

Impact of Date of Sowing and Spacing on Growth and Yield of Potato (*Solanum tuberosum* L.) in Dehradun

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Abstract: The growth and yield of potato (*Solanum tuberosum* L.) are considerably influenced by agronomic operations sowing dates as well as plant spacing. A field experiment was conducted during the Rabi season of 2025-26 at Shivalik Institute of Professional Studies, Dehradun. This experiment was laid out in a split-plot design having three sowing dates first 15th October second 1st November, and third 15th November) as a major plots and three spacing's first 45 cm × 15 cm second 60 cm × 20 cm, and third 60 cm × 25 cm) as subplots. The findings of present study revealed that sowing on 1st November combined with 60 cm × 20 cm spacing recorded considerably higher plant height (72.4 cm), number of shoots per plant (5.8), and tuber yield (34.2 t/ha) as compared to remaining treatment. Early or late sowing of potato revealed that declines in yield due to adverse climatic circumstances during the time of tuber formation. Close spacing also increased competition between tubers that's results reduces tuber size, while wider spacing increased tuber size however reduced the number of tubers per unit area. As a result, 1st November sowing along with plant spacing 60 cm × 20 cm is recommended for Dehradun conditions.

Keywords: Potato, tuber yield, sowing date, spacing, growth, tuber size

1. Introduction

Potato (*Solanum tuberosum* L.) is one of the major food crops cultivated worldwide due to its major contribution to world food as well as nutritional security. Potato is rich in carbohydrates, vitamins, as well as minerals that are why potato serves as a major dietary source in some countries. In India, potato cultivation is mainly during the Rabi season in the mid-hilly regions, where the agro-climatic circumstances are favorable for its growth and development.

The yield of potato is influenced by several agronomic operations, along with sowing time and plant spacing play a crucial role. These two factors seriously impact the growth and yield of potato. Early or late sowing can disturb the management practices and adversely affect tuber formation and yield. Similarly, inappropriate plant spacing also affects adversely canopy development, inter-plant competition, and inefficient utilization of inputs.

The present field experiment was conducted during the Rabi season of 2025–26 in the Dehradun region. The main objective of this study was to evaluate and identify the most suitable sowing date and plant spacing for potato cultivation which enhance tuber yield and performed better under mid hill conditions.

2. Materials and Methods

2.1 Experimental Site

The present experiment was carried out at the Research Farm of Shivalik Institute of Professional Studies, Dehradun during Rabi season 2025-26. The soil was loamy and pH 6.7.

2.2 Treatments and Design: The Present study conducted in three sowing dates first D1: 15th October, second D2: 1st November and third D3: 15th November as major plot treatments with three spacing's first S1: 45 cm × 15 cm second S2: 60 cm × 20 cm and S3: 60 cm × 25 cm) as subplot treatments following the split-plot design. Each treatment were replicated three times

Table 1: Treatments and Experimental Design

Factor	Particulars	Treatment Symbols
Sowing Dates	15th October	D1
	1st November	D2
	15th November	D3
Plant Spacing	45 cm × 15 cm	S1
	60 cm × 20 cm	S2
	60 cm × 25 cm	S3
Design	Split-plot design	
Replications	Replicated three times	

2.3 Crop Management

Tubers were planted manually. Recommended doses of NPK were applied, with half dose of nitrogen and full dose of P and K at planting, and the remaining nitrogen at earthing up.

Irrigation, weeding, as well as plant protection measures activity were carried out as per needed (NHB, 2020).

2.4 Observations recorded

Data related to plant height, number of shoots per plants, number of tubers per plant, average tuber weight as well as yield was recorded.

Statistical Analysis

Data analyzed with OPSTAT software, and treatment means were compared with the help of ANOVA at 5% level of significance (Gomez and Gomez, 1984).

3. Results and Discussion

3.1 Plant Height

Table-2 revealed that Potato plant height was considerably influenced by both the sowing dates and plant spacing. The maximum plant height 72.4 cm, were obtained with sowing on 1st November with combination of plant spacing of 60 cm × 20 cm. This positive response can be associated with most favorable temperature during the early vegetative stages. Early sowing probable permitted the plants to set up well before temperatures declined, facilitating superior shoot elongation. Additionally, the wider row spacing probably reduced shading along with plants (Khurana et al., 2015).

Table 2: Effect of Dates of Sowing and plant Spacing on Plant Height

Sowing Date	Spacing	Plant Height (cm)
D1 (15 Oct)	S1 (45×15 cm)	65.1
D1 (15 Oct)	S2 (60×20 cm)	67.3
D1 (15 Oct)	S3 (60×25 cm)	66.5
D2 (1 Nov)	S1 (45×15 cm)	69.2
D2 (1 Nov)	S2 (60×20 cm)	72.4
D2 (1 Nov)	S3 (60×25 cm)	70.3
D3 (15 Nov)	S1 (45×15 cm)	60.8
D3 (15 Nov)	S2 (60×20 cm)	63.5
D3 (15 Nov)	S3 (60×25 cm)	62.1
CD (P = 0.05)	Sowing Dates (D)	1.84
	Plant Spacing (S)	1.32
	D × S Interaction	2.25
SEm ±	D	0.61
	S	0.44

	D × S	0.75
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3.2 Number of Shoots per plant

Table-3 revealed that a considerable effect was observed between sowing date and spacing on the number of shoots per plant. The combination D2S2 1st November sowing and 60 cm × 20 cm spacing yielded the maximum number of shoots per plants (5.8). Sufficient plant spacing might have reduced the competition. (Sharma *et al.*, 2018) reported the superior ventilation along with reduced plant stress also supports superior shoot formation.

Table-3: Effect of Sowing Dates and Spacing on Number of Shoots plant⁻¹

Sowing Date	Plant Spacing (cm)	Treatment Symbols	No. of Shoots plant ⁻¹	CD	SEm ±
15th Oct	45 × 15	D1S1	4.3	0.35	±0.12
15th Oct	60 × 20	D1S2	4.6		
15th Oct	60 × 25	D1S3	4.5		
1st Nov	45 × 15	D2S1	5.1		
1st Nov	60 × 20	D2S2	5.8		
1st Nov	60 × 25	D2S3	5.5		
15th Nov	45 × 15	D3S1	4.0		
15th Nov	60 × 20	D3S2	4.2		
15th Nov	60 × 25	D3S3	4.1		

3.3 Yield

Table-4 revealed that tuber yield 24.3 to 34.2 t/ha across the all diverse treatment combinations. The maximum yield (34.2 t/ha) was obtained in D2S2 combination. This can be recognized early sowing provided a favorable temperature for tuber formation, whereas moderate plant density ensures best possible resource use. Reduction in yield in late sowing conditions has also been reported in earlier studies, citing stress during critical stages of tuber development (Verma *et al.*, 2019; Singh and Singh, 2021).

Table 4: Effect of Sowing Dates and Spacing on Tuber Yield (t/ha) in Potato

Sowing Date	Plant Spacing (cm)	Treatment Symbols	Tuber Yield (t/ha)	CD	SEm ±
15th Oct	45 × 15	D1S1	29.8	0.47	0.86
15th Oct	60 × 20	D1S2	31.0		

15th Oct	60 × 25	D1S3	30.4		
1st Nov	45 × 15	D2S1	32.6		
1st Nov	60 × 20	D2S2	34.2		
1st Nov	60 × 25	D2S3	33.0		
15th Nov	45 × 15	D3S1	24.3		
15th Nov	60 × 20	D3S2	25.6		
15th Nov	60 × 25	D3S3	26.1		

3.4 Tuber Size and Quality

Table-5 revealed that the spacing had a considerable impact on tuber size and quality. Wider spacing (60 cm × 25 cm) promoted the development of larger-sized tubers due to minimum competition and greater resource availability per plant. However, the total yield in treatments was relatively lower because of minimum plant population per unit area. On the other hand, closer spacing increased the number of tubers per area but resulted in smaller tubers due to competition for imperfect resources. This substitution between tuber size and yield has also been obtained in earlier research (Patel et al., 2020).

Table-5: Effect of Sowing Dates and Spacing on Tuber Yield (t/ha) in Potato

Sowing Date	Plant Spacing (cm)	Treatment Symbols	Tuber Yield (t/ha)	CD	SEm ±
15th Oct	45 × 15	D1S1	29.8	1.48	±0.52
15th Oct	60 × 20	D1S2	31.0		
15th Oct	60 × 25	D1S3	30.4		
1st Nov	45 × 15	D2S1	32.6		
1st Nov	60 × 20	D2S2	34.2		
1st Nov	60 × 25	D2S3	33.0		
15th Nov	45 × 15	D3S1	24.3		
15th Nov	60 × 20	D3S2	25.6		
15th Nov	60 × 25	D3S3	26.1		

4. Conclusion

The results of the present investigation revealed that sowing on 1st November with plant spacing of 60 cm × 20 cm proved the most efficient treatment for potato cultivation under Dehradun region. This exact combination provided most favorable ecological as well as physiological conditions for the growth and yield of potato crop.

The superior growth and yield parameters under this treatment emphasize its suitability for maximizing profitability from potato farming. Hence, the result of this study can serve as a realistic point for farmers and extension workers. Adoption of these recommendations may also contribute in sustainable and climate-resilient agriculture operations in similar agro-ecological zones. On the basis of study it is recommended that best Sowing Time of potato is around 1st November, Ideal Plant Spacing 60 cm × 20 cm is recommended. Additional studies could assess the performance of diverse potato varieties in recommended sowing time and spacing for better yield as well as sustainability.

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