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Effect of spacing and pinching on growth and yield of French marigold (*Tagetes patula* L.)

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Abstract

In order to investigate the effect of spacing and pinching on growth, flowering and yield of french marigold an experiment was carried out during rabi season 2022-23 at Hazipur research farm, C B G Agriculture P G college, Lucknow (U.P.). The experiment was on *Tagetes patula*, the French marigold flower in combination of two intervals of pinching at 30 DAT and 60 DAT with three spacing viz., 30X30 cm, 30X45 cm and 30X60 cm respectively. Making it all in nine combinations which were tested in factorial randomized block design. Maximum plant height was recorded with closer spacing S₀ i.e. 30 x 30 cm (58.90 cm) followed by closer spacing S₁ i.e. 30X45 cm (57.88 cm) respectively. Under pinching treatment maximum height was recorded with P₁ i.e. without pinching (57.91 cm) followed by (55.62 cm) with P₁ i.e. pinching (at 30DAT) respectively. While growth characters under spacing treatment i.e. maximum spread of plant (35 cm), Numbers of branches (38.60) and Diameter of stem (1.65 cm) were recorded with wider spacing S₂(30x60 cm) followed by S₁ (30x45 cm). However, maximum spread of plant (31.40 cm), Number of branches per plant (37.5 cm) and diameter (1.63 cm) were recorded with pinching after 60 DAT respectively. spacing and pinching affects yield characters of *Tagetes patula* mainly Dry matter content (18.56%) (19.38%), Number of flower (48.31) (51.97), Fresh weight of flower (445.6 g) (452.5 g), yield of flower (306.2 q/ha) (321.3 q/ha), Net return (126696.7 rs/ha) (129698.7 rs/ha) and B:C Ratio (1.42) (1.44) were found with the widest spacing (30X60 cm) and pinching done at 60 days after transplanting. Results revealed that plants pinched at 60 DAT with widest spacing (30X60 cm) were giving best growth and flowering of French marigold respectively.

Keywords: Marigold flowering, spacing & pinching on growth, yield, dry matter content, FRBD

Introduction

French marigold (*Tagetes patula* L.) is the popular small annual marigold is planted as bedding plant widely grown on garden borders and edges. It has culinary and medical uses. It is one of the most commonly grown flowers for garden decoration and extensively used as loose flowers for making garlands for religious and social function. Its habit of free flowering and short duration to produce marketable flowers wide range of attractive colours, shape, size and good keeping quality is attracted the attention of growers. Marigold are one of the most popular annual worldwide but these plants are known for their striking colour and abundant flowers. The main medicinal application of marigold are skin condition of all kinds including bruises, minors injuries etc. leaf paste is used against boils and carbuncles. Marigold is one of the most commonly grown loose flower in India and is extensively used in religious and social occasions in one form or the other. Among the various factors of crop production, spacing and pinching has been found to be an effective treatment in regulating and increasing flower production in ornamentals crops. A wider spacing increases the photosynthetic area and reduces the Competitions for nutrients while the reverse is true for closer spacing. Plant required a certain area for their normal growth and developments as they compete for the space and in appropriate planting distance affects the plant growth and flower yield. Time of pinching plays a significant role in the flower production as this operations affects the vegetative growth and flower production, both. The purpose of pinching has been to check vertical growth and to encourage side branching making the pinched plants dense and bushy. In this context, an experiment was conducted with the objective to study the effect of spacing and pinching on growth, yield quality and economics of marigold per ha area under semiarid condition of U.P.

Materials and Methods

The present field experiment entitled "Effect of spacing and pinching on growth, yield and

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quality of French marigold (*Tagetes patula* L.)" was carried out at Agriculture Research Farm, Hajipur, Chandra Bhanu Gupta Krishi Mahavidyalaya, B.K.T., Lucknow (U.P.) during Rabi season 2022-23. The details of the experiment conducted and methodology followed are described under this chapter.

Details of the experiment

The experimental layout was in Factorial Randomized Block Design with nine treatment and three replication. Total no of plots are 27. the levels of spacing kept are 30 × 30 cm, 30 × 45 cm, and 30 × 60 cm along with intervals of pinching i.e. Pinching at 30 DAT and at 60 DAT. Sowing of Seed in the nursery beds are done on second week of November. RDF was recommended dose of fertilizer (90:90:75) NPK kg/ha). The land was brought to a fine tilth through ploughing and tillage. Irrigation channels and bunds were prepared according to layout. The twenty five days old seedling were transplanted in the field with three different spacing. Light irrigation was given just after transplanting. Organic manures were applied before one week of transplanting. Full dose of phosphorous, potassium and half dose of nitrogen as per treatment were applied just after sowing. All cultural practices were followed regularly during crop growth and observations were recorded on yield and yield attributing characters. The data on these parameters were subjected to statistical analysis to draw logical conclusions.

Results and Discussion

Results revealed that maximum plant height was recorded 58.90 cm with S₀ (30x30 cm) which was followed by 57.88 cm with wider spacing (30X45cm) and minimum plant height 56.3 cm was recorded with treatment S₂ (30x60 cm) which is

the widest spacing treatment. Under pinching treatment maximum plant height 57.91 cm was recorded with P₀ (without pinching), which was followed by P₁ 55.62 cm with pinching done at 30 DAT and minimum plant height 53.79 cm was recorded with treatment P₂ (pinching at 60 DAT) at all stages of crop growth. Other growth characters i.e. maximum spread of plant (31.40), no of branches per plant (37.50) and diameter of main stem (1.63 cm) was recorded with the widest spacing treatment i.e. 30X60 cm (Table 1 and fig 1). The increased thickness of stem and spread could be ascribed to a better availability of nutrients per unit area due to sufficient space resulting in less competition among the plants. The results are in accordance with the report of Yadav *et al.*, (2004)^[6] whereas, minimum plant spread (22.42 cm) and (21.07 cm), number of branches (32.13) and (32.2) and diameter of main stem (1.60) were recorded with the closest spacing S₀ (30X30 cm) of plants at all stages of growth respectively. More number of branches per plant recorded under wider spacing may be due to fact that wider spacing provides a congenial growing condition like more space available for growth of root and shoot and less competition for nutrients among the plants. Under pinching treatment maximum spread of plant (35.0 cm), no of branches (38.6) and diameter of main stem (1.64) cm was recorded treatment P₂ (pinching done at 60 DAT) which were followed by treatment P₁ (pinching done at 30 DAT) respectively. However, minimum spread of plant 21.07, 32.2 and 1.62 cm were recorded with P₀ (without pinching). The increase in stem diameter under pinching treatment might be due to physiological effect of pinching due to arrest of apical dominance by way of pinching which stopped further plant growth and induced the stem diameter.

Table 1: Effect of spacing and pinching on plant height (cm), Spread of plant (cm), Number of branches per plant and Diameter of main stem (cm) of French marigold (*Tagetes patula* L.)

Treatment	Plant height (cm)	Spread of plant (cm)	No. of branches per plant	Diameter of main stem (cm)
S ₀ (30x30 cm)	58.90	22.42	32.13	1.60
S ₁ (30x45 cm)	57.88	28.69	36.50	1.61
S ₂ (30x60 cm)	56.53	31.4	37.50	1.63
SEM ±	0.247	0.152	0.158	0.026
CD (P= 0.05%)	0.748	0.460	0.476	NA
P ₀ (Without Pinching)	57.91	21.07	32.2	1.60
P ₁ (Pinching 30 DAT)	55.62	26.90	35.5	1.62
P ₂ (Pinching 60 DAT)	53.79	35.0	38.6	1.64
SEM ±	0.247	0.152	0.158	0.026
CD (P= 0.05%)	0.748	0.460	0.476	NA

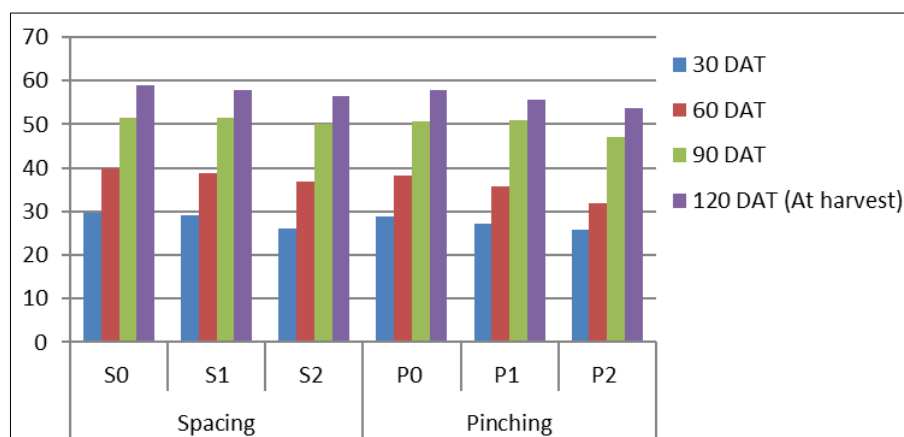


Fig 1: Effect of spacing and pinching on plant height (cm) of French marigold (*Tagetes patula* L.) at 30, 60, 90 and 120 DAT

Yield Studies

Table 2 and Fig 2 revealed that Maximum Dry matter content (18.56%), Number of flowers(48.31),fresh weight of flower (445.6 g), yield of flower (306.2qha⁻¹) Net return (126696.7Rs per ha) and B:C ratio (1.42) were recorded with S₂ (30 x 60 cm) with the widest spacing at harvest stage of crop growth which was followed by treatment S₁ (30 x 45 cm) at respective stage of crop growth Whereas, closer spacing 30 x 30 cm (S₀) produced minimum dry matter content (17.78%), no of flower (46.69), fresh wt. of flower (421.3 g), yield of flower(292.1qha⁻¹),Net return (121673.8Rs per ha) and B:C ratio (1.32) at harvest stage of crop growth .However, under pinching treatment maximum dry matter content (19.38%), number of flower per plant (49.97),fresh weight of flower (442.5 g), yield of flower (298.3qha⁻¹), Net return (127698.7 Rs. per ha) and B:C ratio (1.44) were found highest with P₂ (pinching done at 60 days after transplanting) respectively. Which was followed by treatment P₁ (pinching done at 30 DAT) at all stages of crop growth and minimum number of flower (41.88), fresh weight of flower (421.3 g), yield of

flower (284.9qha⁻¹), Net return (118867.3Rs per ha) and B:C ratio (1.35) was recorded with (P₀) without pinching treatment. The mean difference between the treatment were found non-significant to each other at respective stage of crop growth. The mean difference between the treatment were found non significant among all the treatment. The minimum plant height in pinching treatments may be due to breaking of apical dominance. Similar results were reported by Maharnor *et al.* (2011) [2] and Sasi Kumar *et al.* (2015) [5] in marigold. The reduction in fresh flower weight in pinching treatment might be attributed to the fact that pinched treatment increased the number of flowers per plant hence; the developing flowers might have been supplied with comparatively lesser quantities of plant bio-regulators and food reserve resulting ultimately in reduction of fresh and dry flower weight. Flower yield per hectare increased significantly with increase in days of pinching. Pinching checks the apical dominance and increased the growth of laterals maximum flower yield per ha with wider spacing give more area for nutrient and water absorption to the plant.

Table 2: Effect of spacing and pinching on Dry matter content (%), Number of flower per plant, Fresh weight of flower per plant (g), Yield of flower (q/ha) and Net return (Rs.h⁻¹) of French marigold (*Tagetes patula* L.)

Treatment	Dry meter content (%)	Number of flower	Fresh weight of flower (g)	Yield of flower (q/ha)	Net return (Rs./h)	B:C Ratio
S ₀ (30 x 30 cm)	17.78	46.69	421.3	292.1	121673.8	1.35
S ₁ (30 x 45 cm)	18.13	47.84	433.0	304.8	124440.4	1.39
S ₂ (30 x 60 cm)	18.56	48.31	445.6	306.2	126696.7	1.42
SEM ±	0.266	0.544	1.114	0.087	14.250	.003
CD (P= 0.05%)	NA	NA	3.369	0.263	43.089	.010
P ₀ (Without Pinching)	17.98	46.88	422.3	284.9	118867.3	1.35
P ₁ (Pinching 30 DAT)	18.52	48.99	432.8	296.9	124544.8	1.40
P ₂ (Pinching 60 DAT)	19.38	49.97	442.5	298.3	127698.7	1.44
SEM ±	0.266	0.544	1.114	0.087	14.250	.003
CD (P= 0.05%)	0.804	1.646	3.369	0.263	43.089	.010

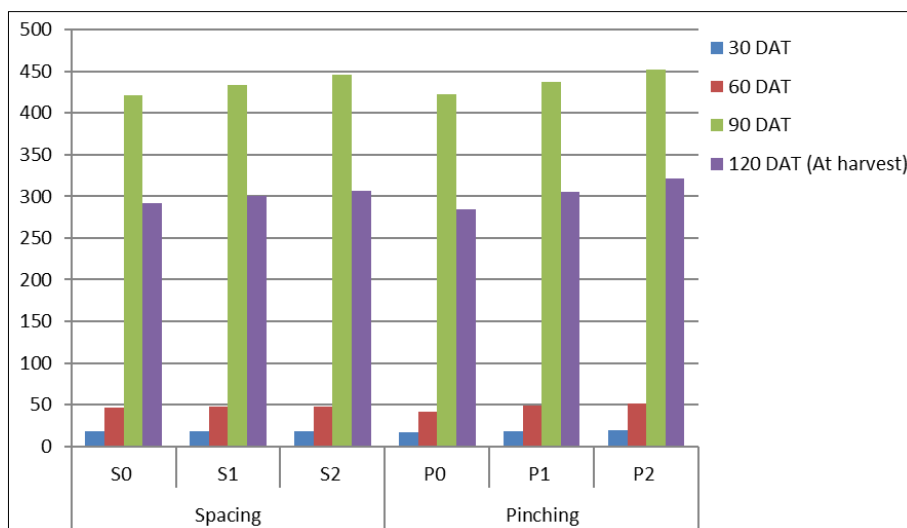


Fig 2: Effect of spacing and pinching on Dry matter content (%), Number of flower per plant, Fresh weight of flower per plant (g) and Yield of flower (qt/ha) of French marigold (*Tagetes patula* L.)

Conclusion

Keeping in view of the results obtained from the research experiment, it can be recommended that the french marigold cultivar pusa basanti recommended to be transplanted at the spacing of 30 cm × 60 cm with double pinching after 60 DAT should be practiced to obtain higher growth and flower yield under semi arid conditions of Uttar Pradesh.

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