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AGRONOMY

# Standardization of Glycerinisation for Leaves of Silver Oak (*Grevillea robusta*), Kanchan (*Bauhinia purpurea*) and Pipal (*Ficus religiosa*)

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**Abstract**

Studies were carried out to standardize the dehydration technology for leaves of kanchan, pipal and silver oak under laboratory conditions in the Department of Post Harvest Technology of Horticultural Crops, Faculty of Horticulture, Bidhan Chandra Krishi Vishwavidyalaya, Nadia, West Bengal during 2012-13. The foliages were subjected to four treatments replicated four times containing five foliage per replication. An experiment was carried out by placing only the stems or dipping the foliages in the glycerine solution, which were harvested at matured stage. The parameters like change in fresh weight and change in leaf area. Other quality parameters like texture, shape, brittleness, colour retention and over all acceptance were also recorded. Findings of results revealed that best results were obtain terms of texture, shape, brittleness, over-all acceptability was maximum in glycerine (20%) by uptake method for silver oak with high flexibility and glossiness. However, in case of kanchan glycerine (20%) by uptake method gave best result with similar attributes followed by glycerine (40%). In Pipal leaves, glycerine (40%) by dip method showed best results with maximum retention of colour.

**Highlights**

- Ideal concentration of glycerine best suited for preservation varied from species to species and method of treatment.
- Best results were obtained in terms of texture, shape, brittleness, over-all acceptability for silver oak in glycerine-20% by uptake method.

**Keywords**: Brittleness, colour, glycerine, Kanchan, pipal, silver oak

Drying and preserving foliage and flowers is a form of artistic way of expressing since ancient times (Lourdusamy *et al.,* 2001). Cut flowers or foliages though exquisite in nature but cannot be retain for longer period of time. On the other hand beauty and everlasting value can be can be preserve by applying different dehydration which can be kept and cherish for years without losing their appearance and decorative value. Many workers have used glycerine for Preservation of foliage. It was comparatively less expensive and has high water attracting capacity (Joyce 1998). Many foliages have been successfully preserved by either immersing leaves or placing crushing stems in 33 per cent glycerol solution. The resultant leaves are soft and flexible (Dana 1993). Therefore, in present study efforts were made to preserve foliages of Silver oak (*Grevillea robusta*), Kanchan (*Bauhinia purpurea*) and Pipal (*Ficus religiosa*) by using glycerine as drying tool.

## Materials and Methods

Two methods of glycerinisation were employed for dehydration of foliages which was conducted

under laboratory conditions in the Department of Post Harvest Technology of Horticultural Crops, Faculty of Horticulture, Bidhan Chandra Krishi Vishwavidyalaya, Nadia, and West Bengal during 2012-13. Matured foliages were collected from the naturally available trees around the campus. The experiment was laid out in Completely Randomised Design with four replications containing five leaves per replication. Electronic balance was used to record changes in fresh weight and change in leaf area was calculated using graph paper by recording initial and final shape. Other quality parameters like texture, shape, brittleness and over-all acceptance were assessed by means of sensory evaluation by scoring on a ten point hedonic scale (Ranganna 1997). Royal Horticultural Mini Colour Chart was used to note change in colour of foliage during the experiment.

## Results and Discussion

### *Changes in fresh weight*

Study of fresh weight change showed that there was significant difference in some cases as well as non-significant results in other treatments (Fig. 1 to 6). For silver oak, maximum (26.72%) uptake was recorded in glycerine-20% and minimum uptake (9.21%) in control in dip method. In uptake method, maximum (22.22%) uptake was observed in glycerine-20% and minimum uptake in control. In case of kanchan, maximum (8.81%) uptake by dip method was observed in glycerine-20% followed by glycerine-40% and minimum (2.53%) in control whereas in uptake method, glycerine-20% showed maximum (8.29%) uptake and least in control. In pipal leaves, glycerine-20% showed maximum (14.89%) uptake and uptake was minimum (4.44%) in control by dip method. However, in uptake method there was no uptake of the solution.

### *Leaf area reduction*

Change in leaf area reduction (%) did not show significant differences among the different treatments used for preserving the leaves of silver oak, kanchan and pipal. However, in case of silver oak, maximum leaf area reduction (30.02%) was obtained in control by uptake method and minimum (2.29%) in glycerine-20% by uptake method. Reduction of leaf area (9.43%) was found to be maximum in control by uptake method for the leaves of kanchan and minimum (1.15%) in glycerine-20% by uptake method. Similarly, in case of pipal the maximum leaf area reduction (10.55%) was obtained in control by uptake method and minimum (1.02%) in glycerine-20% by uptake method (Fig. 7)

### *Sensory attributes*

Significant differences among the different treatments on the sensory qualities were obtained for the leaves of pipal, silver oak and kanchan. (Table 1 to 3). In silver oak, texture of foliages scored best (8.75) in glycerine-20% by uptake method and least score of 3 was recorded in control whereas in Kanchan leaves highest score of 7.55 was retained in glycerine-20% by uptake method and least score of 5.5 in control. Similarly, in pipal maximum score of 8.22 was recorded in dip method when treated with glycerine-40% and minimum score of 5.5 in control by uptake method.

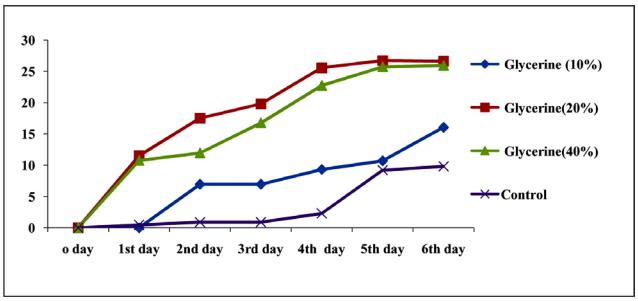


**Fig. 1:** Effect of different concentration of glycerine on fresh weight change (%) of Silver oak by dip method

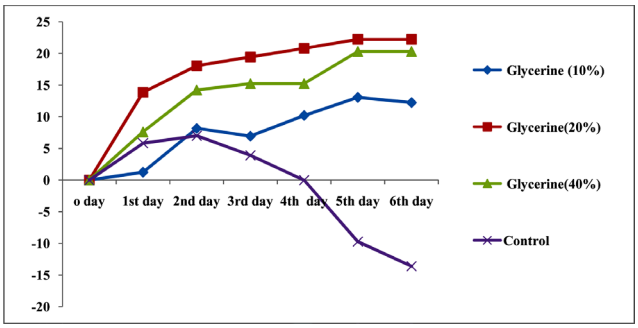


**Fig. 2:** Effect of different concentration of glycerine on fresh weight change (%) of Silver oak by uptake method

Retention of shape when the foliages were treated with different treatments pronounced the significant effect on the foliage of pipal, kanchan and silver oak. Leaves of silver oak scored maximum points of 4.47 in glycerine-20% by uptake method and showed

minimum points of 3.54 when kept under control by dip method. In case, of kanchan highest (4.75) shape retention was observed in glycerine-20% by uptake method and least retention (2.75) in control by uptake method. Likewise for pipal, maximum score (4.4) was obtained in glycerine-40% by dip method and minimum score (3.1) in control by uptake method.

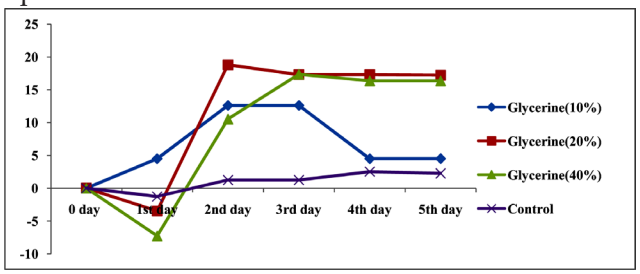


**Fig 3:** Effect of different concentration of glycerine on fresh weight change (%) of Kanchan by dip method

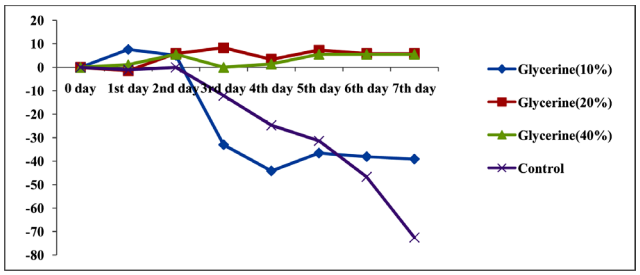


**Fig. 4:** Effect of different concentration of glycerine on fresh weight change (%) of Kanchan by uptake method

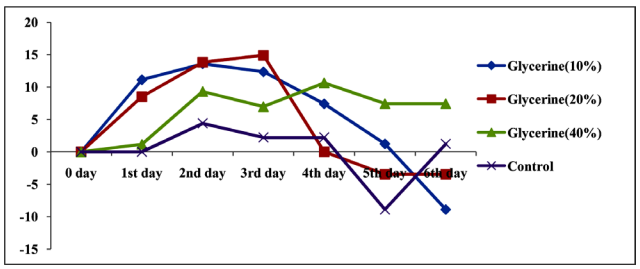


**Fig. 5:** Effect of different concentration of glycerine on fresh weight change (%) of Pipal by dip method

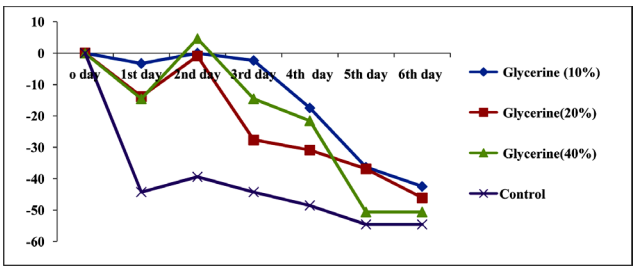


**Fig. 6:** Effect of different concentration of glycerine on fresh weight change (%) of Pipal by uptake method

As per the observation recorded by sensory evaluation, brittleness was not observed in in glycerine-10%, glycerine -20% and glycerine-40% for leaves of silver oak and kanchan, except in pipal done by uptake method. However, in all the cases brittleness observed in control for all the samples.

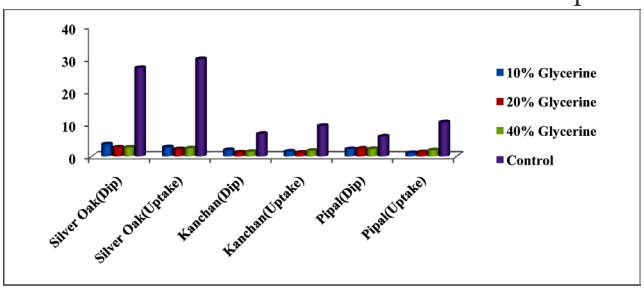


**Fig. 7:** Effect of glycerine on % reduction in leaf area

Retention of colour was recorded, as per Royal Horticultural Colour Chart by panel of judges. Colour of leaves gradually changes after employing different treatments. In silver oak leaves, intensity of colour changes to deeper shade for all the treatments and lighter RHS136C in control by uptake method. For leaves of kanchan, dip method retained deeper shade RHS199A and all treatments in uptake method retained deep colour RHSN 199A and RHSN 199C respectively, however, in control by dip method colour retention RHS152B differed from the others to lighter shade. In Pipal, initially colour of leaves was RHS137A and best retention was obtained to RHS 137C by dip method when treated with 40% glycerine while least retention of RHS199A was observed in glycerine 40% by dip method.

The over-all acceptability of glycerinized foliages differed significantly with the different treatments for different foliages. Leaves of silver oak showed most acceptable (8.85) when treated with glycerine-20% by uptake method and least (4.88) acceptable in control by uptake method. Foliages of kanchan when treated with glycerine-20% by uptake method exhibited maximum (8.68) acceptability and least (5.64) in control by uptake method. In case of pipal, over-all acceptability was highest (8.51) in dip method when glycerine-40% was used for treatment and showed least (5.85) acceptable in control by uptake method.

Glycerine ($CH_2OH.CHOH.CH_2OH$) is a thick syrupy sweetish liquid triol soluble in water and occurs in combination with fatty acid in fats and oil. The effectiveness of treatment in the experiment may be due to glycerine, where the water molecule

**Table 1:** Effect of glycerine on sensory qualities on leaves of Silver oak

| Treatments | Texture (1-9) | | Shape retention (1-9) | | Brittleness Yes/No | | Over all acceptability (1-9) | | Colour (RHS Colour chart) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dip | | Uptake | |
| | Dip | Uptake | Dip | Uptake | Dip | Uptake | Dip | Uptake | Before | After | Before | After |
| Glycerine (10%) | 7 | 6.75 | 8.25 | 8.1 | No | No | 7.63 | 7.43 | RHS 136A | RHSN 186A | RHS 136A | RHSN 186A |
| Glycerine (20%) | 8.25 | 8.75 | 8.5 | 8.95 | No | No | 8.35 | 8.85 | RHS 136A | RHSN 186A | RHS 136A | RHSN 186A |
| Glycerine (40%) | 8 | 7.75 | 8.55 | 8.9 | No | No | 8.28 | 8.33 | RHS 136A | RHSN 186A | RHS 136A | RHSN 186A |
| Control | 3 | 4 | 7.05 | 5.75 | Yes | Yes | 5.03 | 4.88 | RHS 136A | RHS 137C | RHS 136A | RHS 137C |
| S.Em(±) | 0.37 | 0.29 | NS | 0.23 | | | 0.34 | | 0.21 | | | |
| CD at 5% | 1.15 | 0.91 | | 0.70 | | | 1.04 | | 0.62 | | | |

**Table 2:** Effect of glycerine on sensory qualities on leaves of Kanchan

| Treatments | Texture (1-9) | | Shape retention (1-9) | | Brittleness Yes/No | | Over all acceptability (1-9) | | Colour (RHS Colour chart) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dip | | Uptake | |
| | Dip | Uptake | Dip | Uptake | Dip | Uptake | Dip | Uptake | Before | After | Before | After |
| Glycerine (10%) | 6 | 7.5 | 9 | 8 | No | No | 7.5 | 7.75 | RHS 144A | RHS 199A | RHS 144A | RHSN 199C |
| Glycerine (20%) | 7.25 | 7.75 | 9 | 9.62 | No | No | 8.13 | 8.68 | RHS 144A | RHS 199A | RHS 144A | RHSN 199A |
| Glycerine (40%) | 7.5 | 5.5 | 9 | 9.5 | No | No | 8.25 | 7.5 | RHS 144A | RHS 199A | RHS 144A | RHSN 199A |
| Control | 5.5 | 5.77 | 7 | 5.5 | Yes | Yes | 6.25 | 5.64 | RHS 144A | RHS 152B | RHS 144A | RHSN 199A |
| S.Em(±) | 0.37 | 0.29 | NS | 0.57 | | | 0.33 | 0.36 | | | | |
| CD at 5% | 1.15 | 0.95 | | 1.76 | | | 0.99 | 1.08 | | | | |

**Table 3:** Effect of glycerine on sensory qualities on leaves of Pipal

| Treatments | Texture (1-9) | | Shape retention (1-9) | | Brittleness Yes/No | | Over all acceptability (1-9) | | Colour (RHS Colour chart) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Dip | | Uptake | |
| | Dip | Uptake | Dip | Uptake | Dip | Uptake | Dip | Uptake | Before | After | Before | After |
| Glycerine (10%) | 8.02 | 6.02 | 8.2 | 6.46 | No | Yes | 8.11 | 6.24 | RHS 137A | RHS 152B | RHS 137A | RHS 152B |
| Glycerine (20%) | 8.25 | 6.45 | 8.1 | 6.4 | No | Yes | 8.3 | 6.43 | RHS 137A | RHS 199A | RHS 137A | RHS 152B |
| Glycerine (40%) | 8.22 | 6.5 | 8.8 | 7.95 | No | Yes | 8.51 | 7.23 | RHS 137A | RHS 137C | RHS 137A | RHS 152B |
| Control | 6.15 | 5.5 | 7.65 | 6.2 | Yes | Yes | 6.9 | 5.85 | RHS 137A | RHS 152B | RHS 137A | RHS 152B |
| S.Em(±) | 0.14 | 0.25 | 0.22 | NS | | | 0.15 | 0.14 | | | | |
| CD at 5% | 0.44 | 0.79 | 0.68 | | | | 0.45 | 0.43 | | | | |

inside the cell was replaced by the glycerine solution by process of osmosis. Studies in plant cell showed that, turgid cell containing cell sap with certain osmotic concentration when placed in solution of higher osmotic concentration (hypertonic solution) than the cell sap; exosmosis takes place and hypertonic solution try to become isotonic. The solution inside the cell sap is then replaced by the hypertonic solution as reported by (Mitra *et al.*, 1997). Glycerine has been used by various workers especially to preserved foliage. No relevant works were found with proper scientific justification; however the incident could be explained by simple osmosis.

Glycerine preserves foliages by replacing the natural moisture present in leaves with a substance that reduces its form, texture and sometimes colour. About 50% of most plant fresh weight is water but brittleness is usually only the problem if water content falls below 10 per cent. At high humidity, all humectants absorb a great deal of water from the atmosphere, and also so proportionally less humectant is required to keep foliage supple. At 90% Relative humidity, glycerol will have a water content of 215 g per g of glycerol. Humectants are absorbed into plant tissues either by transpiration or by immersing the cut foliage in humectants solution.

Preserving foliage in glycerine and hot water solution brings them to everlasting category. In glycerine drying the quality of flowers of product found to be good as moisture in flower is replaced by mixture of water and glycerine. It serves as a good source for micro organism so a pinch of antibiotic is needed to prevent microbial growth in the dried specimen. It replaces the water consist of leaves giving them a strong and stable nature. The preserving solution consists of one part of glycerine and two parts hot water along with the addition of chloro-hexidine to reduce bacterial growth. Most foliage preserved by glycerine turns brown but remain pliable. This technique makes the leaves and stem soft, pliable and long lasting so that they may be used over and over.

## Conclusion

Results of the experiment showed that the ideal concentration of glycerine best suited for preservation varied from species to species and method of treatment. Best results were obtained in terms of texture, shape, brittleness, over-all acceptability for silver oak in glycerine-20% by uptake method with high flexibility and glossiness. However, in case of kanchan glycerine-20% by uptake method gave best result with similar attributes followed by glycerine-40%. In pipal leaves, glycerine-40% by dip method was most effective.

## Photos

Control (RHS 136A) Glycerine (20%) (RHS186A)

**Silver oak in uptake method**

Control (RHS 144A) Glycerine (20%) (RHS199A)

**Kanchan in uptake method**

Glycerine (20%) (RHS 137C) Control (RHS152C)

**Pipal in dip method**

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