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Full Length Research Paper

Improvement of Zinnia flower (*Zinnia elegans*) through evaluating of various pinching methods

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A field trial was carried out to investigate the response of different Zinnia cultivars to various pinching methods. The experiment was laid out in an RCB design with two factorial arrangements in three replicates. Control, single pinching and double pinching with cultivars Sun Gold, Master Elite, Magellan Orange and Dreamland Red were performed. The results illustrate that both pinching methods and cultivars significantly affected all the parameters except the plant height. Maximum days to flowering (64.83), number of branches (20), number of flowers plant⁻¹ (16.11), fresh flower weight (14.03 g), flower diameter (13.86 cm), and stem girth (15 mm) were noticed in plants subjected to double pinching, while minimum were noticed in control. Whereas, lowest plant height (58.42 cm) was documented in plants treated with double pinching. Among cultivars, maximum plant height (75.11 cm), number of branches (20.89), number of flower plant⁻¹ (16.45) and flower diameter (12.22 cm), were observed in cultivar Sun Gold, while maximum fresh flower weight (13.29 g) and stem girth (15.56 mm) were noticed in cultivar Magellan Orange. Maximum days to flowering (61.00) were noted for cultivar Master Elite. Smallest plant height (55.56 cm), number of branches (14.00), number of flower plant⁻¹ (11.28), fresh flower weight (10.08 g), flower diameter (10.36 cm), and stem girth (9.56 mm) were recorded for cultivar Master Elite, as minimum days to flowering (54.56) was counted in Magellan Orange. The interaction among pinching methods and cultivars were found non significant. From the findings of this research, it may be concluded that cultivar Sun Gold in combination with double pinch could enhance the production of Zinnia flowers.

Keywords: Zinnia, pinching, cultivars, physiological characteristics

INTRODUCTION

Floriculture is the study of cultivation, production and marketing of a large number of plants and planting materials like flowers, potted plants, foliage, cut flowers, garden flowers stock for nursery flowering leaves, annuals, perennials, flower bulbs and tubers (Uffelen., 2005). The tendency of the floriculture sector explains that the annual flowering plants becoming more admired in the Khyber-Pakhtunkhwa Province of Pakistan. The key reason of the status of plants is due to the variety of colors that it provides to landscape and cut flowers. Commonly, the plants give best profit around year with no waiting for specific season as for other scheduled crops. In addition, the total outcome of these crops is much more as compare to other traditional crop plants. Earn more foreign exchange and high demand for floricultural products at local markets are the motivations behind successful floriculture. Among floriculture plants, annual flowers have a major role in flower industry and Zinnias are the most important ones in this regard (Cohoon., 2000). Zinnia (*Zinnia elegans*) is an important annual summer flowering plant and belongs to family Asteraceae, generally grown in borders, beds, cottage containers and landscape or used in background of plants. Zinnias are produced all over Pakistan (Nassir., 2004) and in Peshawar, its growing season start from April and flowers are available up to October. Zinnias attract butterflies, hummingbirds and other different birds in the garden (Johnson and Kassler., 2007). Pinching is a recommended practice to make the plant busier for more flowers. Pinching is the removal of terminal growing tips of stem mainly for stimulating branches, which reduce height of plant. The pinched plant becomes compact, bushy, with more flowers due to number of pruning spreading of plant, diameter of the stem and significantly enhanced numbers of flowering shoots (Brum *et al.*, 2007).

In Pakistan its growing season start from April and flowers are available up to October. But, its use as cut flowers cannot be disparate Zinnia is an important Annual flowering plant. Zinnias attract butterflies, humming birds and different birds to garden (Johnson and Kassler., 2007).

Keeping in view the importance of pinching in inducing bushy plants, compactness and more flower production, the present study has been envisaged to investigate the evaluation of various pinching methods on growth and flowering of Zinnia cultivars. The findings of this study will help Zinnia growers for production of supplementary quality flowers.

MATERIALS AND METHODS

The experiment was conducted at The University of Agriculture Peshawar, Pakistan. Seeds of Zinnia were purchased from Pride seed store Lahore and seedlings were prepared in nursery and shifted at a height of about 8-10 cm. prior to transplantation in evening time the pots size (6 inches) were irrigated. Homogeneous cultural practices (land preparation, hoeing, weeding,) were applied to all the treatments.

Different cultivars of Zinnia used in the current study:

Four cultivars were used:

1. Sun Gold (golden color, superior diameter)
2. Master Elite (white in color)
3. Magellan Orange (orange in color, round shape flower) and
4. Dreamland Red (small in shape and red in color)

Experimental layout

Plot size was kept as 1.5 m² with Row x Row and Plant x Plant distance as 30 and 20 cm respectively.

Experimental Design

The research was conducted in RCB Design with two factors, *i.e.*,

1. Zinnia Cultivars: (Sun Gold, Master Elite, Magellan Orange, and Dreamland Red)
2. Pinching methods: (Control, Single Pinching and double pinching)

Statistical Analysis

The recorded data were analyzed by using the software STASTIX 8.1 to determine mean differences at 5% level of significance.

RESULTS

Days to flowering

Data of days to flowering indicated maximum value for days to blossoming in cultivar Master Elite (61) while Magellan Orange took minimum days to flowering (54.56) followed by cultivar Dreamland Red (56.44) and cultivar Sun Gold (57.89) (Table.1). Comparison of means for

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Table1. Days to flowering as affected by various pinching methods in Zinnia cultivars

Pinching Methods	Cultivars				Means
	Sun Gold	Master Elite	Magellan Orange	Dreamland Red	
Control	52.00	54.67	46.00	48.00	50.17c
Single pinch	58.00	60.33	55.00	56.33	57.42b
Double pinch	63.67	68.00	62.67	65.00	64.83a
Means	57.89b	61.00a	54.56c	56.44bc	

LSD value for cultivars at 5% level of significance = 1.95

LSD value for pinching at 5% level of significance = 1.69

Means followed by same letters are not significantly different using LSD at 5 % level of significance

Table2. Effect of various pinching methods on plant height of Zinnia cultivars

Pinching Methods	Cultivars				Means
	Sun Gold	Master Elite	Magellan Orange	Dreamland Red	
Control	85.00	61.33	81.67	71.33	74.83a
Single pinch	73.67	53.67	64.67	60.67	63.17b
Double pinch	66.67	51.67	60.00	55.33	58.42c
Means	75.11a	55.56d	68.78b	62.44c	

LSD value for cultivars at 5% level of significance = 2.54

LSD value for pinching at 5% level of significance = 2.19

Mean value followed by same letters are not significantly different using LSD at 5% level of significance

Table3. Effect of various pinching methods on number of branches plant⁻¹ of Zinnia cultivars

Pinching Methods	Cultivars				Means
	Sun Gold	Master Elite	Magellan Orange	Dreamland Red	
Control	16.00	9.00	13.00	11.00	12.25c
Single pinch	23.00	16.00	19.00	16.00	18.50b
Double pinch	23.67	17.00	20.33	19.00	20.00a
Means	20.89a	14.00d	17.44b	15.33c	

LSD value for cultivars at 5% level of significance = 0.85

LSD value for pinching at 5% level of significance = 0.74

Mean followed by same letters are not significantly different using LSD at 5% level of significance

pinching methods revealed that minimum (50.17) days to flowering was found in control treatment, followed by single pinching (57.42).

Plant height (cm)

Comparison of means for pinching methods exhibited more plant height in control treatments (74.83 cm), followed by single pinching (63.17 cm). The smallest height of plant (58.42 cm) was observed in double pinching method treatment. Among the cultivars Sun Gold was the tallest one (75.11 cm) while lowest plant height was exhibited by cultivar Master Elite (55.56 cm) (Table.2).

Number of branches plant⁻¹

The greatest number of branches (20.00) plant⁻¹ was recorded in cultivars that were treated by double pinch and minimum number of branches (12.25) was established in control treatments. Among the cultivars, Sun Gold established maximum number of branches (20.89), followed by cultivar Magellan Orange (17.44) and Dreamland Red (15.33) plant⁻¹, whereas lowest number of branches was obtained from cultivar Master Elite (14.00) (Table.3).

Table 4. Number of flower per plant of zinnia cultivars as influenced by different Pinching methods

Pinching Methods	Cultivars				Means
	Sun Gold	Master Elite	Magellan Orange	Dreamland Red	
Control	14.07	9.00	13.00	11.00	11.77c
Single pinch	16.33	12.00	15.50	13.33	14.23b
Double pinch	18.95	12.83	17.67	15.00	16.11a
Means	16.45a	11.28d	15.39b	13.11c	

LSD value for cultivars at 5% level of significance = 0.84

LSD value for pinching at 5% level of significance = 0.73

Mean followed by same letters are not significantly different using LSD at 5% level of significance

Table 5. Effect of various pinching methods on flower diameter of Zinnia cultivars

Pinching Methods	Cultivars				Means
	Sun Gold	Master Elite	Magellan Orange	Dreamland Red	
Control	9.18	7.88	9.03	8.96	8.76c
Single pinch	12.26	10.2	11.69	10.74	11.23b
Double pinch	15.2	12.99	13.98	12.28	13.86a
Means	12.22a	10.36c	11.57ab	10.99bc	

LSD value for cultivars at 5% level of significance = 0.77

LSD value for pinching at 5% level of significance = 0.67

Means followed by same letters are not significantly different using LSD at 5% level of significance.



Figure 1. Pictorial Illustration of Zinnia Cultivars: (A) Magellan Orange. B) Sun Gold. C). Dreamland Red D) Master Elite

Number of flowers plant⁻¹

The highest number of flowers (16.11) plant⁻¹ was ascertained in a plant that was treated with double pinching, followed by single pinching (14.23) and lowest number of flowers (11.77) was calculated from control treatment. Similarly among the cultivars, Sun Gold contributed maximum number of flowers (16.45) whereas

least number of flowers were produced by cultivar Master Elite (11.28) (Table.4).

Flower Diameter (cm)

Statistical analysis of the data revealed that flower diameter is significantly affected ($P \leq 0.05$) among the cultivar and by pinching methods as compare to control, but the interaction was found non-significant (Table. 5).

The largest flower diameter (13.86 cm) was established in plant treated with double pinching, followed by single pinch (11.23 cm) and the lowest (8.76cm) was observed in control. Similarly, among the cultivars, Sun Gold gave the highest flower diameter (12.22 cm), while lowest flower diameter was recorded for cultivar Master Elite (10.36 cm).

DISCUSSION

The present study was performed to evaluate the effects of pinching methods on the Zinnia flowering plant. Pinching methods are reported to significantly influence the different parameters such as days to flowering, plant height, number of branches, number of flowers per individual plant and flower diameter. All these parameters are key towards more and quality production of the flowers. Zinnia is one of the important flowering plant worldwide. The current results are much convincing in this regard and will be useful for the floriculturists in order to execute these recommended practices of pinching methods for an enhanced yield production of Zinnia flowers.

In our research, maximum days to flowering (64.83) were observed in double pinching. The similar findings were also reported by Wainwright and Irwin, 1987, they observed that flowers formation were delayed by pinching in all treatments as control plants or non pinched plant produced their first flower earlier than the treatments with pinching. This delayed in flowering occur due to pushing back of plant to the juvenile phase after pinching. Zalewska and Antkowiakb (2011) elaborated that delayed in flowering occur due to pushing back of plant to the juvenile phase after pinching. The exact explanation of postponed flowering may be due to the auxiliary branches being less superior in physiological phase than the apical tips to build up behind pinching.

Moreover the judgment of this observations are also agreement with Ryagi *et al.* (2007) they noted that delay in flowering (147 days) occurs due to double pinching and 107 days were noticed in single pinching in Carnation plant.

We found, that pinched plant height decreased as contrast to unpinched plant. A decreased in plant height was (17.6 cm) as the plant was disbud thirty days after transplanting as contrast to unpinched plant (17.66 cm) in Marigold Chauhan *et al.* (2005). This result is in line with the finding of Rakesh *et al.* (2005) they accounted that the height of plant found tallest in control while shortest plant height occurred in pinched plants. Furthermore, increased in branches is due to neutralization of apical dominance because it enhanced side shoots and produce maximum branches, solid and aesthetically pleasurable thick plant that is the major impact of pinching Karunananda and

Peiris (2010). However, exact efforts were also done by (Sharma *et al.*, 2006) they observed that more energy have been diverted for more number of lateral branches plant⁻¹ when African marigold was subjected to removing tip. More number of flowers is due to increase in number of shoots this may be due to the pinching level that increases, raises capacity of buds. The dominance of pinching practice could be explained by the competent photosynthetic and superior absorption of materials in reproductive part as suggested by Beniwal *et al.* (2005). Kour *et al.* (2012) reported to evaluate optimal flower yield and improve flower quality in Marigold via pinching. Pinching was applied at three phases with control (pinched was done at 20, 30 and 40 days after transplanting) .Delayed pinching (40 days after transplanting) gave maximal flower size and character of flower increased. Delayed pinching (40 days after transplanting) also increased secondary branches numbers of flowers per plants.

Our results on flower diameter are very much in agreement with the finding of Rao *et al.* (2008), who observed maximum flower diameter when plant was pinched after transplantation. Increased of flower diameter may be due to the addition of synthetic compounds (Benzyl adenine, a synthetic cytokinin, is commonly used to promote diameter in ornamental plants) which positively affect cell division and formation, which leads to improve number of petals and their expansion or both of them (Dorajeero and Makashi, 2012)

CONCLUSION

The present results suggested that most of the parameters were improved by double pinching. Cultivar "Sun Gold" showed improved growth as compared to other cultivars and could be recommended for growing under agro-climatic conditions.

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