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Effect of planting date on incidence of early blight (*Alternaria Solanai*) and yield of potato due to climate change

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Abstract

Field experiments were conducted at main experiment station Department of vegetable science, Narendra Dev University of Agriculture and Technology Kumarganj, Faizabad (UP) during 2011-12 and 2012-13. To study five planting dates 17 October, 27 October, 7 November, 17 November and 27 November with four potato cultivars Kufri Ashoka, Kufri Pushkar, Kufri Bahar and Kufri Arun on incidence of early blight (*Alternaria Solanai*) during crop season. The minimum incidence of early blight was recorded (24.05% and 22.34%) on 17 November and the maximum incidence of early blight recorded (38.84% and 37.26%) when crop was planted on 17 October during 2011-12 and 2012-13, respectively however, the variety Kufri Ashoka more susceptible with early blight in respect of Kufri Bahar, Kufri Pushkar, and Kufri Arun. The production of potato tubers was obtained i.e. 471.48q. And 487.48q/ha was significantly highest with 17 November planting of variety Kufri Arun during 2011-12 and 2012-13, respectively. Thus, the results revealed that the best time for planting of potato in eastern Uttar Pradesh on 17th November which shifted from 7th November of planting due to climate change.

Keywords: *Alternaria Solanai*, Agriculture and Technology, vegetable science

Introduction

Potato (*Solanum tuberosum* L.) belongs to family 'solanaceae' is one of the most important vegetable crops grown throughout India. Potato plays an important role in Indian diet since multifarious preparations are prepared from it. It is consumed as cooked vegetable and being versatile can be mixed with almost every cooked vegetable. It is also used for making chips, potato powder, French-fries and for the extraction of starch. In some areas, it is often consumed as a substitute of cereals. Presently, India contributes 10-11 percent of the world potato production and is the second largest producer of potato after china which enjoys a share of 26 percent of the total cultivated area. India produces about 42.33mt of potato from an area of 1.86mha. Among the states, Utter Pradesh is the leading state with annual production of 13.57mt of potato from 0.55mha area. The productivity of India and Utter Pradesh is 22.72 and 24.40 tonnes per ha, respectively during 2011-12. (Anonymous, 2012) [1].

Potato plant is very sensitive to climate factors such as temperature and day length, which exert a considerable influence on its growth and development. A temperature of 15-20 °C is optimum for sprouting and emergence of tubers. Maximum tuberization taken place a mean temperature of about 20 °C. Soil has great influence on yield and quality of the potato tubers. Crop grown on coarse textured (light) soils produces better quality tubers with characteristic shape and bright skin colour, which fetches higher price in the market, however, tuber grown in loamy soils have comparatively better keeping quality than those grown in sandy soils, as the latter become too hot by the time of main and late crops are harvested (Anonymous, 1960) [3]. The criteria for working out the optimum time of planting is that the temperature at planting should be below 32 °C, while minimum temperature should be less than 20 °C by about 25-30 days after planting and the available growing period with this temperature range should be more than 70 days so that economic yield could be obtained. Potato crop planted on 10 20 September at Jalandhar and harvested on 24 November resulted in higher yield as compared to the crop planted on September, however, the per day yield was higher with delay in planting due to favourable environment during plant growth and development stages (Anonymous, 1974) [2].

Materials and methods

The present study was carried out at main experiment station Department of vegetable science,

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Narendra Dev University of Agriculture and Technology Kumarganj, Faizabad (UP) during 2011-12 and 2012-13. The experiment was conducted under humid, sub-tropical climate at 26.47° N latitude and 82.12° E longitudes with an elevation of about 113 meters above mean sea level in the Indo-genetic alluvial plains of eastern Uttar Pradesh. The metrological data receives a mean annual precipitation about 1200mm. Maximum rainfall in this area is received from mid June to end September. However, occasional showers are very common in the month of January and February. The winter months are very cold whereas, summer months are extremely hot. The hot Western winds locally known as *Loo* starts from April and continued till on set of monsoon in the month of June. In all the experimental plots recommended package of practices for potato FYM @ 25tonnes ha⁻¹ + 150: 100: 120Kg ha⁻¹ was used. At the last ploughing, the whole quantity of FYM @ 20 tonnes per hectare was incorporated in the soil. In addition to this half quantity of nitrogen and full phosphorus and potassium were applied in rows about 4-5 cm away from seed tubers and remaining quantity of nitrogen was top dressed in furrow at the time of earthing up.

Disease free certified seed tubers of the potato varieties i.e. Kufri Ashoka, Kufri Pushkar, Kufri Bahar and Kufri Arun were used for planting in the prepared plots on 17th October, 27th October, 7th November, 17th November and 27th November during 2011-12 and 2012-13. Tubers of 2.5-3.0 cm diameter were used. The tubers were planted on the surface of plots at a spacing of 60 cm x 20 cm and covered with soil to make the ridges. Irrigations were applied by tube well at fortnightly interval. Earthing up was done at 30 days after planting of tubers with the help of *Kudal*. At the same time remaining dose of nitrogen was also applied. Application of Indofil M-45 @ 2.5 kg ha⁻¹ was done against late blight disease of potato. Haulms cutting was done on 2nd March (2011-12) and in 5th March (2012-13). The crop was dehaulmed after 110 days of planting. All plots were harvested after 10 days of dehaulming to allow tuber hardening (curing) and the yield of total tubers of each plot was weighed and recorded in kilograms separately and converted into quintal per hectare.

The number of early blight infected plants out of total number of plants in a plot was recorded. Per cent disease incidence was calculated by the following formula:

$$\text{Disease Incidence(\%)} = \frac{\text{Number of early blight infected plants per plot}}{\text{Total number of examined plants per plot}} \times 100$$

Statistical analysis of data recorded in all observations were carried out by method of analysis of variance and treatments were compared with the help of critical difference, following the techniques described by Panse and Sukhatme (1961) [6] and results were evaluated at 5% level of significance.

Results and discussion

The observation recorded in respect of disease incidence of early blight as affected by various planting dates and varieties have been given in (Table-1). The results for disease incidence of early blight showed significant variation among different dates of planting, varieties and their interactions. The incidence of early blight was showed maximum with early and delayed planting on 17 October and 27 November, respectively. However, minimum incidence was recorded 17 November planting during both the years. Among the varieties Kufri Ashoka observed maximum incidence and the minimum incidence was found in Kufri Arun. The results are similar to those of Tiwari *et al.* (2004) [9] who reported that maximum temperature and relative humidity had significant effect on early blight severity.

A significant difference was recorded among the varieties with respect to the incidence of early blight. However, varieties Kufri Bahar and Kufri Pushkar were statistically at par. Minimum incidence of early blight i.e., 22.81% was observed in variety Kufri Arun, which was significantly lowest among the varieties. However, maximum disease incidence was noted in variety Kufri Ashoka. Similar trend was also observed during the second year of investigation. Interaction effect of planting dates and varieties showed significant variation. The minimum disease incidence was recorded in variety Kufri Arun when planted on 17 November, while maximum disease incidence was observed in variety Kufri Pushkar when planted on 27 November.

The yield data indicated that planting on 17 November produced maximum tuber yield i.e. 391.59 quintals and 404.59 quintals per hectare during 2011-12 and 2012-13, respectively. However, the minimum total tuber yield i.e. 282.61 q/ha and 291.74 q/ha was recorded when planted on 27 November during both the years of investigation. The results confirm the findings of Sharma and Prasad (1999) [8] observed total tuber yield was highest from potatoes planted on 30 October and lowest when planted on 20 November in Kufri Badshah under Delhi conditions. Patel *et al.* (2000) [7] and Khan *et al.* (2011) [5] found similar results. Among the varieties the maximum total tuber yield was obtained i.e. 376.33 quintal per hectare in variety Arun followed by Kufri Pushkar. However the variety Kufri Ashoka and Kufri Bahar found to be at par during 2011-12 and 2012-13, respectively. The combination of planting dates and varieties have showed significant results on total tuber yield. The maximum production was obtained i.e. 471.48 quintal and 487.33 quintal per hectare when variety Kufri Arun was planted on 17 November. However, the minimum production of total tubers was recorded in variety Kufri Bahar when planted on 17 October during both the years of experimentation. The results confirm the findings of Ezekil and Bhargava (1992) [4] and Sharma and Prasad (1999) [8].

Table 1: Effect of planting dates and varieties on incidence of early blight and yield of potato during the year 2011-12 & 2012-13.

Treatments	Incidence of early blight (%)		Yield (q/ha.)	
	2011-12	2012-13	2011-12	2012-13
Planting dates (D)				
17 October	38.84 (38.54)	37.26 (37.60)	291.78	304.98
27 October	28.70 (32.25)	27.55 (31.52)	330.13	341.72
7 November	24.99 (29.85)	23.97 (29.17)	367.86	380.68
17 November	24.05 (28.82)	22.34 (27.73)	391.59	404.59
27 November	35.29 (36.41)	33.87 (35.55)	282.61	291.74
SEM	0.537	0.518	5.322	5.591
C.D. (P=0.05)	1.526	1.468	15.073	15.834
Cultivars (V)				
Kufri Ashoka	36.24 (36.98)	34.18 (35.75)	309.09	320.18

Kufri Pushkar	31.03 (33.48)	29.77 (32.68)	343.23	355.53
Kufri Bahar	31.42 (34.03)	30.16 (33.25)	302.53	313.40
Kufri Arun	22.81(28.21)	21.88 (27.57)	376.33	389.87
SEM	0.482	0.464	4.761	5.001
C.D. (P=0.05)	1.365	1.313	13.481	14.162
Interaction (DxV)				
SEM	1.078	1.037	10.645	11.182
C.D. (P=0.05)	3.052	2.936	30.145	31.667

(Figures in parentheses are angular transformed values)

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