



A PRELIMINARY STUDY ON THE RELATIONSHIP BETWEEN NUMBER OF LEAVES AND FLOWER QUALITY AND LONGEVITY IN *TULIPA LANATA* REGEL

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Tulipa lanata Regel popularly known as Gul-i-Lala in Kashmir for its attractive scarlet blooms is an alien naturalized ornamental found growing wild across the valley. The plant is 3, 4 or 5-leaved and produces solitary terminal blooms on a scape immediately after winter during ending March to beginning of May. 4-leaved plants are comparatively more common. Generally 3-leaved plants have flowers with larger fresh and dry weight followed by 5-leaved and 4-leaved plants. The flower on an average lasts for ten days under field conditions while an average vase life of 8 days has been recorded in plain deionized water at room temperature. A general positive relationship between leaf area and floral size, fresh and dry weight, longevity and post harvest life has been recorded during the course of present study.

Key words: Flower quality, Leaf area, Longevity, *Tulipa lanata*, Vase life

Tulip belonging to the family Liliaceae is one of the most important bulbous ornamental plants cultivated for cut flower, potted or garden plant and for landscaping. It occupies 4th position among the top ten cut flowers in global floriculture trade (Jhon and Neelofer 2006). Tulips are native to the mountainous areas of Central Asia and originated from the Pamir Alai and Tien Shan mountain ranges and have been cultivated for more than 500 years (Hoog 1973). There are about 150 species of tulips including 75 wild ones (Christenhusz *et al.* 2013). Many tulip varieties have been developed mainly in the Netherlands and more than 8,000 of them have been included in the list of 'tulips names' (Van Scheepen 1996). The Netherlands remains world's main producer of commercially sold tulips, producing as many as 3 billion bulbs annually, mostly for export, playing a very important role in the Dutch economy. In India, tulips are grown successfully in temperate regions of Jammu and Kashmir, Himachal Pradesh and Uttarakhand but do not grow well in plains owing to high chilling requirement for flowering and daughter bulb formation. Its showy 6-tepalled flowers with a wide range of attractive colors and exquisite shapes are borne on scapes which may be 10-70 cm in height with a rosette of 2 - 6 or sometimes 12 strap-

shaped alternately arranged leaves at ground level. Tulips normally produce a single flower but in *Tulipa turkestanica*, a scape bears up to four flowers.

Tulipa lanata Regel grows wild in Tajikistan, Afganistan, Pakistan and Western Himalayas. In Kashmir province of north-western Indian Himalayan state of Jammu and Kashmir this 'Mughal Tulip' or 'Gul-i-Lala' as it is popularly known, is considered to be a naturalized alien ornamental plant growing at 1600m-2700m elevations (Khuroo *et al.* 2007). During the months of April and May, thousands of scarlet blooms of this species can be seen growing in the world famous Pampore saffron fields. The plant also grows in some other cultivated *karewa* lands throughout Kashmir. Scanty information is available on various aspects of its growth and flowering besides flower longevity and vase life. The purpose of the present study was, therefore to investigate growth cycle, floral longevity and some other floral characters in *Tulipa lanata* with the aim of its possible exploitation as a garden plant and a cut flower.

MATERIALS AND METHODS

Field observations on growth and flowering of

Tulipa lanata were recorded at different sites in Pampore saffron fields near Srinagar.

Number of leaves per plant, maximum leaf width and leaf area were recorded when the flowers started opening. Leaf area (cm²) was measured by Leaf area meter.

Floral diameter (cm) was calculated as mean of two perpendicular measurements across a fully open flower.

Flower fresh weight (g) was measured at fully open stage. Dry weight (g) was determined after drying them in a forced draught oven at 70°C for 48 hours.

Flower longevity was counted as days from opening to 50% wilting under field conditions.

For recording vase life, the scapes with mature buds about to open next day were harvested at ground level and delivered to the laboratory (18 ±2°C) and placed in beakers containing deionized water. The vase life was counted in days from the second day of harvest till the flower lost its decorative value.

RESULTS AND DISCUSSION

The bulbs of *Tulipa lanata* are usually 2-5 cm across and found at an appreciable depth sometimes more than one foot below ground level in the field. Roots start coming out from the base of these bulbs in the month of October and November. During the months of December and January the plant enters in the rest phase. This cool dormancy is essential for blooming. In the months of February and March, active growth takes place and leaves and floral buds start pushing up above the ground level producing beautiful large sized scarlet blooms during ending March to beginning of May. Floral stalk may be up to 60 cm long, major portion of which remains under ground. Leaves 3-5 in number are sessile, lanceolate to oblong having undulate margins and with a waxy coating (Fig. 1 A & B). Plants with 4 leaves were noted to be more common. Out of the total number of plants observed at twelve different places across the enormous Pampore saffron fields during the course of

present study, 10% - 25% were 3-leaved, 62.5% - 90.6% were 4-leaved and 3.1% - 12.5% were 5-leaved. Scapes above ground are 10-20 cm in height bearing a large sized terminal scarlet flower with 6 tepals each possessing a black blotch at the base on inner side and are light colored outside (Fig 1 C & D). The recorded data is presented in the Table 1. Highest leaf width (4.5 cm), individual leaf area (60.8 cm²), flower fresh weight (5.136 g) and dry weight (2.422 g) was recorded in 3-leaved plants while highest total leaf area (239.7 cm²), flower diameter (10.9 cm), flower longevity (11.8 days) and vase life (8.9 days) was found in 5-leaved plants. In a study on tulip cv. Cassini, flower diameter and vase life of 6.95 cm and 7.43 days has been recorded (Neelofer *et al.* 2007). In *Tulipa gesneriana* cv. Apeldoorn flower diameter, number of leaves/plant and leaf area of 6.22 cm, 3.33 and 74.10 cm² respectively has been recorded while in cv. Golden Oxford the values were 6.0 cm, 3.33 and 58.47 cm² in that order (Ahmed *et al.* 2013). In yet another study flower diameter, number of leaves/plant, leaf area and vase life of 5.40 cm, 3.62, 120.90 cm² and 7.30 days respectively has been recorded in *Tulipa gesneriana* (Kumar *et al.* 2013).

Our results have indicated a more or less positive relationship between total leaf area and floral diameter, fresh and dry weight, longevity and post harvest life. However, a general observation was that 3-leaved plants usually have flowers with larger fresh and dry weight followed by 5-leaved and 4-leaved plants. More leaf area means more photosynthesis and consequently more assimilates for growth of all plant parts including bulbs. Bigger the bulb size more will be the number of leaves. Flower senescence is marked by appearance of small colorless patches first at the central portion of a tepal and then towards the margins resulting in loss of turgidity and consequent wilting first at the tips followed by withering of whole flower in 2 or 3 days. After the blooming period is over, the assimilates are translocated from senescing above ground parts of the plant to the bulbs for regeneration and multiplication during the

Table 1. Leaf area, flower diameter, fresh weight, dry weight, longevity and vase life in *Tulipa lanata*

Plant type	Leaf width (cm)	Leaf area (cm ²)	Total leaf area/plant (cm ²)	Flower diameter (cm)	Fresh weight/flower (g)	Dry weight/flower (g)	Flower longevity (days)	Vase life (days)
3-leaved	4.5± 0.2	60.8± 3.9	182.4± 11.8	9.9±0.3	5.136± 0.278	2.422± 0.169	10.5±0.1	8.0±0.0
4-leaved	3.3± 0.1	44.2± 2.3	176.6± 9.3	9.5±0.3	3.984± 0.272	1.374± 0.199	10.6±0.2	8.5±0.0
5-leaved	3.6± 0.1	47.9± 2.5	239.7± 17.1	10.9±0.3	4.983± 0.445	2.074± 0.234	11.8±0.2	8.9±0.0

(Values are means of at least 20 plants/flowers ± SE)

**Figure 1.** *Tulipa lanata* Regel with three (A) and five (B) leaves, flowering plant (C) and flower from inside showing dark blotches (D)

months of May to September. The senescence of aboveground tissues is followed by root senescence before the plant enters an apparently dormant period without visible organogenesis. Tulip is thus a 'geophyte' with very short above ground growth period in spring surviving through the winter period in the form of the bulbs which are specialized underground storage organs. During the development of tulip flowers, three phases can be distinguished (Boonekamp *et al.* 1990): (I) the initiation and formation of a new sprout with flower (at high temperature) (II) the internal preparation for stem elongation (at low temperature) and (III) the rapid elongation of the sprout (at high temperature). Tulip bulbs, with a terminal bud containing a complete flower, require 12-16 weeks of low temperature treatment for floral stalk elongation. The duration of the cold treatment is a major factor determining stalk growth and flowering. Different species demand various temperature optima, but in general, the optimal temperature for the initial organogenesis ranges from 15- 21°C, while low positive temperature is required for the development of a flower stalk and well-formed flowers (De Hertogh and le Nard 1993). This period of autumn-winter cooling seems to be extremely important for flower development, as its absence leads to slow shoot growth and severe flowering disorders (Khodorova and Boitel-Conti 2013). Since the size of the bulb is considered to be one of the major parameters that influence the quality of flowers, low temperature conditions are more favorable during the aboveground growth of early spring plants. This will promote the production of larger underground organs and flowers in the next spring. Our present study has also revealed that larger bulbs have the ability to produce more number of leaves with comparatively large sized flowers having higher flower longevity and vase life.

CONCLUSION

The plant of *Tulipa lanata* may be 3, 4 or 5-leaved producing solitary terminal scarlet blooms on a scape immediately after winter

during ending March to beginning of May. 4-leaved plants are comparatively more common. Higher number of leaves result in comparatively larger sized flowers with higher flower longevity under field conditions with a higher vase life.

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