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Effect of Depth of Tuber Planting on Growth and Yield Parameters of Potato Crop

Navneet Singh[1]*, Amandeep Singh[2] and Kanwaljit Singh[1]

[1]PG Department of Agriculture, Khalsa College Amritsar, India
[2]Department of Plant Pathology, Punjab Agricultural University, Ludhiana, India

**Corresponding author*

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A B S T R A C T

To view the effect of depth of planting on growth and yield parameters of potato (*Solanum tuberosum* L.) crop, the experiments were conducted at Students Research Farm, Khalsa College Amritsar. The experiments were conducted at three different depths of planting as treatments *viz*., D1 (3"), D2 (5") and D3 (7") and each treatment was replicated three times. The data had been recorded at their respective stages of growth and total yield were measured at the end of the season of the potato crop. It was found that maximum number of stems per plant was 6.07 recorded in D_2 treatment along with maximum plant height of 43.20 cm and maximum leaf area index of 3.14 as compared to other treatments. The maximum tuber yield was 203 q/ha and highest number of tubers per plant (7.60) was found in D2 treatment. The study also revealed that the number of tubers per plant decreased as the depth of planting increased. The shallow and deeper depth of planting would reduce the tuber yield due to delay in plant tuber emergence and unfavorable development soil condition and shallow planting also result in reduced the length of stolons which reduced the yield significantly.

Introduction

Potato (*Solanum tuberosum* L.) is an annual herbaceous tuber crop, belonging to the family Solanaceae (Sayed *et al.*, 2013). It has good nutritive value as it contains starch, sugar, crude fiber, proteins, amino acids, vitamin C and essential minerals (P, Ca, Mg, K, S, and Cl). This crop has immense potential of solving hunger and malnutrition problem of the country's ever growing population. There are many factors affecting the successful cultivation of potatoes but depth and date of planting of potato tubers are two major factors which effects the growth, quality and yield of crop.

Yield is greatly influenced by depth of seed tubers. To obtain a homogeneous culture, the tubers should be distributed evenly with a specific spacing between rows and a uniform planting depth (Sayed *et al.*, 2013).

In addition, Lambion *et al.*, (2006) advocated that deeper planting may also limit the damage to tubers by certain pests. In addition to planting depth, crop yield is also influenced by variety, soil, temperature (Gopal *et al.*, 1998), photoperiod (Pruski *et al.,* 2001), light intensity (Gopal *et al.*, 1998), nitrogen nutrition (Etemad and Sarajuoghi, 2012), potassium (Naik and Sarkar, 1998), planting density, plant height, the number of stems on the surface, number of tubers formed by size. Present study was done to evaluate the effect of depth of sowing tubers on growth and yield of crop.

Materials and Methods

Location and climate

Amritsar is located at 31°-38' North latitude and 74°-52' East longitude and altitude of 236 meters above sea level. The climate is generally semi humid with extreme winters and summers. The maximum temperature of about 45-48°C is not uncommon during summer, while freezing temperature accompanied by frost occurrence may be witnessed in the months of December and January. The total annual rainfall witnessed is about 75 cm.

Treatment and design

The treatments were done on variety (Lady Rosetta) at three different depths- D_1 (3 inch), D_2 (5 inch) and D_3 (7 inch). The area of plot taken was 3x3 m^2. Plants in the central rows were used for determination of agronomic performance, leaving aside those in the two border rows as well as those at both ends of each row to avoid edge effects.

Measured parameters

The following growth parameters viz., days taken to tuber emergence, number of stems per hill at 60 DAP, plant height at 60 DAP, leaf area index and yield characteristic had been recorded.

Results and Discussion

Growth parameters

Days taken to tuber emergence

From table 1, it is revealed that tuber emergence is directly related to depth of planting i.e. maximum number of days taken to emergence was treatment D_3 (16.7 days) followed by D_2 and D_1. Kumar *et al.,* (2015) reported the maximum tuber emergence (98.9 percent) at 10 cm depth of planting as compared to 15 and 20 cm depth of planting.

Number of stems per hill

Table 1 showed that maximum number of stems per hill was 6.07 recorded in D_2 treatment followed by D_1 and D_3, respectively. Similarly, Kumar *et al.,* (2015) recorded maximum number of stem per plant were 4.38 at 10 cm depth of plant as compared to 3.88 and 3.38 at 15 and 20 cm depth of planting.

Plant height

Plants obtained maximum height of 43.2 cm (D_2) followed by 38.1 cm (D_1) and 37.0 (D_3) respectively. Kumar *et al.*, (2015) observed that plants have similar height 52 cm at 10 and 15 cm depth of planting, but the plant height were significantly reduced when the tubers were planted at 20 cm depth.

Hamid Reza Arab *et al.,* (2011) found taller plants at 20 cm depth of planting as compare to 30 and 10 cm depth of planting. It is found that with the increase in planting depth, the height of plant decreased. Similar results were also found by Abbasifar *et al.*, (1995).

Table.1 Effect of depth of planting on growth parameters of potato crop

Planting depth	Days taken to tuber emergence	No. of stems per hill	Plant Height (cm)	Leaf area index
D1 (3")	14.80	5.10	38.30	2.11
D2 (5")	15.70	6.00	43.20	3.14
D3 (7")	16.70	4.50	37.00	2.60
CD (0.05%)	1.12	0.37	2.28	0.15

Table.2 Effect of depth of planting on yield parameters of potato crop

Planting depth	No. of tubers per plant	Total tuber yield (q/ha)
D1 (3")	5.60	185.80
D2 (5")	7.60	203.00
D3 (7")	5.00	173.40
CD (0.05%)	0.47	11.60

Leaf area index

Maximum leaf area index (3.14) had been observed in D2 treatment followed by the 2.60 and 2.11 in D3 and D1 treatment, respectively. Ilyas *et al.*, (2017) also observed the maximum leaf area under optimum depth condition, as too much shallow and deep planting significantly affect the leaf area index.

Yield parameters

Among yield parameters, the number of tubers per plant was significantly higher in D_2 treatment (7.6) followed by D_1 (5.6) and D_3 (5.0), respectively (Table 2). Similarly, maximum number of tubers per plant (9.69) at 10 cm depth of planting followed by 8.97 and 8.34 at 15 and 20 cm depth of planting were observed by Kumar *et al.*, (2015) and Bohl *et al.*, (2011). Hamid Reza Arab *et al.*, (2011) observed that 20 cm depth of planting produced highest number of tubers per plant (5.46) as compared to 10 and 30 cm depth of planting, respectively. From table 2, it is further revealed that the number of tubers per plant decreased as the depth of planting increased. Gholipour (1996) also reported that the number of tubers per plant is inversely related to depth of tubers.

Total tuber yield

Maximum total tuber yield was recorded in treatment D_2 (203.0 q/ha) followed by D_1 (185.8 q/ha) and least in D_3 (173.4 q/ha). Kumar *et al.*, (2015) found maximum tuber yield of 567.9 thousand per hectare at 10 cm depth of planting. The shallow and deeper depth of planting would reduce the tuber yield due to delay in plant tuber emergence and unfavorable development soil condition (Bohl and Love, 2005). The shallow planting of tuber in upper layer of soil resulted in closer setting of tubers further attributed to the reduced length of stolons which ultimately leads to reduction in tuber yield (Kumar *et al.*, 2015).

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