



STANDARDISATION OF PACKAGES FOR FRESHNESS RETENTION AND SHELF LIFE EXTENSION OF CROSSANDRA FLOWERS UNDER DIFFERENT STORAGE CONDITIONS

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Abstract

Crossandra flowers are highly perishable in nature. At present there is no proper packaging for this flower. The flowers are loosely packed in polymeric film bag. Standardisation of package for the crossandra flower for freshness retention and shelf life extension was done by packing flowers 1kg in D955 polymeric film of 100 gauge thickness which is kept in thermocol box and corrugated fibre board box as secondary package. The flowers were stored at ambient temperature (Temp 28.9°C-30.3°C, RH 62-64%) with gel frost pack in secondary package and at low temperature storage conditions (Temp 8°C, RH 88%). The quality parameters namely freshness index, colour retention index and shelf life were recorded at 24 h interval. The flowers in D955 film and stored in CFB box had higher freshness and colour index than those in thermocol box both at ambient and low temperature storage conditions. It was found from the studies that crossandra flower bulk packaged in polymeric film D955 as primary pack with CFB box as secondary package retained freshness colour and marketable upto 72h in ambient storage conditions. At low temperature storage, crossandra flower bulk packaged in polymeric film D955 as primary pack thermocol box as secondary package retained freshness colour and marketable upto 96h.

Key words: Crossandra flowers, packaging, Shelf life, gel frost pack, Corrugated Fibre board box, Thermocol Box

Introduction

Crossandra flowers (*Crossandra infundibuliformis*) belongs to the family Acanthaceae. It is an evergreen shrub native to southern part of India, grown mostly in temperate region or malenadu region. The flowers are red, orange or yellow coloured flowers having 3-5 unsymmetrical petal. Flowers are small in size and are strung into strands either alone or along with jasmine flowers. They are of great demand for making garlands for temple deities or used to embellish womens' hair.

The major loss in the flower production starts after harvesting the flowers because of market fluctuation, perishable nature of flowers and distantly situated markets. Therefore, it is essential to study the post harvest changes accompanying these loose flowers and to derive strategies for extending shelf life. From earlier research works on cut flowers, it was found that the shelf life of loose flowers can be extended by proper packaging method, storage temperature, substituting carbohydrate loss with sucrose and treating with preservative chemicals

and growth regulators. Storage temperature is the important factor in controlling metabolic activities like ethylene production and action. Packaging of loose flowers in polyethylene bags increased the shelf life to the extent of 3 days.

Materials and Methods

Crossandra flowers (Red colour) procured from farmer's field were sorted and flower of uniform size were taken for the study. The experiment was conducted at Division of Post Harvest Technology & Agrl.Engg, ICAR-IIHR, Bengaluru. Crossandra flowers each weighing 1kg were packed in polymeric film D955 of size 550mm x 300mm, thickness 100 gauge purchased from Sealed Air Company was used as primary package. The flowers packed in primary pack were kept in two different secondary packs viz., Thermocol box of size 320mm×310mm×185mm, Corrugated Fibre board (CFB) box of size 380mm×300mm×140mm. Crossandra flowers packed in plastic bag served as control. The flowers were stored at ambient storage (Temp 28.9°C-30.3°C, RH 62-64%) and low temperature storage (Temp 8°C, RH 88%).

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In ambient temperature storage, along with the primary pack as mentioned in the treatment, gel frost pack of 200g was placed in secondary package. The quality parameters namely freshness index, colour retention index and shelf life were recorded based on hedonic scale rating as per Madhu *et al.* 1999. Moisture content (%) was determined as per Ranganna (2000). The PLW was computed by subtracting fresh weight of flowers on any day from its weight on the previous day and expressed as percentage. All the observations were recorded at 24 h interval. The data were analyzed using Web Agri Stat Package version WASP 2.0 developed by the ICAR-Central coastal agricultural research Institute. Goa.

Results and Discussion

It was found from the studies that freshness index was significantly influenced by various packages. The high freshness index was observed in flowers packed in D955 film and kept in CFB boxes followed by those packed and kept in thermocol box. The flowers retained freshness upto 72 hours at storage temperature (Temp 28.9°C-30.3°C, RH 62-64%), whereas control flowers loss freshness in 48 hours. This may be due to the micro climatic environment created by the Corrugated Fibre board box with gel pack surrounding the flowers packed in D-955 film gave the adequate cooling effect to retain the freshness of the flowers in D-955 film. This may be due to modified atmosphere created inside the package which allows the flowers to be stored for several hours without affecting the freshness (Yathendra *et al.*(2018). These results are in close agreement with the findings of Karuppaiah *et al.*(2006) and Madaiah and Venkatesh Reddy 1994.

The colour index of the flowers in the CFB box were on par with those packed in thermocol box but higher than those packed in control. These results are in line with findings of Thamarai selvi *et al.* (2010) and Bhuvaneshwari and Sangama (2018).

At ambient storage condition, the physiological loss in weight was lesser in crossandra packed in polymeric bag (D955) with CFB box as secondary package (18%) than those in thermocol box secondary package (20%) and control (28%). This may be due to maintenance of optimum humidity, CO₂ and O₂ concentration inside the bag which in turn slows down the process of respiration and evapo-transpiration, thereby reducing the PLW (Ahn-Gwi Yeen and Ahn, 1997). Similar finding were reported by Nirmala,S and Venkatesh Reddy (1993), Yatindra *et al.*, 2018 in jasmine and tuberose flowers respectively. The shelf life of the flowers was 72h at ambient storage (Temp Temp 28.9°C-30.3°C, RH 62-64%) (%) both in

thermocol and CFB box as compared to control (Table 1).

At low temperature storage condition, flowers packed in polymeric film with CFB box as secondary package retained freshness, the sample had higher freshness index (94.77) as compared to those packed in thermocol box (91.18) and control (70.78). The minimization of moisture loss under refrigerated condition increased the freshness

Table 1: Quality parameters of crossandra in different packages at ambient storage condition (Temp 28.9°C-30.3°C, RH64%)

Type of Package	Freshness Index	Colour Index	Moisture Content (%)	PLW (%)	Shelf life (h)
T ₁	71.05	53.80	84.72	20	72
T ₂	73.21	54.76	85.12	18	72
T ₃	70.78	53.68	83.17	28	48
CD(1%)	2.097	NS	NS	1.96	-

T₁: Primary pack: D955 film Secondary pack: Thermocol Box with gel frost pack

T₂: Primary pack: D955 film Secondary pack: CFB box with gel frost pack

T₃: Control

Table 2: Quality parameters of crossandra in different packages at low temperature storage condition (Temp 8°C, RH 88%).

Type of Package	Freshness Index	Colour Index	Moisture Content (%)	PLW (%)	Shelf life (h)
T ₁	91.18	64.20	84.16	24	96
T ₂	94.77	65.08	84.13	28	96
T ₃	85.06	63.12	82.13	36	72
CD(1%)	1.78	NS	NS	1.96	-

T₁: Primary pack: D955 film Secondary pack: Thermocol Box with gel frost pack

T₂: Primary pack: D955 film Secondary pack: CFB box with gel frost pack

T₃: Control

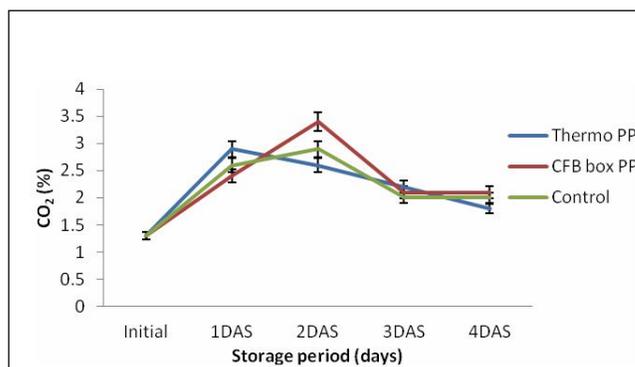


Fig. 1: CO₂ (%) maintained in different packages during low temperature storage

index of the flowers as compared to ambient storage conditions in all packages. Similar results were observed by karuppaiah *et al.* (2006) for jasmine. The sample in the CFB box also recorded higher colour index (65.08) than those packed in thermocol box (64.20) and control (63.12). Higher relative humidity and lower temperature might have favoured the colour retention of crossandra flower at low temperature storage condition. Similar observations were recorded in jasmine flower by thamaraiselvi *et al.*, (2010). The shelf life of the flowers was 96h at low temperature storage (Temp 8°C, RH 88%) both in thermocol and CFB box as compared to control which is 72h. (Table 2). At the end of storage period of 96h at low temperature, the physiological loss in weight was less in thermocol box (24%) compared to CFB box (28%) and control (36%). Hence thermocol box with gel frost pack as secondary package was found suitable for packaging of crossandra flowers.

Carbon di oxide evolution in different packages at low temperature storage

From the fig. 1. it was observed that at low temperature storage, CO₂ evolution in crossandra packed in D-955 bag and stored in thermocol box reached maximum in 24h of storage and then it started decreasing, whereas the CO₂ concentration in the bag stored in thermocol box reached maximum in 48h, then gradually decreased in 72h thereby reducing the metabolic activity and increasing the shelf life of the flowers. Similar trend was observed in crossandra flowers packed in D-955 bag and stored in CFB box kept at ambient storage condition. For fresh products such as cut flowers, decreasing the oxygen (O₂) concentration and increasing the carbon dioxide (CO₂) concentration to reduce the metabolic activity of the product was reported by Rennie & Tavoularis 2009. The CO₂ concentration at end of the shelf life was higher in crossandra flowers packaged in D-955 film and stored in CFB box as compared to control and in thermocol box.

Conclusion

Bulk packaging of crossandra flower in polymeric film D955 as primary pack in Corrugated Fibre Board box as secondary package retained freshness, colour and marketable upto 72h in ambient storage conditions (Temp

28.9°C-30.3°C, RH 64%). The flowers packed in polymeric film D955 as primary pack in Corrugated Fibre Board box as secondary package retained freshness, colour and marketable upto and 96 h in low temperature storage (Temp 8°C, RH 88%).

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