were grown till maturity. Tubers from infected and healthy plants were harvested

and number of tubers per plant, weight of tubers and tuber diameter were recorded for assessing the virus influence. Care was taken to avoid damage to the tubers and loss of moisture during harvesting. As soon as the samples were harvested, they were packed in lavelled polythene bags and later weighed to determine the fresh weight of tubers. The tubers were cut into two equal halves for measuring their diameters in cm.

The percentage loss in yield was calculated as :

$$Q = \frac{a-b}{a} \times 100$$

Where, Q = per cent yield loss,
A = average yield of a healthy plants (g/plant) and
B = average yield of infected plants)g/plant).

RESULTS AND DISCUSSION

Natural incidence of PLRV

During surveys of different farmers' fields, the incidence of PLRV was found to be higher in all the locations than the mosaic disease (Table 1) where the mean percentage infection of PLRV was found to be 75.73% as compared with 18.33% mosaic incidence. The incidence of PLRV was found to be highest at Iroisemba (83.33% followed by Bishnupur (80.00%), Imphal East (Kongpal) (78.33%) Thoubal (75.00%) and Kakching (62.00%). Nagaich et al. (1974) also reported that incidence of PLRV was higher than those of PV-X, S, A and M in potato and the per cent loss in yield due to PLRV was higher than those due to the other viruses. Higher incidence of PLRV than mosaic virus in the field may be due to the seed borne nature of the virus and also to the high population of the insect vector, *Myzus persicae* in the field. In the field experiment conducted at the College of Agriculture farm too, the incidence of PLRV was found to be much higher (72.60%) than the mosaic symptom (20.00%). Ahmed and Ahmed (1995) also reported that the incidence of PLRV ranged from 0.03% to 12.82% in different potato growing areas of Punjab.

Effect of PLRV on growth and yield components

PLRV had profound influence on the growth of potato plants. The mean linear growth of the infected plants was found to be 13.54 cm whereas in case of healthy plants, the linear growth was 16.40 cm. PLRV affected the length of the potato leaves also. The mean length of the PLRV infected leaves was 10.24 cm whereas the mean length of the healthy potato leaves was found to be 12.22 cm. The linear growth of shoots and length of leaves of infected plants showed significant differences with that of uninfected healthy plants.

With regard to the loss of yield, there was a marked decrease in yield of PLRV infected potato (Table 2). In this trial the maximum loss was in the number of tuber per plant (50.00%) followed by mean diameter of tubers (46.23%). However, there was only 45.15% reduction in fresh weight of tuber. Nagaich etc. al. (1974) found 60 to 75% loss in yield due to PLRV. Nelson and Torfason (1974) observed 55.00% loss in yield and 65.00% in marketable yield in the potato cultivar Netted Gem due to PLRV.

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Table 1. Natural incidence of potato viruses in farmers' field

Location	Per cent incidence	
	Potato leaf roll	Mosaic
Imphal East (Kongpal)	78.33	22.00
Bishnupur	80.00	24.00
Thoubal	75,00	16.00
Kakching	62.00	14.00
Irosemba	83.33	15.67
Mean	75.73	18.33

Table 2. Effect of PLRV on growth and yield parameters of potato var. Kufri Jyoti

Parameters	Healthy (± SE)	Infected (± SE)	Per cent loss/ reduction
Shoot length (cm)*	16.40 (± 1.19)	13.54 (± 1.60)	17.44
Leaf length (cm)*	12.22 (± 1.88)	10.24 (± 1.91)	16.20
Tuber no. (Plant)	6.00 (± 1.41)	3.00 (± 1.00)	50.00
Tuber diameter (cm)	5.84 (+ 1.00)	3.14 (+0.91)	46.23
Fresh Tuber yield (g/plant)	179 (± 34.09)	98.40 (± 42.95)	45.15

	Shoot length	Leaf length
*C.D. (5%)	0.82	1.10