*Original Research Article*

# Standardization on effect of storage and packaging materials on shelf life and quality of ridge gourd (*Luffa acutangula*L)


## Abstract

An investigation was carried out to study the effect of storage and packaging materials on shelf life and quality of ridge gourd at PG Laboratory, College of Horticulture, Rajendranagar. The experiment design is factorial completely randomized design with eight packaging materials as factor-1 and three elite treatments as factor-2 with a total of twenty four (24) treatments replicated thrice. The results revealed that, thePolyethylene 200 gauge with 2% vent and Vermicompost 12 t/ha+ Arka microbial consortium was the best in extending the shelf life of the ridge gourd fruits.



**Keywords:** Ridge gourd, Packaging materials, Shelf life, Storage


## 1. Introduction

Ridge gourd (*Luffa acutangula*L) which is also called as silky gourd, kalitori. It belongs to family Cucurbitaceae and is native to India. It can be found throughout the tropical and subtropical regions and is cultivated for its green tender fruits during spring-summer and rainy seasons when the temperature ranges between 20 - 32°C. The unripe fruits are consumed as a cooked vegetable and nutritionally the fruits are rich in several minerals and vitamins. Each 100 g of edible fresh fruit contains around 5 mg vitamin C, 0.01mg riboflavin, 33 µg carotene, 92.5% moisture, 0.5g protein, 0.5 g fat, 3.4 g carbohydrate, 18 mg calcium, 26 mg phosphorous and 0.5 mg iron (Sheshadri and Parthasarthy, 1980) and it is an excellent blood purifier, possessing laxative properties, beneficial for diabetes, jaundice and weight loss.

The primary objective of packaging fruits and vegetables is to protect them during storage, transportation and distribution from deterioration, which may be physical, chemical or biological. Packaging is hence provided at the point of production or at distribution centers. Though packaging constitutes the last link in the chain of production, storage, marketing and distribution. It still plays an important role in delivering the contents safely to the end consumers. Increase in production can have an impact on the consumer only when good

quality produce is available to them, at an economical price. As earlier, about 20 to 30 percent of vegetables are spoiled or become substandard during storage and distribution. This enormous wastage, which results in product scarcity and higher prices, attributed to improper handling methods, poor packaging, and inadequate transportation facilities (Chakravarty *et al*., 2003). Packaging has a great significance in reducing wastage of fresh fruits and vegetables. Hence, experiments were conducted to study the effect of packaging materials on shelf life of ridge gourd.

## 2. Materials and methods

The laboratory experiment was conducted during *Kharif* 2021 and Summer 2022, and the experimental design followed is Factorial CRD consisting of 24 treatments which replicated thrice at PG Laboratory, College of Horticulture, Rajendranagar to standardize the suitable packaging material on shelf life of ridge gourd at ambient temperature. Among the 24 treatments, factor-1 consists of 8 treatments *i.e*., $P_1$: Polyethylene 200 guage with 1% ventilation, $P_2$: Polyethylene 200 guage with 2% ventilation, $P_3$: CFB box (1% vent), $P_4$: Newspaper, $P_5$: Polyethylene + CFB box (1% vent), $P_6$: Newspaper + CFB box (1% vent), $P_7$: Wetted gunny bag, $P_8$: Without packing and three treatments in factor-2*viz*., $F_1$: First best from first experiment (Among organic manure $T_7$- Vermicompost (12t/ha) + Arka microbial consortium), $F_2$: First best from second experiment ($T_1$- RDF+ *Trichoderma viride*), $F_3$: First best from third experiment ($T_5$- RDF+ Silver black polythene sheet). The physico-chemical parameters like Physiological loss in weight (%), Shelf life (days), TSS ($^o$Brix), Ascorbic acid content (mg/100g), Titratable acidity (%), Firmness (kg/cm$^2$ ), Chlorophyll content of fruit (DA meter reading) data were recorded. The data were analyzed statistically and interpreted.

## 3. Results and discussion

### 3.1 Physiological Loss in Weight (%)

The effect of packaging materials and elite treatments on physiological loss in weight (PLW) (%) in ridge gourd stored at room temperature and are presented in Table 1 and 2.

The per cent PLW values showing an increasing trend from 3$^{rd}$ day to 7$^{th}$ day. There was a significant difference observed among all the treatments. Interaction effect between packaging materials and factors was also significant.

***Kharif* season**

On 3rd day of storage, $P_2$ (Polyethylene 200 guage with 2% vent) recorded the least PLW (7.71) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (8.24) and the highest PLW (15.32) was recorded in $P_8$ (without packing).

With respect to the elite treatments, the lowest PLW (9.95) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the highest PLW (11.41) was recorded in $F_3$-First best from third experiment ($T_5$- RDF+ Silver black polythene sheet).

Among interactions, effect between different packaging materials and elite treatments, $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha) + Arka microbial consortium recorded significantly the least PLW (6.84) followed by $P_1F_1$ (7.59), while the highest PLW (15.85) recorded in $P_8F_2$- Control.

**Summer season**

On 3rd day of storage, $P_2$ (Polyethylene 200 guage with 2% vent) recorded the least PLW (7.73) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (8.19) and the highest PLW (15.33) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the lowest PLW (10.08) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the highest PLW (10.70) was recorded in $F_3$: First best from third experiment ($T_5$- RDF+ Silver black polythene sheet).

Among interactions, effect between different packaging materials and elite treatments, $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha) + Arka microbial consortium recorded significantly the least PLW (7.06) followed by $P_1F_1$ (7.65), while the highest PLW (15.62) was recorded in $P_8F_2$ - Control (15.62).

The mean values recorded among the PLW of ridge gourd fruits at 5th and 7th day at storage during *Kharif* and Summer season. A similar trend of increasing in respect of PLW was observed.

At room temperature, there was a gradual increase in physiological loss in weight percentage with increase in days of storage. The reduction in physiological loss in weight of ridge gourd stored in ventilated polythene bags arrest moisture loss and maintained turgidity.

However, oxygen depletion, $CO_2$ accumulation occurred in polythene bags resulting in low rate of respiration (Bindiya and Srihari, 2013). The similar result was observed by Attri*et al.* (2002) in chilli and Mangal *et al.* (2001) in brinjal.

### 3.2 Shelf life (days)

Shelf life of ridge gourd with the effect of packaging materials and elite treatments stored at room temperature was significant and are presented in the Table 3.

***Kharif* season**

Higher shelf life (6.34) was recorded in $P_2$ (Polyethylene 200 guage with 2% vent) which was on par with $P_1$ (Polyethylene 200 guage with 1% vent) (6.23) and lower shelf life (4.08) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the highest shelf life (6.94) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the lowest shelf life (4.66) was recorded in $F_3$ -First best from third experiment ($T_5$- RDF+ Silver black polythene sheet).

Among interactions, effect between different packaging materials and elite treatments, $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha) + Arka microbial consortium recorded significantly highest shelf life (7.83) followed by $P_1F_1$ (7.73), $P_3F_1$ (7.67), while the lowest shelf life was recorded in $P_8F_2$ (3.08).

**Summer season**

Higher shelf life (6.26) was recorded in $P_2$ (Polyethylene 200 guage with 2% vent) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (6.09) and the lowest shelf life (3.97) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the highest shelf life (6.66) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial

consortium and the lowest shelf life (4.48) was recorded in $F_2$:First best from second experiment ($T_1$- RDF+ *Trichoderma viride*).

Among interactions, effect between different packaging materials and elite treatments, $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha+ Arka microbial consortium recorded significantly the highest shelf life (7.79) followed by $P_1F_1$ (7.65), while the lowest shelf life was recorded in $P_8F_2$ (3.02).

The extended shelf life observed with ventilated polyethylene bags may be due to optimum level of humidity and modified gaseous composition inside the bags which did not favour the growth of fungus, but in polyethylene bags without ventilation, which favours fungal growth leading to reduced storage life. These results are in confirmation with the results obtained by earlier workers Anandaswamy*et al*. (1989) in capsicum, Lingaiah *et al*. (1983) in bell pepper, Badgujar *et al*. (1987) and Viraktamath*et al*. (1963) in brinjal, Saimbhi and Ranohawa (1983) in okra.

**3.3 Total soluble solids (°Brix)**

The effect of packaging materials and elite treatments in ridge gourd on total soluble solids stored at room temperature and are presented in the Table 4 and 5.

***Kharif* season**

Total soluble solids increased with the storage period at room temperature up to 7$^{th}$ day. There was a significant difference observed among all the treatments. Interaction effect between packaging materials and elite treatments was non-significant.

On the 1$^{st}$ day of storage, $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest TSS (4.55) which was on par with $P_1$ (Polyethylene 200 guage with 1% vent) (4.48) and the lowest TSS (3.99) was recorded in $P_8$-(without packing).

On 3$^{rd}$ day $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest TSS (4.75) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (4.62) and the lowest TSS (4.21) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the highest TSS (4.62, 4.71) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the lowest TSS was recorded in $F_3$:First best from third experiment ($T_5$- RDF+ Silver black polythene sheet) (4.05, 4.20) on 1$^{st}$ and 3$^{rd}$ day of storage respectively.

Among interactions effect, there was no significant difference between different packaging materials and elite treatments on 1st day, Whereas, on 3rd day there was significant difference observed among the interactions. The highest TSS (4.93) was recorded in $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha) + Arka microbial consortium followed by $P_1F_1$ (4.82), $P_2F_2$ (4.78), while the lowest TSS (3.93) was recorded in $P_8F_3$- Control.

**Summer season**

Total soluble solids increased with the storage period at room temperature up to 7th day. There was significant difference observed among all the treatments. Interaction effect between packaging materials and elite treatments was non-significant.

On the 1st day of storage, $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest TSS (4.60) which was on par with $P_1$ (Polyethylene 200 guage with 1% vent) (4.50) and the lowest TSS (4.05) was recorded in $P_8$-(without packing).

On 3rd day, $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest TSS (4.78) which was on par with $P_1$ (Polyethylene 200 guage with 1% vent) (4.71) and the lowest TSS (4.26) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the highest TSS (4.60, 4.72) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the lowest TSS was recorded in $F_3$: First best from third experiment ($T_5$- RDF+ Silver black polythene sheet) (4.12, 4.31) on 1st and 3rd day of storage respectively.

Among interactions effect, there was no significant difference between different packaging materials and elite treatments.

The mean values recorded among the TSS of ridge gourd fruits at 5th and 7th day at storage during *Kharif* and Summer season. A similar increasing trend in respect of TSS was observed.

**3.4 Ascorbic acid content (mg/100g)**

The effect of packaging materials and elite treatments in ridge gourd on ascorbic acid content stored at room temperature and are presented in the Table 6 and 7.

***Kharif* season**

Ascorbic acid content decreasing trend with the increase in storage period at room temperature up to 7$^{th}$ day. There was no significant difference observed among the packaging materials.

With respect to the different elite treatments, there was significant difference among the treatments observed. The highest ascorbic acid content (13.59, 13.30) was recorded in $F_1$- First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the lowest ascorbic acid content (12.40, 12.33) was recorded in $F_2$: First best from second experiment ($T_1$- RDF+ *Trichoderma viride*) on 1$^{st}$ and 3$^{rd}$ day respectively.

Among interactions effect, there was no significant difference between different packaging materials and elite treatments.

**Summer season**

Ascorbic acid content decreased with the increase in storage period at room temperature up to 7$^{th}$ day. There was no significant difference observed among the packaging materials.

With respect to different elite treatments, the highest ascorbic acid content (13.51, 13.40) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the lowest ascorbic acid content (12.35) was recorded in $F_2$:First best from second experiment ($T_1$- RDF+ *Trichoderma viride*) on 1$^{st}$ day and whereas in 3$^{rd}$ day of storage, $F_3$:First best from third experiment ($T_5$- RDF+ Silver black polythene sheet) recorded was the least (12.08).

Among interactions effect, there was no significant difference between different packaging materials and elite treatments.

The mean values recorded among the ascorbic acid content of ridge gourd fruits at 5$^{th}$ and 7$^{th}$ day at storage during *Kharif* and Summer season respectively.

**3.5 Titratable acidity (%)**

The effect of packaging materials and elite treatments stored at ambient temperature in ridge gourd and are presented in Table 8 and 9.

Titratable acidity decreased with the progress in the storage period. There was significant differences among treatments on storage conditions from 1$^{st}$ to 7$^{th}$ day.

***Kharif* season**

On 1st day $P_2$ (Polyethylene 200 guage with 2% vent) recorded the lowest acidity (0.255) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (0.276) and highest acidity (0.341) was recorded in $P_8$-(without packing).

On 3rd day of storage, $P_2$ (Polyethylene 200 guage with 2% vent) recorded the lowest acidity (0.208) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (0.238) and highest acidity (0.320) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the lowest acidity (0.260, 0.241) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the highest acidity (0.327, 0.290) was recorded in $F_3$: First best from third experiment ($T_5$- RDF+ Silver black polythene sheet) on 1st and 3rd day respectively.

Among interactions effect, between different packaging materials and elite treatments, $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha) + Arka microbial consortium recorded significantly the lowest acidity (0.205) which was on par with $P_1F_1$ (0.224), while the highest acidity (0.359) recorded in $P_8F_3$ - Control on 1st day of storage. Whereas in 3rd day of storage, the lowest acidity (0.195) was recorded in $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha) + Arka microbial consortium which was on par with $P_1F_1$ (0.208) and the highest acidity (0.336) was recorded in $P_8F_2$ - Control.

**Summer season**

On 1st day $P_2$ (Polyethylene 200 guage with 2% vent) recorded the lowest acidity (0.246) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (0.262) and highest acidity (0.330) was recorded in $P_8$-(without packing).

On 3rd day $P_2$ (Polyethylene 200 guage with 2% vent) recorded the lowest acidity (0.217) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (0.223) and highest acidity (0.313) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the lowest acidity (0.253, 0.237) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the highest acidity (0.333, 0.277) was recorded in $F_3$: First best from third experiment ($T_5$- RDF+ Silver black polythene sheet) on 1st and 3rd day of storage respectively.

Among interactions effect between different packaging materials and elite treatments, $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha) + Arka microbial consortium recorded significantly lowest acidity (0.219) which was on par with $P_1F_1$ (0.234), while the highest acidity recorded in $P_8F_3$ (0.363) on 1st day of storage. Whereas in 3rd day of storage, lowest acidity (0.196) was recorded in $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha) + Arka microbial consortium followed by $P_1F_1$ (0.207) and the highest acidity (0.338) was recorded in $P_8F_3$- Control.

The mean values recorded among the titratable acidity of ridge gourd fruits at 5th and 7th day at storage during *Kharif* and Summer season. A similar decreasing trend in respect of acidity was observed.

Retention of quality parameters were better in ventilated polythene bags when compared to other treatments. The ascorbic acid and titratable acidity decreased with increase in days of storage. Whereas, total soluble solids (TSS) increased with increase in days of storage.Within the sealed packages, a micro atmosphere developed which was saturated with water and possessed elevated $CO_2$ and decreased $O_2$ concentrations. It is well known that both these changes in atmospheric gas composition are beneficial for extending post harvest shelf life of fruits and vegetables (Khader, 1980).

**3.6 Firmness (kg/cm$^2$)**

Results on firmness of ridge gourd stored at room temperature affected by the packaging materials and elite treatments are presented in the Table 10 and 11. Firmness of ridge gourd showed decreasing trend with increase in storage period.

***Kharif* season**

On 1st day of storage, $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest firmness (4.56) which was on par with $P_1$ (Polyethylene 200 guage with 1% vent) (4.49) and the lowest firmness (4.03) was recorded in $P_8$-(without packing).

On 3rd day, $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest firmness (4.48) which was on par with $P_1$ (Polyethylene 200 guage with 1% vent) (4.40) and the lowest firmness (3.90) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the highest firmness (4.52, 4.33) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the lowest firmness (4.05, 4.03) was recorded in $F_3$:First best from third experiment ($T_5$-RDF+ Silver black polythene sheet) on 1st and 3rd day of storage respectively.

Among interactions effect, there was no significant difference observed between different packaging materials and elite treatments.

**Summer season**

On 1st day of storage, $P_2$ (Polyethylene 200 guage with 2% vent) recorded highest firmness (4.48) which was on par with $P_1$ (Polyethylene 200 guage with 1% vent) (4.40) and the lowest firmness (4.04) was recorded in $P_8$-(without packing).

On 3rd day, $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest firmness (4.34) which was on par with $P_1$ (Polyethylene 200 guage with 1% vent) (4.27) and the lowest firmness (3.49) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the highest firmness (4.42, 4.32) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the lowest firmness (4.10, 3.90) was recorded in $F_3$: First best from third experiment ($T_5$-RDF+ Silver black polythene sheet) on 1st and 3rd day respectively.

Among interactions effect, there was no significant difference observed between different packaging materials and elite treatments.

The mean values recorded among the firmness of ridge gourd fruits at 5th and 7th day at storage during *Kharif* and Summer season. A similar decreasing trend in respect of firmness was observed.

The firmness of ridge gourd fruits in terms of pressure was found to be reduced with the increase in the storage period. However fruits packed with polyethylene bags with ventilation were more firmer than other treatments. This can be attributed mainly to more loss of moisture from the other packaging fruits. Where packaging helped to prevent moisture stress and softening and thereby maintained a high firmness. Similar findings were observed by Yehoshua *et al*. (1979) in tomato and Yehoshua *et al*. (1983), Miller *et al.* (1986) in bell pepper and Showalter (1973) in green capsicum.

**3.7 Chlorophyll content (DA meter reading)**

The effect of packaging materials and factors stored at ambient temperature of ridge gourd are presented in Table 12 and 13.

***Kharif* season**

The chlorophyll content showed a decreasing trend with the increase in the storage period. There was significant difference among treatments in storage conditions from 1$^{st}$ to 7$^{th}$ day.

On 1$^{st}$ day $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest value of chlorophyll content (1.57) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (1.46), while the lowest chlorophyll content (1.16) was noticed in $P_8$-(without packing).

On 3$^{rd}$ day $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest value of chlorophyll content (1.27) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (1.22) and the lowest chlorophyll content (0.81) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the highest chlorophyll content (1.56, 1.32) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the lowest chlorophyll content (1.17, 0.81) was recorded in $F_3$: First best from third experiment ($T_5$- RDF+ Silver black polythene sheet) on 1$^{st}$ and 3$^{rd}$ day respectively.

Among interactions effect, on 1$^{st}$ day of storage there was no significant difference observed between the packaging materials and elite treatments. Whereas in 3$^{rd}$ day of storage, highest chlorophyll content (1.63) was recorded in $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha) + Arka microbial consortium followed by $P_1F_1$ (1.52) and the lowest chlorophyll content (0.53) was recorded in $P_8F_3$- Control.

**Summer season**

The chlorophyll content showed a decreasing trend with the progress in the storage period. There was significant difference among treatments in storage conditions from 1$^{st}$ to 7$^{th}$ day.

On 1st day $P_2$ (Polyethylene 200 guage with 2% vent) recorded the highest value of chlorophyll content (1.55) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (1.45), while the lowest chlorophyll content (1.10) was noticed in $P_8$-(without packing).

On 3rd day $P_2$ (Polyethylene 200 guage with 2% vent) recorded highest value of chlorophyll content (1.26) followed by $P_1$ (Polyethylene 200 guage with 1% vent) (1.18) and lowest chlorophyll content (0.80) was recorded in $P_8$-(without packing).

With respect to the different elite treatments, the highest chlorophyll content (1.42, 1.25) was recorded in $F_1$-First best from first experiment $T_7$- Vermicompost (12t/ha) + Arka microbial consortium and the lowest chlorophyll content (1.21, 0.78) was recorded in $F_3$:First best from third experiment ($T_5$- RDF+ Silver black polythene sheet) on 1st and 3rd day respectively.

Among interactions effect between different packaging materials and elite treatments, $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha+ Arka microbial consortium) recorded significantly the highest chlorophyll content (1.64) which was on par with $P_1F_1$ (1.62), while the lowest chlorophyll content (1.05) was recorded in $P_8F_3$ on 1st day of storage, Whereas in 3rd day of storage, the highest chlorophyll content (1.49) was recorded in $P_2F_1$- Polyethylene 200 guage with 2% vent+ Vermicompost (12t/ha)+ Arka microbial consortium followed by $P_1F_1$ (1.42) and the lowest chlorophyll content (0.57) was recorded in $P_8F_3$- Control.

The mean values recorded among the chlorophyll content of ridge gourd fruits at 5th and 7th day at storage during *Kharif* and Summer season. A similar increasing trend in respect of chlorophyll content was observed.

The $CO_2$ accumulation evolved during respiration in polyethylene films was an important factor in preventing chlorophyll degradation in fruits. Rapid chlorophyll degradation in control fruits may be due to higher water loss in these fruits which led to more degradation of pigments (Singh *et al*. 1980).

**Conclusion**

From the results it was concluded that among the packaging materials affecting storage life of ridge gourd, Polyethylene 200 gauge with 2% vent and Vermicompost 12 t/ha+ Arka microbial consortium was the best in extending the shelf life of the ridge gourd fruits.

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**Table 1. Effect of different packaging material and elite treatments on physiological loss in weight (g) in shelf life of ridge gourd during *Kharif*, 2021**

| Treatments | Physiological loss in weight (g) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | |
| Packaging materials (P) | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 7.59 | 8.41 | 8.73 | 8.24 | 14.43 | 16.29 | 18.12 | 21.82 | * | * |
| $P_2$ | 6.84 | 7.63 | 8.66 | 7.71 | 13.75 | 15.02 | 17.16 | 21.19 | * | * |
| $P_3$ | 7.97 | 8.72 | 8.96 | 8.55 | 14.68 | 19.57 | 16.56 | 22.67 | * | * |
| $P_4$ | 12.84 | 15.36 | 13.17 | 13.79 | 19.87 | * | * | * | * | * |
| $P_5$ | 10.24 | 11.16 | 12.42 | 11.27 | 16.15 | 18.27 | * | * | * | * |
| $P_6$ | 11.49 | 12.03 | 13.59 | 12.37 | 18.34 | * | * | 24.54 | * | * |
| $P_7$ | 8.09 | 9.97 | 10.13 | 9.40 | 15.45 | 17.51 | * | * | * | * |
| $P_8$ | 14.50 | 15.85 | 15.61 | 15.32 | 21.54 | * | * | | | |
| Mean | 9.95 | 11.14 | 11.41 | | | | | | | |

| | 3rd day | | |
|---|---|---|---|
| | Factor (P) | Factor (F) | P×F |
| SEm± | 0.09 | 0.06 | 0.16 |
| CD at 5% | 0.27 | 0.16 | 0.46 |

**Table 2. Effect of different packaging material and elite treatments on physiological loss in weight (g) in shelf life of ridge gourd during Summer, 2022**

| Treatments | Physiological loss in weight (g) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | |
| Packaging materials (P) | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 7.65 | 8.27 | 8.65 | 8.19 | 14.39 | 17.19 | 18.92 | 24.66 | * | * |
| $P_2$ | 7.06 | 7.79 | 8.34 | 7.73 | 13.42 | 15.52 | 17.27 | 23.86 | * | * |
| $P_3$ | 7.98 | 8.53 | 8.78 | 8.43 | 14.92 | * | 19.35 | * | * | * |
| $P_4$ | 12.18 | 13.04 | 12.06 | 12.43 | 20.86 | * | * | * | * | * |
| $P_5$ | 10.90 | 11.11 | 11.35 | 11.12 | 16.38 | * | * | * | * | * |
| $P_6$ | 11.87 | 11.33 | 11.56 | 11.59 | 19.47 | * | * | * | * | * |
| $P_7$ | 8.04 | 9.51 | 9.45 | 9.00 | 15.56 | 19.84 | * | * | * | * |
| $P_8$ | 14.95 | 15.62 | 15.43 | 15.33 | 22.88 | * | * | * | * | * |
| Mean | 10.08 | 10.65 | 10.70 | | | | | | | |

| | 3rd day | | |
|---|---|---|---|
| | Factor (P) | Factor (F) | P×F |
| SEm± | 0.09 | 0.05 | 0.15 |
| CD at 5% | 0.25 | 0.15 | 0.44 |

**Table 3. Effect of different packaging material and elite treatments on shelf life (days) of ridge gourd during *Kharif*, 2021 and Summer, 2022**

| Treatments | Shelf life (days) *Kharif* 2021 | | | |
|---|---|---|---|---|
| | Elite treatments (F) | | | |
| Packaging materials (P) | $F_1$ | $F_2$ | $F_3$ | Mean |
| $P_1$ | 7.73 | 5.82 | 5.13 | 6.23 |
| $P_2$ | 7.83 | 5.98 | 5.21 | 6.34 |
| $P_3$ | 7.67 | 5.02 | 5.38 | 6.02 |
| $P_4$ | 6.25 | 4.14 | 3.98 | 4.79 |
| $P_5$ | 6.46 | 5.19 | 4.75 | 5.47 |
| $P_6$ | 6.31 | 4.11 | 4.54 | 4.99 |
| $P_7$ | 7.53 | 5.21 | 4.87 | 5.87 |
| $P_8$ | 5.75 | 3.08 | 3.41 | 4.08 |
| Mean | 6.94 | 4.82 | 4.66 | |
| | Factor (P) | Factor (F) | P×F | |
| SEm± | 0.05 | 0.03 | 0.08 | |
| CD at 5% | 0.13 | 0.08 | 0.23 | |

| Treatments | Shelf life (days) Summer, 2022 | | | |
|---|---|---|---|---|
| | Elite treatments (F) | | | |
| Packaging materials (P) | $F_1$ | $F_2$ | $F_3$ | Mean |
| $P_1$ | 7.65 | 5.11 | 5.51 | 6.09 |
| $P_2$ | 7.79 | 5.75 | 5.23 | 6.26 |
| $P_3$ | 6.83 | 4.95 | 5.15 | 5.64 |
| $P_4$ | 6.22 | 3.43 | 3.76 | 4.47 |
| $P_5$ | 6.39 | 4.42 | 4.99 | 5.27 |
| $P_6$ | 6.28 | 4.17 | 3.89 | 4.78 |
| $P_7$ | 6.46 | 5.02 | 4.65 | 5.38 |
| $P_8$ | 5.63 | 3.02 | 3.27 | 3.97 |
| Mean | 6.66 | 4.48 | 4.56 | |
| | Factor (P) | Factor (F) | P×F | |
| SEm± | 0.05 | 0.03 | 0.08 | |
| CD at 5% | 0.13 | 0.08 | 0.22 | |

**Table 4. Effect of different packaging material and elite treatments on TSS (°Brix) in shelf life of ridge gourd during *Kharif*, 2021**

| Treatments | TSS (°Brix) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 4.74 | 4.49 | 4.22 | 4.48 | 4.82 | 4.61 | 4.43 | 4.62 | 4.99 | 4.83 | 4.55 | 5.02 | * | * |
| $P_2$ | 4.79 | 4.56 | 4.31 | 4.55 | 4.93 | 4.78 | 4.55 | 4.75 | 5.02 | 4.89 | 4.68 | 5.11 | * | * |
| $P_3$ | 4.70 | 4.35 | 4.17 | 4.41 | 4.75 | 4.57 | 4.28 | 4.53 | 4.94 | 4.79 | 4.53 | 4.98 | * | * |
| $P_4$ | 4.49 | 4.17 | 3.81 | 4.16 | 4.63 | 4.32 | 3.99 | 4.31 | 4.69 | * | * | * | * | * |
| $P_5$ | 4.63 | 4.28 | 4.01 | 4.31 | 4.67 | 4.41 | 4.15 | 4.41 | 4.74 | 4.62 | * | * | * | * |
| $P_6$ | 4.54 | 4.21 | 3.97 | 4.24 | 4.64 | 4.5 | 4.07 | 4.40 | 4.71 | * | * | * | * | * |
| $P_7$ | 4.66 | 4.31 | 4.08 | 4.35 | 4.70 | 4.68 | 4.18 | 4.52 | 4.86 | 4.72 | * | 4.90 | * | * |
| $P_8$ | 4.43 | 3.76 | 3.79 | 3.99 | 4.57 | 4.13 | 3.93 | 4.21 | 4.64 | * | * | * | * | * |
| Mean | 4.62 | 4.27 | 4.05 | | 4.71 | 4.50 | 4.20 | | | | | | | |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.04 | 0.02 | 0.06 | 0.04 | 0.02 | 0.06 |
| CD at 5% | 0.10 | 0.06 | NS | 0.10 | 0.06 | 0.18 |

**Table 5. Effect of different packaging material and elite treatments on TSS (°Brix) in shelf life of ridge gourd during Summer, 2022**

| Treatments | TSS (°Brix) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 4.70 | 4.53 | 4.27 | 4.50 | 4.91 | 4.77 | 4.46 | 4.71 | 5.01 | 4.89 | 4.54 | 5.07 | * | * |
| $P_2$ | 4.73 | 4.62 | 4.45 | 4.60 | 4.98 | 4.83 | 4.52 | 4.78 | 5.03 | 4.97 | 4.61 | 5.14 | * | * |
| $P_3$ | 4.68 | 4.47 | 4.23 | 4.46 | 4.82 | 4.64 | 4.41 | 4.62 | 4.95 | * | 4.67 | * | * | * |
| $P_4$ | 4.52 | 4.18 | 3.97 | 4.22 | 4.55 | 4.43 | 4.17 | 4.38 | 4.60 | * | * | * | * | * |
| $P_5$ | 4.60 | 4.37 | 4.07 | 4.35 | 4.66 | 4.59 | 4.22 | 4.49 | 4.84 | * | * | * | * | * |
| $P_6$ | 4.58 | 4.26 | 4.02 | 4.29 | 4.63 | 4.48 | 4.20 | 4.44 | 4.79 | * | * | * | * | * |
| $P_7$ | 4.63 | 4.44 | 4.18 | 4.42 | 4.72 | 4.61 | 4.32 | 4.55 | 4.87 | 4.75 | * | * | * | * |
| $P_8$ | 4.33 | 4.05 | 3.76 | 4.05 | 4.51 | 4.11 | 4.15 | 4.26 | 4.58 | * | * | * | * | * |
| Mean | 4.60 | 4.37 | 4.12 | | 4.72 | 4.56 | 4.31 | | | | | | | |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.04 | 0.02 | 0.06 | 0.04 | 0.02 | 0.06 |
| CD at 5% | 0.10 | 0.06 | NS | 0.11 | 0.06 | NS |

**Table 6. Effect of different packaging material and elite treatments on ascorbic acid (mg/100g) in shelf life of ridge gourd during *Kharif*, 2021**

| Treatments | Ascorbic acid (mg/100g) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 13.75 | 12.59 | 12.40 | 12.91 | 13.64 | 12.51 | 12.31 | 12.82 | 13.50 | 12.29 | 12.01 | 12.36 | * | * |
| $P_2$ | 13.84 | 12.66 | 12.45 | 12.98 | 13.76 | 12.52 | 12.43 | 12.90 | 13.59 | 12.38 | 12.11 | 13.41 | * | * |
| $P_3$ | 13.70 | 12.57 | 12.23 | 12.83 | 13.59 | 12.49 | 12.20 | 12.76 | 13.48 | 12.21 | 11.82 | 12.25 | * | * |
| $P_4$ | 13.51 | 12.28 | 12.38 | 12.72 | 13.17 | 12.23 | 12.37 | 12.68 | 12.14 | * | * | * | * | * |
| $P_5$ | 13.59 | 12.34 | 12.44 | 12.79 | 13.35 | 12.29 | 12.38 | 12.71 | 12.29 | 12.15 | * | * | * | * |
| $P_6$ | 13.50 | 12.31 | 12.43 | 12.75 | 13.33 | 12.22 | 12.33 | 12.70 | 12.20 | * | * | * | * | * |
| $P_7$ | 13.64 | 12.30 | 12.30 | 12.80 | 13.43 | 12.29 | 12.05 | 12.73 | 13.31 | 12.18 | * | 12.03 | * | * |
| $P_8$ | 13.22 | 12.20 | 12.65 | 12.69 | 13.11 | 12.12 | 12.74 | 12.66 | 12.07 | * | * | * | * | * |
| Mean | 13.59 | 12.40 | 12.41 | | 13.30 | 12.33 | 12.37 | | | | | | | |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.11 | 0.07 | 0.19 | 0.11 | 0.06 | 0.18 |
| CD at 5% | NS | 0.19 | NS | NS | 0.18 | NS |

**Table 7. Effect of different packaging material and elite treatments on ascorbic acid (mg/100g) in shelf life of ridge gourd during Summer, 2022**

| Treatments | Ascorbic acid (mg/100g) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 13.69 | 12.48 | 12.30 | 12.82 | 13.52 | 12.37 | 12.19 | 12.69 | 13.28 | 12.16 | 11.98 | 12.06 | * | * |
| $P_2$ | 13.72 | 12.58 | 12.41 | 12.90 | 13.63 | 12.42 | 12.23 | 12.76 | 13.37 | 12.21 | 12.07 | 12.24 | * | * |
| $P_3$ | 13.55 | 12.46 | 12.27 | 12.81 | 13.37 | 12.28 | 12.14 | 12.65 | 13.24 | * | 11.62 | * | * | * |
| $P_4$ | 13.40 | 12.21 | 12.11 | 12.59 | 13.28 | 12.15 | 11.95 | 12.46 | 12.08 | * | * | * | * | * |
| $P_5$ | 13.51 | 12.32 | 12.15 | 12.66 | 13.42 | 12.21 | 12.09 | 12.57 | 12.17 | * | * | * | * | * |
| $P_6$ | 13.43 | 12.22 | 12.13 | 12.60 | 13.37 | 12.19 | 12.07 | 12.54 | 12.12 | * | * | * | * | * |
| $P_7$ | 13.53 | 12.41 | 13.08 | 12.76 | 13.46 | 12.25 | 12.11 | 12.61 | 13.20 | 11.97 | * | * | * | * |
| $P_8$ | 13.22 | 12.15 | 12.33 | 12.57 | 13.17 | 12.09 | 11.89 | 12.38 | 11.03 | * | * | * | * | * |
| Mean | 13.51 | 12.35 | 12.44 | | 13.40 | 12.25 | 12.08 | | | | | | | |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.11 | 0.06 | 0.18 | 0.10 | 0.06 | 0.18 |
| CD at 5% | NS | 0.18 | NS | NS | 0.18 | NS |

**Table 8. Effect of different packaging material and elite treatments on titratable acidity (%) in shelf life of ridge gourd during *Kharif*,2021**

| Treatments | Titratable acidity (%) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 0.224 | 0.296 | 0.309 | 0.276 | 0.208 | 0.243 | 0.264 | 0.238 | 0.203 | 0.191 | 0.157 | 0.181 | * | * |
| $P_2$ | 0.205 | 0.272 | 0.287 | 0.255 | 0.195 | 0.187 | 0.243 | 0.208 | 0.190 | 0.176 | 0.134 | 0.172 | * | * |
| $P_3$ | 0.231 | 0.307 | 0.312 | 0.283 | 0.216 | 0.255 | 0.274 | 0.248 | 0.212 | 0.213 | 0.238 | 0.187 | * | * |
| $P_4$ | 0.293 | 0.339 | 0.347 | 0.326 | 0.271 | 0.315 | 0.329 | 0.301 | 0.261 | * | * | * | * | * |
| $P_5$ | 0.272 | 0.323 | 0.335 | 0.310 | 0.233 | 0.282 | 0.292 | 0.269 | 0.227 | 0.253 | * | * | * | * |
| $P_6$ | 0.281 | 0.328 | 0.339 | 0.316 | 0.267 | 0.291 | 0.298 | 0.285 | 0.245 | | * | 0.193 | * | * |
| $P_7$ | 0.252 | 0.315 | 0.327 | 0.298 | 0.228 | 0.272 | 0.286 | 0.262 | 0.216 | 0.238 | * | * | * | * |
| $P_8$ | 0.323 | 0.341 | 0.359 | 0.341 | 0.307 | 0.318 | 0.336 | 0.320 | 0.297 | * | * | * | * | * |
| Mean | 0.260 | 0.315 | 0.327 | | 0.241 | 0.272 | 0.290 | | | | | | | |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.002 | 0.002 | 0.004 | 0.002 | 0.001 | 0.004 |
| CD at 5% | 0.007 | 0.004 | 0.012 | 0.006 | 0.004 | 0.011 |

**Table 9. Effect of different packaging material and elite treatments on titratable acidity (%) in shelf life of ridge gourd during Summer, 2022**

| Treatments | Titratable acidity (%) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 0.234 | 0.238 | 0.315 | 0.262 | 0.207 | 0.219 | 0.242 | 0.223 | 0.195 | 0.201 | 0.218 | 0.199 | * | * |
| $P_2$ | 0.219 | 0.221 | 0.298 | 0.246 | 0.196 | 0.217 | 0.237 | 0.217 | 0.183 | 0.190 | 0.186 | 0.171 | * | * |
| $P_3$ | 0.239 | 0.247 | 0.325 | 0.270 | 0.219 | 0.223 | 0.251 | 0.231 | 0.201 | 0.212 | * | * | * | * |
| $P_4$ | 0.276 | 0.315 | 0.352 | 0.314 | 0.266 | 0.287 | 0.319 | 0.290 | 0.264 | * | * | * | * | * |
| $P_5$ | 0.253 | 0.271 | 0.334 | 0.286 | 0.240 | 0.242 | 0.275 | 0.252 | 0.228 | * | * | * | * | * |
| $P_6$ | 0.262 | 0.295 | 0.346 | 0.301 | 0.251 | 0.258 | 0.289 | 0.266 | 0.247 | * | * | * | * | * |
| $P_7$ | 0.245 | 0.255 | 0.327 | 0.276 | 0.228 | 0.233 | 0.266 | 0.242 | 0.212 | 0.237 | * | * | * | * |
| $P_8$ | 0.298 | 0.329 | 0.363 | 0.330 | 0.285 | 0.316 | 0.338 | 0.313 | 0.281 | * | * | * | * | * |
| Mean | 0.253 | 0.271 | 0.333 | | 0.237 | 0.250 | 0.277 | | | | | | | |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.002 | 0.001 | 0.004 | 0.002 | 0.001 | 0.004 |
| CD at 5% | 0.007 | 0.004 | 0.012 | 0.006 | 0.004 | 0.011 |

**Table 10. Effect of different packaging material and elite treatments on Firmness (kg/cm$^2$) in shelf life of ridge gourd during *Kharif*, 2021**

| Treatments | Firmness (kg/cm$^2$) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 4.66 | 4.50 | 4.31 | 4.49 | 4.55 | 4.42 | 4.22 | 4.40 | 4.41 | 4.20 | 4.02 | 3.79 | * | * |
| $P_2$ | 4.75 | 4.57 | 4.36 | 4.56 | 4.67 | 4.43 | 4.34 | 4.48 | 4.50 | 4.29 | 3.92 | 3.82 | * | * |
| $P_3$ | 4.61 | 4.48 | 4.14 | 4.41 | 4.50 | 4.40 | 4.11 | 4.34 | 4.39 | 4.12 | 4.73 | 3.67 | * | * |
| $P_4$ | 4.42 | 4.19 | 3.89 | 4.17 | 4.08 | 4.14 | 3.78 | 4.00 | 4.05 | * | * | * | * | * |
| $P_5$ | 4.50 | 4.25 | 3.97 | 4.24 | 4.26 | 4.20 | 4.08 | 4.17 | 4.20 | 4.06 | * | * | * | * |
| $P_6$ | 4.41 | 4.22 | 3.94 | 4.19 | 4.24 | 4.13 | 4.09 | 4.15 | 4.03 | * | * | * | * | * |
| $P_7$ | 4.55 | 4.36 | 4.03 | 4.31 | 4.34 | 4.20 | 3.97 | 4.18 | 4.22 | 4.09 | * | 3.34 | * | * |
| $P_8$ | 4.23 | 4.10 | 3.76 | 4.03 | 4.02 | 4.03 | 3.65 | 3.90 | 3.98 | * | * | * | * | * |
| Mean | 4.52 | 4.33 | 4.05 | | 4.33 | 4.24 | 4.03 | | | | | | | |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.04 | 0.02 | 0.06 | 0.03 | 0.02 | 0.06 |
| CD at 5% | 0.10 | 0.06 | NS | 0.10 | 0.06 | NS |

**Table 11. Effect of different packaging material and elite treatments on firmness (kg/cm$^2$) in shelf life of ridge gourd during Summer, 2022**

| Treatments | Firmness (kg/cm$^2$) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 4.6 | 4.39 | 4.21 | 4.40 | 4.43 | 4.28 | 4.10 | 4.27 | 4.19 | 4.07 | 3.89 | 3.53 | * | * |
| $P_2$ | 4.63 | 4.49 | 4.32 | 4.48 | 4.54 | 4.33 | 4.14 | 4.34 | 4.28 | 4.12 | 3.98 | 3.75 | * | * |
| $P_3$ | 4.46 | 4.37 | 4.18 | 4.34 | 4.41 | 4.19 | 4.05 | 4.22 | 4.15 | * | 3.93 | * | * | * |
| $P_4$ | 4.31 | 4.12 | 4.02 | 4.15 | 4.19 | 4.06 | 3.86 | 4.04 | 3.99 | * | * | * | * | * |
| $P_5$ | 4.42 | 4.23 | 4.06 | 4.24 | 4.33 | 4.12 | 4.00 | 4.15 | 4.08 | * | * | * | * | * |
| $P_6$ | 4.34 | 4.13 | 4.04 | 4.17 | 4.28 | 4.10 | 3.98 | 4.12 | 4.03 | * | * | * | * | * |
| $P_7$ | 4.44 | 4.32 | 3.99 | 4.25 | 4.37 | 4.16 | 4.02 | 4.18 | 4.13 | 3.98 | * | * | * | * |
| $P_8$ | 4.13 | 4.06 | 3.94 | 4.04 | 3.98 | 3.41 | 3.08 | 3.49 | 3.94 | * | * | * | * | * |
| Mean | 4.42 | 4.26 | 4.10 | | 4.32 | 4.08 | 3.90 | | | | | | * | * |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.04 | 0.02 | 0.06 | 0.03 | 0.02 | 0.06 |
| CD at 5% | 0.10 | 0.06 | NS | 0.10 | 0.06 | NS |

**Table 12. Effect of different packaging material and elite treatments on Chlorophyll content in shelf life of ridge gourd during *Kharif*, 2021**

| Treatments | Chlorophyll content | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 1.65 | 1.42 | 1.31 | 1.46 | 1.52 | 1.18 | 0.96 | 1.22 | 1.45 | 1.06 | 0.87 | 1.18 | * | * |
| $P_2$ | 1.75 | 1.59 | 1.38 | 1.57 | 1.63 | 1.2 | 0.99 | 1.27 | 1.52 | 1.15 | 0.91 | 1.31 | * | * |
| $P_3$ | 1.63 | 1.37 | 1.26 | 1.42 | 1.48 | 1.22 | 0.94 | 1.21 | 1.36 | 0.99 | 0.85 | 1.06 | * | * |
| $P_4$ | 1.46 | 1.15 | 1.05 | 1.22 | 1.12 | 0.96 | 0.69 | 0.92 | 1.07 | * | * | * | * | * |
| $P_5$ | 1.52 | 1.25 | 1.14 | 1.30 | 1.25 | 1.10 | 0.73 | 1.03 | 1.14 | 0.72 | * | * | * | * |
| $P_6$ | 1.49 | 1.23 | 1.09 | 1.27 | 1.18 | 1.01 | 0.79 | 0.99 | 1.09 | * | * | * | * | * |
| $P_7$ | 1.58 | 1.33 | 1.15 | 1.35 | 1.32 | 1.15 | 0.81 | 1.09 | 1.25 | 0.88 | * | 1.03 | * | * |
| $P_8$ | 1.37 | 1.11 | 0.99 | 1.16 | 1.04 | 0.87 | 0.53 | 0.81 | 0.96 | * | * | * | * | * |
| Mean | 1.56 | 1.31 | 1.17 | | 1.32 | 1.09 | 0.81 | | | | | | | |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 |
| CD at 5% | 0.03 | 0.02 | NS | 0.03 | 0.02 | 0.02 |

**Table 13. Effect of different packaging material and elite treatments on chlorophyll content in shelf life of ridge gourd during Summer, 2022**

| Treatments | Chlorophyll content | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Elite treatments (F) | | | | | | | | | | | | | |
| Packaging materials (P) | 1st day | | | | 3rd day | | | | 5th day | | | 7th day | | |
| | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | Mean | $F_1$ | $F_2$ | $F_3$ | $F_1$ | $F_2$ | $F_3$ |
| $P_1$ | 1.62 | 1.41 | 1.32 | 1.45 | 1.42 | 1.17 | 0.95 | 1.18 | 1.15 | 1.02 | 0.74 | 0.83 | * | * |
| $P_2$ | 1.64 | 1.55 | 1.46 | 1.55 | 1.49 | 1.23 | 1.05 | 1.26 | 1.23 | 1.12 | 0.98 | 1.17 | * | * |
| $P_3$ | 1.54 | 1.39 | 1.31 | 1.41 | 1.39 | 1.15 | 0.88 | 1.14 | 1.07 | 0.97 | * | * | * | * |
| $P_4$ | 1.28 | 1.11 | 1.08 | 1.16 | 1.03 | 0.91 | 0.64 | 0.86 | 0.73 | * | * | * | * | * |
| $P_5$ | 1.37 | 1.33 | 1.12 | 1.27 | 1.21 | 1.06 | 0.71 | 0.99 | 0.97 | * | * | * | * | * |
| $P_6$ | 1.29 | 1.23 | 1.11 | 1.21 | 1.17 | 1.02 | 0.69 | 0.96 | 0.88 | * | * | * | * | * |
| $P_7$ | 1.46 | 1.35 | 1.25 | 1.35 | 1.27 | 1.09 | 0.73 | 1.03 | 1.04 | 0.76 | * | * | * | * |
| $P_8$ | 1.16 | 1.10 | 1.05 | 1.10 | 0.99 | 0.83 | 0.57 | 0.80 | 0.67 | * | * | * | * | * |
| Mean | 1.42 | 1.31 | 1.21 | | 1.25 | 1.06 | 0.78 | | | | | | | |

| | 1st day | | | 3rd day | | |
|---|---|---|---|---|---|---|
| | Factor (P) | Factor (F) | P×F | Factor (P) | Factor (F) | P×F |
| SEm± | 0.01 | 0.01 | 0.02 | 0.01 | 0.01 | 0.02 |
| CD at 5% | 0.03 | 0.02 | 0.05 | 0.02 | 0.02 | 0.04 |