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Evaluation of Vegetative Parameters of Exotic Pomegranate (*Punica granatum* L.) Germplasms under Mid-Hill Zones of Himachal Pradesh, India

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A B S T R A C T

Twenty pomegranates (*Punica granatum* L.) germplasms were studied under mid-hill conditions of Himachal Pradesh at the Experimental farm of Fruit Science, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan during 2013 in ten year old plants. Dewey recorded maximum plant height (3.18 m) and Trunk girth (96.09 mm) whereas maximum plant spread in N-S direction (2.65 m) and plant spread in E-W direction (2.54 m) was recorded in Loulou and Green Globe, respectively. Leaf area was maximum (27.75 cm^2) in Green Globe. Fruit yield were recorded highest (13.6 kg) in Green Globe.

Introduction

In India pomegranate production traditionally more under arid zone conditions. Considering the increasing population, expanding pomegranate cultivation in non-traditional areas may contribute towards nutritional security. The experimental farmat an altitude of 1270 meters above mean sea level lying between 35.5° North latitude and 77.8° East longitude. The farm area falls in the mid-hill zone of Himachal Pradesh. Most of the farmers in this zone are interested to cultivate temperate horticultural crops (like apple, peach, pear, plum etc.) for their remunerative return. The pomegranate is known to be dry land horticultural crops. Hence, an attempt was made for the collection of exotic pomegranate varieties for identifying a suitable germplasm to the mid-hill zone which can replace temperate horticultural crops to improve the financial conditions of farmers as well as mitigate climate effect with creating varietal diversification.

Twenty germplasms (Table 1) were evaluated for testing their performance in mid hill conditions. The growth parameters viz., plant height (m), plant spread (m), trunk girth (mm), number of stems, number of suckers, thorn length and length of internodes were recorded in all germplasm.

Table.1 Plant growth characteristics of twenty different pomegranate germplasms

Germplasm accessions		Growth habit	Height (m)	Plant spread (m)		Trunk girth (mm)	Number of stems	Number of suckers	Thorn length (mm)	Length of internodes (cm)	Colour of young shoot
				N-S	E-W						
1.	**20090265**	Spreading	1.35	1.19	0.58	40.34	1.00	2.00	8.26	2.91	Red Group 46 C
2.	**AlkPustGhernezSveh**	Spreading	1.68	0.55	0.49	38.78	1.33	0.67	0.00	2.43	Red Group 50 A
3.	**Al-sirin-nar**	Spreading	1.85	1.46	1.16	44.71	1.00	8.67	6.52	2.65	Red Group 50 B
4.	**Cloud**	Upright	1.59	0.45	0.44	60.44	2.00	1.00	8.55	3.08	Red Group 53 B
5.	**Crab**	Spreading	2.15	1.66	1.69	88.19	2.33	5.67	6.52	3.24	Red Group 50 B
6.	**Dewey**	Spreading	3.18	1.61	1.74	96.09	2.00	5.67	7.12	2.85	Red Group 51A
7.	**Eve**	Spreading	2.19	1.97	1.47	21.21	1.67	0.67	5.13	2.64	Red Group 48 B
8.	**Green Globe**	Spreading	3.16	2.54	2.54	49.84	2.00	1.00	5.67	4.32	Red Group 50 A
9.	**Gulyalek**	Spreading	2.33	2.08	2.13	65.91	2.33	28.67	6.59	2.87	Red Group 52 A
10.	**Haku-botan**	Spreading	2.10	1.61	1.26	65.30	3.33	0.67	7.18	3.34	Yellow Green Group 144 D
11.	**Kaim-anar**	Upright	1.65	0.46	0.38	28.20	2.00	0.67	9.21	3.25	Red Group 51A
12.	**Loulou**	Upright	3.09	2.65	2.489	91.11	3.00	5.00	9.58	2.62	Red Group 52 A
13.	**Nusai**	Upright	2.18	1.55	1.54	51.16	1.67	1.00	9.96	3.26	Red Grroup 51 B
14.	**Orange**	Spreading	2.15	1.35	1.77	35.50	2.33	0.67	10.00	2.76	Red Group 51 C
15.	**Ovadan**	Spreading	1.62	0.88	1.14	32.76	2.00	2.67	9.18	3.72	Red Group 52 A
16.	**Parfyanets**	Drooping	2.31	1.65	1.88	40.98	3.00	3.00	6.85	2.80	Red Group 48 B
17.	**Podarok**	Upright	2.37	1.57	1.69	38.54	1.67	1.00	7.82	3.23	Red Group 51 A
18.	**Purple Heart**	Upright	1.55	0.54	0.34	20.11	1.00	0.67	0.00	2.03	Red Group 51 C
19.	**Saharnyi**	Spreading	2.24	2.20	1.57	59.00	2.33	7.00	6.24	3.55	Red Group 48 B
20.	**Sogdiana**	Upright	1.82	1.62	1.38	24.30	3.33	0.67	6.13	3.09	Red Group 39 A
Mean			2.13	1.48	1.38	49.62	2.02	3.85	6.82	3.03	
C.D$_{0.05}$			0.14*	0.09*	0.05*	0.18*	0.84*	0.73*	0.04*	0.05*	

Table.2 Foliage characteristics of twenty different pomegranate germplasms

Germplasm accessions		Date of leaf bud break	Leaf Length (mm)	Leaf Breadth (mm)	Leaf area (cm^2)	Petiole length (mm)	Colour of leaves		Leaf shape	Leaf apex	Time of leaf fall
							Young	Mature			
1.	**20090265**	21/2/13	43.50	14.24	5.44	5.02	Greyed Purple Group 187B	Green Group 143A	Lanceolate	Acute	13/11/12
2.	**AlkPustGhermezSaveh**	22/2/13	60.39	16.03	17.97	5.18	Greyed Purple Group 148A	Yellow Green Group 147A	Lanceolate	Acute	11/12/12*
3.	**Al-sirin-nar**	21/2/13	55.54	15.16	8.24	4.88	Greyed Red Group 181A	Green Group 144B	Lanceolate	Acute	22/11/12
4.	**Cloud**	26/2/13	96.43	19.79	20.28	9.31	Greyed Purple Group 187B	Green Group 143A	Lanceolate	Acute	24/11/12
5.	**Crab**	21/2/13	83.10	19.30	20.14	5.78	Greyed Red Group 181A	Green Group 141A	Lanceolate	Acute	20/11/12
6.	**Dewey**	22/2/13	53.80	17.34	13.1	4.70	Greyed Purple Group 183A	Green Group 143A	Lanceolate	Acute	21/11/12
7.	**Eve**	19/2/13	36.53	7.57	6.13	4.48	Greyed Purple Group 184A	Green Group 137A	Lanceolate	Acute	19/11/12
8.	**Green Globe**	22/2/13	73.70	21.50	27.75	10.01	Greyed Purple Group 184A	Green Group 143A	Lanceolate	Acute	21/11/12
9.	**Gulyalek**	22/2/13	79.64	21.68	14.12	5.42	Greyed Purple Group 185A	Green Group 137A	Lanceolate	Acute	18/11/12
10.	**Haku-botan**	22/2/13	77.54	22.69	19.10	5.90	Yellow Green Group 151C	Green Group 139A	Lanceolate	Acute	16/11/12
11.	**Kaim-anar**	24/2/13	65.82	16.37	15.26	4.4	Greyed Purple Group 185A	Green Group 144A	Lanceolate	Acute	25/11/12
12.	**Loulou**	21/2/13	74.92	20.96	25.17	8.75	Greyed Purple Group 187C	Green Group 141A	Lanceolate	Acute	2/12/12
13.	**Nusai**	21/2/13	76.49	17.30	14.85	7.85	Greyed Purple Group 185A	Green Group 144A	Lanceolate	Acute	29/11/12
14.	**Orange**	19/2/13	77.76	23.74	18.92	6.92	Greyed Purple Group 184B	Green Group 143A	Broad elliptic	Acute	10/12/12*
15.	**Ovadan**	22/2/13	58.11	13.48	7.85	5.46	Greyed Purple Group 185A	Yellow Green Group 145A	Elliptic lanceolate	Acute	19/11/12
16.	**Parfyanets**	19/2/13	64.55	18.53	12.69	7.89	Greyed Purple Group 184B	Green Group 143A	Lanceolate	Acute	17/11/12
17.	**Podarok**	28/2/13	70.46	21.40	18.96	7.40	Greyed Purple Group 185A	Green Group 144A	Lanceolate	Acute	20/11/12
18.	**Purple Heart**	14/2/13	53.78	16.96	13.54	3.33	Greyed Red Group 181A	Green Group 141A	Lanceolate	Acute	12/12/12*
19.	**Saharnyi**	22/2/13	59.76	17.31	14.61	4.14	Greyed Purple Group 187C	Green Group 143A	Lanceolate	Acute	4/12/12
20.	**Sogdiana**	17/2/13	46.24	12.61	6.47	3.27	Greyed Purple Group 184A	Green Group 137A	Lanceolate	Acute	18/11/12
Mean			65.40	17.7	15.03	5.50					
$CD_{0.05}$			0.21*	2.35*	3.86	1.10					

Table.3 Time of maturity, days taken from full bloom to maturity and yield per plant of twenty different pomegranate germplasms

Germplasm accessions	Time of maturity	Days from full bloom to maturity	Yield per plant (kg)
20090265	12/8/13	118	1.60
AlkPustGhermezSaveh	15/8/13	110	1.74
Al-sirin-nar	10/8/13	110	1.99
Cloud	18/8/13	115	1.72
Crab	17/8/13	123	3.80
Dewey	5/8/13	110	5.60
Eve	8/8/13	114	2.44
Green Globe	8/8/13	108	13.60
Gulyalek	16/8/13	112	4.90
Haku-botan	15/8/13	61	2.86
Kaim-anaranar	10/8/13	107	1.11
Loulou	18/8/13	124	10.9
Nusai	15/8/13	124	5.58
Orange	7/8/13	118	2.63
Ovadan	24/8/13	130	2.03
Parfyanets	19/8/13	126	4.34
Podarok	17/8/13	117	3.51
Purple Heart	10/8/13	119	1.40
Saharnyi	16/8/13	118	3.30
Sogdiana	8/8/13	118	1.88
Mean			3.85
$CD_{0.05}$			0.02*

The plant were planted during 2009 in an RBD design with 20 treatments and 3 replications. The data were collected during 2013 and their average mean values were taken into consideration.

Among the twenty pomegranate germplasms studied, Dewey (3.18 m) was highest in plant height which was at par with Green Globe (3.16 m) and Loulou (3.09 m). Plant height, plant spread (N-S and E-W) and cumulative stem girth was found to vary between 1.35 - 3.18 m, 0.45 – 2.65 m (N-S) and 0.34 - 2.54 m (E-W) and 20.11 -.96.09 mm, respectively suggesting considerable variation in plant vigour. Such variations in growth characters are reported by Sharma and Bist (2005). The maximum internodal length was observed in Green Globe (4.32 cm) with the overall mean for intermodal length was recorded as 3.03 cm. The leaf area (27.75 cm^2) and fruit yield/tree (13.6 kg) were recorded highest (Table 2 and 3) in Green Globe followed by Loulou (leaf area 25.17 cm^2 and yield 10.9 kg). Wani *et al.,* (2012) reported that leaf area of wild pomegranate selections accessions ranged between 7.48 cm^2 and 14.04 cm^2. Also, Rao and Subramanyam (2009) reported that among four varieties of pomegranate nine years old Mridula recorded with highest fruit yield/tree (14.1 kg) under scarce rainfall zone. Days from bloom to maturity ranged from 61 days (Haku-botan) to 130 days (Ovadan). Though, duration from anthesis to maturity in pomegranate has been reported to vary from three to five months (Patil and Karale, 1992).

The present studies do indicate that some of these germplasms (like Dewey, Green Globe, Loulou) do possess one or more horticulturally desirable characteristics and thus can be future commercial varieties provided they yield quality fruits consistently and sufficiently.

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