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Evaluation of Sub-tropical Pear Germplasm

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Key Words: Pear, Evaluation, Flowering characters, Morphological variation

Pear is one of the most important temperate fruits of the world next to apple. Most of the cultivars belonging to *Pyrus communis* are suitable for cultivation in temperate climate. However, the Oriental pear [*Pyrus pyrifolia* (Burm.) Nakai] cultivars are well adapted to sub-tropical climate of North-Western states of India. The Patharnakh is the leading cultivar in the region although some scattered plantations of soft pear cultivars such as LeConte and Baggugosha also exist. To broaden genetic base of pear, a survey of Punjab and adjoining states was made to harness the genetic variability both in sand and soft pears. As a result 19 superior strains of soft pear were collected. In addition, Asian pear cultivars and their hybrids were also introduced from France and USA. This paper deals with studies wherein evaluation of sub-tropical pear germplasm has been done with respect to morphological and flowering characteristics.

Thirty different strains/cultivars of Asian and European pears and their hybrids were collected from indigenous and exotic sources during 1989-1992 and planted in the test block of New Orchard of the Department of Horticulture, Punjab Agricultural University, Ludhiana, for evaluation of their performance under Punjab conditions. The observations on morphological and flowering characteristics were recorded. The tree height and mean tree spread from North-South and East-West and plant girth were measured when the plants were dormant. The volume of the tree was calculated and expressed in m^3. The data was also recorded on the date of leaf fall, leaf emergence, full-bloom and duration of flowering. The percentage of fruit set was recorded by bagging the unopened flowers on the spurs to assess the self-compatibility in different genotypes.

The data given in Table 1 indicate that the AR-89-2 was the most vigorous which recorded maximum tree height (7.27 m), spread (3.560 m) and volume (49.51 m^3). This was followed by AR-89-1 and ARP-90-17. The least vigorous strain was found to be ARNBD-92-28 which had minimum height (4.08 m) and tree volume (4.63 m^3). However, the stem girth was maximum (63.50 cm) in AR-89-8 followed by AR-89-2 (61.12 cm) and it was minimum (34.37 cm) in ARG-90-18. In earlier studies, Gupta and Chauhan (1976) reported that average tree height of Patharnakh was 5.8 m, whereas that of LeConte and Smith cultivars was 4.4 m. The coefficient of variance of volume was recorded to be 58.52 which indicates that the great variability in terms of tree volume does exist in the

Table 1. Morphological and flowering characteristics of pear germplasm

Strain	Height (m)	Spread (m)	Girth (cm)	Volume (m^3)	Date of leaf fall*	Date of leaf emergence	Date of full bloom	Duration of flowering (days)	Percentage Fruit-set (self-pollination)
AR-89-1	6.63	3.46	56.00	43.68	17/2 Dec/Jan, 2000	4/5 Mar	18 Mar	17	1.46
AR-89-2	7.27	3.56	61.12	49.51	18/3 Dec/Jan	3/4 Mar	15 Mar	19	1.32
AR-89-3	6.43	2.90	53.62	31.62	20/1 Dec/Jan	5/6 Mar	16 Mar	17	0.64
AR-89-4	6.58	2.81	57.50	28.42	18/3 Dec/Jan	1/5 Mar	18 Mar	16	0.98
AR-89-5	6.39	2.19	49.75	16.69	4/7 Jan	29 Feb/1 Mar	13 Mar	10	0.52
AR-89-6	4.78	1.57	37.16	14.05	3/5 Jan	2/11 Mar	17 Mar	14	0.83
AR-89-7	6.52	3.16	60.12	33.43	22/8 Dec/Jan	1/5 Mar	16 Mar	17	0.57
AR-89-8	6.95	2.60	63.50	25.96	28/4 Dec/Jan	1/2 Mar	14 Mar	16	0.42
AR-89-9	6.57	2.59	55.87	23.40	28/3 Dec/Jan	4/7 Mar	17 Mar	16	1.19
AR-89-10	6.89	2.81	59.49	29.64	28/4 Dec/Jan	4/5 Mar	15 Mar	15	0.39
AR-90-11	6.54	2.71	56.00	23.62	4/6 Jan	4/6 Mar	16 Mar	17	0.45
AR-90-12	5.85	1.66	44.50	20.44	2/6 Jan	5 Mar	16 Mar	17	1.06
AR-90-13	5.93	2.46	49.25	25.55	28/10 Dec/Jan	6/9 Mar	22 Mar	14	0.00
AR-90-14	7.16	2.13	54.00	16.87	3/8 Jan	3/4 Mar	17 Mar	18	0.84
AR-90-15	6.77	2.00	56.62	14.30	30/5 Dec/Jan	1/5 Mar	15 Mar	16	0.00
AR-90-16	6.45	2.07	54.75	16.82	2/5 Jan	3/5 Mar	17 Mar	16	0.55
ARP-90-17	7.18	3.01	55.25	36.90	22/25 Oct, 1999	12/15 Feb.	25 Feb.	15	0.00
ARG-90-18	5.18	1.37	34.37	7.51	30/2 Dec/Jan, 2000	1/8 Mar	13 Mar	13	0.00
ARG-90-19	6.34	2.05	54.37	11.51	3/10 Jan	1/2 Mar	13 Mar	13	0.00
AR-90-20	4.93	1.77	44.12	8.27	6/11 Jan	19/23 Mar	28 Mar	09	12.81
AR-90-21	4.73	1.13	39.00	4.40	1/10 Jan	18/28 Mar	29 Mar	11	24.13
ARA-90-22	5.20	2.28	51.37	14.93	11/15 Jan	6/10 Mar	19 Mar	13	2.19
ARA-90-23	5.96	1.96	46.87	10.55	6/16 Jan	18/20 Mar	26 Mar	13	26.44
ARA-90-24	5.92	2.72	53.50	31.24	5/10 Jan	15/18 Mar	23 Mar	14	38.57
ARA-90-25	6.24	2.59	56.75	22.18	28/3 Dec/Jan	16/21 Mar	25 Mar	15	10.76
ARA-90-26	5.37	1.39	46.87	8.11	26/3 Dec/Jan	22/26 Mar	01 Apr.	14	41.61
ARNBD-92-27	5.75	1.50	45.00	9.71	29/5 Dec/Jan	16/20 Feb.	06 Mar	16	0.00
ARNBD-92-28	4.08	1.22	36.49	4.63	2/5 Jan	10/12 Mar	20 Mar	12	0.00
ARNBD-92-29	6.07	1.36	46.25	8.43	4/6 Jan	6/8 Mar.	17 Mar	07	19.13
ARNBD-92-30	4.81	1.45	35.10	9.04	2/5 Jan	19/24 Mar.	03 Apr.	19	0.00
Coefficient of Variance	13.75	30.78	16.61	58.53	–	–	–	–	193.86

* Data recorded in December-January, 2000 except for APR-90-17 (year 1999)

germplasm which can be exploited to identify low canopy genotypes. The date of leaf fall in all the strains ranged between December 17 to January 16 except in ARP-90-17 in which leaf fall took place on 22nd to 25th October. The leaf fall started as earlier as on 17th December in AR-89-1 and as late as 11th January in ARA-90-22. The last date of leaf fall was recorded to be 16th January in ARA-90-23. The variation in leaf fall in different strains indicates that all the strains/cultivars do not enter into induction phase of dormancy at one time.

The date of leaf emergence in different strains ranged between 12th February to 28th March. The earliest (12th February) leaf emergence was recorded in the ARP-90-17. The wide variation in the leaf emergence also indicated their varied chilling requirement. In most of the strains full bloom occurred around mid of March, except a few in which full bloom occurred in February and April. The full-bloom was earliest (25th February) in AR-90-17 and it was delayed to 3rd April in Strain No. 30. Earlier studies also indicated that the flowering in domesticated varieties of the region started between February to March (Aulakh *et al.* 1981). Similarly, the duration of flowering ranged between 7 to 19 days in different strains. Salwan (1985) also revealed that duration of flowering was 4-15 days in some of the pear varieties.

The percentage of fruit-set through self-pollination ranged between 0.00 to 38.54 being highest in AR-90-24. The AR-90-13, 15, 17, 18, 19 and 30 did not set any fruit. This indicates that these strains/cultivars may be self-incompatible and need pollinizer for satisfactory fruit set. However, this needs further investigation. The coefficient of variation for fruit set was as high as 193.86 which shows that some of the strains/cultivars which have high fruit set on selfing could be the potential genotypes for obtaining higher yield. Earlier, Mukherjee and Rana (1966) reported 18.6, 13.8 and 5.9% natural fruit set in LeConte, Kieffer and Smith cultivars, respectively under sub-tropical conditions.

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Screening Soybean (*Glycine max* (L) Merr.) Germplasm for Spring Summer Cultivation

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Key Words: Soybean. Early maturity, Spring-summer cultivation

Soybean as a spring-summer crop has a great potential in India. It can serve two vital purposes. It can provide sustainability to rice-wheat cropping system, which is followed in an area of around 9 million ha and is facing problem of declining factor productivity due to its high energy demand, nutrient deficiencies, build-up of pests and deterioration in physical conditions of soil. Secondly, it can bring additional area under soybean cultivation to narrow down the current gap of 8 million tonnes that exists between the production of soybean in the country and the installed processing capacity of the soybean oil processing industry (Lal, 2001). As soybean is a short-day plant (Meyer *et al.* 1973), a different plant type is required for spring-summer crop. The present varieties under cultivation are too late in maturity and may not be suited for long day and short-duration of spring-summer crop. Genotypes less sensitive to photoperiod and early in maturity are required for this purpose. Therefore, an experiment was undertaken to screen lines from the working germplasm collections available with the project.

Early maturing lines are generally less sensitive to photoperiod (Shanmugasundaram, 1981). Therefore, out of 600 lines working collections, 20 lines of *G. Max* (L) Merr. maturing in less than 100 days during *Kharif* season and one line of *G. sojae* were selected for planting during spring-summer 2000. The genotype were planted in a RBD with three replications, with a plot size of 2 rows of 5m length.

Days to 50% flowering of these lines were observed during *Kharif* 1999 and spring-summer 2000 (Table 1). Delay in days to 50% flowering ranging from 6 to 23 days was observed during spring-summer season as compared to *Kharif* season. Flowers were not developed on *G. sojae*. Out of 21 lines studied, pod formation was observed only in four lines. But seed filling was very poor in all the four lines.

Floral induction in early maturing varieties are less influenced by photoperiod than in the late maturing varieties (Yoshida, 1952). Since early maturing lines are less sensitive to photoperiod, out of working collection of six-hundred germplasm lines, 21 lines maturing in less than 100 days during *Kharif* season were selected for this study. The delay in flowering during spring-summer season was due to sensitivity of the genotypes to the long day conditions. The cumulative photoperiod observed during *Kharif* 99 and spring summer 2001 is shown in Fig. 1. This finding is consistent with the