



## Amenability of stored pollens to pollination in potato (*Solanum tuberosum* L.)

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In India, hybridization in potato (*Solanum tuberosum* L.) is carried out in open fields, as compared to large glasshouses/polyhouses in America and Europe. Promising parents are grown in hybridization garden in high hills at Kufri, Himachal Pradesh, where the cooler climate and long summer days are conducive for flowering [1]. The male flowers are kept overnight for moderate drying of anthers under room temperature to facilitate easy extraction of the pollen. The present study was conducted to examine the viability of freshly harvested and room temperature-stored pollen for its effectiveness in potato hybridization.

The experimental material comprised of six profuse flowering potato genotypes, viz., Kufri Chandramuki, Kufri Sutlej, Kufri Lalima, Kufri Sindhuri, Kufri Swarna and QB/A-9-120 (used as females) and three highly pollen fertile advanced hybrids, viz., MP/92-35, MP/97-783 and MP/97-1008 (used as males.) planted in the hybridization garden at Kufri, Himachal Pradesh (30°N, 75°E: 2370m amsl). Sixty tubers (4 rows of 15 tubers each) of each parents were planted in RBD (3 replications) in last week of April, 2003 with a distance of 50 cm between rows and 20 cm within rows. At the time of peak flowering (July 1st week), the pollens from male parents were collected and stored in butter paper cups at ambient temperature at an interval of one day till eight days making 9 treatments i.e., fresh to 8- day-old pollens. Flowers going to open next day were emasculated and used for pollination. Pollen fertility was studied by squashing anthers in 1% solution of acetocarmine and nearly 500 pollens/replication from 5 microscopic fields were examined. The actual pollen viability was ascertained though in vitro germination following the method of Malik and Chhabra [2]. Each male parent was crossed with two female parents on a single day and in each treatment, 20 flowers/replication were pollinated. Six weeks after pollination, % berry setting was calculated from the number of flowers pollinated. Hybrid seeds were extracted and counted treatment wise. The data were analyzed statistically [3] using MSTAT-C statistical soft-ware (Michigan State University, USA).

The minimum and maximum temperature varied from 11.8°C to 30.2°C during the period of experimentation. Stainability and germinability of pollen was maximum in the genotype MP/92-35 indicating that it might be a better parent in crossing (Table 1). The Stainability of pollens remained almost same in fresh pollens and pollens stored up to 8 days. Kaushik *et al.* [1] also reported no deviation in pollen Stainability from the pollen collected between 50 to 90 days old crop. Similarly loss of 5 to 35% viability in pollens stored at 30°C up to 180 days was reported by Estevez [4]. The pollen germinability was nearly 70-80% in all male parents in the freshly harvested pollens and remained almost same up to 24 hours, however, thereafter, significant decline in pollen germinability was observed which indicated that all the stained pollens were not viable. Gonzalez *et al.* [5] revealed that staining with acetocarmine is not a trustworthy for estimating pollen viability and *in vitro* pollen germination is more reliable. The result indicates that either fresh or one day old pollen may be used in pollination to get the best success.

Per cent berry ranged from 36 (Kufri Lalima × MP/97-784) to 75% (Kufri Chandramukhi × MP/97-1008) among the different crosses when fresh pollens was tested. It remained almost same or declined slightly when one day stored pollen was used (Table 2). The per cent berry setting decreased markedly when pollination was done using pollens stored for 2 to 6 six days. Pollens stored for 7 and 8 days failed to produce any seeds on pollination. Similar trend was also observed with number of seeds/berry. Number of seeds/berry was maximum when fresh pollens were used as compared to pollens stored for varying periods. Maximum seeds were obtained in cross Kufri Swarna × MP/92-35 (262 seeds/berry), which was expected as the male parent had high pollen stainability and pollen germinability.

Significantly positive correlations were observed between pollen germinability vs percent berry setting (0.906\*\*), between % berry setting vs number of seeds/berry (0.837\*\*) and pollen germinability vs number

**Table 1.** Pollen stainability and germinability in pollens stored under ambient condition in potato

Male parent	Pollen stored for (days)									
	Fresh	1	2	3	4	5	6	7	8	Mean
<b>% pollen staining</b>										
MP/92-35	91.96	91.87	91.97	92.00	91.34	91.68	91.49	92.02	86.15	91.79
MP/97-784	80.39	83.55	80.37	80.39	80.20	80.00	80.06	78.74	79.89	80.12
MP/97-1008	82.63	82.35	81.52	81.12	81.78	81.43	80.26	81.22	82.39	81.63
<b>Mean</b>	84.99	85.92	84.62	84.50	84.44	84.37	83.93	83.99	82.81	84.51
LSD <sub>0.05</sub> = 1.78										
<b>% In-vitro pollen germination</b>										
MP/92-35	85.21	72.78	67.99	59.54	32.24	11.13	6.12	3.84	0.75	37.73
MP/97-784	69.97	63.19	23.97	17.73	11.18	5.28	0.00	0.00	0.00	21.26
MP/97-1008	78.94	79.66	74.25	68.27	53.87	10.14	7.83	4.34	0.99	42.03
<b>Mean</b>	78.04	71.88	55.40	48.51	32.43	8.85	4.65	2.72	0.58	33.67
LSD <sub>0.05</sub> = 3.49										

**Table 2.** Berry setting and seeds/berry in various crosses with pollens stored under ambient condition in potato

Cross	Pollen stored for (days)									
	Fresh	1	2	3	4	5	6	7	8	Mean
<b>% berry setting</b>										
K. Sutej × MP/97-1008	66.45	63.77	43.88	20.70	17.74	6.94	1.00	0	0	25.49
K. Chandramukhi × MP/97-1008	75.20	73.02	49.50	47.96	33.31	22.37	19.72	0	0	35.67
QB/A9-120 × MP/92-35	63.19	60.42	38.29	28.32	18.43	12.56	12.54	0	0	25.37
K. Swarna × MP/92-35	55.15	49.72	50.37	35.23	34.24	29.93	10.30	0	0	29.44
K. Sindhuri × MP/97-784	50.33	51.04	31.52	23.37	1.60	0.00	0.00	0	0	17.54
K. Lalima × MP/97-784	35.79	33.45	23.11	19.60	6.24	0.53	0.00	0	0	13.19
<b>Mean</b>	57.68	55.23	39.44	29.19	18.60	12.05	7.25	0	0	
LSD <sub>0.05</sub> = 1.03										
<b>No. of seeds/berry</b>										
K. Sutej × MP/97-1008	248.67	204.67	142.33	130.00	20.33	18.00	10.33	0	0	86.04
K. Chandramukhi × MP/97-1008	236.33	199.33	135.33	102.67	28.67	13.67	10.00	0	0	80.67
QB/A9-120 × MP/92-35	115.67	50.67	19.67	11.33	11.33	7.67	2.00	0	0	24.26
K. Swarna × MP/92-35	262.33	211.67	144.67	87.00	12.00	10.33	5.00	0	0	81.44
K. Sindhuri × MP/97-784	104.00	63.33	32.33	6.33	3.67	0.00	0.00	0	0	23.30
K. Lalima × MP/97-784	112.67	79.67	24.33	8.00	3.33	0.67	0.00	0	0	25.41
<b>Mean</b>	179.94	134.89	83.11	53.56	13.22	8.39	4.56	0	0	
LSD <sub>0.05</sub> = 3.16										

of seeds per berry. However, the correlations were weak among pollen stainability vs pollen germination and pollen stainability vs number of seeds/berry. The results indicated that in addition to pollen staining pollen fertility test may be conducted, if possible for working out actual pollination capability of parents.

In conclusion, breeder should either use fresh pollens or 24 hours stored pollens, however, pollen stored up to 6 days can be used, if fresh pollen of male parent is not available. Pollen germination test may be considered as an indicator of pollen fertility instead of pollen stainability, which may give erroneous results.

## References

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