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DETERMINATION OF SUITABLE PLANTING GEOMETRY FOR DIFFERENT TRUE POTATO SEED TUBERLET GRADES

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ABSTRACT: Planting geometry is considered as a very important tool for better production of True Potato Seed (TPS). The experiments were conducted to determine the suitable planting geometry for better yield from TPS mini tubers during autumn 2006-2007 and 2007-2008. It was revealed that even small size (5-20g, 20-30g) tubers planted at closer row and plant spacing (60cm x 15cm,70cm x 15 cm) produced 31.00%, 31.33% and 28.33%, 32.33% medium size tubers (35-55 mm size). Whereas wider spacing (70cm x 20cm, 50cm x 20cm) produced relatively higher number of large size tubers.

Key Words: True Potato Seed; Mini Tubers; Seedling Tubers; Cultural Practices; Size; Spacing; Pakistan.

INTRODUCTION

Potato (*Solanum tuberosum L*) is one of the most important commercial and profitable vegetable crop in human nutrition and has got the popularity throughout the world (FAO, 1995) including Pakistan. The yield of potato in Pakistan is still lowest than other developed countries (FAO, 2002). It is due to the susceptible nature of potato crop to viruses and diseases (Falloon et al., 1998). In Pakistan potato is commonly cultivated through tuber. Recent findings suggested that TPS had advantage over conventional seed potato for minimum transmission of viruses and other pathogens (Jackson, 1987)

True Potato Seed (TPS) technology has a great potential in supplementing the availability of healthy propagules for potato production and high yielding homogenous population (Martinetti, 1987). True Potato Seed technology is an alternative or supplement to traditional seed tubers (Berrios, 1995), when seed or seedling planted at high density in the nursery. While the percentage of small size tubers (< 25mm) is generally over 40% and remaining 60% tuberlets are not suitable for field planting. It has been confirmed that the mini tubers produced after raising TPS nursery were almost healthy having great potential for production of commercial crop (Iqbal and Khan, 2003). Similarly, Ananda et al. (2000) reported that the yields from F and D grade tubers were less in wider spacing (40cm x 15cm) as compared to 30cm x 10cm and 30cm x 15cm. Das and Deka (2002) found that average tuber weight, total tuber yield and marketable yield were highest with 50cm x 20cm plant spacing. The present studies were therefore carried out to determine the impact of suitable planting geometry for different tuberlet grades.

MATERIALS AND METHODS

Experiments were conducted to assess the planting mode for getting maximum return from different sizes of tuberlets (5-20 and 20-30g) and three row to row distances (70cm, 60cm, 50cm) and two plant to plant distances (20cm, 15cm) at Potato Research Station Sialkot. The experiment was laid out in split plot design having net plot size of 6m x 1.4 m, with four replications using TPS family, 88001. Seed was sown in raised nursery beds. After sowing, beds were covered with rice straw and watered early in the morning and late afternoon with hand sprinkler till germination.

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After 15 days of sowing, straw cover was removed and irrigation water was applied through channel irrigation. The recommended fertilizer dose of 225-125-125 NPK kg ha^{-1} in the form of urea, single super phosphate (SSP) and sulphate of potash (SOP) was applied. The phosphatic and potash fertilizers were applied at the time of seed bed preparation, while nitrogenous fertilizer was applied in two split doses after 30 and 60 days of planting. All other cultural practices were carried out according to the requirements of nursery. The vines were dehaulmed before 15 days of harvesting. The data on emergence percentage, size of tuber grades (mm) and yield (t ha^{-1}) were collected. The level of significance was measured through determining least significance difference at 5% using Statix software.

RESULTS AND DISCUSSION

Emergence (%)

The data on emergence percentage of tuberlets indicated that the highest emergence 97.5% was recorded for seed size of 20-30 g, with 50cm and 15cm row to row and plant to plant spacing respectively, followed by 96.25%, for treatment with seed size of 20-30 g and plant to plant spacing of 15 cm and row to row spacing of 70 cm during 2006-07 (Table 1). The emergence ranged from 90.55% to 97.50 %. The differences in means were statistically significant. Similarly, maximum large size tuber grades (18 %) were recorded with 70 cm and 20 cm row and plant spacing, respectively with seed size of 20-30 g and the mean differences ranged between 8% and 18%. In 2007-08 the emergence of tuberlets, ranged from 87.71% to 95.83% and large size tubers (>55mm) ranged from 11.66 % to 17%. The differences were statistically significant. The results are also close with the findings of Mukhopadhyay (2001), he reported the emergence of TPS families ranged from 76.6% to 94.0 %.

Tuber Grades

The data indicated that during 2006-07 the medium size tubers (35-55mm) were recorded 36% with row to row distance of 60 cm, plant to plant distance of 20 cm and seed size of 20-30 g, whereas 38.66% medium size tubers were recorded from 50 cm row to row and 20 cm plant to plant distance with 5-20 g seed size during 2007-08 (Table 1). The differences were statistically significant. In small size tubers (< 35 mm) the highest percentage (61) was recorded with 60 cm row to row and 15 cm plant to plant distance using 5-20g seed size during 2006-07 whereas highest (58.00 %) tubers (< 35 mm) was recorded with 70 and 15 cm row to row and plant to plant spacing, respectively with the same seed size during 2007-08. Similarly Rasul et al. (1998) reported that small tubers of size less than 25 g derived from TPS are useful as seed tubers. These results are also close with the findings of Ahmed et al. (2001), who concluded that TPS progenies perform significantly better than the control, for all the yield parameters i.e., number and weight of large, medium and small tubers.

Yield (t ha^{-1})

The yields ranged from 30.90 to 45.24 t ha^{-1}during 2006-07 (Table 1). The maximum yield 45. 24 t ha^{-1} was recorded with row to row (70 cm), plant to plant distance (15cm) and seed size (20-30 g) during 2006-07. In 2007-08, the maximum yield of potato 43.65 t ha^{-1} was recorded with 60 cm row to row spacing and 20 cm plant to plant spacing and seed size of 20-30 g while lowest yield of 28.17 t ha^{-1} was recorded with row to row and plant to plant spacing of 50 and 15cm, respectively and with size of 20-30 g. Moreover the differences in yield were statistically significant. These results are in agreement with the findings of Patel et al. (2002) who observed that intra-row spacing of 5 cm gave significantly higher number and weight of total and the other categories of tuberlets , except large sized compared to the wider spacing. Similarly Karle et al. (1998) reported that highest returns were obtained with small seed tubers and

SUITABLE PLANTING GEOMETRY

Table 1. Determination of suitable planting geometry for different TPS tuberlet grades, conducted at Potato Research Station, Sialkot, during Autumn, 2006-07 and 2007-08

Treatment				Tuber grades (%)			Yield (t ha^{-1})
Row to row (cm)	Plant to plant (cm)	Seed sizes (g)	Emergence percentage	>55mm	35-55mm	<35mm	
2006-07							
70	20	5-20	92.22	16.00	30.67	53.33	37.30
		20-30	91.66	18.00	33.33	48.67	40.08
70	15	5-20	92.92	11.00	28.33	60.67	42.06
		20-30	96.25	13.0	32.33	54.67	39.24
60	20	5-20	96.00	11.00	30.67	58.67	39.24
		20-30	95.00	13.00	36.00	51.00	40.07
60	15	5-20	94.17	8.00	31.00	61.00	40.48
		20-30	94.58	11.00	31.33	57.67	45.24
50	20	5-20	90.55	10.33	20.00	59.67	30.95
		20-30	93.88	14.67	31.00	53.67	32.94
50	15	5-20	95.42	10.67	31.00	57.00	34.13
		20-30	97.50	13.67	30.66	55.67	30.90
LSD (5%)			3.22	1.21	1.35	2.641	0.326
2007-08							
70	20	5-20	91.10	17.66	32.33	50.00	36.90
		20-30	94.99	20.00	38.00	42.66	33.66
70	15	5-20	95.99	15.00	28.33	58.00	38.66
		20-30	95.83	17.66	31.66	50.00	36.90
60	20	5-20	91.66	2.00	32.00	56.00	40.07
		20-30	93.88	16.33	25.66	46.00	43.65
60	15	5-20	92.50	14.00	36.00	49.33	32.14
		20-30	95.00	16.00	38.00	46.00	33.33
50	20	5-20	87.71	11.66	38.66	49.66	30.95
		20-30	91.666	13.00	38.00	49.00	32.93
50	15	5-20	995.83	11.66	35.66	52.66	29.76
		20-30	95.00	14.66	32.00	53.00	28.17
LSD (5%)			0.423	0.641	0.497	0.703	

high NPK rates, provided tubers were healthy.

It is clear that all seed sizes of tuberlets can be utilized for sowing for raising next generation successfully. Closer planting and size tubers contribute much towards production of medium size tubers while large size tubers with wider spacing shared towards production of higher number of large size tubers. Furthermore, it is concluded that the seedling tubers received after raising nursery can be grown successfully for raising commercial crop of potato following proper planting geometry.

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