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# POST HARVEST PACKAGE TECHNOLOGY FOR DISTANT MARKETING OF GLADIOLUS SPIKES

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**ABSTRACT**

The three-year investigation conducted between 2017-18 to 2019-20 at AICRP on Floriculture, Horticulture Research Station, Kahikuchi Center in Assam aimed to enhance postharvest packaging technology for distant marketing of gladiolus spikes, particularly focusing on the White Prosperity variety. Harvesting was executed at two stages: the tight bud stage and when 4-5 florets showed coloration. The study employed a Factorial Completely Randomized Design (CRD). Six diverse packaging treatments (LDPE-100 gauge thick, PP-100 gauge thick, cellophane, newspaper, gunny bags, and no packing material) were utilized to evaluate their impact on spike quality during simulated transit in Controlled Environment Fibreboard (CFB) boxes. Several parameters including basal floret opening days, overall vase life, floret opening percentage, second floret diameter (in cm) and weight loss after simulated transit were recorded. The findings suggest harvesting of gladiolus spikes at the tight bud stage and wrapping them in Low-Density Polyethylene (LDPE) significantly enhances vase life, floret opening, floret diameter and weight loss after simulated transits.

***Key words :*** Cellophane, Gladiolus, Newspaper, Tight bud, Vase life.

## Introduction

Cut flower cultivation stands as a prominent sector within ornamental horticulture. The quality and longevity of cut flowers are influenced by an array of factors occurring before and after harvest (Fanourakis *et al.*, 2013; Jêdrzejuk *et al.*, 2018). *Gladiolus grandiflorus* is recognized as a specialized cut flower of significant commercial value, holding a position among the top five in the international market for cutflowers (Darras, 2021). It is cultivated worldwide because of its attractive flower spikes containing a considerable quantity of florets per spike (Islam and Haque, 2011; Memon *et al.*, 2012). Its vibrant and diverse range of colours, striking tall spikes, and elegant florets make it a favoured choice for floral arrangements, bouquets and ornamental gardens (Lepcha *et al.*, 2007). Typically, gladiolus flower spikes have a lifespan of 7-8 days when immersed in tap water (Singh and Sharma, 2003; Singh *et al.*, 2008). However, despite its widespread popularity, the postharvest handling and preservation of gladiolus flowers presents significant challenges for growers due to the limited vase life of most cut flowers. Unlike fruits and vegetables, extending the vase life of cut flowers relies on a continuous supply of water and carbohydrates (Halevy and Mayak, 1979; Singh and Sharma, 2003**)**. Thus, the inclusion of chemical preservatives in water is advised as a means to prolong the vase life of flowers. A refrigerated van can maintain the quality of flowers during extended shipping over long distances. Nelofar and Paul (2008) reported marked decline in both the quality and longevity of gladiolus flowers as the duration of storage increased. Gladiolus faces postharvest challenges like wilting, yellowing and petal issues, impacting market value. Materials like cellophane, card board and paper are used for flower protection. Standardizing postharvest processes targets temperature, humidity, packaging and transport, meeting demand for quality gladiolus, boosting market edge and ensuring sustainability in the floral industry. Considering this view, the current research entitled Postharvest package technology for distant marketing of gladiolus spikes has been studied.

## Materials and Methods

The three-year study conducted from 2017-18 to 2019-20 at AICRP on Floriculture, Horticulture research station, Kahikuchi Center in Assam focused on improving postharvest package technology for the distant marketing of gladiolus spikes, particularly the White Prosperity variety. The harvesting process was carried out at two distinct stages: the tight bud stage and when 4-5 florets displayed color.

To assess the impact of packaging on spike quality during transit, six different packaging treatments were employed, including LDPE-100 gauge thick, PP-100 gauge thick, cellophane, newspaper, gunny bags and an open treatment with no packing material. Simulated transit conditions were replicated using Controlled Environment Fibre board (CFB) boxes, with a duration of 24 hours, and each treatment was replicated four times. The experimental design followed a Factorial Completely Randomized Design (CRD).

Prior to packaging, the gladiolus flower spikes underwent a pulsing treatment with a 20% sucrose solution for a period of 16 hours to enhance their postharvest life and quality. Several crucial parameters were recorded to evaluate the effectiveness of different packaging treatments and the pulsing process. These parameters included the number of days required for basal florets to open in a vase, the overall vase life in days, the percentage of floret opening, the diameter of the second floret in centimeters, and the percentage of weight loss after simulating transit conditions.

## Results and Discussion

Pooled data of days for basal floret to open in vase of the gladiolus cv. White Prosperity of three years (2017-18 to 2019-20) was presented in Table 1. The effect of stages of harvest on the days for basal floret to open in vase of pooled data was found to be significant. The pooled data is concerned the minimum days for basal floret to open in vase (2.73 days) was recorded in $S_1$ (Tight bud). This might be due to flower's physiological condition i.e., internal mechanisms such as cell expansion and hormonal adjustments require time to facilitate the blossoming process. This delay functions as a safeguard, ensuring the flower opens when conditions are optimal for pollination and for a longer vase life. The maximum days for basal floret to open in vase of pooled data (3.26 days) was recorded in $S_2$ (4-5 Floret show colour). Moreover, the effect of packaging materials on the days for basal floret to open in vase of pooled data was found to be non-significant. The interaction effect between stage of harvest and packaging materials on days for basal floret to open in vase of pooled data was found to be significant. The minimum days for basal floret to open in vase of pooled data (2.65 days) was recorded in $S_1P_4$ (Tight bud + Newspaper) i.e., newspaper's role in maintaining favourable humidity and temperature conditions, creating an environment conducive to accelerated blooming. The inherent gradual development of the "Tight bud" stage further benefits from these optimal external conditions. Moreover, which was statistically at par with $S_1P_1$ (Tight bud + LDPE-100G), $S_1P_2$ (Tight bud + PP-100G), $S_1P_3$ (Tight bud + Cellophane), $S_1P_5$ (Tight bud + Gunny bag), ), $S_1P_6$ (Tight bud + Open), $S_2P_1$ (4-5 Floret show colour + LDPE-100G), $S_2P_2$ (4-5 Floret show colour + PP-100G) and $S_2P_5$ (4-5 Floret show colour + Gunny bag) and which had duration for basal floret to open in vase were 2.75 days, 2.68 days, 2.80 days, 2.77 days, 2.73 days, 3.10 days, 3.06 days and 3.24 days, respectively. The maximum days for basal floret to open in vase of pooled data (3.45 days) was recorded in $S_2P_4$ (4-5 Floret show colour + Newspaper). Similar findings were obtained by Miano (2015) in dendrobium Sonia.

From the given below data (Table 1), pooled data of vase life (days) of the gladiolus cv. White Prosperity of three years (2017-18 to 2019-20) was presented.The effect of stages of harveston vase life (days) of pooled data was found to be non-significant. However, the effect of packaging materials on vase life (days) of pooled data was found to be significant. The maximum vase life of pooled data (9.18 days) was recorded in $P_1$ (LDPE-100G) and which was statistically at par with $P_2$ (PP-100G) and $P_3$ (Cellophane), which had vase life of 9.01 and 8.25, respectively. The minimum vase life of pooled data (5.88 days) was recorded in $P_6$ (Open). The reduced transpiration of water and decreased carbohydrate respiration at lower temperatures when using polypropylene wrapping help preserve the fresh weight and cell turgidity of cut spikes during cold storage. Similar findings for maximum vase life have been Hatibarua and Devi (2022) for chrysanthemum cv. Birbal Sahni and Varu and Barad (2008) for tuberose cv. Double. The interaction effect between stage of harvest and packaging materials on vase life of pooled data was found to be significant. The maximum vase life of pooled data (9.59 days) was recorded in $S_1P_1$ (Tight bud + LDPE-100G) + and which was statistically at par with $S_1P_2$ (Tight bud + PP-100G), $S_1P_5$ (Tight bud + Gunny bag) and $S_2P_1$ (4-5 Floret show

**Table 1 :** Effect of stages of harvest and packaging material on postharvest characters of gladiolus cv. White Prosperity spikes for distant marketing (Pooled 2017-18 to 2019-20).

| Treatments | Days for basalfloret to open in vase | | | | Vase life(days) | | | | Opening of florets(%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 17-18 | 18-19 | 19-20 | Pooled | 17-18 | 18-19 | 19-20 | Pooled | 17-18 | 18-19 | 19-20 | Pooled |
| **Stages of harvest** | | | | | | | | | | | | |
| $S_1$ Tight bud | 2.68 | 2.67 | 2.85 | **2.73** | 8.79 | 8.79 | 6.68 | 8.09 | 75.66 | 76.18 | 74.77 | 75.43 |
| $S_2$ 4-5 Floret show colour | 3.36 | 3.36 | 3.06 | 3.26 | 8.06 | 8.11 | 6.26 | 7.50 | 67.04 | 68.30 | 71.66 | 69.00 |
| S. Ed. (±) | 0.30 | 0.27 | 0.17 | 0.29 | 0.43 | 0.38 | 0.22 | 0.98 | 5.85 | 2.23 | 4.48 | 5.71 |
| C. D. (0.05) | 0.60 | 0.56 | 0.35 | 0.60 | 0.88 | 0.78 | 0.45 | 2.03/NS | 11.93 | 4.54 | 9.14 | 11.78/NS |
| **Packaging materials** | | | | | | | | | | | | |
| $P_1$ LDPE-100G | 2.75 | 2.75 | 3.29 | 2.93 | 10.54 | 10.08 | 7.39 | **9.18** | 79.44 | 79.44 | 80.14 | **79.67** |
| $P_2$ PP-100G | 2.67 | 2.72 | 3.23 | 2.87 | 9.50 | 10.00 | 7.07 | **9.01** | 75.55 | 77.56 | 83.88 | **79.00** |
| $P_3$ Cellophane | 2.96 | 2.98 | 3.23 | 3.06 | 9.00 | 9.03 | 6.71 | **8.25** | 72.06 | 72.58 | 75.42 | **73.40** |
| $P_4$ Newspaper | 3.13 | 3.13 | 2.90 | 3.05 | 8.21 | 8.22 | 6.42 | 7.62 | 72.55 | 71.65 | 73.11 | 72.12 |
| $P_5$ Gunny bag | 3.17 | 3.20 | 2.70 | 3.02 | 7.17 | 7.24 | 6.06 | 6.82 | 68.91 | 69.95 | 64.93 | 67.94 |
| $P_6$ Open | 3.43 | 3.30 | 2.40 | 3.05 | 6.13 | 6.16 | 5.18 | 5.88 | 59.61 | 62.28 | 61.82 | 61.23 |
| S. Ed. (±) | 0.17 | 0.16 | 0.10 | 0.41 | 0.25 | 0.22 | 0.13 | 0.57 | 3.38 | 1.29 | 2.59 | 3.30 |
| C. D. (0.05) | 0.35 | 0.32 | 0.21 | NS | 0.51 | 0.45 | 0.26 | 1.17 | 6.89 | 2.62 | 5.27 | 6.80 |
| **Interaction effects** | | | | | | | | | | | | |
| $S_1$ x $P_1$ | 2.50 | 2.48 | 3.27 | **2.75** | 10.67 | 10.58 | 7.53 | **9.59** | 82.61 | 82.68 | 81.57 | **82.29** |
| $S_1$ x $P_2$ | 2.42 | 2.45 | 3.18 | **2.68** | 10.42 | 10.45 | 7.27 | **9.38** | 81.08 | 82.10 | 82.43 | **81.87** |
| $S_1$ x $P_3$ | 2.59 | 2.60 | 3.20 | **2.80** | 9.33 | 9.36 | 6.88 | 8.52 | 78.77 | 78.78 | 78.67 | **78.71** |
| $S_1$ x $P_4$ | 2.67 | 2.66 | 2.63 | **2.65** | 8.92 | 8.90 | 6.50 | 8.11 | 75.08 | 75.20 | 75.73 | 75.34 |
| $S_1$ x $P_5$ | 2.92 | 2.90 | 2.50 | **2.77** | 7.33 | 7.35 | 6.25 | **8.98** | 74.35 | 75.40 | 67.07 | 72.27 |
| $S_1$ x $P_6$ | 3.00 | 2.99 | 2.30 | **2.73** | 6.09 | 6.11 | 5.63 | 5.94 | 60.08 | 63.10 | 63.13 | 62.10 |
| $S_2$ x $P_1$ | 3.00 | 3.01 | 3.30 | **3.10** | 9.50 | 9.57 | 7.25 | **8.77** | 76.27 | 76.20 | 78.70 | 77.06 |
| $S_2$ x $P_2$ | 2.92 | 3.0 | 3.27 | **3.06** | 9.50 | 9.55 | 6.87 | 8.64 | 70.01 | 73.02 | 85.33 | 76.12 |
| $S_2$ x $P_3$ | 3.33 | 3.36 | 3.25 | 3.31 | 8.67 | 8.70 | 6.53 | 7.97 | 65.34 | 66.38 | 72.17 | 67.96 |
| $S_2$ x $P_4$ | 3.59 | 3.60 | 3.17 | 3.45 | 7.50 | 7.54 | 6.33 | 7.12 | 68.03 | 68.20 | 70.48 | 68.90 |
| $S_2$ x $P_5$ | 3.42 | 3.44 | 2.87 | **3.24** | 7.00 | 7.12 | 5.87 | 6.66 | 63.46 | 64.56 | 62.78 | 63.60 |
| $S_2$ x $P_6$ | 3.92 | 3.70 | 2.50 | 3.37 | 6.17 | 6.20 | 4.73 | 5.70 | 59.14 | 61.45 | 60.50 | 60.36 |
| S. Ed. (±) | 0.12 | 0.11 | 0.07 | 0.29 | 0.18 | 0.16 | 0.09 | 0.40 | 2.39 | 0.91 | 1.83 | 2.33 |
| C. D. (0.05) | 0.25 | 0.23 | 0.14 | 0.60 | 0.36 | 0.32 | 0.18 | 0.83 | 4.87 | 1.85 | 3.73 | 4.81 |

colour + LDPE-100G), which had vase life of 9.38 days, 8.98 days and 8.77 days, respectively. The minimum vase life of pooled data (5.70 days) was recorded in $S_2P_6$ (4-5 Floret show colour + Newspaper). This might be characterized by decreased metabolic activity and lower external stress, extends flowers' post-cut life at tight bud stage. While, LDPE-100G preservation, possibly due to its composition or application, creates an ideal microenvironment. This helps reduce water loss, limit microbial growth and sustain vital physiological processes, ensuring the flowers' longevity.

Pooled data of opening of florets (%) of the gladiolus cv. White Prosperity of three years (2017-18 to 2019-20) was presented in Table 1. The effect of stages of harvest on opening of florets (%) of pooled data was found to be non-significant. Moreover, the effect of packaging materials on opening of florets (%) of pooled data was found to be significant. The maximum opening of florets of pooled data (79.67 %) was recorded in $P_1$ (LDPE-100G) and which was statistically at par with $P_2$ (PP-100G) and $P_3$ (Cellophane), which had vase life of 79.00 (%) and 73.40 (%), respectively. The minimum opening of florets of pooled data (61.23%) was recorded in $P_6$ (Open). LDPE-100G likely provided an optimal environment conducive to floret development and blooming. This preservation technique might have maintained adequate moisture levels, minimized stress, and regulated gas exchange, enabling the flowers to undergo their natural developmental processes effectively. The results were similar to Naz (2003) findings in rose for maximum opening of florets. The interaction effect between stage of harvest and packaging materials on opening of florets (%) of pooled data was found to be significant. The maximum opening of florets of pooled data (9.59 days) was recorded in $S_1P_1$ (Tight bud + LDPE-100G) and which was statistically at par with $S_1P_2$ (Tight bud + PP-100G), $S_1P_3$ (Tight bud + Cellophane) and which had vase life of 82.29 (%), 81.87 (%) and 78.71 (%), respectively. The initial tight bud phase represents flowers encounter reduced stress, enhancing their ability to sustain blooming once harvested. Moreover, the application of LDPE-100G may have sustained optimal moisture levels, minimized stress and promoted a balanced gas exchange, facilitating a gradual and healthy blooming cycle for an extended duration. The minimum opening of florets of pooled data (60.36 %) was recorded in $S_2P_6$ (4-5 Floret show colour + Newspaper.

Pooled data ofdiameter of 2nd floret (cm of the gladiolus cv. White Prosperity of three years (2017-18 to 2019- 20) was presented in Table 2. The effect of stages of harvest on diameter of 2nd floret (cm) of pooled data was found to be non-significant. While, the effect of packaging materials on diameter of 2nd floret (cm) of pooled data was found to be significant. The maximum diameter of 2nd floret of pooled data (10.54 cm) was recorded in $P_2$ (PP-100G) and which was statistically at par with $P_1$ (LDPE-100G) and $P_3$ (Cellophane), which had diameter of 2nd floret of 10.52 cm and 10.41 cm, respectively. The minimum diameter of 2nd floret of pooled data (10.29 cm) was recorded in $P_6$ (Open). This might be characterized by PP-100G likely creates an optimal environment for the florets and maintains of high $CO_2$ and low $O_2$, promoting ideal growth conditions by ensuring adequate moisture retention, balanced nutrient availability, and potentially regulating gas exchange. This favourable environment supports robust and healthy development, leading to an increased diameter of the florets in Gladiolus. The interaction effect between stage of harvest and packaging materials on diameter of 2nd floret (cm) of pooled data was found to be significant. The maximum diameter of 2nd floret of pooled data (3.25) was recorded in $S_1P_1$ (Tight bud + LDPE-100G) and which was statistically at par with $S_1P_2$ (Tight bud + PP-100G) and which had diameter of 2nd floret of 10.63 cm. The minimum diameter of 2nd floret of pooled data (10.27 cm) was recorded in $S_2P_6$ (4-5 Floret show colour + Newspaper). The combined effect of the advantageous tight bud stage and the supportive conditions provided by LDPE-100G preservation maintaining necessary moisture levels, minimizing stress factors, and supporting nutrient uptake leading to an increased diameter in Gladiolus florets. Similar results for maximum diameter were noticed by Kumar *et al*. (2011) for *Chrysanthemum morifolium* Ramat. cv. Shanti.

From Table 2, pooled data of weight loss after simulated transit (%) of the gladiolus cv. White Prosperity of three years (2017-18 to 2019-20) was presented. The effect of stages of harvest on weight loss after simulated transit (%) of pooled data was found to be non-significant. While, the effect of packaging materials stages on weight loss after simulated transit (%) of pooled data was found to be significant. The minimum weight loss after simulated transit of pooled data (3.32%) was recorded in $P_1$ (LDPE-100G) and which was statistically at par with $P_2$ (PP-100G) and $P_3$ (Cellophane) which had weight loss after simulated transit of 3.88 (%) and 4.32 (%), respectively. LDPE-100G likely created a protective barrier around the flowers, shielding them from adverse environmental conditions during transit. This preservation technique may have effectively minimized moisture loss, reduced physical damage and provided insulation against external stressors. The optimal protective environment established by LDPE-100G helped maintain the flowers' integrity and reduced weight loss during transit, ultimately resulting in the minimal percentage recorded in P1 of Gladiolus. The maximum weight loss after simulated transit of pooled data (7.80%) was recorded in $P_6$ (Open). From the above findings, it can be concluded that, LDPE was recorded minimum weight loss. Similar results were found by Roychowdhury *et al*. (2008) in tuberose. The interaction effect between the stage of harvest and packaging materials on weight loss after simulated transit (%) of pooled data was found to be significant. The minimum weight loss after simulated transit of pooled data (10.66 cm) was recorded in $S_2P_1$ (4-5 Floret show colour + LDPE-100G) and was at par with $S_2P_2$ (4-5 Floret show colour + PP-100G), $S_2P_3$ (4-5 Floret show colour + Cellophane), $S_1P_1$ (Tight bud + LDPE-100G), $S_1P_2$ (Tight bud + PP-100G) and $S_1P_3$

**Table 2 :** Effect of stages of harvest and packaging material on postharvest characters of gladiolus cv. White Prosperity spikes for distant marketing (Pooled 2017-18 to 2019-20).

| Treatments | Dia. of 2nd floret (cm) | | | | Weight loss after simulated transit (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | **17-18** | **18-19** | **19-20** | **Pooled** | **17-18** | **18-19** | **19-20** | **Pooled** |
| **Stages of harvest** | | | | | | | | |
| $S_1$ Tight bud | 10.46 | 10.44 | 10.48 | 10.46 | 4.12 | 4.00 | 7.73 | 5.28 |
| $S_2$ 4-5 floret show colour | 10.36 | 10.34 | 10.33 | 10.34 | 4.83 | 4.81 | 6.61 | 5.42 |
| S. Ed. (±) | 0.15 | 0.16 | 0.15 | 0.07 | 1.50 | 0.62 | 1.40 | 1.61 |
| C. D. (0.05) | 0.30 | NS | 0.30/NS | 0.15/NS | NS | NS | NS | NS |
| **Packaging materials** | | | | | | | | |
| $P_1$ LDPE-100G | 10.54 | 10.50 | 10.51 | **10.52** | 2.23 | 2.31 | 5.41 | **3.32** |
| $P_2$ PP-100G | 10.55 | 10.52 | 10.54 | **10.54** | 2.81 | 2.81 | 6.01 | **3.88** |
| $P_3$ Cellophane | 10.42 | 10.38 | 10.42 | **10.41** | 3.02 | 2.92 | 7.01 | **4.32** |
| $P_4$ Newspaper | 10.30 | 10.33 | 10.35 | 10.33 | 4.74 | 4.82 | 7.46 | 5.67 |
| $P_5$ Gunny bag | 10.33 | 10.32 | 10.34 | 10.33 | 6.64 | 6.58 | 8.10 | 7.11 |
| $P_6$ Open | 10.30 | 10.29 | 10.27 | 10.29 | 7.39 | 7.00 | 9.02 | 7.80 |
| S. Ed. (±) | 0.18 | 0.09 | 0.09 | 0.04 | 0.86 | 0.36 | 0.81 | 0.92 |
| C. D. (0.05) | 0.17 | 0.19 | 0.18 | 0.85 | 1.76 | 0.73 | 1.65 | 1.92 |
| **Interaction effects** | | | | | | | | |
| $S_1$ x $P_{1\ ldpe100}$ | 10.68 | 10.65 | 10.64 | **10.66** | 1.89 | 1.90 | 6.35 | **3.38** |
| $S_1$ x $P_{2\ pp100}$ | 10.63 | 10.62 | 10.63 | **10.63** | 2.45 | 2.42 | 6.59 | **3.82** |
| $S_1$ x $P_{3\ cello}$ | 10.47 | 10.40 | 10.52 | 10.46 | 2.37 | 2.35 | 7.49 | **4.07** |
| $S_1$ x $P_{4\ newspaper}$ | 10.32 | 10.33 | 10.37 | 10.34 | 5.30 | 5.33 | 7.82 | 6.15 |
| $S_1$ x $P_{5\ gunny\ bag}$ | 10.31 | 10.32 | 10.43 | 10.35 | 5.89 | 5.78 | 8.80 | 6.82 |
| $S_1$ x $P_{6\ open}$ | 10.34 | 10.28 | 10.28 | 10.30 | 6.82 | 6.20 | 9.32 | 7.45 |
| $S_2$ x $P_1$ | 10.40 | 10.39 | 10.37 | 10.39 | 2.58 | 2.70 | 4.46 | **3.25** |
| $S_2$ x $P_2$ | 10.48 | 10.43 | 10.45 | 10.45 | 3.18 | 3.20 | 5.42 | **3.93** |
| $S_2$ x $P_3$ | 10.38 | 10.36 | 10.32 | 10.35 | 3.68 | 3.50 | 6.53 | **4.57** |
| $S_2$ x $P_4$ | 10.28 | 10.27 | 10.33 | 10.29 | 4.20 | 4.30 | 7.10 | 5.20 |
| $S_2$ x $P_5$ | 10.35 | 10.32 | 10.25 | 10.31 | 7.40 | 7.37 | 7.40 | 7.39 |
| $S_2$ x $P_6$ | 10.26 | 10.30 | 10.25 | 10.27 | 7.95 | 7.80 | 8.72 | 8.16 |
| S. Ed. (±) | 0.06 | 0.07 | 0.06 | 0.03 | 0.60 | 0.25 | 0.54 | 0.66 |
| C. D. (0.05) | 0.12 | 0.14 | 0.12 | 0.06 | 1.25 | 0.51 | 1.17 | 1.36 |

(Tight bud + Cellophane) and which had of 3.93 (%), 4.57 (%), 3.38 (%), 3.82 (%) and 4.07 (%), respectively. The maximum weight loss after simulated transit of pooled data (8.16 %) was recorded in $S_2P_6$ (4-5 Floret show colour + Newspaper).

## Conclusion

Based on the findings obtained from the present investigation on various post-harvest packaging technologies for distant marketing of gladiolus spikes, it can be concluded that harvesting of gladiolus spikes at the tight bud stage and enveloping them with Low-Density Polyethylene (LDPE) enhances vase life, promotes floret opening, and increases floret diameter. LDPE emerges as the preferred packaging material. Conversely, spikes wrapped with newspaper after harvesting at the tight bud stage resulted in the minimum number of days required for basal floret opening. Harvesting spikes with 4-5 florets displaying color and wrapping them with LDPE minimizes weight loss after simulated transit.

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