

EVALUATION OF TRUE POTATO SEED (TPS) FAMILIES FOR SEEDLING TUBER PRODUCTION IN MID AND FAR WESTERN TERAJ OF NEPAL

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ABSTRACT

The investigation entitled "Evaluation of true potato seed (TPS) families for seedling tuber production in mid and far western terai of Nepal" was carried out at Regional Agriculture Research Station Khajura, Nepalgunj during the winter season of 2066/67 and 2067/68. Studies were performed taking eight genotypes of TPS families namely MFII x TPS67, HPSII/67, HPS7/67, TPS7 x TPS67, C98HT-200.14 x C99HT-2-58.1, C96H-02.4 x C99HT-1-58.1, C96H-4 x C99HT-64.8, C96H-02.4 x C99HT-2-32.17. The families were tested in randomized complete block design (RCBD) with 3 replications. Plot size was 1m x 1m. Nursery beds were raised to 15 cm height with the mixture of soil and farm yard manure at 1:1 ratio. Fertilizers were applied @ 150:100:50 kg/ha (NPK). The major objectives of the experiment was to identify the suitable true potato seed (TPS) families for seedling tuber production in nursery bed with good uniformity, color, shape, resistant to disease and yield. The tuber yield produced by HPS II/67 (2.614 kg/m²) and C98HT-200.14x C99HT-2-58.1 (2.596 kg/m²) were obtained higher than other tested families. The maximum plant uniformity was also recorded on HPSII/67. None of the tested families were found resistant to late blight. On the basis of the results obtained it can be concluded that TPS family HPSII/67 and C98HT-200.14 x C99HT-2-58.1 of potato were suitable for seedling tuber production in mid and far western terai of Nepal. However for recommendation it requires further investigation.

Key words: Families, evaluation, late blight, seedling tuber, resistance.

INTRODUCTION

Potato (*Solanum tuberosum* L.) plays an important role in the food production and poverty alleviation of the country. It is utilized as a major vegetable in terai and mid hills; and as a vegetables and staple food in the high hills of the country (Khairegoli, 1997). In the year of 2007 area under potato was estimated 1,83,000 hectares and total production 24,59,000 tons with an average productivity of 13.43 t/ha (ABPSD, 2008). The potato yield is much lower than neighboring countries and the world average. The major causes for this lower productivity are the high cost, poor quality seed and diseases (NPRP, 1990; NPRP, 1997). Since some years, there has been an increasing interest of the farmers in the production of potatoes from true potato seed (TPS). It offers alternative technology of crop production for the mid and far western regions where resource poor farmers can have quality-planting material. There are several advantages of using true potato seed for potato production including the cost of true potato seed which is cheaper than clonal potato tubers. It can almost reduce more than 50% cost of cultivation (Sadik, 1983). It can be stored and distributed easily and economically. Most of the pathogens are not transmitted to next generation through seed. There is no loss of potential food as planting material. It would make possible expansion of potato cultivation into areas previously unable to produce potato, due to lack of good quality seed tubers (Acantino and Malagamba, 1983; Sadik, 1983). The production of seedling tubers from the TPS in the first season and planting them to raise the crop in the succeeding season appears promising for ware potato production. Hence, this investigation was undertaken to evaluate the true potato seed (TPS) families for production of seedling tubers in nursery bed.

MATERIALS AND METHODS

The experiment was conducted during the winter season of 2066/67 and 2067/68 at the Regional Agriculture Research Station Khajura, Nepalgunj. The major objectives of the experiment were to identify the suitable true potato seed (TPS) families for seedling tuber production with good uniformity, color, shape resistant to pest and disease and yield parameter. Eight genotypes of TPS families namely MFII x TPS67, HPSII/67, HPS7/67,

TPS7 x TPS67, C98HT-200.14 x C99HT-2-58.1, C96H-02.4 x C99HT-1-58.1, C96H-4 x C99HT-64.8, C96H-02.4 x C99HT-2-32.17, of potato were sown in nursery bed in randomized complete block design with 3 replication. Plot size was 1m x 1m. Nursery beds were raised to 15 cm high with a mixture of soil and farm yard manure (1:1) ratio. At the time of seed sowing half cm layer of fine compost was broadcasted and the seeds were sown in the holes prepared by marker board and covered further half cm layer of fine compost. Since seed were very delicate and sensitive, beds were mulched with paddy straw. Plots watered daily until seeds germinated well. Fertilizers were applied at the rate of 150:100:50 kg/ha. (NPK). One hundred seedlings were kept in 1m² with 25x4 cm spacing; excess plants were thinned out after germination. Earthing-up were done twice, once at 45 days after sowing and another at 60 days. Harvesting was done at full maturity. Observations were recorded on plant height, late blight reading, plant uniformity, ground cover percent, tuber uniformity, tuber number and weight percent by size and total weight kg/square meter. Data were analyzed in MSTATC.

RESULTS AND DISCUSSION

The data on observation of the yield and yield attributing characteristics of TPS progenies were statistically analyzed which have been presented in tables below.

Plant height (cm)

The examination of data mean table regarding plant height centimeter in 2067 did not show any significant results among the tested families, however, mean table showed highest plant height by HPS 7/67 (14.7 cm), whereas minimum in TPS7 x TPS67 (5.7 cm). In year 2068 mean data table showed highly significant among the tested families. Tallest plants were observed in the progenies C98HT-200.14 x C99HT-2-58.1 (21.9 cm) followed by C96H-02.4 x C99HT-2-32.17 (21.1 cm). Shortest plants were observed in HPS 7/67 (11.9 cm). The two years' mean data revealed that the maximum plant height was measured in the progenies C96H-02.4 x C99HT-2-32.17 (16.5 cm) and minimum in TPS7 x TPS67 (11.1 cm).

Late blight reading (1-9scale)

A highly significant difference between the tested progenies in late blight disease severity was observed in the year 2067. However, minimum level of late blight scoring was recorded in C96H-02.4 x C99HT-1-58.1 (1.3) whereas maximum infestation was observed in HPS II/67 (4.7), whereas in the year 2068, the difference was non-significant among the tested families. Minimum score of 2.0 in 1 to 9 scale was recorded in MFII x TPS 67, TPS7 x TPS67, C96H-02.4 x C99HT-2-32.17, respectively, whereas maximum 3.0 in C96H-02.4 x C99HT-1-58.1 and HPS II/67. The two years mean data table revealed that the minimum late blight infestation by C96H-02.4 x C99HT-2-32.17 (1.85) whereas maximum 3.85 by HPS II/67.

Table-1: Yield and yield attributing characteristics

Variety	Plant height (cm)			Late Blight (1-9)			Plant Uniformity (1-5)			Ground Cover (%)	Tuber uniformity (1-5)		
	2067	2068	Mean	2067	2068	Mean	2067	2068	Mean	2068	2067	2068	Mean
MFIIxTPS 67	11.3	17.4	14.35	4.0	2.0	3.00	2.0	1.3	1.65	36.7	3.0	3.7	2.35
HPS II/67	9.8	14.7	12.25	4.7	3.0	3.85	2.7	2.6	2.65	28.3	3.7	4.0	3.85
HPS 7/67	14.7	11.9	13.30	4.0	2.3	3.15	3.0	2.3	2.65	23.3	4.0	4.0	4.00
TPS7xTPS67	5.7	16.5	11.10	3.0	2.0	2.50	1.0	2.0	1.50	35.0	1.7	3.3	2.50
C98HT-200.14xC99HT-2-58.1	9.1	21.9	15.50	1.7	2.3	2.00	1.0	2.0	1.50	40.0	1.7	3.0	2.35
C96H-02.4xC99HT-1-58.1	10.9	16.2	13.55	2.3	3.0	2.65	1.7	1.7	1.70	40.0	2.3	3.3	2.80
C96H-02.4xC99HT-64.8	13.1	19.8	16.45	1.3	2.7	2.00	1.6	2.0	1.80	31.7	2.0	3.0	2.50
C96H-02.4xC99HT-2-32.17	11.8	21.1	16.50	1.7	2.0	1.85	2.3	1.3	1.80	33.3	3.0	4.0	3.50
F-Test	ns	**		**	ns		*	*		**	**	*	
CV (%)	25.3	10.7		14.1	24.5		32.2	31.9		9.55	25.7	13.9	
LSD (0.05)	-	3.15		0.67	-		0.89	1.03		5.41	1.15	0.83	

Table-2: Tuber number and weight percent by size class

Variety	Number and size classes of seedling tubers in two size grades											
	<25g						25-50g					
	Tuber number			Weight (%)			Tuber number			Weight (%)		
	2067	2068	Mean	2067	2068	Mean	2067	2068	Mean	2067	2068	Mean
MFIIxTPS 67	581.7	547.3	564.50	83.3	96.2	89.75	13.0	2.7	7.85	16.7	3.8	10.25
HPS II/67	622.0	619.7	620.85	85.6	83.7	84.65	11.3	11.7	6.50	14.4	9.8	12.10
HPS 7/67	720.0	398.3	559.15	80.1	100.0	90.05	30.7	0.0	15.35	19.9	0.0	9.95
TPS7xTPS67	923.3	603.7	493.50	90.9	85.7	88.30	6.7	15.7	10.85	9.1	14.2	11.65
C98HT-200.14xC99HT-2-58.1	410.0	540.3	475.15	77.3	75.6	76.45	16.7	21.7	19.20	22.0	24.4	23.20
C96H-02.4xC99HT-1-58.1	592.7	586.3	589.50	77.9	85.3	81.60	15.3	10.3	12.80	22.1	14.6	18.35
C96H-02.4xC99HT-64.8	480.7	557.0	518.85	82.3	82.0	82.15	14.0	25.7	19.85	17.7	18.0	17.85
C96H-02.4xC99HT-2-32.17	486.0	620.7	553.35	80.6	83.2	81.90	18.0	20.3	19.15	19.4	16.8	13.10
F-Test	ns	ns		ns	*		ns	ns		Ns	*	
CV (%)	33.3	27.0		15.9	10.4		101	102		74.3	66.5	
LSD (0.05)	-	-		-	15.2		-	23.4		-	14.2	

Plant uniformity (1-5 scale):

The examination of the data of mean table regarding plant uniformity of TPS family revealed that the difference among the different family was significant in both years. In year 2067, significantly maximum plant uniformity was observed by HPS 7/67(3.0) whereas minimum uniformity by C98HT-200.14xC99HT-2-58.1(1.0). In year 2068, significantly maximum uniformity was recorded by family HPS II/67(2.6) whereas minimum by C96H-02.4xC99HT-2-32.17(1.3). The two year mean table showed that the maximum uniformity 2.265 by HPS II/67, HPS 7/67 and the minimum 1.50 by C98HT-200.14xC99HT-2-58.1.

Ground cover percent:

The ground cover percent in year 2068 was revealed highly significant difference among the tested family of TPS. Significantly maximum ground cover percent(40.0) was recorded by C98HT-200.14xC99HT-2-58.1, C96H-02.4xC99HT-1-58.1, whereas minimum ground cover percent by HPS 7/67(23.0).

Tuber uniformity:

The examination of the data mean table in both experimental years regarding tuber uniformity percent were significant difference among the tested family. In year 2067, significantly maximum tuber uniformity was recorded by HPS 7/67(4.0%) followed by HPS II/67(3.7%), whereas minimum uniformity(1.7%) was observed by TPS7xTPS67, C98HT-200.14xC99HT-2-58.1. In year 2068, significantly maximum uniformity (4.0%) was recorded by HPS II/67, HPS 7/67 and C96H-02.4xC99HT-2-32.17 whereas minimum tuber uniformity(3.0%) was observed by C96H-02.4xC99HT-64.8 and C98HT-200.14xC99HT-2-58.1. In the two years mean data table revealed that maximum tuber uniformity was observed by (4.0%) followed by HPS II/67(3.85%), whereas minimum uniformity was recorded by MFII x TPS 67(2.35%).

Total tuber number/m²:

The perusal of data presented (Table-3) regarding total tuber number per square meter transpired that the differences of the effect of TPS family were non-significant in both experimental year, however the mean value of year 2067, indicated highest number of tuber (930.0) in TPS7xTPS67, whereas minimum (426.3) in C98HT-200.14xC99HT-2-58.1. In year 2068 indicated highest number of tuber (650.7) in C96H-02.4xC99HT-2-32.17 whereas minimum (398.3) in HPS 7/67. The two years mean data table revealed that highest tuber number (775.15) was recorded in TPS7xTPS67, whereas minimum(494.65) in C98HT-200.14xC99HT-2-58.1.

Tuber yield (kg) / m²:

The data presented (Table-3) regarding tuber yield kg /m² in year 2067, did not show significant difference. However, the highest yield (2.877kg) in HPS 7/67 and lowest yield (1.321kg) in MFIIxTPS 67. In the year 2068, the mean data regarding yield per square meter was significant among the tested family. Significantly highest yield (3.379kg) in HPS II/67, where as minimum (1.623kg) in HPS 7/67. The two years mean data table revealed that highest tuber yield (2.614kg) recorded in HPS II/67 and minimum tuber yield (1.731kg) recorded in TPS family MFIIxTPS 67.

Tuber color and shape: All of the tested TPS family bear white skin color, whereas the TPS family MFIIxTPS 67 and C98HT-200.14xC99HT-2-58.1 have oblong shape, rest of the tested TPS family were round shape.

Table-3: Total tuber number and yield kg/m²

Progenies	Tuber number			Yield kg/m ²			Tuber color	Tuber Shape
	2067	2068	Mean	2067	2068	Mean		
MFIIxTPS 67	594.7	550.0	572.35	1.321	2.141	1.731	W	OL
HPS II/67	633.3	631.3	632.30	1.849	3.379	2.614	W	R
HPS 7/67	727.3	398.3	562.80	2.877	1.623	2.250	W	R
TPS7xTPS67	930.0	620.3	775.15	2.167	2.482	2.324	W	R
C98HT-200.14xC99HT-2-58.1	426.3	563.0	494.65	2.390	2.801	2.595	W	OL
C96H-02.4xC99HT-1-58.1	608.0	596.7	602.35	2.082	2.362	2.222	W	R
C96H-02.4xC99HT-64.8	494.7	582.7	539.70	1.938	2.974	2.456	W	R
C96H-02.4xC99HT-2-32.17	504.0	650.7	577.35	2.155	2.692	2.423	W	R
F-Test	ns	ns		ns	*			
CV (%)	33.3	26.8		37.7	32.2			
LSD (0.05)	-	-		-	1.438			

CONCLUSION

The TPS family HPS II/67 (2.614 kg/m²) and C98HT-200.14 x C99HT-2-58.1 (2.596 kg/m²) were found promising in mid and far-western terai of Nepal. Further verification is needed for recommendation.

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