

## COMPARATIVE EVALUATION OF TRUE POTATO SEED FAMILIES WITH COMMERCIAL VARIETY DIAMANT

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### ABSTRACT

True potato seed (TPS) is a tiny tomato like botanical seed of potato (*Solanum tuberosum*). Production of TPS is an alternative technology that is scientifically sound, technically feasible, economically viable and eco-friendly. There is a great potential to adapt TPS families in commercial crop production. The experiments were conducted during autumn 2006-07 and 2007-08 at Potato Research Station Sialkot, to compare TPS mini tubers produced after nursery raised with normal sized seed of commercial variety Diamant. It was concluded from the study that all the TPS families yielded higher than commercial variety Diamant. During autumn 2006-07, TPS families, Serana x TPS 47, Serana x TPS 13, Serana 7 x TPS 67, Serana 15x TPS 13 produced, 24.85, 23.28, 22.75 and 20.82, tons ha<sup>-1</sup>, respectively, while Diamant variety produced 20.47 tons ha<sup>-1</sup>, similarly during autumn 2007-08, TPS families Serana x TPS 47 and Serana x TPS 13, Serana 7 x TPS 67, Serana 15 x TPS 13 produced 27.77 and 25.79, 24.60 and 23 tons ha<sup>-1</sup>, respectively. The Diamant variety during this year yielded 19.84 tons ha<sup>-1</sup>. However, in both experiments TPS family Serana x TPS 47 gave highest yield of 27.77 tons ha<sup>-1</sup> than other families.

**Keywords:** Mini tubers, Normal seed size, Potato tubers, *Solanum tuberosum* L., TPS.

### INTRODUCTION

Commercial use of True Potato Seed, stemmed first in China around 60s and now a days the research on TPS is being conducted more than two dozen countries of the world including China, Sri Lanaka, Nepal, Rwanda, Egypt, Samoa, Philippines, India, Indonesia, Banglades, Thailand, Vietnam, Korea, Chile, etc. Research on TPS in about 34

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countries is at experimental station level (Jackson, 1987). In Pakistan potato cultivation through TPS is under practice at Muree, Abbotabad, Sialkot, Okara, Sahiwal and Balochistan. It is an alternative technology to generate planting material at low cost. The technology has advantage over conventional potato seed for minimum transmission of viruses and other pathogens. True Potato Seed has been found tolerant to most common Late blight (*Phytophthora infestans*) disease of Pakistan. Initial seed cost of this technique in seedling production is nominal. Transport and storage of TPS is generally easy and inexpensive. Management, size of land use and other inputs required for this technology are very low in comparison of economic return from seedling tubers.

Longer growing season is one of the factors of low productivity in TPS families. Fruscione *et al.* (1987) found large differences among the TPS families for yield, tuber uniformity and plant vigour. Martinetti (1987) advocated that TPS technology is the possible way of solving disease problem, storage, transport and high cost of production. Sinung-Basuki (1988) reported after evaluation of hybrid families that Atzimta DTO-28, Serana X DTO-28 and Atzimba X R-128.6 are good hybrid TPS families. Macaso *et al.* (1988) reported that TPS families are essential and can be utilized in commercial crop production after producing mini tubers. Nandekar *et al.* (1995) observed the highest number of tubers in DPS – 25/13 and also found that growing potato through TPS is highly profitable in comparison to seed tubers. Malathy and Jayawardene (1999) released two hybrid TPS progenies (Atzimba X 260/398 and SE-II X 260/39B) named as Manike and Lakshemi, respectively in 1992 for general cultivation in Sri Lanka, having high yield and tolerant to late blight. Iqbal and Khan (2003) reported that there is great potential in TPS families and can successfully be adapted for commercial crop production after nursery raising. True potato seed was first time introduced at Mirpurkhas, Khairpur and Shikarpur districts of Sindh. In Pakistan, this technology is new and not tested on large scale. Presently TPS hybrid families have been evaluated at some research stations located in different parts of the country. Preliminary trials are being conducted to produce seedling tubers on nursery beds. Keeping in view the importance of TPS technology and to overcome the shortage of pathogen free seed production this study was conducted. The main objective of this study was to compare the yield potential of TPS families with commercial variety in Punjab province.

## **MATERIALS AND METHODS**

Two year (Autumn 2006-07 and 2007-08) field study was conducted at Potato Research Station Sialkot to compare the performance of TPS mini tubers obtained from 4 TPS families available at National Potato

Program, NARC, Islamabad with normal seed of commercial variety Diamant. True Potato Seed families and commercial variety Diamant were planted directly in nursery beds according to Randomized Complete Block Design having net plot size of 6x2.8m, row to row distance 70 cm and plant to plant distance 20cm with four replications. The recommended fertilizer dose of 225-125-125 N P K kg ha<sup>-1</sup> was applied through urea, single super phosphate (SSP) and sulphate of potash (SOP). The phosphatic and potash fertilizers were applied at the time of seedbed preparation, while urea was applied in two splits. In addition to this all other cultural practices were carried-out according to the requirement of the crop. The data regarding emergence (%), tuber grade (%), tuber disease infestation (%) and yield ha<sup>-1</sup> were collected. The emergence of seed was recorded after 45 days of sowing. The level of significance was measured through determining least significance difference (LSD) using Statix software.

## RESULTS AND DISCUSSION

It is evident from the data of autumn 2006-2007 presented in Table 1 and Figure 1, that there was no significant difference among TPS families and a commercial variety Diamant for emergence %, Scab, Rhizoctonia and cracking. However, the difference for other variables such as tuber grades and yield was significant ( $P < 0.05$ ).

Table1.Comparative evaluation of True Potato Seed families with commercial variety Diamant during Autumn 2006-2007.

TPS families/ variety	Emergence %	Tuber grades (%)			Tuber disease infestation (%)			Yield tons ha <sup>-1</sup>
		55 mm	35-55 mm	35 mm	Scab	Rhizo	Cracking	
Serana X TPS 47	86.1	19.7	49.0	31.3	0	0	1.0	24.857
Serana X TPS 13	85.6	18.3	43.3	38.4	0	0	1.3	23.280
Serana 7 X TPS 67	83.6	13.7	57.7	28.6	0	0	0.7	22.753
Serana 15 X TPS 13	91.7	16.7	47.0	36.3	0	0	0	20.827
Diamant	98.3	20.3	51.7	28.0	0.3	1.3	0	20.477
LSD (0.05)	N.S.	3.5	4.5	3.4	N.S.	N.S	N.S.	2.054

The lowest % age of medium size tubers was recorded from Serana X TPS 13 and highest % age was recorded from TPS 7 X TPS 67. The differences were statistically significant. For small size tubers, minimum percentage was recorded from commercial variety Diamant and maximum from Serana X TPS 13, all the TPS families produced higher

number of small size tubers. The difference was statistically significant. Results for tuber disease infestation showed that there was no scab problem on tubers produced by all TPS families; only 0.3% scab infestation was recorded on Diamant. No incident of Rhizoctonia disease was found. Only 1.3% Rhizoctonia infestation was found on Diamant with non significant difference. The data regarding cracking incidence ranged from 0.7% to 1.3%, no cracking was recorded on Serana 15 X TPS 13 and Diamant. The difference was also statistically non-significant.

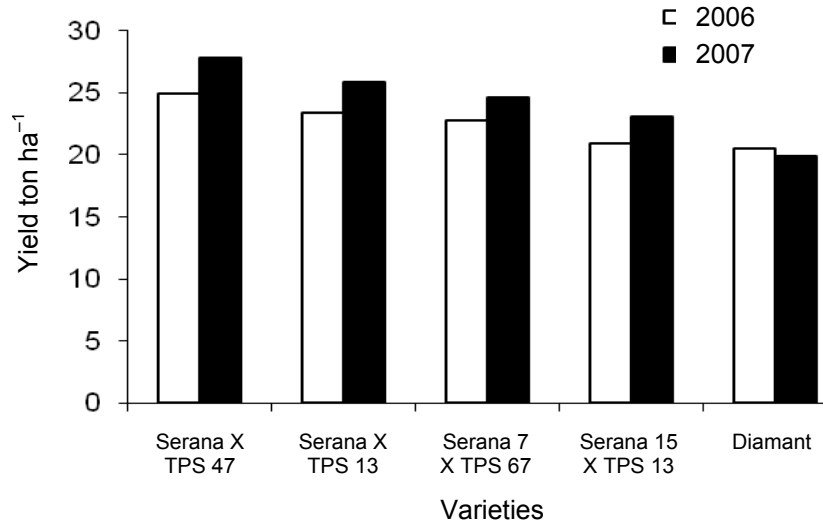


Figure1. Comparative yield potential difference between TPS families and Diamant variety during 2006-07 and 2007-08.

For the yield results it is observed that all the TPS families produced higher yield than commercial variety Diamant. During autumn 2006-07 TPS families, Serana X TPS 47, Serana X TPS 13, Serana 7 X TPS 67, Serana 15 X TPS 13 produced, 24.85, 23.28, 22.75 and 20.82 tons ha<sup>-1</sup>, respectively, While Diamant produced 20.47 tons ha<sup>-1</sup>. Similarly during autumn 2007-08 TPS families Serana x TPS 47, Serana x TPS 13, Serana 7 x TPS 67, Serana 15 x TPS 13 produced, 27.77, 25.79, 24.60 and 23 tons ha<sup>-1</sup>, respectively. The Diamant variety yielded 19.84 tons ha<sup>-1</sup>. However during two year experimentation TPS family Serana X TPS 47 gave highest yield of 27.77 tons ha<sup>-1</sup>.

The data presented in Table-2 showed that the similar range of emergence was maintained by Serana X TPS 13, Serana trend 15 X TPS 13 and Diamant during 2007-2008. The difference was also significant. The highest % of large sized tubers was recorded from

Serana X TPS 47 and lowest from Serana 7 X TPS 67. Maximum number of medium size tubers was recorded from Serana X TPS 67. The highest % of small sized tubers was recorded from Serana 15 X TPS 13 and lowest % was recorded from Seana X TPS 67. The difference was also statistically significant. For tuber disease percentage, only scab disease was recorded on Serana X TPS.47. Other TPS lines were found scab free. The difference was also statistically non-significant. The Rhizoctonia disease was recorded on Serana X TPS-47, while other TPS families were found free of this disease. The difference was also non-significant. About 0.33% cracking was recorded on Serana X TPS 47, 1% on Serana X TPS 13 and TPS 7 X TPS 67, while other TPS families and Diamant were found free of cracking. The difference was statistically non-significant.

Table2. Comparative evaluation of True Potato Seed families with commercial variety Diamant during Autumn 2007-2008.

TPS families/ variety	Emergence %	Tuber grades (%)			Tuber disease infestation (%)			Yield tons ha <sup>-1</sup>
		55 mm	35-55 mm	35 mm	Scab	Rhizo	Cracking	
Serana X TPS 47	88.88	22.00	48.33	29.66	1.00	0.33	0.33	27.77
Serana X TPS 13	94.99	19.66	44.66	34.66	0.00	0.00	1.00	25.79
Serana 7 X TPS 67	93.88	14.66	57.33	28.00	0.00	0.00	1.00	24.60
Serana 15 X TPS 13	94.99	17.00	47.00	35.33	0.00	0.00	0.00	23.00
Diamant	94.99	20.00	51.00	29.00	0.66	1.66	0.00	19.84
LSD (0.05)	2.51	4.038	3.385	4.98	N.S.	N.S.	N.S.	N.S.

The highest yield of 27.77 tons ha<sup>-1</sup> was recorded from Serana X TPS-47, whereas Serana x TPS 13, Serana 7 x TPS 67, Serana 15 x TPS 13 and Diamant produced yield of 25.79, 24.60, 23.00 and 19.84 tons ha<sup>-1</sup>, respectively. Basuki (1988) reported after evaluation of hybrid families that Atzimta DTO-28, Serana X DTO-28 and Atzimb X R- 128.6 are good hybrid TPS families. Our results coincide with Chaudhuri *et al.* (1988), who compared seedling tubers of 9 TPS families with local check Kufri Jyoti and found that all hybrids produced higher yield (15 to 26.0 tha<sup>-1</sup>) than Kufri Jyoti (14.6 tha<sup>-1</sup>). It is concluded from the study that TPS families performed overall better than commercial variety Diamant.

## CONCLUSION

It can be concluded from the study that through TPS technology disease free potato tubers can be produced on commercial basis.

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