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Economics of Flower Production Influenced by Inter- Plant Spacings and Transplanting Dates in Annual Chrysanthemum

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ABSTRACT

An experiment was carried out under open field conditions to ascertain the influence of inter-plant spacing's and planting dates on flower marketable yield and economics of annual chrysanthemum at the Experimental Farm, Division of Floriculture & Landscaping, Sher-e-Kashmir University of Agricultural Sciences and Technology, Main Campus, Chatha, Jammu (J&K) during the year 2022-23. The experiment was laid out in randomized complete block design (RCBD) under factorial arrangement with three replications. Two factors were studied Factor A= Dates of transplanting viz D_1 – 10th October, D_2 – 25th October, D_3 – 10th November, D_4 – 25th November and Factor B= Inter plant spacing's viz.S_1 – 30 cm × 30 cm, S_2 – 45 cm × 45cm, S_3 – 60 cm × 60cm. Data regarding flower yield (kg/ ha), post-harvest losses, actual marketable yield (kg/ha), total expenditure (₹), gross returns (₹.), net returns (₹) and benefit cost ratio (BCR) were collected. The experimental results revealed that the overall cost of cultivation as well as the economics of flower production were significantly influenced by inter-plant spacing's and planting dates. While evaluating the cost of production for different treatments it was observed that treatment T_1 produced the maximum yield of saleable flowers (72486.76 kg/ha) followed by T_{10}(60251.70 kg/ha). Highest gross returns (₹ 1449735.20) and net returns (₹ 11, 98,039.20) were also recorded with treatment T_1. The highest benefit-cost ratio (BCR) of 4.66:1 was recorded with T_1closely followed by benefit-cost ratio of 3.79 in T_{10}.

Keywords: *Annual chrysanthemum, inter-plant spacing, transplanting dates economic analysis, Benefit-cost ratio (BCR) were collected.*

INTRODUCTION

Annual Chrysanthemum (*Chrysanthemum coronarium* L.) is one of the most profitable commercial loose flower crops of Jammu region. Huge demand of this flower is witnessed in general and during festive occasions for garland making and offering in temples attracts the attention of flower growers of the area. Flowers are used in combination with marigold for garland making and also sold as loose individually. The acreage under this flower in the region is low and is increasing. The low production alone cannot meet the ever-increasing demands due to which flowers worth lakhs needs to be procured from the neighboring states. The varied agro-climatic conditions of the state are highly suitable for the cultivation of this flower. Among the various agronomic factors responsible for proper growth and development, suitable transplanting time and inter-plant spacing's are primarily important to get profitable yields and lack of knowledge among the farming community results in yield penalty which limits the production and productivity of this crop. Hence, it is necessary to standardize the best time and optimum spacing for getting quality flowers with maximum yield in annual chrysanthemum. However, research work on this aspect of agrotechnique in annual chrysanthemum under Jammu region is lacking. Keeping in view the importance of the crop and the present demand of loose flower in Jammu region, the present investigation was being undertaken

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MATERIAL AND METHODS

The present investigation was carried out at the Experimental Farm, Division of Floriculture & Landscaping, Sher-e-Kashmir University of Agricultural Sciences and Technology, Main Campus, Chatha, Jammu (J&K). The experimental field of the Division of Floriculture & Landscaping, SKUAST - Jammu is situated at 32° 40'N latitude and 74° 58' E longitude and has an elevation of 332 m above mean sea level.

Experimental details
Design : RCBD (factorial)

Factors : 02	Treatment combinations :12
Factor 1- Dates of transplanting: 04 1. D_1 – 10th October 2. D_2 – 25th October 3. D_3 – 10th November 4. D_4 – 25th November **Factor 2- Inter-plant spacings: 03** 1. S_1 – 30 cm × 30 cm 2. S_2 – 45 cm × 45cm 3. S_3 – 60 cm × 60cm	**T_1:** 10th October transplanting at 30 cm × 30 cm spacing **T_2:** 25th October transplanting at 30 cm × 30 cm spacing **T_3:** 10th November transplanting at 30 cm × 30 cm spacing **T_4:** 25th November transplanting at 30 cm × 30 cm spacing **T_5:** 10th October transplanting at 45 cm × 45 cm spacing **T_6:** 25th October transplanting at 45 cm × 45 cm spacing **T_7:** 10th November transplanting at 45 cm × 45 cm spacing **T_8:** 25th November transplanting at 45 cm × 45 cm spacing **T_9:** 10th October transplanting at 60 cm × 60 cm spacing **T_{10}:** 25th October transplanting at 60 cm × 60 cm spacing **T_{11}:** 10th November transplanting at 60 cm × 60 cm spacing **T_{12}:** 25th November transplanting at 60 cm × 60 cm spacing

The experimental field was prepared to a fine tilth by 2 to 3 times ploughings with the help of tractor fitted with a rotavator and finally the field was leveled by planking after removing the plant residues and weeds. Seeds were sown and healthy seedlings were transplanted on different dates as per the experimental treatments in the experimental plots at spacings of 30 cm x 30, 45cm x45 cm and 60 cm x 60 cm thereby accommodating 30, 16 &9 seedlings per bed size of 1.8 m × 1.8 m dimensions. Transplanting was done during evening hours when the temperature was low to avoid the transplanting shock. Light irrigation was given immediately after transplanting. Gap filling was done with fresh seedlings in order to maintain cent percent plant population in each plot till ten days after transplanting. All other intercultural operations were carried out from time to time. Pinching was done after 30 days after transplanting. The experimental plots were kept clean by regular hand weeding. Irrigations were given as and when required during the crop growth. No disease incidence was recorded during the experiment. Data on various growth and flowering parameters were recorded and statistically analyzed by applying the technique of analysis of variance using Completely Randomized Block Design **(Gomez and Gomez 1985).** The level of significance for t-test was kept at 5% (P=0.05).
The yield of loose flowers was calculated and expressed in kilograms. The economics of the individual treatment was calculated based on the total cost of cultivation and gross income. The expenditures incurred during the cropping period were computed taking into account the land lease charges, cost of land preparation, material inputs, irrigation, harvesting and assembling expenses, etc. with labour charges taken as ₹ 400 per manday. For calculating the gross income, sale price of the loose flower has been taken as ₹20/kg. Gross monetary returns (₹ /m^2) was worked out for different treatments as:

Gross monetary returns (₹/ha) was worked out for different treatments as: Gross Income = Marketable flower yield/hectare x sale price of the flower Net Income = Gross Returns – Total expenditure Benefit Cost ratio (BCR) = Net returns/Total expenditure.

RESULTS AND DISCUSSION

The benefit cost ratio (BCR) of the treatments is the most important factor which determines its usefulness and acceptance by the grower. It is the most important single factor which decides the adoption of any improved cultural practice by the grower. A treatment should not only be effective but also should be profitable in proposition to be accepted by a grower. In the present study, the different treatments showed clear impact on the comparative economics of the production of flowers in annual chrysanthemum. The details pertaining to costs and returns are given in Table 1.

Yield analysis

The yield data pertaining to flower production under the influence of different inter- plant spacing's and planting dates are appended in Table 2. From the data, it is evident that the treatment T_1 recorded significantly highest marketable flower yield of 72486.76 Kg/ha followed by 60251.70 Kg/ha in treatment T_{10} and 48466.34 Kg/ha in treatment T_4 whereas, the lowest marketable yield of 12643.32 Kg/ha was recorded in T_{12}.The economics under various treatments are worked out on the basis of yield under each individual treatment.
Different studies conducted have reported increased in yield of cut/loose flowers under different inter- plant spacing's and planting dates. Lakshmi *et al* (2014) reported maximum flower yield (26483.56 kg/ha) with 1st October transplanting at a closer spacing of 40x20 cm in African marigold in African marigold. Desai and Thirumala (2015) reported highest cumulative spike yield/plant/year of 4.22 with 30x30 cm planting density in tuberose cv. Shringar. Jain *et al* (2018) reported wider spacing of 45x45 cm optimum for growth and flowering in statice (*Limonium sinuatum*). Pratibha *et al* (2018) reported maximum yield /sq.m (843.25 g) at a closer spacing of 30x20 cm in French marigold Sel. FM-786. Sachin *et al* (2023) reported the highest flower yield/plot and per hectare (5.59 kg &5.09t/ha) with spacing of 30x30 cm in chrysanthemum cv. Marigold.

Total expenditure

Among all the treatments, the highest total expenditure of ₹. 2, 51,696.00 per ha was incurred in (T_1, T_4, T_7 and T_{10}) and lowest of ₹ 185222.00 per ha with (T_3, T_6, T_9 and T_{12}).

Gross returns

Highest gross returns in monetary terms (₹1449735.00/ha) was recorded with T_1, followed by ₹1205034.00 with T_{10} and ₹ 969327/- in T_4. Lowest gross return of ₹252866.00 was recorded with T_{12}. Arslan *et al* (2019) reported highest gross profit at 15 cm row spacing in Chamomile (*Matricaria recutita* L.)

Net returns

Adoptability of any farming system is decided by the net returns which are regarded as the main parameter deciding its sustainability. The highest net income of ₹ 1198039.20.00 per ha was recorded with treatment T_1 followed by ₹ 953338.00 in T_{10} and ₹ 717630.80 in T_4, whereas as the lowest net income of ₹67644.40 was recorded with T_{12}.

Benefit cost analysis

In the present investigations, economic analysis of different treatments revealed that treatment T_1 gave maximum returns with benefit cost ratio (BCR) of 4.76:1 closely followed by 3.79: in T_{10} and 2.85:1 in T_4. The economic value of a crop is determined by its yield and quality. If growing conditions provide required microclimate and nutrition, plants exhibit full expression of genetic potential, yield and quality for long period. The acceptance of any package by farmers depends largely on the comparative economics of a practice and also feasibility of adoption as well as its effect on yield and quality as well. This increase in monetary return may be attributed to higher yield and improved quality of flowers which fetches more price in the market. The variation in net returns and cost: benefit ratio might be due to the difference in yield and planting densities.

Several studies conducted from time to time in various ornamentals cut and loose flowers/agronomic crops suggest the importance of planting dates and planting densities on yield and productivity .Patel and Patel (2022) recorded highest net realization rate of 69922 ₹/hectare and BCR of 3.05 and 3.07 with 30th October planting and 45x45 cm planting geometry in mustard. Mohanty et al (2023) reported highest yield/plant, per plot and per hectare with December planting in chrysanthemum. Also reported decrease in yield with delayed planting after December which signifies the importance of the planting dates in recording good and profitable marketable yields. Halagi *et al* (2023) reported highest BCR of 2.77 with 40x20 cm &40x 40 cm in African marigold.

Conclusion

From the above studies, it can be concluded that treatment T_1 (**10 October planting + 30 cm × 30 cm inter-plant spacing**) gave maximum returns with benefit cost ratio (BCR) of 4.76:1 in annual chrysanthemum

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Conflict of interest

Conflicts of interest are disclosed by the authors

Table 1: Economics of flower production influenced by Inter- Plant Spacings and transplanting dates in Annual Chrysanthemum for 1hectare area (Cultivated land is taken as 8000m²).

Particulars	Quantity.	Rate (in ₹.)	Total cost (in ₹.)
1. Input cost (Preparatory cultivation)			
a) Ploughing, Leveling and bed preparation	50mandays	₹ 400 per manday	₹ 20,000/-
b) Planting and pinching	50 mandays	₹. 400 per manday	₹ 20,000/-
2. **Intercultural operations**			
a) Weeding and hoeings	50 mandays	₹400 per manday	₹ 20,000/-
b) Irrigation	40 mandays	₹ 400 per manday	₹16,000/-
Harvesting	80 mandays	₹ 400 per manday	₹32,000/-
2.Transportation and packaging			₹15,000/-
3. Land lease			₹40,000/-
Total charges			**₹1,63,000**
4. Material cost (cost of seedlings)	30x30 cm=88888/- plants 45x45 cm=39505 plants 60x60 cm=22222/- plants	₹88888 ₹39505 ₹22222	

Table 2: Effect of inter- plant spacings and planting dates on flower yield (kg/ ha), post harvest losses, actual marketable yield (kg/ha), total expenditure (₹), gross returns (₹), net returns (₹) and benefit cost ratio (BCR) of annual chrysanthemum.

Treatments	Flower yield (kg. ha^{-1})	Post Harvest Losses (5% of flower yield, kg. ha^{-1})	Marketable flower yield (kg ha^{-1})	Total expenditure (₹ ha^{-1})	Gross returns (₹ ha^{-1})	Net return (₹ ha^{-1})	Benefit cost ratio (BCR)
T_1	76301.85	3815.09	72486.76	251696.00	14,49,735.20	11,98,039.20	4.76:1
T_2	31101.97	1555.10	29546.87	202506.00	5,90,937.40	3,88,431.40	1.92:1
T_3	18680.82	934.04	17746.78	185222.00	3,54,936.60	1,69,714.60	0.92:1
T_4	51017.20	2550.86	48466.34	251696.00	9,69,326.80	7,17,630.80	2.85:1
T_5	25357.31	1267.87	24089.44	202506.00	4,81,788.80	2,79,282.80	1.38:1
T_6	20292.15	1014.61	19277.54	185222.00	3,85,550.80	2,00,328.80	1.08:1
T_7	50197.01	2509.85	47687.16	251696.00	9,53,743.20	7,02,047.20	2.79:1
T_8	26292.43	1314.62	24977.81	202506.00	4,99,556.20	2,97,050.20	1.47:1
T_9	17680.89	884.04	16796.85	185222.00	3,35,937.00	1,50,715.00	0.81:1
T_{10}	63422.84	3171.14	60251.70	251696.00	12,05,034.00	9,53,338.00	3.79:1
T_{11}	23737.99	1186.90	22551.09	202506.00	4,510,21.80	2,48,515.80	1.23:1
T_{12}	13308.76	665.44	12643.32	185222.00	2,52,866.40	67,644.40	0.37:1

T_1=10 October planting + 30 cm × 30 cm inter-plant spacing;T_2=10 October planting + 45 cm × 45 cm inter-plant spacing;T_3=10 October + 60 cm × 60 cm inter-plant spacing;T_4=25 October + 30 cm × 30 cm inter-plant spacing;T_5=25 October planting + 45 cm × 45 cm inter-plant spacing;T_6=25 October planting + 60 cm × 60 cm inter-plant spacing;T_7=10 November planting + 30 cm × 30 cm inter-plant spacing;T_8=10 November planting + 45 cm × 45 cm inter-plant spacing;T_9=10 November planting + 60 cm × 60 cm inter-plant spacing;T_{10}=25 November planting + 30 cm × 30 cm inter-plant spacing;T_{11}=25 November planting + 45 cm × 45 cm inter-plant spacing; T_{12}= 25 November planting + 60 cm × 60 cm inter-plant spacing

REFERENCES

1. Arslan D, Bayraktar OV, Temel M and Bayram E. 2019. Economical analysis of chamomile (*Matricaria recutita* L.) cultivars, flower yields which are obtained from different sowing times and row spacings. Journal of Agricultural Sciences.25: 129-136

2. Desai N and Thirumala S. 2015. Effect of spacing and fertilizer levels on growth, flowering and spike yield in tuberose (*Polianthes tuberosa*) cv. Shringar under field experiment. International Journal of Research in Agricultural Sciences. 2(6): 2348-3997

3. Halagi MS, Maurya RP, Bundela MK and Jat MK.2023. Effect of plant spacing and pinching interval on growth, yield and flower quality of African marigold (*Tagetes erecta* L.) under semi arid-conditions The Pharma Innovation Journal. 12(4): 2246-2254

4. Gomez, K. A. and Gomez, A. A. 1985. *Statistical procedure for agricultural research*. 2nd Edition. A wiley International Publication Singapore pp 20-25.

5. Jain R, Singh MK, Swaroop K, Reddy MV, Janakiram T, Kumar and Pinder R.2018. Optimization of spacing and nitrogen dose for growth and flowering of statice (*Limonium sinuatum*). Indian Journal of Agricultural Sciences 88(7): 1108-14

6. Lakshmi, Pandey RK, Dogra S,Laishram N, Bhat D and Singh A.2014 Studies on the effect of planting dates and spacing in African marigold (Tagetes erecta). Progressive Horticulture. 46(1): 149-152

7. Mohanty M, Mohanty CR, Jena S, and Mohanty S. 2023. Effect of planting date on growth and flowering of annual chrysanthemum(*Chrysanthemum coronarium* L.). The Pharma Innovation Journal.12(4): 1906-1910

8. Patel RM and Patel DM. 2022. Efect of date of sowing and planting geometry on growth and yield of mustard (*Brassica juncea* L.)(Czern and Coss). The Pharma Innovation Journal.11(11): 963-966

9. Pratibha C, Gupta YC, Dhiman SR and Gupta RK. 2018. Effect of planting dates and spacing on growth and flowering of French marigold Sel.FM-786. African journal of Agricultural research. 13(37): 1938-1941

10. Sachin SM, Patil MG, Ashok H, Pampana Y, Amaregouda A and Desai BK. 2023. Effect of month of planting and spacing on growth and flower yield in chrysanthemum (*Dendrathema grandiflora* Tzvelev) cv. Marigold. The Pharma Innovation Journal .12(3): 1782-1786