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The growth performance of marigold (*Tagetes erecta* L.) Under Chhattisgarh plains agro-climatic condition

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Abstract
The present investigation entitled "The growth performance of marigold (*Tagetes erecta* L.) Under Chhattisgarh plains agro-climatic condition". The experiment was laid out in Randomized Block Design with fifteen genotypes and three cultivars at instruction farm of Department of Floriculture and Landscape Architecture, Indira Gandhi Krishi Vishwavidayalaya, Raipur.. Studies showed significant effect on plant height CGSG-2 at 30 DAT and CGR-2 at 60 DAT whereas, at 90 DAT, genotype CGJS-4 recorded maximum plant height. Maximum plant spread was recorded in genotype CGR-2 at 60 DAT and CGRJ-1 at 90 DAT. Maximum primary branches plant^{-1} was recorded in genotype CGSG-2 at 30 DAT whereas, CGR-3 at 60 and 90 DAT. Maximum secondary branches plant^{-1} was recorded in genotype PNG at 60 and 90 DAT. Maximum number of leaves plant^{-1} was recorded in genotype CGJS-3 at 30, 60 and 90 DAT.

Keywords: Marigold, *Tagetes erecta*, growth, morphology

Introduction
Marigold (*Tagetes erecta* L.) is an ornamental plant belonging to the family Compositae. The two common species of marigold, both annuals, are distinguished as African marigold (*T. erecta*) and French marigold (*T. patula*) and are native to Mexico and Gautemala. The African marigold has large yellow or orange flower heads. Propagation is by seed or cutting. Leaves are strongly scented and pinnately divided, and leaflets are lanceolate and serrated. Flowers are single to fully double with large-size globular heads, and the color varies from lemon yellow to yellow, golden yellow, or orange. Marigold has its own importance and is called as 'poor man's crop'. It is a universally a popular seasonal flower grown as an ornamental, loose or cut flower, bedding, pot or landscape plant, easy to cultivate with worldwide adaptability to varying soil and climatic conditions. Marigold with its bright colours ranging from yellow to orange is the best for combination in any colour scheme. The attractive and brilliantly colored flowers are the most valuable economic part of the plant, used for garland making, religious offerings, exhibitions, decorations etc.

Materials and Methods
The present investigation was conducted at the Horticultural Research cum Instruction Farm of the Department of Floriculture and Landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. Raipur, the capital of Chhattisgarh state of India is situated in the central part of Chhattisgarh and lies between 21014'06.8" N latitude and 81042'41" E longitude at an altitude of 289.56 m above mean sea level. The materials utilized for the present study consisted of 15 local genotypes collected from different part of Chhattisgarh state *viz*., CGRG-1, CGRG-2, CGJS-1, CGJS-2, CGRJ-1, CGRJ-2, CGJS-3, CGJS-4, CGMS-1, CGMS-2, CGR-2, CGR-3, CGDU-1, CGSG-2, CGKS-1 and 3 known variety Pusa Basanti Gainda, Pusa Narangi Gainda and Pusa Arpita. The experimental field was laid out in Randomized Block Design with three replications. Raised beds, measuring 120 x 60 x 15 cm. The soil of bed was prepared to fine tilth with incorporation of well rotten FYM (15 kg) and 250 g DAP/ bed. The nursery beds were watered daily twice for first 10 days and daily once for the remaining period. The seedlings were ready for transplanting at 30 days after sowing. One month old, healthy, vigorous and uniform seedlings were selected and transplanted during July. The gross plot size was 2.0 × 2.0 m² and in each plot consisted of 20 plants and they were transplanted at a spacing of 40 x 40 cm. Observations on fifth important characters *viz.*, plant height, plant spread, number of primary branches plant^{-1}, number of secondary branches plant^{-1}, number of leaves plant^{-1}.

Results and Discussion

The analysis of variance revealed that all the genotypes differed significantly from each other for the growth attributes. The mean performance of the genotypes for growth attributes have been presented in table 1.

Plant height (cm)

The plant height of five randomly selected plants from each plot was measured from the ground level to the tip of the plant with the help of meter scale. The average height was then worked out by dividing the summation with five. The maximum plant height (37.07 cm) at 30 DAT was recorded in the treatment CGSG-2. At 60 DAT, the maximum plant height was recorded in CGR-2 (84 cm). At 90 DAT, maximum plant height was recorded in CGJS-4 (115.06 cm). Plant height is attributed to be an important varietal character that depends upon the genetic constitution. The variation in plant height among the various genotypes might be due to genotypic differences in phenotypic expression of plant height and variations in different genotype-environmental interaction effects on plant height (Bharathi and Jawaharlal, 2014) [1]. Similar variation in plant height due to genotypes was also reported by Rao *et al*. (2005) [9], Singh and Singh (2006) [11] and Khanvilkar *et al*. (2003) [3] in marigold.

Plant spread (cm)

The plant spread was measured in the five randomly selected plants with the help of meter scale in the North- South and East-West direction. The average value was then worked out. At 60 DAT, significantly maximum plant spread was recorded in CGR-2 (48.56 cm). At 90 DAT, significantly maximum plant spread was recorded in CGRJ-1 (53.2 cm). The observations are in line with the finding of Singh *et al*. (2003), Poonam and Kumar (2007) [7], Narsude *et al*. (2010) [5], Raghuvanshi and Sharma (2011) [8] and Choudhary *et al*. (2014) [2] in marigold, who also observed variation in plant spread in different genotypes of marigold due to the inherent character of marigold genotypes.

Number of primary branches plant^{-1}

All the branches which came out from the main stem were counted and recorded at 30, 60 and 90 DAT. This was done on all the five tagged plants in each treatment and then average worked out. At 30 DAT, the maximum number of primary branches plant^{-1} was noticed in CGSG-2 (11.53 cm). At 60 DAT, the maximum number of primary branches plant^{-1} was noticed in CGR-3 (18.53 cm). At 90 DAT, the maximum numbers of primary branches plant-1 were noticed in CGR-3 (20.53 cm). The variation in number of primary branches plant^{-1} might be due to the difference in their genetic composition and varied growth rate among the genotypes of marigold (Narsude *et al.,* 2010) [5]. Further, the individual genetic makeup of the genotypes may also have been influenced by the environmental conditions. Similar variations for number of branches were also observed by Ravikumar (2002) [10], Rao *et al*. (2005) [9], Singh and Singh (2010), Narsude *et al*. (2010a) [5] in marigold and Munikrishnappa *et al.* (2013) [4] in China aster.

Number of secondary branches plant^{-1}

Number of secondary branches per plant of the five randomly selected plants from each plot was counted at 60 and 90 DAT the average was then calculated by dividing the summation with five. At 60 DAT, the maximum number of secondary branches plant^{-1} were noticed in PNG (51.93 cm). At 90 DAT, the maximum number of secondary branches plant^{-1} were noticed in PNG (55.4 cm). The numbers of secondary branches plant^{-1} may have increased due to pinching of plant which might have forced the auxiliary buds to thrive well (Kelly and Harbaugh, 2002). Similar results have also been reported by Khanvilkar *et al*. (2003) [3] in marigold and Munikrishnappa *et al*. (2013) [4] in China aster.

Table 1: Mean performance of marigold genotypes for vegetative growth

Genotypes Name	Plant Height			Plant Spread		No. of PB Plant^{-1}			No. of SB Plant^{-1}		No. of leaves Plant^{-1}		
	30 DAT	60 DAT	90 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
CGRG-1	18.67	76.40	105.00	43.06	48	7.93	15.40	17.35	37.60	39.06	14.07	25.86	41.60
CGRG-2	19.73	41.53	67.86	42	49.6	6.07	11.33	14.73	31.80	39.53	14.13	22.73	37.46
CGJS-1	22.20	63.00	99.26	39.36	46.3	6.67	13.40	19.78	30.73	40.46	12.33	24.66	38.86
CGJS-2	25.60	64.06	98.13	40.63	47.56	6.00	13.07	15.53	32.13	40.93	13.97	23.00	40.13
CGRJ-1	19.80	64.33	99.53	36.76	53.2	6.53	15.73	18.00	30.93	34.60	13.60	25.33	40.20
CGRJ-2	26.20	67.46	100	40.5	51.27	7.87	14.67	17.40	35.87	42.08	12.93	21.00	34.86
CGJS-3	36.73	78.93	112.6	45.1	52.3	6.40	15.07	17.47	34.67	40.6	17.61	27.80	43.86
CGJS-4	33.67	77.6	115.1	47.53	52.7	8.47	15.80	19.73	41.00	46.2	17.07	24.33	38.46
CGMS-1	25.40	66.73	104.9	43.8	51.56	6.80	9.27	15.27	33.47	41.2	13.20	21.73	38.73
CGMS-2	18.27	59.33	89.86	44.33	46.86	7.07	16.60	20.27	35.67	37.8	13.33	24.00	41.8
CGR-2	36.67	84	114.6	48.56	49.6	9.00	11.73	16.20	38.13	43.31	17.33	24.93	42.26
CGR-3	23.47	61.73	96.26	46.07	47.1	8.53	18.53	20.53	40.93	45.08	16.13	24.33	42
CGDU-1	19.80	57.93	92.6	32.33	40.43	6.07	12.80	15.13	24.93	29.86	12.27	24.26	40
CGSG-2	37.07	71.8	107.7	47.16	48.13	11.53	17.40	20.13	35.20	41.8	17.13	26.46	43.33
CGKS-1	23.00	59.46	69.8	39.7	45.35	5.53	7.13	15.67	32.73	45.13	14.27	14.40	26.13
PBG	29.07	52.6	79.33	29.43	36.86	6.60	13.67	17.27	49.40	54.24	15.33	26.40	40.13
PNG	25.67	53.53	76.4	32.47	40.17	6.63	14.33	17.40	51.93	55.4	14.40	22.80	39
PA	20.87	54.06	98.06	45.33	49.07	9.40	15.80	18.27	35.60	40.20	11.47	18.26	40
C.D. at 5%	8.44	12.47	12.02	8.235	7.88	2.37	4.54	N/A	11.64	7.44	N/A	4.83	6.156

PB= primary branches, SB= secondary branches

Number of leaves plant^{-1}

The number of leaves plant^{-1} of the five randomly selected plants plot^{-1} was recorded at 30, 60 and 90 DAT. The average was then worked out by dividing the summation with five. At 30 DAT, the maximum number of leaves plant^{-1} were noticed in CGJS-3 (17.61 cm). At 60 DAT, the maximum number of

leaves plant^{-1} were noticed in CGJS-3 (27.80 cm). At 90 DAT, the maximum number of leaves plant^{-1} were noticed in CGJS-3 (43.86 cm). The production of more number of leaves may be attributed to the production of more number of branches per plant (Verma *et al.,* 2004). Similar variation in number of leaves plant^{-1} among the genotypes was also observed previously in marigold by Singh and Misra (2008) [12] and Zosiamlianana *et al.* (2012) in china aster.

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