



## The Impact of Variable Sowing Dates on the Morphological Characteristics of Three Zinnia Cultivars

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### ARTICLE INFO

### ABSTRACT

#### Key Words:

- Sowing date
- Varieties
- Morphological response
- Weather uncertainty
- Plant height.

Zinnias have been loved by gardeners for generations, leading to the development of many cultivars of various sizes and plant types. Plants respond differently to sowing time. Some cultivars have highly double-flowered capitula and brightly coloured, bi-colored ray florets. Success and flower yield depend on zinnia cultivar selection. Local cultivars are resistant to insects, pests, and diseases, promoting vigorous growth and resilience to seasonal challenges. The horticulture research area, college of Agriculture, University of Sargodha, examined zinnia three varieties' morphological traits at different sowing times. Zinnia varieties were sown on three dates for this experiment. V2 excelled in height, flowers, and leaves. Meanwhile, v1 had larger flowers and leaves. In all three sowings, the first sowing performed best in both varieties. No Zinnia haageana germinated.

## Introduction

The colourful blooms of zinnia, an annual flower, are making it popular. Its Compositae family origins are Mexico and Central America. The popular zinnia varieties "Blue Point" and "Oklahoma," perform well and have many blooms. Zinnia (*Zinnia elegans*) is a herbaceous Asteraceae summer annual flower that blooms from midsummer to frost. American zinnias are native to the Southwest, Mexico, and Central America. Its hybridization has made it a popular bedding plant and cut flower (Hegazi and El-Kot 2010). Zinnia flowers have strong stems, vibrant colours, disease resistance, and long vase life (Dole, 1999). New and innovative ornamental plants are in demand.

*Zinnia elegans* and *Zinnia haageana* are the most promising of 20-30 species in the Asteraceae genus (Javid, Abbasi et al. 2005). Most ornamental Zinnia cultivars originated from *Zinnia elegans*, but there are many types and cultivars. Growing it in beds, pots, window boxes, and rock gardens is easy. Zinnia's brightly bi-colored ray florets and highly double-flowered capitula type make it more ornamental than single and semi-double capitula (Miyajima and Nakayama 1994). Mexico and Central America are its homeland (McVaugh 1984). Traditional flowers are raised for beauty, socializing, essential oil extraction, and perfumes (Byczynski 2008). The ornamental plant market is dynamic and requires constant innovation. Consumer-focused genetic improvement programs are essential to meet such needs (Pasha, Ahmad et al. 2015)

Zinnia is grown for its beautiful flowers and is a diverse plant. *Zinnia elegans* is the parent of many ornamental cultivars. These flowering plants vary in growth, flower colour, shape, size, bloom structure, and colour pattern. Each year, new zinnia cultivars have unusual patterns and colours. These flowers are easy to grow, start flowering young, produce flowers throughout the season, and make great cut flowers (Metcalf and Sharma 1971). Zinnia cultivar selection is key to success and increases flower number and size, increasing yield. Varieties that thrive in their local climate avoid insect, pest, and disease damage and grow vigorously to face seasonal hazards. Plants have tensile strength to withstand high winds, and more healthy, beautiful, and large flowers are produced to improve aesthetics. Cut flower demand has increased, especially in summer when a few summer annuals bloom (Saleem, Nafees et al. 2003). This versatile plant grows in beds, pots, window boxes, and rock gardens. Some zinnia cultivars have highly double-flowered capitula and brightly coloured, bi-colored ray florets, making them more attractive than single or semi-double varieties (Miyajima D et al., 2018). Successful zinnia

cultivation requires choosing the right cultivars to maximize flower quantity and size. Locally adapted cultivars resist insects, pests, and diseases, promoting vigorous growth and resilience to seasonal challenges. These adapted cultivars can also withstand high winds, producing healthier, more attractive flowers. This is especially useful in summer when summer annuals are scarce and cut flower demand is rising (Saleem et al., 2003).

Temperature controls plant growth. When temperatures drop below the critical range, determinate crop development is shortened, reducing yield. Warmer temperatures, especially in spring, accelerate flowering and crop development (Craufurd and Wheeler, 2009). Temperature affects chemical, biological, and physiological processes in Zinnia growth and flowering (Kim et al., 2009). High summer temperatures above 38°C harm cut flower production and biological processes. Plant proteins denature at high temperatures, disrupting these processes and lowering flower quality (Ha, 2014).

70% of Pakistan's land, 562,594 km<sup>2</sup>, is dry with high temperatures and low precipitation. Pakistan is arid and semi-arid worldwide (Riaz et al., 2010). Pakistan has hot summers and cold winters. Many parts of the country are hot and dry from April to July, and sometimes into autumn. The Pakistani plains experience daily hot winds and average June temperatures of 38°C (100°F). The highest recorded temperature in Pakistan and Asia was 53.5°C (128.3°F) in Mohenjo-Daro, Sindh, in May 2010 (Vidal and Walsh, 2010).

With little research on this flower in Pakistan's agroclimatic conditions, a study was done. Zinnia Dwarf, Elegance, and Cactus were planted on different dates for the study. The study examined these cultivars' morphology.

## Material and method:

### Study Area:

This horticulture research was done at the University of Sargodha College of Agriculture in Pakistan. Sargodha is in Punjab, Pakistan. It is 190 kilometres (118 miles) northwest of Punjab's capital, Lahore, in the northeast. Sargodha is 32.0836°N, 72.6711°E. The soil is sandy loam, PH 7.5-8.5 (Zakka et al., 2004).

### Method:

Zinnia cactus, dwarf, and haageana seeds from Pak Seed Lahore were used for this study. This study used Factorial RCBD (Randomized complete block design) with three replicates for each sowing time in all three varieties. One replication planted eight seeds 6 inches apart and 15 inches apart. The College of Agriculture University of Sargodha's horticulture

research area selected a 204-by-168-inch plot. The soil was prepared by hoeing and adding 50 kg of dried FYM. Flood irrigation occurred on 20-2-2023. To prepare vattar, the soil was left open for 10 days. Before planting seeds on March 1, hand-weeding occurred.

Sowing began on March 2, 2023, with seeds sown ½ and 2 cm deep. Twelve days after the first sowing, the second was done on 14 March 2023. Third sowing was 14 days after second plantation on 28 March 2023. Sargodha rains prevented plant irrigation. On the first sowing, the temperature was 16-22 degrees Celsius, on the second 18-35, and on the third 14-29. For accurate data, sowing time, replications, varieties, and plants were tagged. Data was collected twice in the research: 4 and 23 May 2023.

#### Statistical analysis:

First, Excel was used to collect data. Statistical analysis was done with Statist 8.1. Statistic 8.1 analyzed data and created an Anova table using analysis of variance. LSD was used for all pair-wise Anova table mean comparisons after storage. Thus, results were reported.

#### Results and discussion:

Creating favourable environmental conditions for zinnia plants can boost their growth and flowering. To accomplish this, three zinnia cultivars were grown and their morphological traits were examined to determine their performance at different sowing times. The average mean morphological traits of zinnia cultivars are shown in Table 1. All morphological traits showed significant differences between zinnia cultivars, according to the analysis of variance. Table 2 shows the average mean morphological traits of zinnia cactus at different sowing times. Table 3 shows the average mean morphological traits of zinnia dwarf at different sowing times.

#### Plant height (cm):

Plant height was measured by tape from ground to flower tip. Cultivar V2 reached 22 cm at maturity (table 1). The S1 cultivar had 25cm V2 height. Overall, V2 is taller than V1. All three sowing times in both cultivars showed a significant height difference, indicating that showing time affects zinnia plant height. Plant growth is most visible in increased height, which is influenced by genetics and cultural practices, especially fertilization (Ahmad HM et al., 2012). Machado et al. (2002) found genotypic differences in plant height. However, plant height

alone cannot predict yield potential without another parameter that accounts for plant spatial variability (Machado et al., 2002).

#### Number of flowers:

Table 1 shows that V2 produced the most flowers, averaging ten. At S2, V2 had 14 flowers, the most. Both varieties showed a significant difference, but VS2 showed a huge difference in flower count at all three sowing times. Humans have used flowers for centuries to beautify their surroundings, symbolize romance, participate in rituals, serve religious functions, provide medicinal benefits, and even as food. Zinnia, grown for ornamental purposes, is valued for their flower production.

#### Flowers diameter (inches):

Flower diameter is one of many factors that affect flower yield. Flower size affects yield. Flower diameter was measured with a digital Verner calliper. Table 1 shows that V1 had the largest flower diameter, 3.9 inches. At S1, V1's flower diameter was 4.06 inches. Both varieties differed significantly at all three sowing times.

#### Leaf area (inches):

Leaf size and shape affect photosynthesis, temperature regulation, and energy exchange. Leaf size may be optimized for water efficiency. Thus, warm-to-hot climates with limited light, like temperate and tropical forest understory, have larger leaves. Increased nutrient uptake and photosynthesis may increase chlorophyll formation and leaf area (Belorkar et al., 2014). In v1, the maximum leaf area was 4.11 inches. Both varieties showed significant variation at all three sowing times (table 2).

#### Number of leaves:

Table 1 shows that V2 had the most leaves per plant, 183, reaching 205 at sowing time S1. Both varieties' leaf counts varied significantly at different sowing times. Plant vegetative traits are heavily influenced by genetics and environment (Lucidos et al., 2016). Regular irrigation helps zinnias grow in hot weather. Along with these factors, the right chemical fertilizers promote shoot and leaf growth, which boosts flower production and quality and extends blooming.

#### Tables:

Table 1: Table of means for morphological traits of zinnia cultivars. (V1- zinnia cactus) (V2- zinnia dwarf)

cultivars	Plant Hight(cm)	No of flower	Leaf Area(inches)	Flower Diameter(inches)	No of Leaf
Cactus	15.5 B	4.11 B	4.06 A	3.9 A	114.56 B

Dwarf	22 A	10 A	3.6 B	3.6 B	183.67 A
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Table 2: Table of means for morphological traits of (V1) zinnia cactus at different sowing time. (s- sowing time)

V1	Zinnia cactus									
V2	Zinnia dwarf									
V3	Zinnia haageana									
S1	Sowing time 1. 2 March 20u23									
S2	Sowing time 2. 14 March 2023									
S3	Sowing time 3. 28 March 2023									
Sowing Time	Plant Hight(cm)		No of flower		Leaf Area(inches)		Flower Diameter(inches)		No of Leaf	
variety	cactus	dwarf	cactus	dwarf	cactus	dwarf	cactus	dwarf	cactus	dwarf
2 March	18 C	25 A	5 CD	10 B	4 A	3.6 C	4.06 A	3.5 CD	130 C	203 A
14 March	15 D	20 B	4 DE	14 A	4.3 B	3.4 C	3.9 AB	3.2 D	101 D	167 B
28 March	13 D	21 B	3 E	6 C	3.9 B	3.9 B	3.7 BC	4.0 A	112 D	180 B

### Conclusion:

Create suitable environmental conditions, choose appropriate cultivars, and follow proper cultural practices to grow high-quality zinnia plants. Low temperatures increase vegetation. Abnormal weather and low temperatures affected plant height, but height increased leaf count. Overall plant growth was greatly affected by sowing times. Early March-grown plants performed best. Early March Zinnia planting is advised. Zinnia dwarf has the most flowers, while cactus has the largest. Z. haageana did not germinate at all three sowing times. Zinnia haageana needs more study.

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