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Influence of Date of Planting on the Development of Late Blight of Potato

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Late blight of potato caused by *Phytophthora infestans* is an important disease in West Bengal. The disease is not of regular occurrence, but appears in a noticeable form in every 2-3 years. Average yield loss due to the disease is approximately 75% of the total production (Paharia, 1961). The causal pathogen mainly perpetuates from one season to another through infected seed tubers. In the plains, the pathogen survives in seed tubers in cold stores, without showing any external symptom (Pushkarnath & Paharia, 1963). Most of the tubers, having 5% or less surface infections, were found to germinate and give rise to diseased plants (Bhattacharya *et al.*, 1990). The present studies were undertaken to investigate the disease initiation and development at different time of planting.

The studies were conducted at Adisaptagram block seed farm, Hooghly during 1997-98, 1998-99 and 1999-2000 crop seasons. Naturally infected potato tubers of cv. Kufri chandramukhi were collected from the field. Tubers having more than 10% infestation were washed thoroughly with tap water, air dried, dipped in methyl alcohol and then, treated with flame for surface sterilization. Tubers were sliced (5 mm thickness) with a sterilized knife. Then the slices, having blighted patches, were incubated at 14 ± 1°C for sporangial development in humid sterilized chambers, prepared by placing sterilized blotter sheet, wetted by sterilized water in a 9 inch dia. Petriplate. Tubers were taken out from cold storage during October, washed, dried, dipped in methylated spirit and flammed for surface sterilization. These tubers were packed with the help of sterilized tips of forceps dipped in sporangial solution of *P. infestans* (4.0×10^5 sporangia/ml). The sporangial suspension was prepared from inoculum produced on potato slices and was amended with antibiotic mixture i.e. penicillin - 500 ppm, vancomycine-200 ppm, chloramphenicol-100 ppm and carbendazim - 100 ppm to check other fungal growth and bacterial contamination. These inoculated tubers were incubated at 18 ± 1°C in perforated plastic bags for a period of three weeks for proper build up of inoculum potential and sown in the field. Tubers inoculated in the laboratory, were planted on ridges at 10 cm depth and 20 cm distance from tuber to tuber under field condition in an area of 1000^2 m. Total sprouting as well as diseased sprouts were recorded at 5 days intervals upto 45 days after planting. The meteorological data i.e. soil temperature (°C) and soil moisture (%) were recorded with the help of soil thermometer and hygrometer. The blighted tubers were planted in the field on November 5th, 15th, 25th and December 5 during the year 1997-98, 1998-99, 1999-2000 respectively. Data on tuber rotting and emergence of diseased sprouts were collected at 5 days interval upto the 45th day and final date of sowing was presented after 45 days observation. Healthy uninoculated tubers were used as control.

Affected tubers on germination did not produce any diseased sprout, when planted on 5th November, during the years on experiment. Tuber rotting on the other hand was maximum (av. 56.2%) during this period (Table 1). The total sprouts were less

Table 1. Effect of date of sowing on disease sprouting and tuber rotting

Date of sowing	Average number of sprouts/tuber		Disease sprouting (%)						Tuber rotting (%)					
			1997-98		1998-99		1999-2000		1997-98		1998-99		1999-2000	
	D	H	I	C	I	C	I	C	I	C	I	C	I	C
5th November	0	5	0	0	0	0	0	0	58.6 (49.95)*	0	60.0 (50.77)	0	50.0 (45.00)	0
15th November	3	2	6.0 (14.18	0	3.7 (11.09)	0	4.5 (12.25)	0	4.7 (33.21)	30.0	28.0 (31.95)	0	25.0 (30.00)	0
25th November	2	3	10.0 (18.43)	0	9.0 (17.46)	0	8.8 (17.26)	0	11.6 (19.91)	0	9.0 (17.46)	0	9.4 (17.85)	0
5th December	4	1	25.0 (30.00)	0	20.0 (26.57)	0	22.5 (28.32)	0	8.0 (16.43)	0	6.0 (14.18)	0	8.0 (16.43)	0
SEm±			1.65		1.85		1.69		1.90		2.15		2.28	
CD (P=0.05)			4.95		5.68		4.92		5.75		6.68		7.05	

* Figures in parentheses are the transformed ($\sqrt{X+0.5}$) values
D=Disease, H=Healthy, I=Inoculated, C=Control (1997-98, 1998-99, 1999-2000)

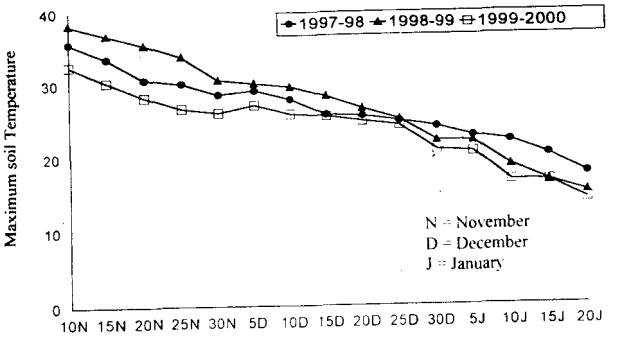

Fig. 1A Effect of soil temperature on date of planting

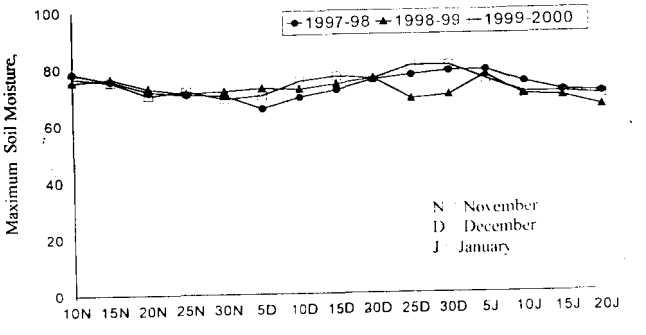

Fig. 1B Effect of soil moisture on date of planting

and the incidence of diseased sprouts was insignificant in crop sown on 5th November as compared to healthy ones. Diseased sprouts were also quite low (av. 4.7%), when tubers were sown on 15th November. At the same time, tuber rotting was lowest (av. 29.3) during this period. Maximum diseased sprouts (about 22.5%) was noticed, when tubers were sown on 5th December in all the years. Data from the observations showed a similar trend.

From the data on some soil environment condition, presented in Fig IA and Fig IB, a correlation between soil temperature and soil moisture at one hand and percentage of diseased sprout and tuber rotting on the other hand could be drawn. Tuber rotting was higher at higher temperature and soil moisture as recorded in the early part of November. Such reduction in soil temperature might be a infestation of two factors. (1) Genral decrease in soil temperature during

later part of November and December as well as (2) Irrigation at certain interval of the crop which tend to reduce the soil temperature and at the same time increase the soil moisture.

It has been reported that inoculum of *Phytophthora infestans* does not survive at a comparatively high temperature (Singh, 1984). Sekhon and Sokhi (1999) also reported that potato crop (cv. Kufri chandramukhi) did not produce disease when planted on September 20 and 30 during 1994 and 1995 under field condition due to prevalence of high temperature (40 ± 2°C). It is evident from the present investigation that, 1st week of December are not the favourable period of planting in this area. But 4th week of November appears to be suitable time of sowing, because the incidence of diseased sprouts was low (9.2%) and the tuber rotting was below the risk level (around 10.0%) as compared to other dates of planting.

Acknowledgements : I express thanks to Dr. S.M. Paul Khurana, Project Coordinator, AICPIP, CPRI, Shimla for his kind cooperation in this investigation. The author is also thankful to Prof. P. K. Sen Gupta for his valuable advice and suggestions during the study.

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Studies on the Progression of Early Blight of Potato

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Early blight disease of potato caused by *Alternaria solani* is one of the important destructive diseases in temperate climate world wide. Potato crops severely infested with early blight often produce 30-50% lower yield than those uninfested (Rouse, 1985). Failure of crop was due to this disease because of highly favourable weather conditions. The present investigation was carried out on farmers fields, to study the progression of the disease at different growth stages of the host and the relationship between the disease intensity and some weather parameters by developing model for assessing frequency of disease occurrence using average air temperature, relative humidity, rainfall and cloud cover.

Data of the early blight disease infection were collected during 1997-99 through extensive survey from the five villages *viz.*, Bawan, Lal Ka Purva (Faizabad), Tirhut, Kanpa and Pandey Pur (Sultanpur). In each village, sixteen farmers were selected who grew four varieties of potato *viz.*, Kufri chandramukhi, Kufri kuber, Kufri chamatkar and Kufri jyoti. The crops were sown during 2nd week to 4th week of November in each year. Data of disease infection was collected randomly and were analyzed. The disease intensity was recorded in respect of periodical progression (Pp) and cumulative progression (Cp) at different crop growth stages as given by FAO. The % of disease intensity (PDI) was calculated following 0-5 scale as done by earlier workers. Weather data were collected every day from the N.D.U.A&T. meteorological observatory located near by the fields selected for study.