



## Impact of Different Seasons on Flowering Parameters of Odisha Lotus-9 (OL-9), A Local Germplasm of Sacred Lotus (*Nelumbo nucifera* Gaertn.)

Avinash Patnaik and Sashikala Beura\*

Department of Floriculture & Landscaping, College of Agriculture,  
Odisha University of Agriculture and Technology, Bhubaneswar (Odisha), India.

(Corresponding author: Sashikala Beura\*)

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**ABSTRACT:** The present research was done to study the influence of different seasons (summer and rainy) on different flowering parameters of Odisha Lotus-9 (OL-9), a local germplasm of Lotus (*Nelumbo nucifera* Gaertn.). This experiment was laid out in Completely Randomized Design (CRD) with three replications in the Department of Floriculture & Landscaping, on the research plot located at BTCC (Biotechnology cum Tissue Culture Centre) of the Odisha University of Agriculture and Technology, Barmunda, Bhubaneswar, Odisha during 2021-22. OL-9 (*Nelumbo nucifera* Gaertn.) were planted inside the cemented wells exhibited best performance for flowering parameters in terms of petal length (8.78 cm), petal breadth (4.44 cm), length of flower peduncle (68.45 cm), no. of anthers per flower (126.11) and total no. of flowers per plant/month (4.44) in October during rainy season. Rainy season is the best season for flowering and hence peak production during rainy season is favorable to produce flowers and enhance the flowering characters. The revealed data can be utilized for development of lotus as a commercial crop & more advanced studies for improvement.

**Keywords:** *N. nucifera*, *Phalaenopsis*, Completely Randomized Design (CRD), Odisha Lotus-9(OL-9).

### INTRODUCTION

*Nelumbo*, popularly known as Lotus, is the most attractive aquatic plants of India. The Lotus flower is most important due to its national importance in India as a National Flower. The plant has rhizomatous stem, large peltate leaves, some floating and some standing above the water. The genus consists of two species- *N. lutea*, a native of North America, which bears scented yellow flowers and *N. nucifera* is a native to India. The flowers are white, rosy or deep pink in colour, single or double type.

Lotus (*Nelumbo nucifera* Gaertn.), also called Asian lotus, is an aquatic herbaceous perennial plant. *N. nucifera* has an extremely long history in cultivation as a vegetable, medicinal, and ornamental plant in Eastern countries (Wang and Zhang 2004). Sacred lotus is associated with Hindu Gods, Bramha and Vishnu and also cited in Bhagwat 'Geeta'. The lotus flowers & garlands are offered to Gods and Goddesses in temples, the buds of lotus are used in flower arrangements.

*Nelumbo nucifera* stands out not solely for its historical and aesthetic significance but also for the breadth of research elucidating its complex nature (Salaemae *et al.*, 2018b).

The lotus, *Nelumbo nucifera*, is an aquatic plant that plays a central role in the art of Indian religions. In Asian art a lotus throne is a stylized lotus flower used as the seat or base for a figure. It is the normal pedestal for divine figures in Buddhist art and Hindu art. Originating in Indian art, it followed Indian religions

to East Asia in particular. It is also popularly called as Sacred lotus because of its religious significance in Hinduism and Buddhism (Shen-Miller, 2002).

Lotus is considered the most important offering to the God & Goddess. In Jagannath temple Padma Vesha is done on any Saturday or Wednesday between the new moon day of Magha and Basanta Panchami. Prior to the Odia month of Magha, we have the winter season when the lotus disappears from the tanks and reservoirs. But from the month of Magha onwards, these flowers reappear. The lotus signifies 'health and wealth' at the same time. The lotus blossoms when the sun rises in the morning and it is mythologically held that Goddess Lakshmi (the Goddess of Wealth), moves on fully blossomed lotus. In the fitness of things, Lord Jagannath is dressed with the "Vesha of Lotus". This also indicates that gifts of Nature like the lotus must be duly honoured (Pradhani, 2004).

Pink and white lotus flowers is offered to Goddess specially Lakshmi and during few other local festivals at different locations of Odisha. But the city residents are facing difficulty in fetching flowers from the market as it is selling at almost thrice its usual price since florists aren't able to match the high demand during the Puja. Residents had no other options but to purchase white and pink lotuses at high rates. This shows the market demand for the lotus flowers round the year and high at certain time but less supply since only few farmers taken up cultivation of lotus due to lack of systematic research for enhance its commercial production and also government support & awareness.

Odisha has a rich source of lotus germplasm across the State but not yet properly documented or any research work done. So this research work will be the first step towards that. The study aims to understand the impact of different seasons on the plants flowering characters which is essential for horticulturists, florists, landscapers and urban planners. In order to promote country's national flower as a commercial crop across the State.

## MATERIALS AND METHODS

For the experiment Odisha Lotus-9 (OL-9) rhizomes were planted in a cemented well of size 4m diameter and depth of 90cm and replicated thrice. The cemented well was filled with soil upto 1 foot height and filled 1 day before planting. Weeds and stubbles were completely removed. The plants were planted in the cemented well filled up with soil media & organic compost and watered to settle down the soil as well standing water of 2 cm for planting of rhizome. Rhizomes with minimum 3 nodes were planted per pit, hence 3 plants were planted per cemented well and replicated thrice. The rhizomes were planted in the month of March 2021.

The observations on flowering parameters were taken from three sample plants in each replication and recorded at 30 days intervals. Petal length, petal breadth, length of flower peduncle, no. of anthers and total no. of flowers per plant/month were among the flowering characteristics for which data were collected and analyzed statistically following CRD by OP STAT application.

## RESULTS AND DISCUSSION

In the present work, the flowering started from July *i.e.* rainy season in OL-9 which produced single pink type lotus (Fig. 1). Flowering of lotus generally blooms from June to August but the population of flowering can be extended to October (Deng *et al.*, 1990). The data presented in Table 1 for studying the effect of seasons on petal length in OL-9 during 2 seasons revealed that petal length was significantly larger in rainy season with highest petal length (8.78 cm) and highest petal breadth (4.44 cm) recorded in late-rainy season in the treatment T<sub>8</sub> for the month of October 2021 and the data for petal length is on par with T<sub>6</sub> (8.67 cm) for the month of early-rainy. For petal breadth on par with T<sub>7</sub>

(4.33 cm) for the month of September. This indicated the vigorous photosynthetic activities of leaf might have led to the efficient partitioning of photosynthates towards sink as already observed by Wang (2000) in *Phalaenopsis*.

Transition from vegetative development to reproductive development is controlled by temperature, photoperiod, hormone status and available nutrient (Srikanth, 2011).

The highest length of flower peduncle (68.45cm) was recorded for the month of July 2021 in early rainy season for the treatment T<sub>5</sub> and on par with T<sub>7</sub> (September) and T<sub>8</sub> (October) which is a genotype dependant character of OL-9.

The highest number of anthers (126.11) was recorded in early rainy season in the treatment T<sub>5</sub> for the month of July 2021 and on par with T<sub>8</sub> (October, 2021) number of anthers in a flower also depends on the genotype of the germplasm.

The highest number of flowers per plant/month (4.44) was recorded in late rainy season in the treatment T<sub>8</sub> for the month of October 2021 and the data stood on par with T<sub>7</sub> (September, 2021). A balanced supply of nutrients provided by the growing propagules (rhizome) in the growing stage might have promoted the translocation of phytohormones to the shoot which probably induced flower initiation. This confirms the earlier findings of Dezheng *et al.* (2009) where during flower bud differentiation of the lotus plant, high GA concentrations favour the initiation of flower bud differentiation, while low GA concentrations favour the differentiation of flower bud segments. Sacred lotus (*N. nucifera* Gaertn.) has been classified as an LDP, and therefore requires light durations of more than a critical day length for flowering (Qi and Xing 2004). Ishizuna and Tsutsumi (2014) also showed that most flower buds formed by lotus plants aborted in the course of floral development during the growing season (May to October 2021) and mentioned that formed buds that reached blooming stage (complete flower development) may depend on other environmental factors.

The results corroborated with findings of Lin *et al.* (2019), who reported that the flowering period of common lotus cultivars concentrated in summer to rainy *i.e.* from June to September. Lotus is a seasonal flower, and its growth and development are mainly affected by temperature and light.

**Table 1: Impact of seasons on flowering parameters of OL-9 (*Nelumbo nucifera* Gaertn.).**

Characters		Petal length (cm)	Petal breadth (cm)	Length of Flower peduncle (cm)	No. of anthers per flower	No. of flowers per plant/month
Treatments (Months)						
T <sub>1</sub> Mar 21	Summer	0.00	0.00	0.00	0.00	0.00
T <sub>2</sub> Apr 21		0.00	0.00	0.00	0.00	0.00
T <sub>3</sub> May 21		0.00	0.00	0.00	0.00	0.00
T <sub>4</sub> Jun 21		0.00	0.00	0.00	0.00	0.00
T <sub>5</sub> Jul 21	Rainy	8.44	4.28	<b>68.45</b>	<b>126.11</b>	1.28
T <sub>6</sub> Aug 21		<b>8.67</b>	4.22	64.89	124.78	4.22
T <sub>7</sub> Sept 21		8.39	<b>4.33</b>	<b>66.78</b>	124.89	<b>4.33</b>
T <sub>8</sub> Oct 21		<b>8.78</b>	<b>4.44</b>	<b>66.11</b>	<b>125.67</b>	<b>4.44</b>
SE(m) ±		0.05	0.03	1.06	0.29	0.03
CD (5%)		0.15	0.1	3.19	0.87	0.1



**Fig. 1.** Flower of Odisha Lotus -9(OL-9) in the cemented well.

## CONCLUSIONS

Flowering started from the rainy season in OL-9 along with enhanced flowering characteristics of lotus. Higher petal length, petal breadth, length of flower peduncle, total number of anther per flower and no. of flowers per plant/month recorded during rainy season. Higher number of flowers & other enhanced flowering characteristics helps a farmer to estimate its economic return as a commercial crop and researcher to develop new lotus varieties.

## FUTURE SCOPE

Research in this area could lead to commercialization of sacred lotus. More research work can be done to establish different post harvest aspects as a cut flower and value addition of sacred lotus as loose flower. Further research required to develop year round production of lotus by controlling photoperiod and temperature. Also to explore & select lotus germplasm best for landscape gardening.

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**Conflict of Interest.** None.

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