International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(2): 196-201

Received: 19-01-2019
Accepted: 23-02-2019

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Performance of African marigold varieties to cycocel for growth and yield attributes in rainy season

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Abstract
The experiment was conducted during rainy season 2010-11 and 2011-12 at Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra), India to study performance of African marigold varieties to cycocel for growth and yield attributes in rainy season. The results of the experiments revealed that significantly, minimum plant height was recorded in Pusa Narangi Gainda (73.65 cm) followed by Pusa Basanti Gainda and African Double Orange. Whereas, among various concentrations cycocel 2000 ppm reported minimum plant height (81.19 cm). Significantly, maximum number of branches plant^{-1} (31.17) was noticed in African Double Orange and growth regulator cycocel 2000 ppm (33.62). Significantly, maximum plant spread was observed in African Marigold local-01 (50.58 cm) fallowed by African Double Orange when spayed with cycocel 2000 ppm (47.55 cm). Significantly, maximum fresh and dry biomass was noticed with variety African Marigold Local-1 (471.26 and 94.25g respectively) followed by African Double Orange (296.36g and 59.27g respectively) when sprayed with cycocel 2000 ppm (405 g and 81.17 g respectively). In respect of flowering parameters, significantly minimum days to emergence of flower bud (40.17 days), and days to harvesting (62.14 days) were recorded in var. African Double Orange. Whereas, in treatment control minimum days to emergence of flower bud and flowering (44.83 days and 61.91 days) were noticed. As regards yield attributes, significantly maximum number of flowers plant^{-1} (35.84), weight of flowers plant^{-1} (242.65 g) and flower yield ha^{-1} (17.97 t) were recorded in var. African Double Orange. Among the different concentrations, cycocel 2000 ppm recorded significantly maximum number of flowers plant^{-1} (36.14), weight of flowers plant^{-1} (194.69 g) and flower yield ha^{-1} (14.47 t).

Keywords: African marigold, cycocel, growth, flowering, yield

Introduction
African marigold or Mexican marigold (*Tagetes erecta* Linn) is a native of Central and South America especially Mexico (Kaplan, 1960) [10]. But it is presumed that marigold is of Indian origin (Desai, 1967) [6]. It was a well known garden flower but today it is one of the most important commercial flowers grown world over and in India as well accounting for more than half of the nation as loose flower production. The farmers are already fetching lucrative returns by growing this crop in rainy season for Dasara, Diwali and other ceremonies. However, in rainy season marigold crop owing to high rainfall and high humidity, tends to grow taller i.e. apical dominance is in preponderance and the plant spread is comparatively lesser resulting in only marginal profit to the farmers (Narayan-Gowda and Jayanti., 1986) [19]. Plant growth retardants are synthetic organic chemicals that cause the retardation of cell division and reduce the plant height and hence prevent lodging. These are used to retard the shoot length of plants in a desired way without changing developmental patterns or evoke phytotoxic effects. Cycocel (2-chloroethyl trimethyl ammonium chloride) is a chemical gives an anti-gibberelline dwarfing effect and restrict the growth of the internodes and regulates the plant height physiologically. This reduces the cost of pinching and allows obtaining the best ratio between the vegetative growth and flower production, thereby improving the market quality of flowers (Marosz and Matisiak, 2005 and Bekheta *et al*. 2008) [15, 3]. Considering the above facts present investigation was undertaken.

Materials and Methods
A field experiment was carried out at Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during *Kharif* season of the years 2010-11 and 2011-12 in Factorial

Randomised Block Design with two factors i.e. Factor A-Varieties,V_1- Pusa Basanti Gainda, V_2- Pusa Narangi Gainda, V_3- African Double Orange, V_4- African Marigold Local -1 and Factor B-Cycocel, C_1 - Control (Water spray) C_2 - Cycocel 1000 ppm, C_3 - Cycocel 1500 ppm, C_4 - Cycocel 2000 ppm. Seedlings were allowed to grow in the nursery for 25 days and then transplanted in the experimental plot.

The African marigold varieties uniform and healthy seedlings were selected and transplanted on ridges with one seedling per hill at the spacing of 30 cm between two seedlings during both the years of experimentation i.e. 2010-11 and 2011-12. Immediately after transplanting of marigold seedling the experimental plots were irrigated lightly. The stock solutions of cycocel (1000, 1500 and 2000 ppm) were prepared by taking the required quantity of chemicals and dissolving them initially in a small quantity of absolute alcohol and there after diluted with water as per the treatment concentration. The cycocel of the respective concentration were sprayed after 30 days from transplanting of seedlings as per the treatment. All plant protection measures were undertaken to protect crop from pest and diseases.

Observations on plant height (cm), number of branches plant spread (cm), fresh and dry biomass, were recorded at 90 DAT. Flowering parameters *viz*., days to emergence of flower bud, days to flowering from bud emergence, days to first picking were recorded. The yield contributing characters viz., number of flowers^{-1}, diameter of flower, weight of flower plant^{-1}, and hectare^{-1}were recorded and analyzed statistically as per the method suggested by Panse and Sukhatme (1967) [23].

Results and Discussion

The results obtained from present investigation are presented in Table no. 1 on the basis of pooled mean of two years (2010-11and 2011-12).

Influence of African marigold Varieties

Growth Parameters

Growth parameters of different African marigold varieties were significantly influenced and presented in Table-1.

The results revealed that significantly minimum plant height (73.65cm) was observed in var. Pusa Narangi Gainda followed by Pusa Basanti Gainda (75.73 cm). The variation in plant height of different African marigold varieties might be due to congenial environment to express the dominant genes in different genotypes and genetic makeup of varieties. Similar observations are conformity with the Bhanu Pratap *et al*. (1999) [4], Sreekala *et al*. (2002) [35]. Rao *et al*. (2005) [27] in African marigold Namita *et al.* (2008) [17] in French marigold and Narsude *et al*. (2010) [21] in African marigold. The number of branches plant^{-1} were found statistically maximum in African Double Orange (31.17) and found to be at par with variety Pusa Narangi Gainda. The chlorophyll content in leaves might have increased the synthesis of carbohydrates, amino acids etc. from which phytochrome have been synthesized resulting in increase in vegetative characters. The present study confirms the findings with Bhanu Pratap *et al*. (1999) [4], Nand-Kishore and Sreekala *et al*. (2002) [35], Rao *et al*. (2005) [27], Namita *et al.* (2008) [17] and Narsude *et al*. (2010) [21] in African marigold crop. Significantly, maximum plant spread (50.58 cm) was noticed in African Marigold Local-1 followed by African Double Orange (47.66 cm). The fresh and dry biomass were observed in African marigold Local-1 (471.26 and 94.25 g) followed by African Double Orange (296.36 g and 59.27 g). Maximum plant spread, fresh and dry biomass might be due to the congenial environment to express the dominant genes in genotypes and different genetic makeup of the variety. The chlorophyll content in leaves might have increased the synthesis of carbohydrates, amino acids etc. from which phytochrome have been synthesized resulting in increase in vegetative characters. The present study confirms with the findings of Rao *et al*. (2005) [27] in African marigold Ramesh and Singh (2008) [26] in Wild marigold.

Flowering parameters

The data in respect of the flowering parameters as influenced by different varieties is presented in Table: 1.

Significantly, minimum days required for emergence of first flower bud in variety African Double Orange (40.17 DAT) followed by Pusa Narangi Gainda (44.61 DAT) and Pusa Basanti Gainda (45.07 DAT). Days required for emergence of first flower bud of African marigold might be due to genetic makeup of cultivars. This could also be a more dry matter accumulation and prevailing favourable environment i.e. low night temperature and short day length. Similar findings were recorded by Bhanu Pratap (1999) [4] in African marigold and Raghuvanshi and Sharma (2011) [25] in French marigold.

Among the different varieties, African Marigold Local-1 recorded significantly minimum period to flowering from bud emergence (14.56 days) followed by Pusa Basanti Gainda (17.08 days) and African Double Orange (17.76 days). However, Pusa Narangi Gainda had taken significantly maximum period (17.92 days). Minimum days to flowering from bud emergence found in African Marigold Local-1 might be due to genetical make up of different varieties.Similar findings were noticed by Rao *et al.* (2005) [27], Gourishankarayya *et al.* (2005) [9] in African marigold, Singh and Singh (2010) [32] and Raghuvanshi and Sharma (2011) [25] in French marigold.

Significantly, minimum days were required for first picking of flowers in variety African Double Orange (62.14 days) followed by Pusa Narangi Gainda (63.64 days).However, var. African Marigold Local-1 registered significantly maximum days for first picking of flower (70.22 days). Days required for first picking of flower in African marigold might be due to genetic makeup of cultivars. This could also be a more dry matter accumulation and prevailing favourable environment i.e. low night temperature and short day length. Similar findings were noticed by Bhanu Pratap *et al*. (1999) [4], Singh and Singh (2010) [32] in African marigold and Raghuvanshi and Sharma (2011) [25] in French marigold crop.

Yield Parameters

The data obtained in respect of yield contributing parameters of African marigold as influenced due to African marigold varieties is presented in Table: 1.

The pooled results from Table 1 exhibited that the variety African Double Orange noted maximum number of flowers plant^{-1} (35.84) followed by the variety Pusa Narangi Gainda (33.46). Maximum number of flowers plant^{-1} might be due to production of higher leaf area, maximum number of branches plant^{-1} and higher nutrient uptake. Similar conformity were found with the research finding of Anuradha *et al*. (1990) Narayana-Gowda and Jayanthi (1991) [20], Sreekala *et al*. (2002) [35], Rao *et al.* (2005) [27] and Narsude *et al*. (2010) [21] in African marigold.

The variety African Double Orange registered significantly maximum weight of flowers plant^{-1} (242.65 g) followed by African Marigold Local-1 (167.50 g) whereas variety Pusa

Narangi Gainda recorded significantly minimum weight of flowers plant^{-1} (108.98 g). Maximum weight of flowers plant^{-1} might be due to production of higher leaf area plant^{-1}, biomass and higher nutrient uptake. Similar conformity were found with the research finding of Anuradha *et al.* (1990) [2], Bhanu Pratap *et al.* (1999) [4], Nandkishor and Raghva (2001) [18], Pattnaik and Mohanti (2002) [24], Rao *et al.* (2005) [27] and Narsude *et al*. (2010) [21] in African marigold. -

The treatment African Double Orange recorded maximum diameter of fully opened flower (7.27 cm) followed by the variety African Marigold Local-1 (6.35 cm) and Pusa Narangi Gainda (4.99 cm). However, the variety Pusa Basanti Gainda recorded significantly minimum diameter of fully opened flower (4.81 cm). Maximum diameter of fully opened flower might be due to production of higher leaf area plant^{-1} and higher nutrient uptake. Similar conformity found with the research finding of Anuradha *et al.* (1990) [2], Rao *et al.* (2005) [27], Namita *et al*. (2008) [17], Singh and Misra (2008) and Singh and Singh (2010) [32] in African marigold.

Significantly maximum flower yield hectare^{-1} recorded in variety African Double Orange (17.97 t) followed by the variety African Marigold Local-1 (12.41 t) and Pusa Basanti Gainda (10.04 t).Whereas, the treatment Pusa Narangi Gainda recorded significantly minimum flower yield hectare^{-1} (8.07 t). Maximum flower yield hectare^{-1} might be due to production of higher leaf area plant^{-1}, higher nutrient uptake, maximum number of flowers and weight of flowers per plant which resulted in increasing yield per hectare. These results are in close conformity with the results of Anuradha *et al.* (1990) [2], Bhanu Pratap *et al.* (1999) [4], Singh and Sen (2000) [34], Nandkishor and Raghava (2001) [18], Rao *et al.* (2005) [27], Narsude *et al*. (2010) [21] in African marigold.

Influence of cycocel

Growth parameters

The data in respect of growth parameters of African marigold as influenced by different concentrations of cycocel is presented in Table 1.

In respect of different levels of cycocel significantly minimum plant height was observed with the treatment cycocel 2000 ppm (81.19 cm) followed by cycocel 1500 ppm (83.01 cm) at the stage of 90 days after transplanting. The reduction in plant height due to growth retardant might be due to inhibition of gibberellins biosynthesis. The anti-gibberelline dwarfing effect of cycocel leads to the deficiency of gibberellins and finally blocking the conversion of geranyl pyrophosphate to capalyl pyrophosphate which is first step in gibberelline synthesis restrict the growth of the internodes. The cycocel might have an inhibitory role of growth retardants on cell division of apical meristematic cells. Similar results were obtained by Narayana and Jayanti (1991) [20] in African marigold, Khandelwal *et al.* (2003) [13], Singh (2004) [31], Rathore *et al.* (2011) [28] Amit kumar *et al.* (2012) [1] in African marigold crop.

The treatment cycocel 2000 ppm recorded significantly maximum number of branches plant^{-1} (33.62) followed by cycocel 1500 ppm (30.96). Increase in number of branches might be due to inhibition of gibberallin biosynthesis and translocation almost exclusively to the meristematic region resulted to maximum number of primary branches. Similar results were obtained by and Narayana and Jayanti (1991) [20], Bhanu Pratap *et al.* (1999) [4], Singh (2004) [31], Rathore (2011) [28] and Amit kumar *et al*. (2012) [1] in African marigold.

Significantly, maximum plant spread was noticed in treatment cycocel 2000 ppm (47.55 cm) followed by cycocel 1500 ppm. Increase in plant spread might be due to spraying of growth retardant cycocel which play a vital role in anti-auxin activity, disturb carbohydrate metabolism, inhibition of cell division and elongation of apical meristem. Reduction in plant height and produced carbohydrates might be utilized to increase the number of branches and plant spread. The results of experimental findings are in accordance with Dani *et al.* (2010) [5].

The treatment cycocel 2000 ppm registered significantly maximum fresh and dry biomass (405.87 g and 81.17 g, respectively) followed by the treatment cycocel 1500 ppm (334.48 g and 66.90 g, respectively). Increase in fresh and dry biomass of plant might be due to increased in number of branches, leaves and leaf area and flowers due to application of cycocel at higher concentration. Similar findings were noticed by Osman *et al.* (2011) [22] in solidago crop.

Flowering parameters

The data in respect of the flowering parameters of African marigold as influenced different levels of cycocel and presented in Table: 1.

The pooled results exhibited significant differences among different levels of cycocel for days required to emergence of first flower bud. The control treatment recorded significantly minimum days (44.83 days) for emergence of first flower bud followed by cycocel 1000 ppm (46.34 days) and cycocel 1500 ppm (47.43 days). However, maximum period required for emergence of first flower buds was reported under the treatment cycocel 2000 ppm (48.70 days). From the pooled results of two years of research work regarding days required for emergence of first flower bud after transplanting indicated that application of cycocel resulted in to delay flowering as the concentration is increased. Maximum days required for emergence of first flower bud in African marigold might be apparently the result of growth inhibition rather than direct effect upon flowering stimulus. Similar findings obtained in the present investigation are in close agreement with the findings of Dutta *et al.* (1993) [7] Nagarjuna *et al.* (1998) in chrysanthemum and Khan *et al*. (2012) [11, 12] in African marigold.

The control treatment recorded significantly minimum period (14.67 days) for days to flowering from bud emergence and it was found to be at par with cycocel 1000 ppm (15.93 days) whereas cycocel 2000 ppm noted significantly maximum period (19.07 days). Maximum days to flowering from bud emergence in African marigold might be apparently the result of growth inhibition rather than direct effect upon flowering stimulus. The results obtained in the present investigation are in close agreement with the findings of Nagarjuna *et al.* (1998) and Dutta *et al.* (1993) [7] in chrysanthemum and Khan *et al.* (2012) [11, 12] in African marigold. The treatment control had noted significantly minimum duration for first picking of flowers (61.91 days) followed by cycocel 1000 ppm (65.76 days) whereas cycocel 2000 ppm recorded maximum days (68.66 days). Maximum days required for first picking of flowers might be apparently the result of growth inhibition rather than direct effect upon flowering stimulus. Similar findings of results obtained in the present investigation are in close agreement with the findings of Dutta *et al*. (1993) [7] and Nagarjuna *et al.* (1988) [16] in chrysanthemum and Khan *et al.* (2012) [11, 12] in African marigold.

Yield Parameters

The data obtained in respect of yield parameters as influenced by application of different levels of cycocel treatments is presented in Table 1.

The treatment cycocel 2000 ppm recorded significantly maximum number of flowers plant^{-1} (36.14) and found to be at par with cycocel 1500 ppm (35.69). However, significantly control treatment had noted minimum number of flowers plant^{-1} (29.72). Maximum number of flowers plant^{-1} in African marigold with the application of cycocel might be due to more number of branches. The apical dominance of the plant suppressed it and allowed the lateral branches or auxiliary shoots with flowers located terminally resulting in increased number of flowers plant^{-1}. These results are in close agreement with findings of Girwani *et al.* (1990) [8] in marigold, Khimani *et al.* (1994) [14] in gaillardia, Narayan-Gowda and Jayanti (1991) [20], Yadav (1997) [36] in marigold, Khan *et al.* (2012) [11, 12] and Amit kumar *et al.* (2012) [1] in marigold.

Significantly, maximum diameter of fully opened flower observed with the treatment cycocel 2000 ppm (6.40 cm) followed by treatment Cycocel 1500 ppm (6.09 cm). However, the control treatment had found to be significantly minimum diameter of fully opened flower (5.09 cm). Maximum diameter of fully opened flower in African marigold with the application of cycocel might be due to the reduction of stem length and increase in number of branches per plant and plant spread which might have resulted in increased photosynthetic activity of treated plants. Similar finding has been reported by Shanmugam and Muthuswamy (1974) [30] Sen and Naik (1977) [29] in chrysanthemum, Yadav (1997) [36] and Dani *et al.* (2010) [5] in African marigold.

The treatment cycocel 2000 ppm recorded significantly maximum weight of flowers plant^{-1} (194.69 g) followed by treatment cycocel 1500 ppm (185.44 g) whereas the control treatment had noted to be significantly the minimum weight of flowers plant^{-1} (125.57 g). Maximum weight of flowers plant^{-1} in African marigold with the application of cycocel might be due to reduction in stem length and increase in number of branches which might have resulted in increased photosynthetic activity of treated plant. Similar results were obtained by Khan *et al.* (2012) [11, 12], Amit kumar *et al.* (2012) [1], Narayan-Gawda and Jayanti (1991) [20] and Yadav (1997) [36] in African marigold.

Significantly maximum flower yield hectare^{-1}(14.47 t) was recorded in treatment cycocel 2000 ppm followed by the treatment cycocel 1500 ppm (13.84 t) whereas the control treatment noted to be significantly the minimum flower yield hectare^{-1} (9.30 t). Maximum flower yield hectare^{-1} in African marigold with the application of cycocel might be due to application of cycocel, apical dominance of the plant get suppressed and allowed the lateral branches or auxiliary shoots with flowers located terminally resulting in increased number of flowers plant^{-1} and hectare^{-1}. Similar results also reported by Khan *et al.*(2012) [11, 12], Amit Kumar *et al.* (2012) [1], Narayan-Gowda and Jayanti(1991) and Yadav (1997) [36] in African marigold.

Interaction effect

Growth parameters

The pooled data presented in the Table 1 revealed that, an interaction effect of African marigold varieties and foliar application of cycocel on growth parameters was found to be non-significant at all growth stages.

Flowering parameters

The pooled results presented in Table 1 revealed that, significantly the treatment combination African Double Orange and Control reported significantly minimum days to emergence of first flower bud (40.01 DAT) followed by treatment combination African Double Orange and cycocel 1000 ppm (42.00 DAT). However, significantly maximum days were required for emergence of first flower bud with the treatment combination African Marigold Local-1 and cycocel 2000 ppm (56.00 DAT).

Significantly, minimum period was required by the treatment combination African Marigold Local-1 and Control (13.33 days) for opening of flower from emergence of flower bud. However, maximum period required for opening of flower from emergence of bud with the treatment combination Pusa Narangi Gainda and Cycocel 2000 ppm (20.67 days).

The treatment combination African Double Orange and Control had marked significantly minimum period (56.35 days) for first picking of flowers followed by treatment combination Pusa Narangi Gainda and Control (60.07 days). However, maximum period was required for first picking of flower with the treatment combination African Marigold Local-1 and Cycocel 2000 ppm (72.21 days).

Yield parameters

Significantly maximum diameter of fully opened flower was recorded with the treatment combination African Double Orange and Cycocel 2000 ppm (8.36 cm) followed by the treatment combination African Double Orange and Cycocel 1500 ppm (7.74 cm). However, the treatment combination Pusa Narangi Gainda and Control had found to be significantly minimum diameter of fully opened flower (4.12 cm).

The significantly maximum number of flowers plant^{-1} reported with the treatment combination African Double Orange and Cycocel 2000 ppm (38.07) and it was found to be at par with the African Double Orange and 1500 ppm Cycocel spray (37.28). However, the treatment combination Pusa Basanti Gainda and Control recorded significantly minimum number of flowers plant^{-1} (28.33).

The significantly maximum weight of flowers plant^{-1} noted with the treatment combination African Double Orange and 2000 ppm (289.76 g) and followed by African Double Orange and Cycocel 1500 ppm (270.19 g). However, the treatment combination Pusa Narangi Gainda and Control reported significantly minimum weight of flowers plant^{-1} (80.89 g).

The significantly maximum flower yield hectare^{-1}was noted with the treatment combination African Double Orange and Cycocel 2000 ppm (21.46 t) followed by African Double Orange and Cycocel 1500 ppm (20.02 t). However, the treatment combination Pusa Basanti Gainda and Control reported significantly minimum flower yield hectare^{-1}(5.99 t).

Table 1: Growth and yield attributes as influenced by of African marigold varieties and different levels of cycocel

Treatments	Pooled data of 2010-11 and 2011-12											
	Plant Height (cm)	Number of branches	Plant spread (cm)	Fresh biomass (g)	Dry biomass (g)	Days to emergence of flower bud	Days to flowering from bud emergence	Days to first picking of flowers	Diameter of fully opened flower (cm)	Number of flowers plant^{-1}	Weight of flowers plant^{-1} (g)	Flower yield ha^{-1} (t)
Factor A-Varieties (V)												
V_1-Pusa Basanti Gainda	75.73	26.52	40.64	262.14	52.68	45.07	17.08	67.64	4.81	32.43	133.52	10.04
V_2-Pusa Narangi Gainda	73.65	30.27	41.81	236.71	47.34	44.61	17.92	63.64	4.99	33.46	108.98	8.07
V_3-African Double Orange	89.94	31.17	47.66	296.36	59.27	40.17	17.76	62.14	7.27	35.84	242.65	17.97
V_4-African Marigold Local-1	100.40	30.02	50.58	471.26	94.25	54.44	14.56	70.22	6.35	32.24	167.50	12.41
F'test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE (m)±	0.43	0.49	0.47	8.56	1.71	0.12	0.26	0.15	0.04	0.30	1.64	0.10
CD at 5%	1.25	1.43	1.36	24.72	4.94	0.34	0.77	0.44	0.12	0.88	4.73	0.28
Factor B-Cycocel levels (C)												
C_1 - Control (water spray)	90.02	24.46	42.51	245.51	49.35	44.83	14.67	61.91	5.09	29.72	125.57	9.30
C_2 – Cycocel 1000 ppm	85.50	28.94	44.49	280.61	56.12	46.34	15.93	65.76	5.85	32.73	146.94	10.88
C_3 – Cycocel 1500 ppm	83.01	30.96	46.15	334.48	66.90	47.43	17.65	67.30	6.09	35.69	185.44	13.84
C_4 – Cycocel 2000 ppm	81.19	33.62	47.55	405.87	81.17	48.70	19.07	68.66	6.40	36.14	194.69	14.47
F'test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE (m)±	0.43	0.49	0.47	8.56	1.71	0.12	0.26	0.15	0.04	0.30	1.64	0.10
CD at 5%	1.25	1.43	1.36	24.72	4.94	0.34	0.77	0.44	0.12	0.88	4.73	0.28
Interaction effect (A x B)												
F test	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE (m)±	0.87	0.98	0.94	17.12	3.42	0.24	0.53	0.30	0.09	0.61	3.28	0.19
CD at 5%	-	-	-	-	-	0.68	1.53	0.88	0.25	1.76	9.46	0.56

Treatments	Pooled mean 2010-11 and 2011-12						
	Days to emer -gence of first flower bud (days)	Days to flowering from bud emmer –gence (days)	Days required for first pic- king (days)	Diameter of fully opened flower (cm)	Number of flowers	Weight of flower (g)	Flower yield (t ha^{-1})
V_1C_1	43.63	14.77	63.95	4.12	28.33	104.92	7.77
V_1C_2	44.89	16.74	67.13	4.81	29.83	108.12	8.01
V_1C_3	45.87	17.77	69.05	5.01	35.20	156.89	12.04
V_1C_4	47.47	19.05	70.42	5.31	35.67	164.16	12.34
V_2C_1	42.79	15.23	60.07	4.42	28.60	80.89	5.99
V_2C_2	44.15	15.78	63.72	5.00	33.30	95.85	7.10
V_2C_3	45.04	19.68	64.81	5.15	35.87	125.50	9.30
V_2C_4	46.48	20.67	65.95	5.43	36.07	133.68	9.90
V_3C_1	40.01	15.35	56.35	5.70	33.33	188.07	13.93
V_3C_2	42.00	17.24	62.01	7.31	34.67	222.60	16.49
V_3C_3	44.27	18.09	64.13	7.74	37.28	270.19	20.02
V_3C_4	44.85	20.65	66.06	8.36	38.07	289.76	21.46
V_4C_1	52.88	13.33	67.28	6.16	28.60	128.42	9.51
V_4C_2	54.35	13.96	70.16	6.30	33.13	161.21	11.94
V_4C_3	54.56	15.06	71.20	6.46	34.40	189.19	14.02
V_4C_4	56.00	15.91	72.21	6.52	34.77	191.18	14.16
"F" Test	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SE (m)±	0.24	0.53	0.30	0.09	0.61	3.28	0.19
CD at 5%	0.68	1.53	0.88	0.25	1.76	9.46	0.56

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