

## Short Communication

**‘Punjab Gaurav’ and ‘Punjab Sartaj’: Tomato varieties for poly-net house cultivation**

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Tomato (*Solanum lycopersicum* L.) is a versatile vegetable grown throughout most of the world under protected and open field conditions. It is one of the most sensitive crop plants and its production is often constrained due to various biotic and abiotic stresses. In north Indian plains, tomato grown in the open experience extreme weather conditions, i.e. sub-optimum temperature in January- February and extreme high temperature in May-June. Generally, it is a warm season crop requiring a relatively long growing season with plenty of sunshine. It is sensitive to frost. Under low temperature, the plant growth is restricted and fruit setting is less. Fruit setting is restricted to a relatively narrow daytime temperature range of 20-28°C. The critical factor in setting of fruit is the night temperature, the optimum range being 15-20°C (Anonymous 2010). However, high quantity and quality of the produce, its availability during lean periods, are important to receive the best price in the market. To increase productivity of good quality fruits, especially under low temperature, protected cultivation for tomato is recommended. Under protected culture, the environment is modified to suitable conditions for optimum plant growth which leads to production of quality tomatoes suitable for exports and domestic consumption (Singh and Sirohi 2006). Use of high tunnels or high clear plastic shelters have been reported from Quebec (Trudel and Gosselin 1982), Connecticut (Gent 1991), and the Mediterranean region (Castilla and Fereres 1990) to force early tomato production in winters. The objective of this study was to develop varieties suitable for cultivation under poly-net

house protected culture.

The trials were conducted from 2011-2012 to 2014-2015 at PAU, Ludhiana by taking two open pollinated varieties namely Punjab Gaurav and Punjab Sartaj along with a commercial hybrid G-600 (from Golden Seeds Private Limited) as a check. The experiment was arranged in a randomized complete block design with 3 replications. In 2013-2014, the experiment was also conducted at other locations i.e. at Krishi Vigyan Kendras (Farm Science Centre of PAU, Ludhiana) situated at Samrala, Fatehgarh Sahib, Sangrur, Bathinda, Jalandhar and Gurdaspur in naturally ventilated poly-net house. Non-replicated adaptive trials were conducted at 24 locations during 2014-2015 in farmer's fields. The data collected at PAU and other locations were subjected to analysis to calculate least square differences; adaptive trials from 24 locations were averaged.

In local research trials, first picking of Punjab Gaurav and Punjab Sartaj was possible 117.67 and 112.00 days after transplanting (Table 2) which was approximately 7.63% and 2.44% late than the check hybrid G-600 (109.33 days). Similarly, early yield (harvested till end March) of the hybrid G-600 was 527.09q ha<sup>-1</sup> which was 14.44% more than Punjab Gaurav (450.97q ha<sup>-1</sup>) and 9.21% more than Punjab Sartaj (478.57q ha<sup>-1</sup>) (Table 2). Similar trend for days to first harvest and early yield

**Table 1:** Relative performance of tomato varieties under poly-net house in On-station trials

Variety	Year				Mean of On-station trials
	2011-12	2012-13	2013-14	2014-15	
Punjab Gaurav	2216.65	2274.98	2302.20	2185.00	2244.71
Punjab Sartaj	2033.32	2099.98	2116.65	2130.00	2094.99
G-600 (Check)	1821.66	1899.99	1972.21	1840.00	1883.47
CD at p=0.05	232.70	265.07	201.71	199.50	-

**Table 2:** Overall performance of tomato varieties along with check at On-station research, multilocation and On-farm trials

Variety	On-station Research Trials	Multilocation Research Trials	On-Farm Trials	Overall Mean
Variety	Days from transplanting to first picking			
Punjab Gaurav	117.67	122.02	121.48	120.39
Punjab Sartaj	112.00	121.48	118.00	117.16
G-600(Check)	109.33	121.76	116.38	115.82
CD at p=0.05	4.34	NS	3.20	-
Variety	Fruit weight (g)			
Punjab Gaurav	92.58	88.80	90.72	90.70
Punjab Sartaj	82.01	85.58	84.64	84.08
G-600(Check)	100.72	95.65	102.39	99.59
CD at p=0.05	4.73	5.83	4.47	-
Variety	Early Yield (q ha <sup>-1</sup> )			
Punjab Gaurav	450.97	732.77	668.38	617.37
Punjab Sartaj	478.57	704.88	720.81	634.75
G-600(Check)	527.09	772.64	774.62	691.45
CD at p=0.05	23.38	50.28	92.21	-
Variety	Total Yield (q ha <sup>-1</sup> )			
Punjab Gaurav	2244.71	2454.42	2305.40	2334.84
Punjab Sartaj	2094.99	2395.54	2244.59	2245.04
G-600(Check)	1883.47	2158.08	1908.03	1983.19
CD at p=0.05	64.99	172.11	269.91	-

of these varieties was observed in multilocation and on-farm trials (Table 2). For total yield, Punjab Gaurav and Punjab Sartaj recorded average fruit yield of 2244.71q ha<sup>-1</sup> and 2094.99q ha<sup>-1</sup> (Table 1) in local research trials, which was approximately 19.18% and 11.23% higher than the check hybrid G-600 (1883.47q ha<sup>-1</sup>). In multilocation trials, fruit yield of Punjab Gaurav, Punjab Sartaj and the check hybrid G-600 was recorded to be 2454.42, 2395.54 and 2158.08q ha<sup>-1</sup>, respectively (Table 2). Based on the mean performance of 24 on-farm trials, Punjab Gaurav (20.83%) and Punjab Sartaj (17.64%) out yielded over the check hybrid G-600 (Table 2). Overall, Punjab Gaurav and Punjab Sartaj recorded an average yield of 2334.84q ha<sup>-1</sup> and 2245.04q ha<sup>-1</sup> which was 17.73% and 13.20% more than the check hybrid G-600 (1983.19q ha<sup>-1</sup>). Cheema et al. (2013) and Jindal et al. (2015) also recorded higher early and total yield of tomato hybrids under naturally ventilated polyhouse.

Based on the local research trials, multilocation trials and on-farm trials, average fruit weight of Punjab Gaurav and Punjab Sartaj was 90.70g and 84.08g which was

8.93% and 15.57% less than G-600 (99.59g) (Table 2). However, fruit size of these new varieties is commercially acceptable which range between 80- 100g. The fruit shape index of Punjab Gaurav was more than unity (Table 2) indicating its oval fruit shape. The other two entries were comparable in fruit shape index and were round in shape. The pericarp of Punjab Gaurav (7.55mm) and Punjab Sartaj (7.13mm) was 66.67% and 57.40% thicker than check hybrid G-600 (4.53mm). The number of locules of Punjab Gaurav (2.61) and Punjab Sartaj (2.84) were 27.09% and 20.67% lesser than the check hybrid G-600 (3.58). Thicker pericarp and lesser number of locules are desirable as these are associated with fruit firmness. Jindal et al. (2015) also observed that the genotype having thicker pericarp has longer shelf life, higher fruit firmness and high transportation ability. Punjab Gaurav and Punjab Sartaj along with check hybrid G-600 were evaluated for important fruit quality attributes (Table 3). These included dry matter (DM, %), total soluble solids (TSS, °Brix), acidity (g 100ml<sup>-1</sup>), vitamin C (g 100ml<sup>-1</sup>), total carotenoids (mg 100g<sup>-1</sup>) and lycopene (mg 100g<sup>-1</sup>).

**Table 3:** Relative performance of tomato varieties for important horticultural parameters\* and quality traits\*\* under poly-net house

Variety	Number of fruits cluster <sup>-1</sup>	Number of clusters plant <sup>-1</sup>	Fruit shape index (P/E)	Pericarp thickness (mm)	Number of locules fruit <sup>-1</sup>	Plant height (cm)	Dry matter (%)	TSS (°Brix)	Acidity (g 100 ml <sup>-1</sup> juice)	Vitamin C (g 100 ml <sup>-1</sup> juice)	Lycopene (mg 100 g <sup>-1</sup> FW)	Total Carotenoids (mg 100 g <sup>-1</sup> FW)
Punjab Gaurav	8.07	9.11	1.16	7.55	2.61	286.95	4.91	5.47	0.39	20.85	4.89	5.24
Punjab Sartaj	5.78	12.23	0.93	7.13	2.84	304.17	5.53	5.67	0.30	27.05	5.33	5.03
G-600 (check)	6.52	10.56	0.89	4.53	3.58	297.00	4.12	4.61	0.31	27.86	4.02	4.46
CD at p=0.05	0.98	1.32	0.04	0.27	0.55	15.15	0.45	0.34	0.05	4.85	0.60	0.48

\*average of 3 years \*\*average of 2 years

Percent dry matter of Punjab Sartaj was very high (5.53), whereas Punjab Gaurav (4.91) and G-600 (4.12) were comparable. TSS content of Punjab Gaurav (5.47 °B) and Punjab Sartaj (5.67 °B) was significantly higher than the check hybrid G-600 (4.61 °B). Acidity content (0.30- 0.39 g 100ml<sup>-1</sup>) of all the three test entries was comparable. Vitamin C content (Table 3) of Punjab Gaurav (20.85) was less than G-600 (27.86), whereas Punjab Sartaj (27.05) and G-600 were at par. Lycopene content of Punjab Gaurav (4.89mg 100g<sup>-1</sup>) and Punjab Sartaj (5.33mg 100g<sup>-1</sup>) was significantly higher than check hybrid G-600 (4.02 mg 100g<sup>-1</sup>). Punjab Gaurav (5.24) and Punjab Sartaj (5.03) also had more total carotenoids than check hybrid G-600 (4.46). Punjab Sartaj developed mild tomato leaf curl disease symptoms under natural epiphytotic (3.00%) and artificial inoculated conditions (10.0%) compared to Punjab Gaurav (19.17% and 60.00%) and G-600 (36.67% and 60.0%). Against late blight, all the three test entries were susceptible under both the natural and artificial conditions. The root gall index of Punjab Gaurav (2.9 and 3.8), Punjab Sartaj (3.1 and 3.4) and G-600 (2.9 and 3.6) were comparable under both the natural and artificial conditions.

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