EFFECT OF SOWING DATES AND SPACING OF HYBRID TRUE POTATO SEED (TPS) PROGENIES ON YIELD OF SEEDLING TUBER

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ABSTRACT

The experiment was conducted to determine the effect of date of sowing, spacing and TPS progeny on seedling tuber production at Rampur, Nepal during 2001/02. Factorial split plot design was used considering three dates of sowing and three spacing as main plot factors, and two progenies as sub-plot factors. TPS sown on 28 October produced highest seedling tuber yield (3.9 kg/m^2) followed by sown on 8 October (3.4 kg/m^2) and lowest yield was observed in crop sown on 19 November (2.98 kgm^2). The spacing of 15 x 4 and 25 x 4 cm produced similar yields (3.56 and 3.55 kg/m^2 respectively) and higher than spaced at 35 x 4 cm (3.17 kg/m^2). Progeny HPS II/67 produced higher yield (3.57 kg/m^2) than HPS 7/67 (3.29 kg/m^2). The total numbers of tubers were highest in crop sown on 19 November (649 tubers/m^2) and spaced at 15 x 4 cm (653 tubers/m^2). Higher yield and number of very small (1-5 g) size tubers were obtained in crop sown on 19 November. The yield and number of small (5-10 g) size tubers were highest in crop sown on 28 October. The crop seeded on 8 October produced highest yield of medium (10-20 g) size of tubers, but it was not significant difference with 28 October sown crop. Highest yield of larger size of tubers were obtained TPS sown on 8 October. Similarly, the spacing of 15 x 4 cm produced highest yield of very small size tubers. But significant differences were not observed in small and medium size tubers. Relatively higher yield of small size tubers in the spacing of 15 x 4 cm and medium size of tuber in 25 x 4 cm were recorded. Lowest yield of large size tubers were obtained in spacing of 15 x 4 cm. Significant difference was observed of progenies only on large size tubers. The crop seeded on 28 October spaced at 25 x 4 and 15 x 4 cm, and progeny HPS II/67 produced higher number and yield of small and medium size of tubers.

INTRODUCTION

Seed potato is an asexually propagated planting material, which must be free from tuber borne pathogens because they are vulnerable to disease, pest and viruses, which are carried with tuber from one generation to next (Batra *et al.*, 1993). To overcome the problem of tuber borne diseases, transportation of bulky seed potato, and higher investment incurred in seed potato as compared to other crops, a technology of producing potatoes by utilizing true potato seed (TPS) has been developed. For the past sixteen years scientists at the International Potato Center (CIP) have been improving TPS technology to provide a low cost alternative to vegetative propagation (Khatana *et al.*, 1996). The use of TPS was already initiated in Nepal during 1978 but actual involvement of potato growers was started during 1992/93 (PDS, 1998).

The recommended dates of sowing and spacing of PRP and PDS are based on recommendation from other location. PDS (1999) stated that HPS II/67 and HPS 7/67 performed as the better progenies in mid hill and terai among the evaluated progenies, and hence recommended to farmers for seedling tuber production. However, the verifications of those recommendations for different ecological regions of Nepal have not been done. Keeping this view the present study

has been under taken to evaluate the performance of two elite hybrid TPS progenies for the production of different graded seedling tubers under different sowing times and spacing in inner terai condition.

METHODOLOGY

The experiment was carried out at Rampur, Chitwan during 2001/02-winter season started on 8th October and completed on 17th October. Factorial split plot design was employed for the experiment. Factorial experiment in a split-plot design was used considering the combination of three dates of sowing and three spacings as main plot factor, and two TPS progenies as sub-plot factor. Three dates of sowing were 8 Oct, 28 Oct and 19 Nov, and spacing were 15 x 4, 25 x 4 and 35 x 4 cm^2. Similarly, progenies were HPS II/67 and HPS 7/67. Thus eighteen treatments were allocated in the experiment. The plot size was 2 x 1m^2 and the net area of 1.05 m^2 was used for yield assessment.

All the agronomic practices were followed as the recommendation of Potato Research Program (PRP) and Potato Development Section (PDS) except seedbed preparation because a surface soil was used instead of sub-soil. Haulm cutting was done at 90 DAS and potatoes were harvested after 10 days of haulm cutting. Harvesting was done from central rows of 1.05-m^2 areas. Therefore, observation per plot indicates the area of 1.05 m^2 and than adjusted to 1 m^2. The observations of different grades of seedling tubers were recorded after 10 days of curing. The yield and number of different grades of tubers were recorded. The grades were: tiny (< 1g), very small (1-5g), small (5-10g), medium (10-20g) and large (> 20g) sized tubers.

The data obtained from observations were processed and analyzed by using statistical software MSTATC. Two ways ANOVA was carried out and for mean comparison LSD and DMRT test was done.

RESULT AND DISCUSSION

The results obtained during the field experimentation are presented and discussed under the following headings.

1 Yield of Seedling Tuber

1.1 Tuber Weight

Effects of date of sowing, spacing and progeny on tuber weight of different grades are presented in Table 1. The sowing date of 28 October with closer and medium spacing, HPS II/67 was consistently better for higher fresh as well as dry matter yield of seedling tuber raised from TPS.

The sowing date of 28 October was best time for higher yield of seedling tuber. Sowing on 28 October produced highest (P=0.01) seedling tuber fresh yield (3.91 kg/m^2) followed by 8 October (3.39 kg/m^2). Lowest yield was produced by 19 November (2.98 kg/m^2). Tuber dry matter yield was decreased in succeeding date of sowing as indicated by less ground cover in lately sown crop due to decreasing temperature. Similarly, the dry matter yields of tubers in crops sown on 8 and 28 October (0.655 and 0.682 kg/m^2 respectively) were at par with each other but were significantly

Table-1 Effect of date of sowing, spacing and progeny on total fresh and dry matter of tuber, of potato grown from true potato seed for seedling tubers production at Rampur, Nepal, 2001/02.

Treatments	Tuber Fresh Wt (g)	Tuber Dry Wt (g)	Total Tuber No
Date of sowing:			
8 Oct	3387.0 [b]	655.4 [a]	461.6 [b]
28 Oct	3914.0 [a]	682.2 [a]	615.8 [a]
19 Nov	2979 [c]	578.0 [b]	649.8 [a]
SEM	103.7	18.9	20.29
Spacing:			
15 x 4 cm^2	3556 [a]	668.0 [a]	653.6 [a]
25 x 4 cm^2	3555.4 [a]	656.1 [a]	586.3 [b]
35 x 4 cm^2	3169.4 [b]	591.6 [b]	487.2 [c]
SEM	103.7	18.9	20.29
TPS Progeny:			
HPS II/67	3575.0 [a]	673.38 [a]	575.93 [a]
HPS 7/67	3278.9 [b]	603.74 [b]	575.54 [a]
SEM	51.28	13.88	8.02
CV%	10.0	11.38	7.23

Means in the column followed by same superscript in each factors are not significant at P=0.05 by DMRT for the factors date of sowing and spacing and LSD for TPS progeny.
SEM = Standard error of mean, CV= Coefficient of Variance.

higher than that sown on 19 November (0.578 kg/m^2). After 19 November the temperature decreased considerably affecting the vegetative growth of the potato plant resulting into poor ground cover that might have caused reduced tuber yield. PRP (1998, 1999, and 2000) and PDS (1997, 1998) also recommended as second to third week of October as suitable sowing time for terai and inner terai climatic conditions.

The closer and medium spacing were significantly better to increase yield of seedling tuber over wider spacing. The crop spaced at 15 x 4 and 25 x 4 cm^2 gave significantly higher (P=0.05) tuber fresh yield (3.56 and 3.55 kg/m^2 respectively) than wider spacing of 35 x 4 cm^2 (3.17 kg/m^2). Like wise fresh yield of both spacing of 15 x 4 and 25 x 4 cm^2 were at par on tuber dry matter yield (0.668 and 0.656 kg/m^2) and they were significantly higher (P=0.05) in yield than the spacing at 35 x 4 cm^2 (0.591 kg/m^2).

The spacing of 15 x 4 cm^2 and 25 x 4 cm^2 seems to be appropriate for seedling tuber production. The early ground cover of closer and medium spacing might have resulted into higher yield. In similar study, Kabir (1991) also reported that the lowest population density (6 plants/m^2) gave lowest yield and numbers of seedling tubers, whereas highest plant population of 100 seedlings/m^2 (25 x 4 cm^2) gave highest (4 kg/m^2) yield, which supported the present findings. Wiersema (1986b), Shakya (1988), Dissanayake (1982), and Devasabai also found similar findings in their evaluation that showed 100 seedlings/m^2 spaced either at 25 x 4 cm^2 or 10 x 10 cm^2 was optimum spacing for seedling tuber production.

HPS II/67 was best suited progeny for higher yield of seedling tubers in Chitwan condition. Significantly higher (P=0.01) tuber fresh as well as dry matter yield (3.58 and 0.673 kg/m^2 respectively) were obtained from HPS II/67 than HPS 7/67 (3.28 and 0.603 kg/m^2 of fresh and dry matter respectively). More vigorous plant growth might have been better adaptability of

HPS II/67, which resulted into better tuber yield in Chitwan. Hoosain *et. al.* (2001) observed similar yield of seedling tubers (i. e., 6.14 kg/m^2 fresh yield by HPS II/67 and 6.13 kg/m^2 by 7/67) at Rangpur, Bangladesh. Akhtar (2001) also recorded 4.47 and 4.64 kg/m^2 by HPS II/67 and HPS 7/67 respectively in Bangladesh. But lower yield and slower ground cover of HPS 7/67 was observed in Chitwan condition compared to progeny HPS II/67.

1.2 Number of Tuber

As shown in Table 1, effects of date of sowing and spacing were conspicuous on total number of tubers but progenies did not show significant effects. Lately sown TPS with closer spacing produced higher total tuber number.

Delayed sowing time increased total number of tubers. Sowing on 28 October and 19 November produced higher number of tubers and they were not significantly different from each other but they were significantly higher than those seeded on 8 October. The reduction of temperature that received by lately sown TPS decreased vegetative growth of the plant. Low temperature did not decrease secondary stolen number considerably and tuberization process was normal. Of course, bulking process of tubers was affected by vegetative growth of the plant. Less vegetative growth caused by low temperature during early stage of growth caused less ground cover percentage in lately sown TPS. The tubers that were already formed remained smaller due to decreased bulking rate.

Closer spacing of plants gave higher number of tubers. The spacing of 15 x 4 cm^2 produced highest (P=0.01) total number of tubers (653.6/m^2) followed by 25 x 4 cm^2 (586.3/m^2). The lowest number was produced by 35 x 4 cm^2 (487.2/m^2).

Higher number of tubers in closer spacing might have been due to formation of more numbers of underground stolens due to lack of aeral space for main stems. Whereas in wider spaced plots, all the initially formed tubers did not increase in size uniformly; it might be due to the distribution of assimilates to succeeding young tubers. After evaluation of plant density of TPS, Wiersema (1986) concluded that the positive response of total tuber weight to increasing plant population seems to be largely associated with the inherently slow rate of ground cover by seedlings and similar result was also shown by the present study.

2 Size of Tuber

The average size of tuber as significantly influenced by sowing time, spacing and progenies is presented in Table 2.

Earlier the sowing date larger was the size of tubers. TPS sown on 8 October produced significantly larger size of tuber (7.394 g) followed by 28 October (6.492 g). Sowing on 19 November gave smaller sized tuber (4.615 g). The temperature effect might be the major cause of the difference on size of the tubers. Another cause might be earlier sown plots had lower plant density, producing more number of larger sized of tubers per plant but less total number. As usual, wider spacing gave larger size of tubers. The spacing of 35 x 4 (6.643 g) and 25 x 4 cm^2 (6.245 g) resulted in significantly larger size of tubers followed by spacing of 15 x 4 cm^2. Effect of both spacings of 25 x 4 and 35 x 4 cm^2 were at par on an average size of tubers. Difference in plant population densities caused difference on average size of tuber. HPS II/67 produced significantly larger size of tuber (6.404 g) than HPS 7/67 (5.93 g). It might be due to high plant vigor of progeny HPS II/67.

Table-2: Effect of date of sowing, spacing and progeny on average size of tuber of potato from TPS for seedling tuber production at Rampur, Nepal during 2001/02.

Treatments		Average size of tuber
Date of sowing:		
	8 Oct	7.394 [a]
	28 Oct	6.492 [b]
	19 Nov	4.615 [c]
	SEM	0.433
Spacing:		
	15 x 4 cm^2	5.614 [b]
	25 x 4 cm^2	6.245 [a]
	35 x 4 cm^2	6.643 [a]
	SEM	1.045
TPS progeny:		
	HPS II/67	6.404 [a]
	HPS 7/67	5.930 [b]
	SEM	0.065
CV%		5.44

Means within the column followed by same superscript in each factor are not significant at P=0.05 by DMRT for the factors date of sowing and spacing, and LSD for progeny.
SEM = Standard error of mean, CV= Coefficient of Variance.

3 Tuber Yields of Different Sizes

On the basis of weight, tubers were separated into different grades and weight and numbers of these graded tubers were recorded. The number and weight of different graded tubers is given in Table 3 and 4. The significant effect of treatments was observed on different graded tubers. Tiny tubers (< 1g) were not counted and only yield was recorded because they were generally considered as non-marketable.

3.1 Very Small (1-5 g) Size Tubers

Tuber number and weight of graded tubers were significantly affected by date of sowing and spacing, but progenies showed no effect.

The number and weight of very small sized tubers per square meter increased with delay in sowing time. Highest weight and number were given by TPS sown on 19 November (1.13 kg and 422.1 tubers/m^2) followed by the crop sown on 28 October (0.93 kg and 320.1/m^2). The sowing date of 8 October produced lowest weight and number of very small size tubers (0.55 kg and 201.3/m^2).

Table 3: Effect of date of sowing, spacing and TPS progeny on number of different graded seedling tuber numbers/m^2 produced from true potato seed at Rampur, Nepal, 2001/02.

Treatments	Number of seedling tuber/m^2 (Grades according to weight)			
	1-5 g	5-10 g	10-20 g	>20 g
Date of sowing:				
8 Oct	201.3^c *(43.6)*	142.4^b *(30.8)*	97.88^a *(21.2)*	19.94^a *(4.3)*
28 Oct	320.1^b *(51.9)*	191.4^a *(31.1)*	87.19^a *(14.1)*	17.09^a *(2.8)*
19 Nov	422.1^a *(64.9)*	174.9^a *(26.9)*	50.59^b *(7.8)*	2.27^b *(0.3)*
SEM	14.02	10.76	4.167	1.109
Spacing:				
15 x 4 cm^2	390.4^a *(59.7)*	181.37^a *(27.7)*	71.86^a *(11.0)*	10.0^b *(1.5)*
25 x 4 cm^2	312.8^b *(53.3)*	174.81^a *(29.8)*	85.08^a *(14.4)*	13.65^a *(2.3)*
35 x 4 cm^2	240.3^c *(49.3)*	152.54^a *(31.3)*	78.73^a *(16.2)*	15.66^a *(3.2)*
SEM	14.02	10.76	4.17	1.109
Progeny:				
HPS II/67	308.76^a *(53.6)*	169.59^a *(29.4)*	82.89^a *(14.4)*	14.71^a *(2.5)*
HPS 7/67	320.27^a *(55.6)*	169.56^a *(29.5)*	74.22^a *(12.9)*	11.50^b *(2.0)*
SEM	9.77	6.44	4.02	0.72
CV%	16.14	19.75	26.60	28.57

Figures in parenthesis are percentage of tubers.

Table-4: Effect of date of sowing, spacing and TPS progeny on different graded seedling tuber yields g/m^2 produced from true potato seed at Rampur, Nepal, 2001/02.

Treatments	Yields (g/m^2) of seedling tubers grades according to weight				
	< 1 g	1-5 g	5-10 g	10-20 g	>20 g
Date of sowing:					
8 Oct	44.65^c	547.7^c	986.1^b	1327.0^a	526.4^a
28 Oct	85.32^b	929.9^b	1365.0^a	1182.0^a	437.6^b
19 Nov	183.9^a	1133.0^a	1166.0^b	627.6^b	52.59^c
SEM	8.933	46.17	64.89	49.31	28.39
Spacing:					
15 x 4 cm^2	130.6^a	1082.0^a	1265.9^a	956.0^a	252.1^b
25 x 4 cm^2	95.41^b	866.0^b	1216.5^a	1130.4^a	342.5^a
35 x 4 cm^2	87.89^b	662.8^c	1035.1^a	1049.5^a	422.0^a
SEM	8.933	46.17	64.89	49.31	28.39
TPS Progeny:					
HPS II/67	101.9^a	869.8^a	1202.8^a	1112.9^a	389.4^a
HPS 7/67	107.4^a	870.6^a	1142.1^a	977.7^a	288.3^b
SEM	3.21	36.14	36.42	46.24	17.83
CV%	15.95	21.58	16.14	22.99	27.34

Means in the column followed by same superscript in each factors are not significant at P=0.05 by DMRT for the factors date of sowing and spacing, and LSD for TPS progeny. SEM = Standard error of mean, CV= Coefficient of Variance.

Reduction in temperature after November caused slower haulm growth that caused less bulking of tubers but the process of tuberization was not affected by low temperature. Therefore higher yield of very small sized tubers were obtained with delayed in sowing time.

These very small sized tubers could be utilized for recycling of seed where ideal storage facility is available. But in areas where potatoes are stored under farm condition, it is difficult to save

those tubers from acute storage loss. The result showed that adjustment of sowing time could help to produce appropriate number of very small sized tubers as per farmers need.

Closer spacing increased weight and number of very small sized tubers. The spacing of 15 x 4 cm^2 produced highest yield and number of tubers (1.08 kg and 390.4/m^2) followed by 25 x 4 cm^2 (0.87 kg and 312.8/m^2) and the widest spacing (35 x 4 cm^2) produced lowest yield (0.66 kg and 240/m^2). Less space in closer spacing always provides minimum availability of nutrients to increase the size of tubers; it could be the cause of higher yield and number of very small sized tubers.

3.2 Small (5-10 g) Size Tubers

The yield of small sized tubers was only affected by date of sowing, and the factors spacing and progenies did not show effects (Table-3 and 4).

Delay in sowing date favored in increasing the yield of small sized tubers. Significantly higher (P=0.05) yield (Table-7 and 8) of this grade of tubers were obtained in 28 October (1.36 kg and 191.4/m^2) and 19 November (0.99 kg and 174.9/m^2) than that sown on 8 October (1.17 kg and142.4/m^2). Both of the dates of 28 October and 19 November were at par on number of small sized tubers. But seeding on 28 October was significantly higher than seeded on 19 November and at par with 8 October on weight of small size tubers.

3.3 Medium (10-20 g) Size Tubers

Like small sized tubers, the effect of date of sowing was consistent (P=0.01) on yield of medium sized tubers but spacing and progeny did not show significant difference (Table 3 and 4).

Unlike small sized tubers, earlier sowing increased the yield of medium sized tubers. TPS sown on 8 and 28 October produced 1.33 kg & 97.9 tubers /m^2 and 1.18 kg & 87.2 /m^2 respectively of medium sized tubers, which were significantly higher (P=0.01) than that sown on 19 November (0.63 kg and 50.6 tubers/m^2). The tendency of producing relatively larger sized tubers has been observed which might be due to optimum temperature that received by early and mid-season sown crop, which favored tuber bulking.

3.4 Large (> 20 g) Size Tubers

The effects of all the treatments and interaction effects were observed on yield of large sized tubers (Table 3 and 4).

TPS sown on earlier dates produced higher yield of large sized tubers. Highest (P=0.01) weight was observed in TPS sown on 8 October (0.53 kg/m^2) followed by 28 October (0.44 kg/m^2). But tuber numbers of 8 and 28 October were at par (19.9 and 17.1 tubers/m^2). Lowest (P=0.00) yield of large sized tubers (0.053 kg and 2.3 tubers/m^2) was observed in 19 November sowing. The tendency of producing larger sized tubers was observed in earlier sowing crop. The plant vigor and vegetative growth was better due to favorable temperature in October sown crop, which caused better tuber growth. In similar study PRP (2000) observed the similar result i.e., highest numbers of this grade of tubers were obtained in normal season sowing (2^{nd} week of October) in terai condition.

The yield of large sized tuber was increased with increase in spacing. Both the sowing spacing of 25 x 4 (0.343 kg and 13.6 tubers/m^2) and 35 x 4 cm^2 (0.422 kg and 15.7 tubers/m^2) gave significantly higher (P=0.01) yield of large size tuber than 15 x 4 cm^2 (0.252 kg and 10 tubers/m^2). More soil space in wider spacing favored tuber-bulking process, which can be attributed to higher yield of large sized tubers. In similar study PRP (2000) found 127 tubers/m^2 of large size tubers spaced at 25 x 4 cm^2 whereas PDS (2000) observed 39 large sized tubers/m^2 in 1998 and 71 tubers/m^2 in 2000 by same spacing using of 1:1 compost and soil substrate.

TPS progeny HPS II/67 showed the tendency of producing large sized tubers (Table-3 and 4). This progeny gave significantly higher (P=0.01) yield of large sized tuber (0.39 kg and 14.7tubers/m^2) than HPS 7/67 (0.29 kg and 11.5 tubers/m^2). Comparatively better plant vigor and vegetative growth resulting earlier ground cover shown by HPS II/67 attributed to higher yield with higher number of large sized tubers.

3.5 Tiny (< 1g) or Non Marketable Tubers

Those tubers with a diameter of at least twice those of the stolen were grouped as tiny tubers (< 1 g grade). The tiny tubers (< 1 g) are considered as waste tubers, which cannot be marketed as seed because it is very difficult to store till next season. Therefore, these tubers were not included on total yield of tubers. There were significant differences in effect of date of sowing and spacing but TPS progenies did not show any difference on yield of tiny tubers (Table-8). Wiersema (1986) reported that large number of tiny tubers (< 1 g) represents an unexploited potential that might further increase multiplication factor.

The yield of tiny tubers increased with delay in sowing date (Table-3). The 19 November produced highest (P=0.01) yield of tiny tubers (0.184 kg/m^2) followed by 28 October (0.085 kg/m^2). The early sown crop gave lowest yield (0.045 kg/m^2) of tiny tubers. As discussed above, it shows that higher the tendency of producing non-marketable tubers as the sowing was delayed.

The yield of tiny tubers increased with closeness in spacing. The crop spaced at 15 x 4 cm^2 produced significantly higher (P=0.01) tiny tuber yield (0.131 kg/m^2) than other spacing. The spacing of 25 x 4 cm^2 (0.954 kg/m^2) and 35 x 4 cm^2 (0.879 kg/m^2) were at par. In closer spacing large numbers of tubers remained smaller which might be due to insufficient soil space and greater competition for available nutrients. The wider spacing of 25 x 4 and 35 x 4 cm^2 provided enough soil space for tuber compared to closer spacing of 15 x 4 cm^2.

SUMMARY AND CONCLUSION

Highest tuber yields were obtained from TPS seeded on 28 October (3.91 kg/m^2) followed by 8 October (3.39 kg/m^2). The spacing of 15 x 4 and 25 x 4 cm^2 (3.556 and 3.555 kg/m^2 respectively) produced higher tuber yield than spaced at 35 x 4 cm^2 (3.12 kg/m^2). The progeny HPS II/67 produced higher yield (3.57 kg/m^2). Highest tuber numbers were produced by crop sown on 19 November (649.8/m^2) spaced at 15 x 4 cm^2 (653.6/m^2) followed by 28 October (615/m^2) with spacing of 25 x 4 cm^2 (586.3/m^2). Both progenies produced almost same number of tubers (575.9 and 575.4/m^2 by HPS II/67 and 7/67 respectively). The effects of treatments on different graded tuber yield were also recorded. Regarding the yield of different graded tubers, the crop sown on 19 November gave in highest tuber yield (1.13 kg and 422 tubers/m^2) of very small (1-5 g) sized tubers followed by the crops seeded on 28 October (0.93 kg and 320.1 tubers/m^2). Significant difference was also observed on fresh weight of very small sized tubers by spacing. Highest yield was obtained from the crops spaced at 15 x 4 cm^2 (1.08 kg/m^2)

followed by 25 x 4 cm^2 (0.87 kg/m^2). But progenies did not show significant difference on yield and numbers of very small sized tubers. Seeding on 28 October produced highest small sized (5-10 g) tubers (1.336 kg/m^2). Other both dates of sowing i.e., 8 October (0.98 kg/m^2) and 19 November (1.16 kg/m^2) were non significant. Spacing and progeny were at par on yield and number of small sized tuber. Unlike small tubers, higher yield and number of medium sized (10-20 g) tubers were produced by 8 (1.3 kg and 97.9 tuberd/m^2) and 28 October (1.2 kg and 87.2 tubers/m^2) than 19 November (0.63 kg and 50.6 tubers/m^2). The effects of treatments were also observed on large sized tubers. The crop seeded on 8 October resulted in highest yield and number of large sized tubers (0.526 kg and 19.94 tubers/m^2) followed by 28 October (0.44 kg and 17.1 tubers/m^2). The crop seeded on 19 November produced lowest yield and numbers of large sized tubers (0.053 kg and 2.27 tubers/m^2). Similarly, spacing at 25 x 4 cm^2 (0.342 kg and 13.65 tubers/m^2) and 35 x 4 cm^2 (0.422 kg and 15.66 tubers/m^2) resulted significantly higher tuber yield and numbers than spacing at 15 x 4 cm^2.

Progeny HPS II/67 showed consistency in producing higher yield of large sized tubers (0.288 kg and 14.71 tubers/m^2) compared to HPS 7/67 (0.389 kg and 11.5 tubers/m^2). Crop sown on 8 October produced bigger tubers (7.39 g/tuber) followed by 28 October (6.49 g/tuber). Smallest sized tubers were produced by crop seeded on 19 November (4.61 g/tuber). The spacing of 25 x 4 cm^2 and 35 x 4cm^2 produced bigger sized tuber (6.24 and 6.64 g/tuber respectively) than 15 x 4 cm^2 (5.61 g/tuber). HPS II/67 seemed bigger sized tuber producer (6.404 g/tuber) than HPS 7/67 (5.93 g/tuber).

Finally, the tendency of producing bigger sized tuber sown on 8 October and very small sized tuber sown on 19 November sowing were recorded. Thus the seeding on 28 October seemed to be the best for optimum sized seedling tuber production. Late sowing and closer spacing can be utilized for production of very small sized seedling tubers in areas where ideal cold storage facility exist thus can increasing the multiplication ratio. In general, 25 x 4 cm^2 spacing and seeding on 28 October were observed as suitable for seedling tuber production under inner terai condition. Progeny HPS II/67 showed consistently better performance in terms of emergence, growth and tuber yield under Chitwan condition.

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