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Impact of different planting dates and spacing on the performance of annual chrysanthemum (*Glebionis coronaria* L Spach)

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Abstract
A field experiment was conducted at the experimental farm of the department of Floriculture and Landscape Architecture, Dr YSP, UHF, Nauni during November, 2021 to April, 2022 in a Randomized Block Design. Twenty four treatments combinations of two cultivars Shubra and Local Collection four levels of spacing *viz*.,15x15cm, 20x20cm, 25x25cm and 30x30cm with three planting dates i.e. November,10 November,30, and December,20. To study the impact of different planting dates and spacing on the performance of annual chrysanthemum (*Glebionis coronaria* L Spach). The observations recorded were based on vegetative, flowering and seed parameters. The result revealed that cv. Shubra performed better as compared to cv. Local Collection in terms of vegetative, flowering and seed parameters. Among the different levels of spacing, 30x30 cm resulted in maximum plant spread (40.40 cm), number of branches (17.15), number of flowers per plant (62.83), flower diameter (5.50cm), number of seeds per flower head (233.37) and seed yield per plant (7.42g) whereas, spacing of 15x15cm resulted in maximum plant height (96.87cm), flower yield per picking (2209.98g/m^2) and seed yield per plot (110.22g) as well as minimum number of days taken to flower bud formation (68.05 days), number of days taken to flowering (106.84 days).When compared to other planting dates, plant height (99.20cm),plant spread (33.75cm), number of branches (17.22), number of flowers per plants (49.19), flower diameter (5.32 cm), flower yield per picking (2203.71g/m^2), number of seeds per flower head (233.30), seed yield per plant (5.52g) and seeds yield per plot (101.05g) were recorded maximum in November,10 planted crops while, December, 20 planted crop resulted in minimum number of days taken to bud formation (66.76 days) and minimum number of days taken to flowering (94.96 days).

Keywords: Floriculture, Shubhra, local collection, plant spread, flower head

1. Introduction
Annual chrysanthemum (*Glebionis coronaria* (L) Spach) is an important annual herbaceous plant with aromatic flavor which is popularly known as garland chrysanthemum or Crown Daisy, belonging to the family Asteraceae. It is native to the Mediterranean region. It is a hardy, vigorous and relatively short duration plant which produces attractive flowers in various shades of yellow and white having single or double forms. It is grown commercially in various parts of India for production of loose flowers which are used alone or in combination with marigold and other flowers for making garlands as well as for religious offerings. Although this flower is extensively used in the state of Odisha as loose flower and its popularity is next to marigold, it is mostly used as a garden plant in beds and borders. Its commercial cultivation has not yet been started because of unavailability of suitable horticultural practices to the flower growers of the state. Among different crop management practices to increase production and quality of various annual flowers including annual chrysanthemum, cultural manipulation of growth and flowering through proper planting density assume greater significance. Spacing or planting density influences, plant growth and yield of flowers in terms of number and size through modifying the microclimate at the close vicinity of the plants exerting a considerable influence on the performance of the crop. Growers have no specific information on spacing and planting date due to which they are unable to produce higher and better quality of flowers and seeds. So, to improve the production of annual chrysanthemum need to standardize optimum planting date and spacing for maximize profit to the growers.

2. Materials and Methods

A field experiment was conducted at the experimental farm of the department of Floriculture and Landscape Architecture, Dr YSP, UHF, Nauni during November, 2021 to April, 2022 to study "Impact of different planting dates and spacing on the performance of annual chrysanthemum (*Glebionis coronaria* L Spach)". The experiment was laid out in a Randomized Block Design (Factorial) with twenty four treatments combinations of two cultivars Shubra and Local Collection four levels of spacing *viz*.,15x15cm, 20x20cm, 25x25cm and 30x30cm with three planting dates i.e. November,10 November,30 and December,20 replicated three times. The observations recorded were based on vegetative, flowering and seed parameters. The data were statistically analyzed as suggested by Gomez and Gomez (1984) [3]. A probability of $P \leq 0.05$ was considered significant.

3. Results and Discussion

Table 1: Effect of cultivar and sowing dates on germination percentage (%) of annual chrysanthemum

Sowing dates Cultivars	October, 10	November, 1	November, 20	Mean
Shubhra	77.67 (8.87)	68.50 (8.37)	61.90 (7.88)	69.11 (8.36)
Local Collection	84.00 (9.22)	72.83 (8.59)	66.50 (8.22)	74.44 (8.68)
Mean	80.83 (9.04)	70.67 (8.46)	63.83 (8.05)	

Table 1 reveals that the effect of cultivars and seed sowing dates on germination percentage of annual chrysanthemum cvs 'Shubhra' and 'Local Collection'. In general better seed germination percentage (74.44%) was recorded in the annual chrysanthemum cv. 'Local Collection' as compared to cv. 'Shubhra' (69.11%). As regards the effect of different sowing dates, maximum seed germination percentage (80.83%) was observed when the seeds were sown on October 10 while, the minimum seed germination percentage (63.83%) was observed of the seeds sown on November, 20.

The effect of interaction between cultivars and sowing dates was found to be non-significant shown in the table 1. However, maximum germination percentage (84.00%) was recorded in seeds of cv. 'Local Collection' sown on October 10 while, minimum seed germination percentage (61.90%) was recorded in the seeds of cv. 'Shubhra' sown on November, 20.Maximum seed germination percentage was observed in seeds sown on October, 10 as compared to seeds sown on November 20, might be due to fall in minimum and maximum temperature which affected the physiological activities related to seed germination.

Table 2: Variation in plant height (cm) due to interaction effect of cultivar, spacing and planting dates

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	115.56	108.24	94.97	91.82	104.31	95.82	92.51	90.36
November, 30	98.10	90.76	82.79	80.91	93.82	82.13	80.36	79.42
December, 20	86.30	83.89	74.13	71.32	83.17	73.72	70.00	68.86
C.D $_{0.05}$ for Cultivar × spacing × panting dates: 2.28								

The data presented in table 2 reveals that interaction between cultivars, spacing and planting dates the maximum plant height (115.56 cm) was recorded in cv. 'Shubhra' with closer spacing of 15 × 15 cm planted on November, 10 while, the minimum plant height (68.86 cm) was recorded in cv. 'Local Collection' with wider spacing of 30 × 30 cm planted on December, 20 which was significantly at par with cv. 'Local Collection' with closer spacing of 25 × 25 cm planted on December, 20 (70.00 cm).

At a closer spacing of 15 × 15 cm, maximum plant height was recorded while, minimum plant height was recorded at a wider spacing of 30 × 30 cm. This might be because plants with close spacing have to compete for light, soil moisture, nutrients, etc., leading to the elongation of stems as compared to wider spacing.The maximum plant height was recorded when planting was done on November, 10. These results may be explained by the fact that, in contrast to other planting dates, the favorable climatic conditions needed for annual chrysanthemum growth may be present during this cropping period and the plants grew considerably much higher than the crops that were planted later. Similar findings were reported by Kumar and Kour (2000) [6], in phlox Singh *et al.* (2015) [14] in marigold and by Dilta *et al.* (2007) [2] in china aster.

Table 3: Variation in plant spread (cm) due to the interaction effect of cultivar, spacing and planting dates

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	25.10	29.55	37.24	46.51	23.06	28.84	35.56	44.18
November, 30	22.43	27.68	33.17	42.55	21.01	25.81	31.96	40.51
December, 20	19.88	22.31	30.30	38.21	17.20	21.91	28.78	30.43
C.D $_{0.05}$ for Cultivar × spacing × planting dates: 1.82								

The interaction between cultivars, spacing and planting dates indicates that maximum plant spread (46.51 cm) was observed in cv. 'Shubhra' with wider spacing of 30 × 30 cm planted on November, 10 while, the minimum plant spread (17.20 cm) was reported in cv. 'Local Collection' with closer spacing of 15 × 15 cm planted on December, 20.

Maximum plant spread was recorded in wider spacing of 30 × 30 cm while, minimum plant spread was recorded at a closer spacing of 15 × 15 cm. This may be because there is more space for roots and shoots to grow, and plants with wider spacing use water, light, and nutrients more effectively than those with closer spacing. Similar results have been reported by Dixit (2004) [1] in annual chrysanthemum cv. 'Local White'. The maximum plant spread was recorded when planting was done on November, 10. These results could be attributed to the fact that, in contrast to other planting dates, the ideal climatic conditions required for annual chrysanthemum growth may exist during this cropping period. As the planting date was delayed, a significant reduction in plant spread was recorded. Due to the decrease in temperature and the delay in planting dates, this may have contributed to the decline in vegetative growth parameters. Similar findings were reported by Kumar and Kour (2000) [6] in phlox, Dilta *et al.* (2007) [2] and by Kaushal *et al.* (2014) [9] in china aster.

Table 4: Variation in number of branches due to interaction effect of cultivar, spacing and planting date

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	16.29	18.12	19.81	21.97	14.17	15.07	15.10	17.24
November, 30	13.27	15.74	17.52	17.84	13.14	14.04	14.64	15.55
December, 20	12.10	12.37	14.78	15.48	10.10	12.04	14.14	14.84
C.D $_{0.05}$ for Cultivar × spacing × planting dates: N.S								

The data recorded on the number of branches per plant in table 4 reveals that the interaction effect of cultivars, spacing, and planting dates was found to be non-significant. However, the maximum number of branches per plant (21.97) was recorded in cv. 'Shubhra' with wider spacing of 30 × 30 cm planted on November, 10 while, the minimum number of branches per plant (10.10) was recorded in cv. 'Local Collection' with closer spacing of 15 × 15 cm planted on December, 20.

Maximum number of branches per plant was recorded with the wider spacing of 30 × 30 cm whereas, minimum number of branches per plant was recorded with the closer spacing of 15 × 15 cm. This may be owing to the fact that plants planted at wider spacing have availability of more space for vegetative growth, as well as less competition for nutrients, light, water and other resources in comparison to the plants planted at closer spacing and these results were in accordance with the findings of Mali *et al.* (2016) [12] in annual chrysanthemum. November, 10 planted crop resulted in maximum number of branches per plant while, minimum number of branches per plant was observed in crop planted on December 20. This may be because these plants had enough time to develop more vegetative growth, specifically a maximum number of branches, than later planted crop. As a result, they produced significantly more flowering branches than the crop that was planted later. Similar findings were reported by Kaushal *et al.* (2014) [9] in china aster, Sharma *et al.* (2015) [15] in garland chrysanthemum and by Jindal *et al.* (2018) [5] in chrysanthemum cv. 'Ratlam Selection'.

Table 5: Variation in number of days taken to flower bud formation (days) due to interaction effect of cultivar, spacing and planting dates

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	71.33	72.66	73.13	73.66	73.00	73.66	74.10	75.43
November, 30	65.40	67.26	68.53	69.26	67.80	68.33	69.53	70.26
December, 20	64.66	66.26	66.80	67.46	66.13	66.73	67.53	68.53
C.D $_{0.05}$ for Cultivar × spacing × planting dates: N.S								

The data presented in table 5 reveals that interaction between cultivars, spacing and planting dates also exhibited non-significant effect. The minimum number of days taken to flower bud formation (64.66 days) was recorded in cv. 'Shubhra' with plant spacing of 15 × 15 cm planted on December, 20 while, the maximum number of days taken to flower bud formation (75.43 days) was recorded in cv. 'Local Collection' with plant spacing of 30 × 30 cm planted on November, 10.

The earliest flower bud formation was seen with the closest spacing of 15 × 15 cm while, formation of flower bud was generally delayed with wider spacing of 30 × 30 cm. This might be caused due to the decrease in plant growth at the closer spacing. As a result, the plants may have entered the reproductive phase relative earlier to those plants planted at a wider spacing that acquired more vegetative growth. Due to more competition among the plants for nutrients, soil moisture, sunlight, etc., the plants growing in closer spacing produced less vegetative growth and tried to complete their reproductive stage earlier. The results are in close agreement with findings of Kour (2009) [8] in chrysanthemum cv. 'Flirt' and Jadhav *et al.* (2014) [4] in calendula. Minimum days taken for flower bud formation was observed in plants planted on December, 20 this might be since later planted crop, the plants did not have enough time for the necessary vegetative growth and entered reproductive phase earlier. The maximum days taken to flower bud formation was observed in plants planted on November, 10 which may be due to fact that the plants planted earlier have enough time for the necessary vegetative growth so, they took considerably longer time for flower bud formation than the later-planted crop. A similar result was observed by Kaushal *et al.* (2014) [9] in china aster.

Table 6: Variation in number of days taken to flowering (days) due to interaction effect of cultivar, spacing and planting dates

Planting dates	Cultivars							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	117.33	118.53	119.13	119.66	118.86	119.73	120.20	121.53
November, 30	107.86	109.26	109.87	110.80	109.40	110.13	111.26	111.53
December, 20	93.40	94.07	95.06	95.53	94.20	94.86	95.80	96.80
C.D $_{0.05}$ for Cultivars × Spacing × Planting dates: N.S								

The effect of interaction between cultivars, spacing and planting dates shown in table 6 was found to be non-significant, however, minimum number of days taken to flowering (93.40 days) was recorded in cv. 'Shubhra' with closer spacing of 15 × 15 cm planted on December, 20 while, the maximum number of days taken to flowering (121.53 days) was recorded in cv. 'Local Collection' with wider spacing of 30 × 30 cm planted on November, 10.

With the closest spacing of 15 × 15 cm, flowering was observed first, while, with the widest spacing of 30 × 30 cm flowering was delayed. This might be caused by a decrease in plant growth at the closer spacing. As a result, the plants may have attained the reproductive phase earlier as compared to those plants which was planted at a wider spacing that has already acquired more vegetative growth. Due to more competition among the plants for nutrients, soil moisture, sunlight, etc., the plants grown at closer spacing attained less vegetative growth and tried to complete their reproductive stage earlier. The results are in close agreement with findings of Kour (2009) [8] in chrysanthemum cv. 'Flirt' and Kaushal *et al.* (2014) [9].

Table 7: Variation in number of flower per plant due to interaction effect of cultivars, spacing and planting dates

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	31.19	39.70	58.97	77.00	25.28	37.51	51.96	71.91
November, 30	25.59	36.65	52.60	65.66	21.86	31.95	45.54	56.83
December, 20	21.61	31.68	47.52	54.31	19.72	29.23	39.36	51.26
C.D $_{0.05}$ for Cultivar × spacing × planting dates: 2.34								

The data shown in table 7 reveals that interaction between cultivars, spacing and planting dates maximum number of flowers per plant (77.00) was recorded in cv. 'Shubhra' with wider spacing of 30 × 30 cm planted on November, 10 while, the minimum number of flowers per plant (19.72) was recorded in cv. 'Local Collection' with closer spacing of 15 × 15 cm planted on December, 20 which was significantly at par with cv. 'Shubhra' with closer spacing of 15 × 15 cm planted on December, 20 (21.61) and cv. 'Local Collection' with the spacing of 15 × 15 cm planted on November, 30 (21.86).

Maximum number of flowers per plant was observed in the crop planted in wider spacing of 30 × 30 cm while, minimum number of flowers per plant was observed in crop planted in closer spacing of 15 × 15 cm. Number of flowers per plant was observed maximum in crop planted on November, 10 while, minimum number of flowers per plant was recorded in crop planted on December, 20. This might be because early planted crop have enough time for vegetative and reproductive growth, which resulted in more number of flowering shoots and produced more number of flowers per plant than late planted crop. Similar finding was reported by Dixit (2004) [1] in annual chrysanthemum.

Table 8: Variation in flower diameter (cm) due to interaction effect of cultivar, spacing and planting dates

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	4.84	5.52	5.78	5.95	4.41	5.08	5.27	5.77
November, 30	3.99	4.84	4.97	5.61	3.86	4.40	4.83	5.43
December, 20	3.75	3.89	4.93	5.20	3.49	3.73	4.53	5.07
C.D $_{0.05}$ for Cultivar × spacing × planting dates: N.S								

The interaction between cultivars, spacing and planting dates shown in table 8 was found to be non-significant, however, maximum flower diameter (5.95 cm) was recorded in cv. 'Shubhra' with wider spacing of 30 × 30 cm planted on November, 10 while, the minimum flower diameter (3.49 cm) was recorded in cv. 'Local Collection' with closer spacing of 15 × 15 cm planted on December, 20.

The maximum flower diameter was recorded in wider spacing of 30 × 30 cm and minimum flower diameter was observed in closer spacing of 15 × 15 cm. This may be because plants with a wider spacing may have experienced lesser competition for resources like soil moisture, light and nutrients, which led to higher plant growth, resulting in the production of better quality flowers than the flowers produced in closer spacing. Similar findings were recorded by Khobragade *et al.* (2012) [10] in china aster. Crop planted on November, 10 resulted in maximum flower diameter while, minimum flower diameter was recorded in crop planted on December, 20. This might be due the fact that crop planted on November,10 was exposed to the best climatic conditions for a longer period of time, which may have resulted in transfer of more photosynthates to the flower, which contributed in increased the size of the flower. Similar findings were reported by Sharma *et al.* (2015) [15] in garland chrysanthemum.

Table 9: Variation in flower yield per picking (g) due to interaction effect of cultivar, spacing and planting dates

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	2807.16	2494.83	2278.66	1732.50	2344.66	2275.08	2078.72	1618.08
November, 30	2303.28	2290.75	2104.26	1477.53	1997.16	1900.92	1821.65	1278.69
December, 20	1980.41	1945.32	1900.96	1222.08	1827.25	1774.68	1574.72	1153.53
C.D $_{0.05}$ for Cultivar × spacing × dates: 52.01								

Data shown in the table 9 interaction between cultivars, spacing and planting dates maximum flower yield per picking (2807.16 g) was recorded in cv. 'Shubhra' with closer spacing of 15 × 15 cm planted on November, 10 while, the minimum flower yield per picking (1153.53 g) was recorded in cv. 'Local Collection' with wider spacing of 30 × 30 cm planted on December, 20.

Maximum flower yield was reported in closer spacing of 15 × 15 cm and minimum was reported in wider spacing of 30 × 30 cm. This might be due to the fact that maximum yield resulted from accommodating more plants per unit space at closer spacing, which increased flower yield in closer spacing. Similar findings were reported by Mahananda *et al.* (2015) [11] in annual chrysanthemum. Crop planted on November, 10 resulted in maximum flower yield and minimum flower yield was recorded in crop planted on December, 20. This might be due to the presence of favourable environmental conditions at the time of flowering and luxuriant growth in the form of greater plant height, plant spread, and number of branches per plant, which in return increased photosynthetic area and ultimately increased photosynthetic assimilates, that can be attributed to the higher flower yield.

Table 10: Variation in number of seeds per flower head due to interaction effect of cultivar, spacing and planting dates

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	225.80	234.98	239.66	243.01	223.88	227.83	233.28	237.98
November, 30	214.39	223.99	230.53	235.36	210.66	218.43	226.53	232.86
December, 20	207.75	215.63	221.67	228.99	200.63	208.95	217.89	224.98
C.D $_{0.05}$ for Cultivar × spacing × dates: N.S								

The data presented in table 10 shows the interaction between cultivars, spacing and planting dates was found to be non-significant. However, maximum number of seeds per flower head (243.01) was recorded in cv. 'Shubhra' with wider spacing of 30 × 30 cm planted on November, 10 while the minimum number of seeds per flower head (200.63) was recorded in cv. 'Local Collection' with closer spacing of 15 × 15 cm planted on December, 20.

The amount of seeds produced per flower head had been significantly influenced by spacing. The present study reveals that the maximum number of seeds per flower head occurs at the wider spacing of 30 × 30 cm as compared to closer spacing. The formation of more number of seeds per head with wider spacing may be ascribed to the increase in head size due to less competition among the plants for space, nutrients, sunlight and water. The crop that was planted on November, 10 produced the maximum number of seeds per flower head, possibly as a result of increased flower size, which ultimately produced larger-sized heads with more seeds. It might also be ascribed to best temperature during the active growth stage with longer reproductive phase and better flower pollination due to increased activity of pollinators, which led to the formation of heads with more number of seeds. A similar result was recorded by Sharma *et al*. (2015) [15] in garland chrysanthemum.

Table 11: Variation in seed yield per plant (g) due to interaction effect of cultivar, spacing and planting dates

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	3.71	4.66	6.26	8.82	3.06	4.16	6.06	7.43
November, 30	3.23	4.05	5.65	8.06	2.86	3.88	5.17	6.65
December, 20	3.15	3.63	5.24	7.56	2.33	2.92	4.26	6.01
C.D $_{0.05}$ for Cultivar × spacing × planting dates: 0.19								

The interaction effect of cultivars, spacing and planting dates shown in table 11 reveals that maximum seed yield per plant (8.82 g) was recorded in cv. 'Shubhra' with wider spacing of 30 × 30 cm planted on November, 10 while, the minimum seed yield per plant (2.33 g) was recorded in cv. 'Local Collection' with closer spacing of 15 × 15 cm planted on December, 20.

The maximum seed yield per plant was recorded when crop was planted in wider spacing of 30 × 30 cm and minimum was recorded in the closer spacing of 15 × 15 cm. This may be the result of increased plant growth and spread, as well as increased production of more vegetative buds that later developed into reproductive buds. As a result, higher-quality flower production leads to better seed setting and the formation of more flower head per plant, both of which contribute to the higher seed yield per plant. The crop planted on November, 10 there was higher weight and greater seed yield per plant due to an increase in the number of heads per plant and maximum number of seeds per head. The results are in close conformity with the findings of Sharma *et al.* (2015) [15] who observed maximum seed yield per plant in sweet William.

Table 12: Variation in seed yield per plot (g) due to interaction effect of cultivar, spacing and planting dates

Planting dates	Cultivar							
	Shubhra				Local Collection			
	Spacing (S)				Spacing (S)			
	S_1	S_2	S_3	S_4	S_1	S_2	S_3	S_4
November, 10	133.80	116.50	100.21	79.44	110.40	104.16	97.01	66.90
November, 30	116.40	101.41	90.40	72.60	103.20	97.00	82.77	59.85
December, 20	113.40	90.91	83.84	68.10	84.12	73.16	68.21	54.09
C.D $_{0.05}$ for Cultivar × spacing × planting dates: 1.78								

The data depicted in table 12 shows that the interaction effect of cultivars, spacing and planting dates the maximum seed yield per plot (133.80 g) was recorded in cv. 'Shubhra' with closer spacing of 15 × 15 cm planted on November, 10 while, the minimum seed yield per plot (54.09 g) was recorded in cv. 'Local Collection' with wider spacing of 30 × 30 cm planted on December, 20.

The closer spacing of 15 × 15 cm was found to have the highest seed yield per plot. This could be as a result of more plants being accommodated per plot with closer spacing, which eventually enhanced flower and seed yield per plot. Similar findings were reported by Poonam *et al.* (2002) [13] in zinnia. Maximum seed yield per plot was recorded in the crop planted on November, 10. Due to the long growing period in November planting for improved seed development, the highest seed yield/plot was observed. Minimum seed yield per plot was recorded in December, 20 planted crop which might be due to the reason that with delayed planting, the seed yield/plot significantly decreased.

Shubra Local Collection

Field Trial at a glance

4. Conclusion

Thus, from the recorded observation it can be concluded cv. Shubra performed better as compared to cv. Local Collection in terms of vegetative, flowering and seed parameters.

References

1. Dixit A. Effect of plant spacing and nitrogen on growth, flowering and yield of annual chrysanthemum cv. Local White. Orissa J Hortic. 2004;32:55-56.
2. Dilta BS, Gupta YC, Sharma P. Effect of different planting dates on performance of china aster (*Callistephus chinensis* Nees.) varieties. Asian J Hortic. 2007;2:245-248.
3. Gomez LA, Gomez AA. Statistical procedures for agricultural research. 3rd ed. Singapore: John Wiley and Sons; 1984. p. 680.
4. Jadhav JG, Chopde N, Gore KS, Patil A, Gaikawad D. Effect of spacing on growth, flower yield and quality of calendula under Vidarbha conditions. J Soils Crops. 2014;24:82-85.
5. Jindal M, Thumar BV, Hallur V. Effect of planting time and pinching on flowering and flower quality of chrysanthemum

cv. Ratlam Selection. J Pharmacogn Phytochem. 2018;7:390-393.
6. Kumar R, Kaur K. Effect of planting time and cultivars on growth, flowering and seed yield in phlox (*Phlox drumondii*). Seed Res. 2000;28:23-26.
7. Karavadia BN, Dhaduk BK. Effect of spacing and nitrogen on annual chrysanthemum. J Ornamental Hortic. 2002;5:65-66.
8. Kour R. Flower production as affected by spacing and pinching in chrysanthemum cv. Flirt. Int J Agric Sci. 2009;5:588-589.
9. Kaushal S, Dilta BS, Chaudhary SVS, Gupta BP. Effect of planting dates on growth and flowering of china aster (*Callistephus chinensis* (L.) Nees.). Int J Farm Sci. 2014;4:60-71.
10. Khobragade RK, Bisen S, Thakur RS. Effect of planting distance and pinching on growth, flowering and yield of china aster (*Callistephus chinensis*) cv. Poornima. Indian J Agric Sci. 2012;82:334-339.
11. Mahananda NW, Munikrishnappa PM, Shantappa T. Effect of spacing and growth regulators on growth, flowering, yield and quality of annual chrysanthemum (*Chrysanthemum coronarium* L.). Trends Biosci. 2015;8:6634-6639.
12. Mali GL, Moond SK, Choudhary A, Bola PK, Chaudhary P. Effect of planting geometry and nitrogen on growth, flowering and yield of chrysanthemum (*Chrysanthemum coronarium* L.). HortFlora Res Spectr. 2016;5:48-52.
13. Poonam, Kumar R, Dubey RK. Effect of planting time and spacing on zinnia. J Ornamental Hortic. 2002;5:49-50.
14. Singh AK, Kumar U, Kumar A. Effect of planting date and spacing on performance of marigold (*Tagetes erecta* Linn.) cv. Pusa Narangi under North Bihar conditions. Int J For Crop Improv. 2015;6:16-20.
15. Sharma P, Gupta YC, Dhiman SR, Sharma P, Gupta R. Effect of planting dates on growth, flowering and seed production of garland chrysanthemum (*Chrysanthemum coronarium*). Indian J Agric Sci. 2015;85:912-916.