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## Evaluation of ornamental safflower (*Carthamus tinctorius* L.) genotypes for pot culture

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### Abstract

Thirteen genotypes of ornamental safflower namely GMU-7948-1, GMU-7942-1, CO-1, GMU-7945-2, AVHT-20-12, SSF-708, SSF-658, AVHT-20-04, GMU-7942-2, AVHT-20-09, IVHT-20-02, GMU-7943-1, SSF-733 were evaluated with the aim to identify suitable genotypes for pot culture during the year 2021-2022 at Modibaug garden, Horticulture Section, College of Agriculture, Pune-05, (M.S). The results revealed that in the vegetative characters, the best performing genotypes for plant height were GMU-7942-2 (40.62 cm), SSF-733 (48.06 cm), GMU-7943-1 (54.24 cm). Maximum stem thickness at middle was recorded by GMU-7942-1 (2.38 cm), CO-1 (2.20 cm), SSF-733 (2.17 cm), Maximum and significantly superior leaf area was recorded by the genotype AVHT-20-09 (28.84 cm<sup>2</sup>), Maximum E-W (28.05 cm) and N-S (37.30 cm) plant spread was recorded in the genotype SF-658. The maximum number of branches per plant recorded in the genotype CO-1 (5.66) and GMU-7945-2 (5.33). The results revealed that in the flowering characters, the best performing genotypes for the parameter maximum number of flowers per plant was recorded in the genotypes SSF-658 (16.57) and SSF-708 (13.92). The genotype SSF-658 (73.53 days), CO- (74.66 days) recorded minimum days required for the bud initiation. The genotype SSF-708 (30.42 days), GMU-7942-1 (30.33 days), SSF-658 (29.50 days) and CO-1 (28.93 days) recorded maximum flowering duration. The maximum flower diameter (3.98 cm) has recorded in GMU-7942-1.

**Keywords:** Ornamental safflower, genotypes, plant height, pot culture

### 1. Introduction

The safflower (*Carthamus tinctorius* L.) belongs to the Asteraceae family, is widely cultivated as an oilseed crop in many countries. *Carthamus* has 25 species, of which only *C. tinctorius* is the cultivated type, having  $2n=24$  chromosomes (Oelke *et al.*, 2010). It is an annual or winter annual herbaceous plant that thrives in hot, dry conditions. Plants have many spines on their leaves and bracts, however there are those with few spines. Young plants generate rosettes that can withstand temperatures as low as  $-7^{\circ}\text{C}$  but struggle to compete with weeds. Spring-planted safflower stem elongation begins around one month after emergence (Helm *et al.* 1991). Florets form a capitulum at the end of each stem, generally in yellow, orange, red, or white, which darkens when dried (Li and Mundel 1996) [3]. In the absence of pollinators, safflower is primarily self-pollinating (Knowels 1969). Flowers are normally orange, yellow, or red, with the exception of white. The inflorescence is of the composite type, with each plant generating 3-50 or more flowering heads, known as capitula, on the ends of the branches. Capitula bloom first on the primary branches, then on the secondary and tertiary branches. Flowering of the individual florets in each capitulum begins at the head's periphery and progresses inward over 3-5 days. Each stem is embellished with a large flower head made up of numerous florets that range in colour from pale yellow to dark orange. These flowers are attractive to bees and other helpful insects and can be used as cut flowers. Because of its lovely and unusual flowers, many people choose safflower to use in arrangements. Each head typically has between 20 and 180 individual florets, but can contain up to 250 florets, with bristles distributed between the flowers (Singh and Nimbkar, 2006) [4]. According to Burkart and Stoner (1974), safflower is the culinary equivalent of saffron, and it is produced as an annual plant as well as for oil. The seeds are tetragonal and hairless, the alternating leaves are toothed or lobed, and the capitula are huge, solitary, and found near the tip of the branches.

### 2. Materials and Methods

The present study was conducted at Modibaug garden, Horticulture Section, College of Agriculture, Pune-05, (M.S). Thirteen genotypes of ornamental safflower collected from AICRP on Safflower, ZARS, MPKV, Solapur-413002 were evaluated during 2021-2022.

Thirteen genotypes are GMU-7948-1, GMU-7942-1, CO-1, GMU-7945-2, AVHT-20-12, SSF-708, SSF-658, AVHT-20-04, GMU-7942-2, AVHT-20-09, IVHT-20-02, GMU-7943-1, SSF-733. The experiment was laid out in Completely Randomized Design. The pot size used was 25 cm diameter and 25 cm depth and potting mixture used for growing plants was Sand: Soil: FYM in 1:2:1 proportion. The data on plant height, stem thickness, leaf area, plant spread, number of branches per plant, number of flowers per plant, days required for the bud initiation, flower diameter, flowering duration. The observations were statistically analysed.

### 3. Results and Discussion

- 1. Plant height (cm):** For pot culture minimum height is best and in the present investigation, the mean plant height was ranged between 40.62 to 72.67 cm with a mean of 60.44 cm. Minimum plant height was recorded in the genotype GMU-7942-2 (40.62 cm). The plant height results obtained in this study are similar to those obtained by Sashidhar (2002), Muhammad *et al.* (2008).
- 2. Stem thickness (cm):** The Stem thickness at middle ranged between 1.75 to 2.38 cm with a mean 1.99 cm. Maximum stem thickness at middle was recorded by GMU-7942-1 (2.38 cm) which was superior than the rest of genotypes studied. The findings are consistent with those reported by De Melo *et al.* (2019)<sup>[1]</sup> in Safflower and Patil (2018)<sup>[15]</sup> in ornamental sunflower.
- 3. Plant spread:** East-West plant spread was ranged between 17.21 to 28.05 cm with a mean of 23.07 cm. Maximum East-West plant spread was recorded by SSF-658 (28.05 cm). Maximum and significantly superior North-South plant spread was recorded by SSF-658 (37.30 cm). The present findings were in confirming with Kumar and Yadav (2003) observed similar results in Gerbera, Bhati and Chitkara (1989)<sup>[6]</sup>, Khanvilkar *et al.* (2003) in marigold and in chrysanthemum.
- 4. Leaf area (cm<sup>2</sup>):** Maximum and significantly superior leaf area was recorded by the genotype AVHT-20-09 (28.84 cm<sup>2</sup>). These findings nearly in agreement with

Blum (2005)<sup>[9]</sup>, Rokulhui (2013), who reported a significant variation in leaf area in gerbera genotypes.

- 5. Number of branches per plant:** The genotype CO-1 had the highest and significantly superior number of branches per plant (5.66). The genotype GMU-7942-2 was recorded the minimum number of branches per plant (3.33).
- 6. Number of flowers per plant:** The total number of flowers per plant for all genotypes ranged in between 8.60 to 16.57. The average of total number of flowers per plant was 3.44. The genotype SSF-658 had the highest number of flowers (16.57). The genotype AVHT-20-12 reported the minimum number of flowers per plant (8.60). Above results were coincided with results made by De Melo *et al.* (2019)<sup>[1]</sup> in safflower.
- 7. Days required for the bud initiation:** Minimum number of days required for appearance of first floral bud from sowing was recorded by the genotype SSF-658 (73.53 days), which was superior than the other genotypes studied, except the genotype CO-1 (74.66 days) which was on par. However, maximum days was required for appearance of first flower bud recorded by the genotype AVHT-20-09 (86.20 days).
- 8. Diameter of flower head (cm):** The flower diameter expressed by various ornamental safflower genotypes ranged from 2.28 to 3.98 cm. The maximum and significantly superior flower head diameter was observed by the genotype GMU-7942-1 (3.98 cm). These findings agreed with those of Singh *et al.* (2003) for marigold, Patil (2019)<sup>[16]</sup> for sunflower.
- 9. Flowering duration:** Maximum flowering duration was recorded by the genotype SSF-708 (30.42 days). Minimum flowering duration was recorded by AVHT-20-09 (20.92 days). These results are in accordance with Giri (2002) in chrysanthemum, Khanvilkar *et al.* (2003) in marigold.





**Table 1:** Mean performance of plant height, stem thickness, plant spread, leaf area ornamental safflower

Treatments	Genotypes	Plant height (cm)	Stem thickness (cm)	Plant spread (cm)		Leaf area (cm <sup>2</sup> )
				East-West	North-South	
T <sub>1</sub>	GMU-7948-1	61.30 <sup>cdef</sup>	1.92 <sup>ab</sup>	21.92 <sup>abcd</sup>	22.11 <sup>abc</sup>	14.60 <sup>de</sup>
T <sub>2</sub>	GMU-7942-1	65.99 <sup>efg</sup>	2.38 <sup>c</sup>	27.09 <sup>cde</sup>	26.40 <sup>cde</sup>	12.72 <sup>bcd</sup>
T <sub>3</sub>	CO-1	66.84 <sup>efg</sup>	2.20 <sup>bc</sup>	26.50 <sup>cde</sup>	24.41 <sup>bcd</sup>	24.66 <sup>g</sup>
T <sub>4</sub>	GMU-7945-2	59.42 <sup>cde</sup>	1.95 <sup>ab</sup>	27.83 <sup>de</sup>	26.40 <sup>cde</sup>	12.58 <sup>bc</sup>
T <sub>5</sub>	AVHT-20-12	69.91 <sup>g</sup>	1.84 <sup>a</sup>	22.81 <sup>abcde</sup>	23.30 <sup>abcd</sup>	13.09 <sup>bcd</sup>
T <sub>6</sub>	SSF-708	55.36 <sup>bcd</sup>	1.98 <sup>ab</sup>	21.22 <sup>abc</sup>	19.93 <sup>ab</sup>	16.51 <sup>f</sup>
T <sub>7</sub>	SSF-658	61.23 <sup>cdef</sup>	1.75 <sup>a</sup>	28.05 <sup>e</sup>	37.30 <sup>f</sup>	9.51 <sup>a</sup>
T <sub>8</sub>	AVHT-20-04	62.22 <sup>defg</sup>	1.84 <sup>a</sup>	24.92 <sup>bcd</sup>	26.58 <sup>cde</sup>	14.22 <sup>cde</sup>
T <sub>9</sub>	GMU-7942-2	40.62 <sup>a</sup>	2.01 <sup>ab</sup>	17.21 <sup>a</sup>	18.71 <sup>a</sup>	9.77 <sup>a</sup>
T <sub>10</sub>	AVHT-20-09	72.67 <sup>h</sup>	2.00 <sup>ab</sup>	19.88 <sup>ab</sup>	28.20 <sup>de</sup>	28.84 <sup>h</sup>
T <sub>11</sub>	IVHT-20-02	67.87 <sup>fg</sup>	1.98 <sup>ab</sup>	22.23 <sup>abcde</sup>	23.58 <sup>abcde</sup>	14.03 <sup>cde</sup>
T <sub>12</sub>	GMU-7943-1	54.24 <sup>bc</sup>	1.94 <sup>ab</sup>	22.17 <sup>abcde</sup>	28.71 <sup>e</sup>	14.75 <sup>ef</sup>
T <sub>13</sub>	SSF-733	48.06 <sup>ab</sup>	2.17 <sup>bc</sup>	18.07 <sup>a</sup>	24.21 <sup>bcd</sup>	12.14 <sup>b</sup>
	Range	40.62 - 72.67	1.75 - 2.38	17.21-28.05	18.71-37.30	9.51 - 28.84
	Mean	60.44	1.99	23.07	25.36	15.18
	SE(m) ±	2.65	0.10	2.07	1.80	0.64
	C.D at 5%	7.75	0.31	6.04	5.27	1.88

**Table 2:** Mean performance of number of branches per plant, number of flowers per plant, days required for bud initiation, diameter of flower head and flowering duration of ornamental safflower

Treatments	Genotypes	Number of branches per plant	Number of flowers per plant	Days required bud initiation	Diameter of flower (cm)	Flowering duration
T <sub>1</sub>	GMU-7948-1	4.23 <sup>c</sup> (2.28)	9.15 <sup>bcd</sup> (3.18)	83.30 <sup>f</sup>	2.77 <sup>abcd</sup>	23.07 <sup>bc</sup>
T <sub>2</sub>	GMU-7942-1	3.53 <sup>a</sup> (2.13)	10.62 <sup>e</sup> (3.40)	83.66 <sup>fg</sup>	3.98 <sup>f</sup>	30.33 <sup>d</sup>
T <sub>3</sub>	CO-1	5.66 <sup>g</sup> (2.57)	10.80 <sup>e</sup> (3.42)	74.66 <sup>a</sup>	2.91 <sup>bcd</sup>	28.93 <sup>d</sup>
T <sub>4</sub>	GMU-7945-2	5.33 <sup>f</sup> (2.51)	12.66 <sup>g</sup> (3.68)	81.46 <sup>de</sup>	2.52 <sup>ab</sup>	23.59 <sup>bc</sup>
T <sub>5</sub>	AVHT-20-12	4.40 <sup>cd</sup> (2.32)	8.60 <sup>a</sup> (3.09)	79.60 <sup>c</sup>	3.22 <sup>de</sup>	24.33 <sup>c</sup>
T <sub>6</sub>	SSF-708	3.46 <sup>a</sup> (2.11)	13.92 <sup>h</sup> (3.86)	77.53 <sup>b</sup>	2.83 <sup>bcd</sup>	30.42 <sup>d</sup>
T <sub>7</sub>	SSF-658	4.46 <sup>cd</sup> (2.34)	16.57 <sup>i</sup> (3.60)	73.53 <sup>a</sup>	3.45 <sup>e</sup>	29.50 <sup>d</sup>
T <sub>8</sub>	AVHT-20-04	3.93 <sup>b</sup> (2.22)	8.73 <sup>ab</sup> (3.11)	81.00 <sup>cd</sup>	2.81 <sup>bcd</sup>	22.69 <sup>abc</sup>
T <sub>9</sub>	GMU-7942-2	3.33 <sup>a</sup> (2.08)	8.73 <sup>ab</sup> (3.12)	76.80 <sup>b</sup>	2.74 <sup>abcd</sup>	22.95 <sup>bc</sup>
T <sub>10</sub>	AVHT-20-09	4.46 <sup>cd</sup> (2.34)	11.06 <sup>d</sup> (3.47)	86.20 <sup>h</sup>	3.06 <sup>cde</sup>	20.92 <sup>a</sup>
T <sub>11</sub>	IVHT-20-02	3.93 <sup>b</sup> (2.22)	9.20 <sup>d</sup> (3.19)	82.90 <sup>ef</sup>	2.79 <sup>abcd</sup>	22.60 <sup>abc</sup>
T <sub>12</sub>	GMU-7943-1	4.86 <sup>e</sup> (2.42)	11.93 <sup>f</sup> (4.18)	84.86 <sup>gh</sup>	2.56 <sup>abc</sup>	22.32 <sup>ab</sup>
T <sub>13</sub>	SSF-733	4.60 <sup>de</sup> (2.36)	10.86 <sup>e</sup> (3.44)	79.73 <sup>c</sup>	2.28 <sup>a</sup>	29.20 <sup>d</sup>
	Range	3.33 - 5.66	8.60 - 16.57	73.53 - 86.20	2.28 - 3.98	20.92 - 30.42
	Mean	4.32	3.44	80.40	2.91	25.45
	SE(m)±	0.09	0.16	0.51	0.17	0.66
	C.D at 5%	0.26	0.46	1.49	0.51	1.95

## Conclusion

The thirteen genotypes of potted ornamental safflower genotypes were evaluated for horticultural parameters considering overall performance. From overall findings it was found that the best four genotypes viz., CO-1, GMU-7942-1, SSF-658 and SSF-733 were identified for planting as pot culture.

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