

## **Elicitation of tuberose concrete, deliberation of recovery and qualitative examination from *Agave amica* L. cv Arka Prajwal**

### **Abstract**

The objective of the study aimed the flower yield and concrete yield of *Agave amica* L. The different treatments was imposed for the study and the concrete recovery percentage was compared with all the treatments in which marigold was imposed as intercrop and also with the control without intercropping. The flowers were extracted with the solvent namely hexane. The maximum concrete recovery was recorded in the treatment T1 (0.171 % and 0.157 %), followed by T2 (0.167 % and 0.145 %) and the minimum recovery of the concrete was found in T6 (0.104 % and 0.103 %) in the first year and second year. The shelf life in the treatment T1 (5.53 days) recorded maximum number of days and the minimum was found with T6 (4.63 days). The maximum vase life of tuberose was observed in T1 (6.92 days) and the minimum was registered by T6 (5.41 days).

**Keywords: Concrete, tuberose, hexane, shelf life**

### **Introduction**

Tuberose bears pure white flowers with one row/ whorl of corolla segment. Flowers are highly scented and are extensively used for loose flower purpose, essential oil and concrete extraction. Single types are more fragrant than double. Concrete content has been observed to be 0.08 to 0.11 per cent. Loose flowers are used for making floral ornaments. Its floral buds are greenish white. Also the per cent seed setting is high in single. Single Mexican, Kalyani Single, Shringar, Prajwal, Arka Nirantara, Rajat Rekha, Hyderabad Single, Calcutta Single, Phule Rajani, Kahikuchi Single, Pune Single are main varieties. This hybrid which bears single type flowers on tall stiff spikes is a cross between ‘Shringar’ x ‘Mexican Single’.

The hybrid was released by Indian Institute of Horticultural Research (IIHR), Bangalore. The flower buds are slightly pinkish in colour, while the flowers are white. The individual florets are large in size, compared to ‘Local Single’. It yields twenty per cent more loose flowers than ‘Shringar’. It is recommended both for loose flower and cut flower purpose. Tuberose is valued much by the aesthetic world for their beauty; the flowers are attractive and elegant in appearance with sweet fragrance. It has long been cherished for the aromatic oils and there is high demand for tuberose concrete and absolute in the international markets which fetch a very good price. The bulbs of tuberose are reported to contain an alkaloid lycorine, which causes vomiting. The bulbs are considered diuretic and emetic. The

aim of this study is to assess the quality of the flowers harvested as a result of the intercropping of tuberose with marigold.

Tuberose is cultivated in large scale in France, South Africa, North Carolina, U.S.A and in many tropical and subtropical areas including India. In India, the commercial cultivation of tuberose is done mainly in Mysore, Devanhalli taluk (Karnataka), East Godavari, Guntur, Chittoor, Krishna districts of Andhra Pradesh, Dahrmapur and Coimbatore (Tamil Nadu), Pune, Thane, Sangli (Maharashtra), Bagnen, Kolaghat, Midnapore, Panskura, Ranaghat, Krishnanagar (West Bengal). At present the total area under tuberose cultivation in the country is estimated to be about 3,000 hectare.

## **Materials and methods**

### **Materials used**

Flowers were soaked for 1 litre of each solvent for 1 hour. Remove debris, the solvents were evaporated leaving the concrete behind. Tuberose absolute was extracted from each concrete sample using alcohol. Physical appearances such as color, odour and other characteristics were observed for all extracts. Yield of the extract from each method were assessed, compared and used to determine the saturation point of fat, oil and solvent to absorb the scent from the tuberose flowers.

### **Methods/ Modus operandi**

**Solvent extraction method:** The solvent extraction method is also known as liquid-liquid extraction for the separation of compounds based on their relative solubilities in two different immiscible liquids namely water and an organic solvent. The simplest extraction can be done with the help of the above liquids.

**Chemical composition analysis:** Absolutes in hexane 100 ppm were analysed for their main chemical components by Shimadzu QP5050A gas chromatography mass spectrometry. The interpretation of the mass spectrum of the parts was compared with the known compounds stored in the NIST library. The name of the compounds, molecular weight and the structures of the components of the samples were found from this library.

### **Concrete recovery (%)**

The concrete extraction from the flowers were harvested during full bloom stage (*ie.*, before 9.30 A.M.). The extraction used is solvent extraction (ASTA, 1960) with food grade hexane. Then, the average is calculated and expressed in terms of percentage. The sample (50 g) was weighed and kept in column made up of glass of Soxhlet apparatus. The estimation of

the concrete was done with the help of hexane (food grade) as a solvent. The extract soluble in nature was drained into a pre weighed 100 ml empty beaker ( $W_1$ ). Then, the extract was kept for evaporation with the help of steam bath and heated for 30 minutes in an oven at a temperature of 60° C. Afterwards, cooled and weighed ( $W_2$ ). The percentage of concrete was calculated by using the formula,

$$\text{Concrete recovery (\%)} = \frac{W_2 - W_1}{50} \times 100$$

### Shelf life (days)

The duration of flowering of a single spike was counted from the day of opening of the first pair of the florets to the day of last pair of florets of the spike.

### Vase life (days)

When one or two basal florets were opened the harvesting of the spikes was done. It was followed by stem cleaning and the base was cut and the stalk was placed under water. The spikes that was harvested was kept under ordinary tap water. The longevity was recorded in terms of days. At the stage of dropping of the florets, was considered and taken as an index for the end of vase life.

## Results and discussion

Maximum recovery of the concrete was observed in the treatment T1 with 3 rows of tuberose as the sole crop and a row of marigold as an intercrop T1 (0.171 % and 0.157 %), followed by T2 (0.167 % and 0.145 %) and the recovery percentage was minimum and was found in T6 (0.104 % and 0.103 %) in two years. The shelf life registered with maximum number of days in T1 (5.53 days) and lesser days was observed in T6 (4.63 days). The treatment T1 recorded 6.92 days of shelf life and the least number of days was found in T6 with 5.41 days. Table 1 furnished below represents the quality parameters of tuberose. The pictorial (Figures 1, 2 and 3) and graphical representation (Figure 4) was given below.

The cv Arka Prajwal registered maximum concrete recovery (0.171%) in T<sub>1</sub> followed by T<sub>2</sub> (0.167 %) and the minimum recovery percentage was found in T<sub>6</sub> (0.104 %). The concrete recovery of single petalled tuberose was registered from 0.134-0.136% was reported by Srinivas *et al.* 1996. In single type of tuberose, the concrete recovery was recorded as 0.161% (Chaudhary and Kumar, 2017). The concrete obtained from single petalled flowers possess stronger aroma than double petalled tuberose varieties. There exists a reduction in the concrete due to the increase in temperature and also by the reduction in the weight of the flowers as well as by evaporation of oil content during evening hours than in the morning

(Chaudhary and Kumar, 2017). In *Rosa damascena* the highest oil content was recorded with flowers harvested during morning hours (Kumar *et al.* 2013; Toncer *et al.*, 2016). The reason is that if there is an increase in the temperature results in the removal of the essential oils present in the trichomes of the floral parts (Kumar *et al.*, 2013).

Priyanka *et al.* (2020) reported that among the seventeen single petalled cultivars evaluated, the maximum number of days for the storage of spike in the vase solution was recorded as 10.85 days incase of Prajwal whereas in Bidhan Rajani-I was 9.38 days. Bidhan Rajani registered the maximum number of field life with 19.99 days followed by Prajwal with 17.60 days. The increase in the field and vase life might be due to the reason that the above mentioned genotypes has more sturdy spikes with maximum number of bold buds. The parameters vary due to the reason that difference in the production as well as by the supply and assimilates storage or carbohydrates which showed variations morphologically also in the photosynthates production. A major role was played by ethylene and thus extending or reducing the vase life.

**Table 1. Performance of tuberose genotypes for quality parameters**

| S.No. | TREATMENTS  | CONCRETE<br>1 <sup>st</sup> year | CONCRETE<br>2 <sup>nd</sup> year | SHELF<br>LIFE | VASE LIFE     |
|-------|-------------|----------------------------------|----------------------------------|---------------|---------------|
| 1.    | <b>T1</b>   | 0.171                            | 0.157                            | 5.53          | 6.92          |
| 2.    | <b>T2</b>   | 0.167                            | 0.145                            | 5.35          | 6.79          |
| 3.    | <b>T3</b>   | 0.151                            | 0.133                            | 5.15          | 6.67          |
| 4.    | <b>T4</b>   | 0.138                            | 0.127                            | 5.07          | 6.65          |
| 5.    | <b>T5</b>   | 0.113                            | 0.116                            | 4.94          | 5.85          |
| 6.    | <b>T6</b>   | 0.104                            | 0.103                            | 4.63          | 5.41          |
|       | <b>MEAN</b> | <b>0.1428</b>                    | <b>0.1306</b>                    | <b>5.1150</b> | <b>6.3867</b> |
|       | <b>SEd</b>  | <b>0.0060</b>                    | <b>0.0005</b>                    | <b>0.0222</b> | <b>0.0244</b> |
|       | <b>CD</b>   | <b>0.0127</b>                    | <b>0.0011</b>                    | <b>0.0474</b> | <b>0.0520</b> |
|       | <b>CV</b>   | <b>5.92</b>                      | <b>0.53</b>                      | <b>0.61</b>   | <b>0.54</b>   |

**Fig. 1 and 2: The concrete obtained through solvent extraction method and evaporation of hexane**



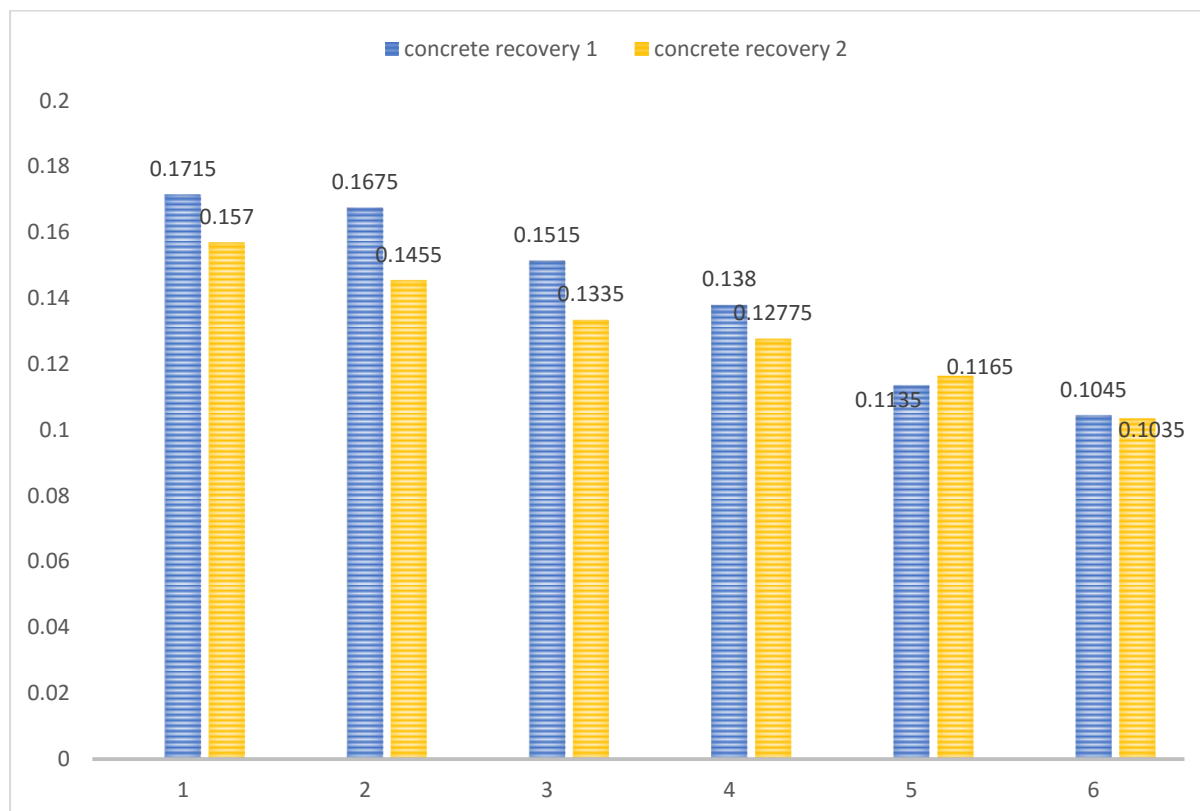
**Fig 1. Concrete obtained through solvent extraction**



**Fig. 2. Evaporation of hexane**



**Fig. 3. Comparison of the concrete of the T1 and T6**



**Fig 4. Graphical representation of the concrete of two years**

## Conclusion

The study concluded the harvesting of flowers during morning hours has more influence on the concrete recovery in tuberose and the compounds identified has applications in plant growth promotion. The single types are more suitable than double type since the double type has lesser oil content when compared with single type (Hussain, 1992; Hussain, 1986). The identified compounds acts as an inhibitor, solvent, defense compounds, phytochemicals and their biological significance can help in the pharmacological applications.

## Reference

Hussain, A. (1992). Essential oils from ornamentals. In: *Ornamental Horticulture in India*. ICAR. Pp. 191-197.

Hussain, A. (1986). In: *Ornamental Horticulture in India*. ICAR. New Delhi.

Kumar R, Sharma S, Sood S, Agnihorti VK, Singh B. Effect of diurnal variability and storage conditions on essential oil content and quality of damask rose (*Rosa damascena* Mill.) flowers in north western Himalayas. *Sci. Hort.* 2013; **154**:102-108.

Ratna Priyanka. R, Kannan. M, Ganga. M, Kumaravadivel. N and Poornima. K. 2020. Studies on crossability, genetic divergence and resistance to root knot nematode in tuberose (*Agave amica* Medik. Syn. *Polianthes tuberosa* L.)

Saborni Maiti and Adinpunya Mitra\*. 2017. Morphological, physiological and ultrastructural changes in flowers explain the Spatio-Temporal emission of Scent Volatiles in *Polianthes tuberosa* L. *Plant Cell. Physiol.* **58(12)**: 2111.

Sirohi, U.M. Kumar, S.K. Singh, P. Chauhan, R. Kumar and P.Chand. 2018. Study on genetic variability, heritability, genetic advance and character association in tuberose (*Polianthes tuberosa* L.)

Sathish Kumar. R, Anburaj. G, Subramanian. S, Vasantha. S and Panneer Selvam A. 2019. Preliminary phytochemical investigation, antimicrobial activity and GC-MS analysis of leaf extract of *Capparis zeylanica* Linn. **8(1)**: 1399-1405.

Toncer O, Karaman S, Diraz E, Sogut T, Kizil S. 2016. Diurnal variation effects in essential oils of wild thyme (*Thymbra spicata* var *spicata* L.) under cultivation conditions, *TEPQ*.**19 (8)**: 2037-2048.

Veena Chaudhary and Mukesh Kumar. 2017. Effect of harvesting time of flowers on concrete and absolute recovery in tuberose (*Polianthes tuberosa* L.): a comparative study of single and double petalled cultivars. *International Journal of Chmeical Studies*. **5(4)**: 1416-1420.