



STUDY ON THE GROWTH AND YIELD ATTRIBUTES OF MARIGOLD (*Tagetes spp.*) HYBRIDS UNDER DHARWAD CONDITION*

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ABSTRACT : The present investigation was conducted during kharif 2014-15 at Floriculture Unit of New Orchard, Department of Horticulture, UAS, Dharwad with the objective to find out the suitable marigold hybrids for cultivation under Dharwad condition. There were significant differences among the hybrids with respect to vegetative and floral characters. Among the hybrids, Double Orange, Garland Orange and Sarpan-11 were found to be superior with respect to vegetative growth, flower yield and quality of marigold.

Keywords : Marigold, flower, growth, hybrids, yield.

Marigold (*Tagetes spp.*) is one of the important commercial flowers of India. It belongs to the family Asteraceae (2n=24). Four annual species of *Tagetes* commonly cultivated throughout the world as ornamentals are *T. erecta* L., *T. patula* L. (French marigold), *T. lunulata* Art. and *T. tenuifolia* Cav. These early marigolds were used as ornamentals, medicinal plants and as ritual plants (Nuttal, 8).

Marigold leaves contain a distinct odoriferous oil which is used in high grade perfumes and cosmetics (Dhingra and Dhingra, 4; and Hemla Naik, 5). Marigold essential oil has bronchodilatory, tranquilizing, anti-inflammatory as well as insect repellent properties. One alternative to the use of nematicides is to intercrop marigold with other crops to reduce the population of most common nematodes *Meloidogyne sp.* (Tyler, 19; and Steiner, 17). Medicinally both flowers and leaves are equally important in the treatment of various diseases and disorders.

Besides, all the above applications recently marigolds are grown commercially for extraction of carotene pigments mainly xanthophyll. The carotene extracted from petals are added to poultry feed for intensification of yellow colour of egg yolk (Bird, 2). Supplementation of poultry feed with marigold pigments helps to improve colour of ornamental fishes as well as fish fillet (Boonyaralpalin, 3). Apart from poultry industry, marigold dye is also used in textile industries for dyeing the fabrics (Taylor, 18).

MATERIALS AND METHODS

The present investigation was carried out at Floriculture Unit of New Orchard, Department of Horticulture, College of Agriculture, University of Agricultural Sciences, Dharwad with the objective to find out the suitable marigold hybrids for cultivation under Dharwad condition. The experiment was laid out in a Randomized Block Design (RBD) with three replications. The treatments in each replication were allotted randomly. This experiment consisted of 12 hybrids viz. Majestic Yellow, Double Orange, Inca Mix, Kilimanjaro White, Mysore Gold, Garland Orange, Indam Gold, Bonanza Mix, Indam Yellow, Indam Yellow New, Sarpan-11 (Orange), Sarpan Hybrid Marigold-33 (Yellow).

Raised nursery bed was drenched with malathion dust. The nursery beds were watered daily twice for first 10 days and daily once for the remaining period. Hand weeding was done twice when the seedlings were 15 days and 25 days old. The seedlings were ready for transplanting at 30 days after sowing. The land was brought to a fine tilth by repeated ploughing and harrowing. Thirty days old healthy and uniformly grown seedlings were used for transplanting with a spacing of 60 cm x 45 cm. Fertilizer application, weeding, plant protection etc. were carried out as per package of practice. The observations were recorded on plant height, number of leaves, plant spared (N-S, E-W), number of primary branches, number of secondary branches, diameter of flower, number of petals per flower, peduncle length, number of seeds per flower, fresh weight of flower, dry weight of flower, petal meal, xanthophyll yield and flower yield per hectare.

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Table 1: Vegetative growth of marigold hybrids at various stages of plant growth.

	Characters	MY	DO	IM	KW	MG	GO	IG	BM	IY	IYN	S-11	SMH-33	Mean	CD (P=0.05)
1	Plant Height 30DAT (cm)	36.3	40.6	24.0	18.8	23.3	33.8	25.6	15.7	30.3	28.7	34.7	36.5	29.1	3.4
2	Plant Height 60DAT (cm)	51.4	71.3	34.7	47.9	37.6	64.9	34.1	21.9	36.3	36.9	67.3	60.0	47.0	5.2
3	Plant Height 90DAT (cm)	59.8	82.6	41.4	61.5	47.4	73.3	42.7	29.5	48.8	43.7	79.0	84.9	57.8	5.5
4	Number of leaves 30DAT	54.0	47.1	38.7	20.1	41.2	47.4	39.7	30.9	23.8	38.3	36.7	24.9	36.8	6.7
5	Number of leaves 60DAT	144.0	270.4	180.9	135.3	175.8	297.4	193.2	146.7	114.1	180.8	165.9	171.3	181.3	41.6
6	Number of leaves 90DAT	222.6	341.5	245.9	204.2	258.6	348.0	251.1	239.6	213.0	278.6	279.1	416.8	274.9	30.1
7	Plant spread N-S 30DAT (cm)	13.2	14.2	12.9	11.9	11.8	13.1	11.8	13.0	12.2	13.4	30.8	13.6	14.3	0.7
8	Plant spread N-S 60DAT (cm)	26.2	32.9	25.5	26.3	23.9	29.1	25.9	27.8	17.9	26.9	15.1	29.0	25.6	3.5
9	Plant spread N-S 90DAT (cm)	50.9	53.3	49.3	46.1	36.9	46.2	52.8	43.4	33.9	44.3	56.2	56.2	47.5	5.5
10	Plant spread E-W 30DAT (cm)	13.2	14.3	12.9	11.9	12.0	13.1	11.8	13.0	12.2	13.4	29.6	13.6	14.2	1.56
11	Plant spread E-W 60DAT (cm)	24.7	29.6	25.9	27.8	24.8	29.0	26.5	24.8	19.4	24.9	12.6	33.7	25.3	6.87
12	Plant spread E-W (90DAT) (cm)	49.5	51.6	50.0	56.3	47.5	44.3	67.1	51.0	43.6	59.7	57.4	76.4	45.5	4.8
13	Primary branches (30DAT)	6.4	5.2	5.2	4.2	5.4	4.5	5.1	3.7	3.6	4.0	9.2	5.4	5.2	0.6
14	Primary branches (60DAT)	8.8	8.8	6.3	5.7	6.4	8.5	8.1	7.3	6.6	7.9	9.2	9.9	7.8	0.6
15	Primary branches (90DAT)	10.5	10.8	8.5	6.6	8.2	11.0	9.9	8.7	8.5	8.4	12.3	15.5	9.9	2.1
16	Secondary branches 30DAT	5.3	4.2	3.7	5.4	6.6	2.7	3.1	2.6	2.6	3.4	18.4	3.7	5.1	0.7
17	Secondary branches 60DAT	17.1	31.2	15.7	16.5	17.3	27.0	22.5	18.4	14.8	18.9	18.4	25.0	20.2	6.8
18	Secondary branches 90DAT	27.1	41.8	21.1	22.4	27.7	34.9	29.6	29.7	25.3	27.9	28.5	45.4	30.1	9.4

MY – Majestic Yellow , DO – Double Orange, IM – Inca Mix, KW – Kilimanjaro White, MG – Mysore Gold, GO- Garland Orange, IG – Indam Gold, BM – Bonanza Mix, IY – Indam Yellow, IYN – Indam Yellow New, S-11 – Sarpan -11 (Orange), SMH-33 – Sarpan Marigold Hybrid -33 (Yellow)

RESULTS AND DISCUSSION

Data with respect to plant height, number of leaves per plant, plant spread (N-S, E-W), number of primary branches, number of secondary branches, diameter of flower, fresh weight of flower, dry weight of flower, petal meal, xanthophyll yield and flower yield per hectare in different hybrids of marigold are presented in Tables 1 and Table 2.

At 60 DAT Indam Yellow recorded less number of leaves (114.13). The variation in plant height and number of leaves per plant in different hybrids may be due to genetic and environmental factors. Similar observations for plant height and number of leaves among the genotypes were also observed previously in marigold by Singh and Singh (15), Singh and Misra (14), Raghuvanshi and Sharma (12), Pramila *et al.* (11) and Pal and Kumar (9) in marigold.

Table 2: Floral parameters of different marigold hybrids.

	Characters	MY	DO	IM	KW	MG	GO	IG	B M	IY	IYN	S-11	SMH- 33	Mean	CD (P=0.05)
1.	Diameter of flower (cm)	5.8	6.3	7.4	4.7	7.3	8.5	8.4	5.3	7.3	6.5	7.2	6.5	6.8	0.4
2.	Fresh weight of flower (g)	10.6	15.3	15.9	5.6	13.9	16.9	14.0	2.9	13.5	14.0	13.9	12.7	12.4	0.9
3.	Dry weight of flower (g)	1.2	1.2	1.5	0.6	1.2	1.4	1.1	0.3	1.4	1.5	1.3	1.2	1.2	0.2
4.	Flower yield (t/ha)	9.3	20.0	16.2	4.0	15.1	23.7	14.6	3.6	11.6	15.2	22.8	18.5	110.5	3.0
5.	Petal meal (q/ha)	9.8	23.4	17.5	3.7	16.6	30.3	16.3	4.3	11.9	17.1	27.5	18.8	16.4	0.81

MY – Majestic Yellow, DO – Double Orange, IM – Inca Mix, KW – Kilimanjaro White, MG – Mysore Gold, GO- Garland Orange, IG – Indam Gold, BM – Bonanza Mix, IY – Indam Yellow, IYN – Indam Yellow New, S-11 – Sarpan -11 (Orange), SMH-33 – Sarpan Marigold Hybrid -33 (Yellow)



Plate 1 : General view of experimental plot

Significant differences were recorded among the hybrids for plant height at all the three stages of plant growth. In the initial stage maximum plant height was recorded in hybrid Double Orange at 30DAT and 60DAT (40.83 cm and 71.33 cm, respectively) and at the later stages i.e.at 90DAT maximum plant height was recorded in Sarpan-33 (84.87cm). Least was recorded in hybrid Bonanza Mix at all the three stages of plant growth (15.70 cm, 21.93cm and 29.47cm, respectively). Number of leaves was maximum for Majestic Yellow (53.97) at 30 DAT, Garland Orange at 60 DAT (297.43) and Sarpan-33 at 90 DAT (416.80). Number of leaves was minimum for Kilimanjaro White at 30 DAT and 90 DAT (20.10 and 204.20 respectively).

Maximum plant spread in the north to south direction and east to west direction was recorded in the hybrid Sarpan-11 (15.07 and 12.77 cm respectively) at 30 DAT. North south plant spread was highest in Double Orange (32.90 cm) at 60 DAT, east west plant spread was highest in Sarpan-11 (29.43 cm) at 60 DAT. North south plant spread was highest in Sarpan-11 and Sarpan-33 (56.17 cm) at 90 DAT, east west plant spread was highest in Sarpan-11 (55.90 cm) at 90 DAT. The least plant spread in the north to south direction was recorded in Indam Gold (11.80 cm) and that of east to west direction was recorded in Mysore gold (11.73 cm) at 30 DAT. At 60 DAT Indam Yellow recorded least spread in both direction (17.90 and 18.03 cm, respectively). That at 90 DAT Indam Yellow recorded least spread in both direction (33.87 and 33.50 cm respectively). Similar observations for plant spread among the genotypes were also observed previously in marigold by Ajit *et al.* (1), Narsude *et al.* (7) and Raghuvanshi and Sharma (12).

Significant difference was observed among the hybrids with respect to number of primary branches and secondary branches. The hybrid Sarpan-11 recorded the maximum number of primary and secondary branches at 30 DAT (9.20 and 18.40 respectively). The hybrid Sarpan-33 recorded the maximum number of primary branches at 60 and 90 DAT (9.90 and 15.47 respectively). The hybrid Double

Orange recorded the maximum number secondary branches at 60 DAT (31.17) and at 90 DAT Sarpan-33 recorded highest secondary branches (45.27). The least number of primary branches were observed in the hybrid Indam Yellow (3.60) and secondary branches were observed in Bonanza Mix (2.57) at 30 DAT. The least number of primary branches were observed in the hybrid Kilimanjaro White at 60 and 90 DAT (5.67 and 6.57 respectively). The least number of secondary branches were observed in the hybrid Indam Yellow at 60 DAT (14.80) and at 90 DAT Inca Mix recorded least (21.10). The increased number of branches in some hybrids may be attributed to the genetic makeup of the cultivars. Similar observation were also recorded in marigold by Ingle *et al.* (6), Singh and Singh (16), Pal and Kumar (9), Narsude *et al.* (7) and Raghuvanshi and Sharma (12) in marigold.

The diameter of flower was maximum in the hybrid Garland Orange (8.50 cm) and the least was recorded in Kilimanjaro White (4.70 cm). Similar results were observed by Singh and Singh (15), Narsude *et al.* (7) and Patil *et al.* (10) in marigold.

The fresh weight of flower was maximum in the hybrid Garland Orange (16.89 g) and least was recorded in Bonanza Mix (2.94g) which is inconsonance with reports of Singh and Singh (15), Narsude *et al.* (7) and Patil *et al.* (10) in marigold. Likewise the dry weight of flower was maximum in Indam Yellow New (1.49). Least dry weight of flower was recorded in Bonanza Mix (0.32).

Flower yield per hectare was maximum in the hybrid Garland Orange (23.71 t) and least flower yield per hectare was recorded in Bonanza Mix (3.59). Similar results were observed by Singh and Kumar (13), Narsude *et al.* (7), Raghuvanshi and Sharma (12) in marigold.

From the above results it is concluded that Garland Orange, Sarpan-11 and Double Orange were found to be superior with respect to vegetative growth and flower yield of marigold. Bonanza Mix, Mysore Gold, Inadam Gold and Indam Yellow New are the most ideal for growing rockery, edging and Hanging baskets.

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