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**To Studies the different planting dates and
varieties on yield performance and incidence of
black scurf of potato (*Solanum tuberosum* L.)**

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Abstract

The field experiment was conducted at Main Experiment Station, Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) during *Rabi* season of 2011-12 and 2012-13. To evaluate the five planting dates (17 October, 27 October, 7 November, 17 November and 27 November) and black scurf incidence with four varieties (Kufri Ashoka, Kufri Pushkar, Kufri Bahar and Kufri Arun) experiments were arranged in Randomized Block Design with factorial concept, replicated four. A perusal of data indicated that with the delay in planting significantly increased the incidence of black scurf. Minimum incidence of black scurf (11.07 and 10.62%) was recorded when the crop was planted on 17 October (20 days early planting), while maximum (24.20 and 23.23%) was observed in planting the crop on 27 November (20 days late planting). 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: black scurf of potato and vegetable science

Introduction

Potato (*Solanum tuberosum* L.) belongs to family 'solanaceae' is one of the most important vegetable crops grown throughout India. The major state of the country growing potato are Uttar Pradesh, West Bengal, Bihar and Gujarat, however, the maximum productivity of the crop is found in West Bengal followed by Gujarat. 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. It is also used as thickener in soups and gravies. Potato starch has molding cast candies, such as jelly bens and gumdrops, as thickening agent in synthetic jellies and ice creams, as dusting agent mixed with powdered sugars, for candy gums, chewing gums etc. Potato is considered a protective food since potato supply a substantial amounts of vitamin C and B group vitamins, which are essential for nervous system, normal digestion and skin health. Its consumption plays an important role in preventing teeth decay because of its lack of stickiness and cleaning effects. It is also used in the textile industry for sizing of cotton and spun rayon.

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

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optimum for sprouting and emergence of tubers. Maximum tuberization takes place at 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, tubers 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) ^[1].

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 favorable environment during plant growth and development stages (Anonymous, 1974) ^[2].

A number of factors like availability of quality seed of good variety, optimum time of planting, use of fertilizer, spacing, weed management etc. play an important role in deciding the productivity and quality of produce. White (1980) ^[11] noted that time of planting was important factor in deciding the potato yield. The result and studies conducted in India and abroad indicated that planting dates and selection of cultivars has great influence on growth and yield of potato. Therefore, selection of proper variety and suitable time of planting is an important aspect to study.

Materials and Methods

The experiment was carried out during *Rabi* season of 2011-12 and 2012-13 at Main Experiment Station, Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.). The experiment was laid out in randomized block design with factorial concept and replicated four times. There were twenty treatment combinations involving five planting dates viz. 17th October, 27th October, 7th November, 17th November and 27th November and four varieties viz. Kufri Ashoka, Kufri Pushkar, Kufri Bahar and Kufri Arun. Tubers of 2.5-3.0 cm diameter disease free certified seed tubers were used and recommended package of practices for potato FYM @ 25 tonnes ha⁻¹ + 150: 100: 120 Kg 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. 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. 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.

After harvesting black scurf infected tubers were removed from total number of tubers in each plot and counted. Per cent

disease incidence was calculated by using the following formula:

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

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) ^[7] and results were evaluated at 5% level of significance.

Results and Discussion

An examination of data presented that delay in planting significantly increased the incidence of black scurf. Minimum incidence of black scurf (11.07 and 10.62%) was recorded when the crop was planted on 17 October (20 days early planting), while maximum (24.20 and 23.23%) was observed in planting the crop on 27 November (20 days late planting) during the years 2011-12 and 2012-13, respectively. Among the varieties, Kufri Arun showed significantly minimum incidence of black scurf (8.07) while maximum (22.55%) was recorded in variety Kufri Bahar. However, the difference between Variety Kufri Ashoka and Kufri Pushkar was at par during the year 2011-12. Similar response was also recorded during second year of experimentation.

Incidence of black scurf was recorded increasing order in delay planting significantly. Minimum and maximum incidence was recorded in 17 October and 27 November planted crop, respectively. Variety Kufri Arun gave less effected tubers with black scurf followed by Kufri Pushkar. However, maximum disease incidence was observed in Kufri Bahar. The present results are in conforming to the findings of Lakra (2000) ^[6] who reported that planting on 1 October, 15 October, 1 November, 15 November and 1 December of variety Kufri Badshah. Crop sown on 15 October had low disease intensity. Singh *et al.* (2005) ^[9] also noted that delay in planting, disease incidence of black scurf was increased significantly up to 1 December planting. Whereas crop was planted at 15 days interval from 1 October to 1 December.

According to Lakra (2000) ^[6] studied the effect of sowing date on black scurf (*Rhizoctonia solani*) of potato cv. Kufri Badshah in Haryana. The disease intensity 20.4, 23.7, 27.5, 32.2 and 38.0% were observed planting on 1 October, 15 October, 1 November, 15 November and 1 December, respectively. Crops sown on 15 October had maximum yield and low disease intensity. Jha and Kumar (2005) ^[4] determined the effects of different sowing dates on the grades of black scurf and tuber yield of potato at Dholi (Muzaffarpur), Bihar. The results showed that the maximum disease incidence (43%) and intensity (2.2) were recorded when the grade of tuber infection was more than 75%, while healthy tubers recorded the minimum disease incidence (2.1%) and intensity (1.0).

Singh *et al.* (2005) ^[9] studied the influence of planting time on black scurf (*Rhizoctonia solani*) of potato cv. Kufri Chandramukhi at CCSHAU, Hisar, Haryana. Seeds were planted on 1 October, 15 October, 1 November, 15 November and 1 December. The number of stems/plant was decreased and percentage necrotic stems were increased with delay in planting up to 1 December. Maximum yields and low disease incidence were recorded in crop planted before 15 October. With delay in planting, disease incidence was increased significantly, which resulted in maximum yield loss (47.9%) in 1 December planted crop.

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 Prashad (1999) [10] 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) [8] 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 Ezekiel and Bhargava (1992) [3] and Sharma and Prasad (1999) [10].

Table 1: Effect of planting dates and varieties on yield and incidence of black scurf of potato (2011-12 & 2012-13).

Treatments	Tubers Yield (q/ha.)		Incidence of viral disease (%)	
	2011-12	2012-13	2011-12	2012-13
Planting dates (D)				
17 October	291.78	304.98	11.07 (19.18)	10.62 (18.77)
27 October	330.13	341.72	12.72 (20.70)	12.20(20.25)
7 November	367.86	380.68	13.80(21.60)	13.24(21.14)
17 November	391.59	404.59	18.00 (24.65)	17.26(24.10)
27 November	282.61	291.74	24.20 (29.03)	23.23 (28.38)
SEM	5.322	5.591	0.383	0.381
C.D. (P=0.05)	15.073	15.834	1.085	1.080
Cultivars (V)				
Kufri Ashoka	309.09	320.18	16.79(23.93)	16.10 (23.40)
Kufri Pushkar	343.23	355.53	16.41(23.81)	15.76 (23.30)
Kufri Bahar	302.53	313.40	22.55(28)	21.64 (27.37)
Kufri Arun	376.33	389.87	8.07(16.40)	7.74 (16.05)
SEM	4.761	5.001	0.343	0.341
C.D. (P=0.05)	13.481	14.162	0.971	0.966
Interaction (DxV)				
SEM	10.645	11.182	0.767	0.763
C.D. (P=0.05)	30.145	31.667	2.171	2.160

(Figures in parentheses are angular transformed values)

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