Original Research Article

<https://doi.org/10.20546/ijcmas.2019.809.199>

Packaging Technology for Extending Shelf Life of Jasmine (*Jasminum sambac* CV. Gundumalli) Flowers

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ABSTRACT

Keywords

Jasmine, Sucrose,
Boric acid,
NAA, Packaging
method, Polythene
bags. Micron
thickness

Article Info

Accepted:
18 August 2019
Available Online:
10 September 2019

A research on standardization of method of packaging to extend shelf life of *Jasminum sambac* CV. Gundumalli was conducted in College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar during 2015-16. The experiment was laid out in FCRD with two factors in three replications, with 16 treatment combinations. Observations were recorded on the visual quality in terms of freshness index, flowers opening index, colour retention index, and shelf life of flowers and the physiological parameters associated with the postharvest quality of flowers, namely, moisture content, relative water content, physiological loss in weight. The flowers treated with 4% boric acid, packed in 60 micron polyethylene bags without ventilation and stored under 7°C significantly extend the shelf life to 168.33 hours with highest freshness index (87.74%), maximum colour retention index of (93.75 %), and lowest flower opening index (11.25%), highest moisture content of (76.20%) and lowest physiological weight loss percent (0.48%) 48 hours after packing

Introduction

Jasmine (*Jasminum sambac* Ait.) is one of the important and oldest fragrant flowers cultivated by man from very ancient days in India. It is highly esteemed for its attractive, white colour and a fragrant flower and has a pride of place in the heart of every Indian woman. In Fragrance industry, jasmine has unique importance and popularity due to its

unique sweet fragrance like that of rose, vetiver and represents a type that cannot be exactly imitated at present by a mixture of any known synthetic aroma chemicals or natural isolates. The extracts of jasmine are used for flavouring or preparation of 'Jasmine scented Tea' in China and 'Jasmine rice' in Bangkok, Thailand. The antioxidant properties has the potential to induce weight loss and to reduce serum and hepatic lipid levels through the

increase of leptin level which address the burning problems of fattiness and obesity (Li Zhen *et al.*, 2011) In addition to use as fresh flowers for making garlands and bouquets, for religious offerings, etc., now a days jasmine is emerging as an important industrial flower crop and also used for production of essential oils in the form of 'concrete' and 'absolute' used in cosmetic and perfumery industries and as a source of aroma chemicals and food flavouring industries. These flowers have good demand for export due to its attractive fragrance. But one of the major problem faced by farmers are lack of suitable packaging material, less shelf of flowers and browning of petals on the second day of harvest with abrupt loss in fragrance. In India, if we avoid wastage of horticultural produce up to 2% from field to market, there will be saving of 100 to 200 crores per year (Ramana *et al.*, 1988). Keeping this in mind, a study was undertaken to enhance the shelf life of Gundumalli flower along with developing a packaging material for export.

Materials and Methods

The present experiment was conducted in the laboratory of Department of floriculture and landscaping, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar. Fully developed fresh flower buds of uniform size, shape and milky white colour, were used for the study. Fifty numbers of fresh flower buds of uniform size were treated with the chemicals and surface dried. Then the treated flowers packed in polythene bags of 40, 60 micron thickness and 20cm*12cm dimension without vents and heat sealed. These bags were stored under room temperature or cold storage conditions. The temperature and relative humidity of the cold room were 7 °C and 80-85 % respectively. This experiment was laid out in FCRD with 16 treatment combinations and 3 replications and the treatments comprised of two factors

Chemical treatments

C1: Sucrose 4%
C2: Boric acid 4%
C3: NAA 100ppm
C4: Water

Packaging method

P1: Packed in 40micron polythene bags and Stored under 7°C
P2: Packed in 60micron polythene bags and Stored under 7°C
P3: Packed in 40micron polythene bags and Stored under room temperature
P4: Packed in 60micron polythene bags and Stored under room temperature

The quality parameters namely, freshness index, flower opening index, colour retention index, fragrance index (Least and undesirable-1, Mild-2, Strong-3, Very strong-4) and shelf life were recorded based on hedonic scale scoring as per Madhu 1999. Physiological parameters namely moisture content (MC), relative water content (RWC), physiological loss in weight (PLW). All the observations were recorded on the 24th, 48th hours after packing. Standard procedure of Sukhatme and Amble 1985 was adopted for statistical scrutiny of data.

Results and Discussion

Visual flower quality parameters

Freshness index

The data presented in table 1 revealed that among the different treatments imposed, treating flowers with Boric acid 4%, packed in 60micron polythene and stored under 7°C (C2P2) recorded the highest freshness index (98.75, 87.74%) on the, 24th, 48th hours after treatment respectively. The lowest freshness index 88.14, 55.82% respectively) was

observed in(C4P3)i.e. flowers treated with water and packed in 40micron polythene and Stored under room temperature.

Colour retention index

The data presented in table2 revealed that the maximum colour retention index of flowers was observed when the flowers subjected to Boric acid 4% and packed in 60 micron polythene and stored under7⁰C (C2P2) with the values being (100, 93.75 %).on the 24th,48th hours after treatment respectively. The lowest colour retention index of 77.77,50.28 % respectively was observed in(C4P3) i.e. flowers treated with water and packed in 40micron polythene and stored under room temperature.

Flower opening index

The lowest flower opening index (3.16, 11.25% respectively) was observed in the treatment C2P2 i.e. Boric acid 4% and packed in 60 micron polythene and Stored under7⁰C. Maximum flower opening index (10.92, 34.93 % respectively) was observed in (C4P3) i.e. flowers treated with water and packed in 40 micron polythene and stored under room temperature.

Shelf life

The data presented in table 4 and figure 4 revealed that the longest shelf life of flowers (168.33 hours) was recorded in the treatment C2P2 i.e. Boric acid 4% and packed in 60 micron polythene and Stored under7⁰C. The shortest shelf life (60.75 hours) was observed in(C4P3) i.e.in flowers treated with water and packed in 40micron polythene and Stored under room temperature.

The results revealed jasmine flowers treated with Boric acid 4 %, Packed in 60micron polythene and Stored under7⁰C had highest

freshness index and colour retention index with a longest shelf life (168.33 hours)while flowers treated with water and packed in 40micron polythene and stored under room temperature lost their colour, fragrance and with a shortest shelf life (60.75hrs.).

Boric acid has been used as a mineral salt that could increase the osmotic concentration and pressure potential of the petal cells, thus improving their water balance and longevity in cut flowers as reported by Vanmeeteren, (1989).. This might be due to treatment of boric acid is an antisense agent. Burzo *et al.*, (1998) reported that the brown colouration and loss of fragrance might be due to the accumulation of flavins and other phenolic substances in flower cell vacuoles. The phenol accumulation was also found to be minimum with normal colour retention and fragrance in the packed flowers than the control In agreement with the present finding, the potential of boric acid in prolonging the postharvest life of flowers has been reported earlier in jasmine by (Mukhopadhyay *et al.*,1980,Binisundar, 2011, Jawaharlalet *al.*, 2012,Manimaranet.al, 2018) in crossandraby Bhattacharjee, 2002,in carnationby Serrano *et al.*, 2006.

Flower physiological parameters

Moisture content

The data presented in table 5and figure2 revealed that the highest moisture content of flowers was observed when the flowers subjected to Boric acid 4% and packed in 60 micron polythene and stored under7⁰C (C2P2) with the values being (82.36, 76.20%). on the 24th,48th hours after treatment respectively. The lowest moisture content (54.88, 35.09 % respectively) was observed in (C4P3) i.e. flowers treated with water and packed in 40micron polythene and stored under room temperature

Table.1 Effect of chemical treatment and packaging on freshness index of *Jasminum sambac*

	Freshness index (%)									
	24 hours after packing					48 hours after packing				
	P1	P2	P3	P4	Mean	P1	P2	P3	P4	Mean
C1	93.82	95.74	90.71	91.24	92.88	83.57	85.99	70.09	72.80	78.11
C2	97.99	98.75	93.42	94.36	96.13	86.25	87.74	77.02	79.28	82.57
C3	96.02	97.23	92.17	93.16	94.65	84.28	85.00	73.14	75.08	79.38
C4	95.20	92.13	88.14	89.42	91.22	75.14	77.77	55.82	56.56	66.32
MEAN	95.76	95.96	91.11	92.05	93.72	82.31	84.13	69.02	70.93	76.60
	SEm(±)	CD(0.05)				SEm(±)	CD(0.05)			
Packing(p)	1.01	2.90				0.90	2.62			
Chemical©	1.01	2.90				0.90	2.62			
PXC	2.01	NS				1.82	5.25			

Table.2 Effect of chemical treatment and packaging on colour retention index of *Jasminum sambac*

	Colour retention index (%)									
	24 hours after packing					48 hours after packing				
	P1	P2	P3	P4	Mean	P1	P2	P3	P4	Mean
C1	100.00	100.00	100.00	100.00	100.00	82.71	83.89	74.72	75.93	79.31
C2	100.00	100.00	100.00	100.00	100.00	92.41	93.75	80.29	84.88	87.83
C3	100.00	100.00	100.00	100.00	100.00	90.51	92.70	76.91	78.22	84.59
C4	100.00	100.00	88.89	77.77	91.67	80.35	81.66	50.28	51.71	66.00
MEAN	100.00	100.00	97.22	94.44	97.92	86.50	88.00	70.55	72.69	79.43
	SEm(±)	CD(0.05)				SEm(±)	CD(0.05)			
Packing(p)	0.12	0.35				0.89	2.59			
Chemical©	0.12	0.35				0.89	2.59			
PXC	0.24	0.71				1.79	5.18			

Table.3 Effect of chemical treatment and packaging on flower opening index of *Jasminum sambac*

	Flower opening index(%)									
	24 hours after packing					48 hours after packing				
	P1	P2	P3	P4	Mean	P1	P2	P3	P4	Mean
C1	6.19	5.83	10.25	9.31	7.89	18.75	16.25	27.12	26.10	22.05
C2	4.16	3.16	9.42	8.12	6.21	13.75	11.25	21.23	20.75	16.74
C3	5.82	5.00	9.12	9.05	7.24	15.00	12.50	25.25	23.75	19.12
C4	9.15	8.75	10.92	10.15	9.74	22.50	19.24	34.93	30.94	26.90
Mean	6.33	5.68	9.92	9.15	7.77	17.50	14.81	27.13	25.38	21.20
Packing(p)	SEm(±)	CD(0.05)				SEm(±)	CD(0.05)			
Chemical©	0.17	0.48				0.35	1.01			
PXC	0.17	0.48				0.35	1.01			

Table.4 Effect of chemical treatment and packaging on shelf life of *Jasminum sambac*

	Shelf life (hours after packing)				
	P1	P2	P3	P4	Mean
C1	140.5	148.66	68.5	73	107.67
C2	158.08	168.33	74.16	78.75	119.83
C3	144.16	150.33	72.75	75.5	110.69
C4	120.75	127.83	60.75	65.66	93.75
Mean	140.87	148.78	69.04	73.22	107.98
	SEm(±)	CD(0.05)			
Packing(p)	1.10	3.20			
Chemical©	1.10	3.20			
PXC	2.21	6.40			

Table.5 Effect of chemical treatment and packaging on moisture content of *Jasminum sambac*

	Moisture content(%)									
	24hours after packing					48hours after packing				
	P1	P2	P3	P4	Mean	P1	P2	P3	P4	Mean
C1	75.75	78.68	58.17	60.62	68.31	72.85	74.34	54.79	55.87	64.46
C2	80.15	82.36	63.07	67.56	73.29	75.18	76.20	58.52	59.68	67.39
C3	78.02	80.14	62.15	63.47	70.95	74.38	75.49	55.17	56.15	65.29
C4	74.02	75.05	54.88	55.96	64.98	57.06	58.75	35.09	36.65	46.88
Mean	76.99	79.06	59.57	61.90	69.38	69.86	71.19	50.89	52.08	61.01
	SEm(±)	CD0.05				SEm(±)	CD0.05			
Packing(p)	0.31	0.90				0.30	0.87			
Chemical©	0.31	0.90				0.30	0.87			
PXC	0.62	1.80				0.60	1.74			

Table.6 Effect of chemical treatment and packaging on Relative water content *Jasminum sambac*

	Relative water content(%)									
	24 hours after packing					48 hours after packing				
	P1	P2	P3	P4	Mean	P1	P2	P3	P4	Mean
C1	89.03	90.86	83.19	85.08	87.04	85.08	86.37	61.17	62.31	73.73
C2	91.82	93.40	89.52	90.73	91.37	87.27	89.35	77.74	79.65	83.50
C3	90.81	91.26	87.74	88.26	89.52	86.23	88.47	64.44	65.32	76.12
C4	85.06	87.27	81.15	84.64	84.53	78.94	80.05	49.82	51.69	65.13
Mean	89.18	90.70	85.40	87.18	88.11	84.38	86.06	63.29	64.74	74.62
	SEm(±)	CD(0.05)				SEm(±)	CD(0.05)			
Packing(p)	0.83	2.4				0.70	2.03			
Chemical©	0.83	2.4				0.70	2.03			
PXC	1.66	NS				1.41	4.06			

Table.7 Effect of chemical treatment and packaging on physiological weight loss percent of *Jasminum sambac*

	PLW (%)									
	24 HOURS					48 HOURS				
	P1	P2	P3	P4	MEAN	P1	P2	P3	P4	MEAN
C1	1.22	0.21	2.47	2.23	1.53	1.65	0.77	6.01	5.00	3.36
C2	0.18	0.12	0.85	0.65	0.45	1.24	0.48	3.33	2.26	1.83
C3	0.23	0.14	2.41	1.71	1.12	1.43	0.52	3.75	2.70	2.10
C4	1.29	0.27	2.78	2.62	1.74	2.09	0.88	7.08	6.00	4.01
MEAN	0.73	0.19	2.09	1.84	1.21	1.60	0.66	5.04	3.99	2.82
	SEm(±)	CD0.05				SEm(±)	CD0.05			
packing(p)	0.03	0.08				0.04	0.12			
chemical©	0.03	0.08				0.04	0.12			
PXC	0.061	0.17				0.08	0.246			

Fig.1 Effect of chemical treatment and packaging on shelf life of *Jasminumsambac*

N.B C1: Sucrose 4%,C2: Boric acid 4% C3: NAA 100ppm C4: Water

P1:Packed in 40micron polythene bags and Stored under 7°C

P2:Packed in 60micron polythene bags and Stored under 7°C

P3:Packed in 40micron polythene bags and Stored under room temperature

P4: Packed in 60 micron polythene bags and Stored under room temperature

Fig.2 Effect of chemical treatment and packaging on moisture content (%) of *Jasminum sambac*

N.B C1: Sucrose 4%, C2: Boric acid 4% C3: NAA 100ppm C4: Water

P1: Packed in 40 micron polythene bags and Stored under 7°C

P2: Packed in 60 micron polythene bags and Stored under 7°C

P3: Packed in 40 micron polythene bags and Stored under room temperature

P4: Packed in 60 micron polythene bags and Stored under room temperature

Relative water content

From table 6 it is clear that the Relative water content was highest when the flowers subjected to Boric acid 4% and packed in 60 micron polythene and stored under 7°C (C2P2) with the values being (93.40%, 89.35%) on the 24th, 48th hours after treatment respectively. The lowest relative water content (81.15, 49.82 % respectively) was observed in (C4P3) i.e. flowers treated with water and packed in 40 micron polythene and stored under room temperature

Physiological loss in weight

The lowest physiological weight loss percent (0.12 %, 0.48 % respectively) was observed in the treatment C2P2 i.e. Boric acid 4% and packed in 60 micron polythene and Stored under 7°C on the 24th, 48th hours after treatment

respectively.

The highest physiological weight loss percent (2.78 %, 7.08% respectively) was observed in (C4P3) i.e. flowers treated with water and packed in 40 micron polythene and stored under room temperature.

Physiological loss in weight (PLW), moisture content, relative water content (RWC) of flowers are traits inter-related to each other. Increased PLW leads to decline in fresh weight of flowers, which expresses visually as symptoms of wilting of flowers, as reported in carnation (Nichols, 1966) and Rosa damascena (Sharma, 1981). Relative water content of flowers manifests water status of petals. It is obvious that when moisture content is higher and weight loss is lower, relative water content stays high. Similar

evidence has been reported in gladiolus, wherein a decrease in RWC of petals caused the dehydration of tissues and in turn wilting, as reported by ZahedHossain *et al.*, 2006. This might be due to maintenance of optimum humidity temperature and proper balance of CO₂ and O₂ concentration under refrigerated condition which in turns slows down the process of respiration and evapo transpiration and ultimately reduced the PLW. The results are in close agreement with the findings of Nirmala and Venkatesh Reddy (1993) and Yathindra *et al.* (2018).

From the present investigation, it may be concluded that for long term storage of J. sambac flowers, a packaging technology of treatment with 4% boric acid + packing 60 micron polythene bags with no ventilation and stored under 7 °C proved effective with a high freshness index, colour retention index, high moisture content and low physiological loss in weight. Flowers in this package can be kept fresh for a longer period with a shelf life of 168.33 hours.

Acknowledgement

The authors wish to thank Research guide and Head, Department of floriculture and landscaping, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar for providing necessary facility in conducting the experiment.

References

- Bhattacharjee, S.K. 2002. Post-harvest management of flowers. In: Handbook of Horticulture. (ed.). Chadha, K.L. New Delhi, ICAR publications.
- Bini Sundar, S.T. 2011. Investigation on the production system efficiency of precision technology in comparison with conventional system in gundumalli (*Jasminum sambac* ait.) Ph. D. Thesis, TNAU, Coimbatore
- Burzo I, Amariute A, Cracium C, Cachita D. 1988. Changes in the potential difference across membranes and ultrastructure of Gladiolus flowers preserved in water at room temperature. Fourth international symposium on Post-harvest Physiology of Ornamental Plants. 119-127
- Jawaharlal, M., S.P. Thamaraiselvi and M. Ganga 2012. Packaging technology for export of jasmine (*Jasminum sambac* Ait.) flowers J. Hortl. Sci. Vol. 7(2):180-189
- Li Zhen, Lin Cong, Tao Zhao 2011. The effects of Jasmine tea on nutritional physiological functions of growing rats. Modern Preventive Medicine; 38(3):456-460.
- Madhu, G.R. 1999. Studies on the effect of different packaging materials and chemicals on the post-harvest life of Jasmine flowers. M.Sc. (Ag.) thesis submitted to Annamalai University, Annamalai nagar, Tamil Nadu
- Manimaran, P., M. Ganga, M. Kannan and K. Arulmozhiselvan 2018. Standardization of post harvest management techniques for *Jasminum nitidum* flowers. Chemical Science Review and Letters 2018, 7(26), 652-658
- Mukhopadhyay, T.P., T.K. Bose, R.G. Maiti, S.K. Misra and J. Biswas. 1980. Effect of chemicals on the post-harvest life of jasmine flowers. National Seminar on Production Technology of Commercial Flower Crops. TamilNadu Agricultural University, Coimbatore, pp. 47 –50.
- Nichols, R. 1966. Ethylene production during senescence of flowers. J. Hort. Sci., 41: 279-290.
- Nirmala S, Venkatesh Reddy T. 1993. Shelf life of Jasmine (*Jasminum sambac*)

- flowers as influenced by packaging and ventilation. Mysore. J Agric. Sci.; 27(3):272-276.
- Ramana KV, Rodoviguez R, Rao V. Packaging of fresh fruits and vegetables. Ibid, 1988, 31-38
- Serrano, M, D. Martinez-Romero, F. Guillen, S. Castillo and D. Valero. 2006. Maintenance of broccoli quality and functional properties during cold storage as affected by modified atmosphere packaging. Post harvet Biol. Technol., 39: 61-68
- Sharma, V.1981. Biochemical changes accompanying petal development in *Rosa damascena*. Plant Biochemical J., 8(1): 13-16
- Sukhatme, P.Vand Amble, V.N. 1985. Statistical Methods for Agricultural Workers ICAR, New Delhi, 553p
- Van Meeteren, U. 1989. Water relations and early leaf wilting of cut chrysanthemums. Acta Hort., 261: 129-135
- Yathindra HA, Keerthishankar K, Rajesh AM, Harshavardhan M, Mutthuraju GP and Mangala KP. 2018Packaging technology for extending shelf life of jasmine (*Jasminumsambac* CV. Mysuru Mallige) flowers
- Journal of Pharmacognosy and Phytochemistry; SP3: 257-259
- Zahed Hossain, Abul Kalam Azad Mandal, Subodh Kumar Datta and Amal Krishna Biswas 2006. Decline in ascorbate peroxidase activity – A prerequisite factor for tepal senescence in gladiolus. J. Plant Physiol., 163: 186 – 194.

How to cite this article:

Sushree Choudhury, Jatindra Nath Das, Chitta Ranjan Mohanty, Arun Kumar.Das and Bijaya Kumar Mishra 2019. Packaging Technology for Extending Shelf Life of Jasmine (*Jasminum sambac* CV. Gundumalli) Flowers. *Int.J.Curr.Microbiol.App.Sci.* 8(09): 1724-1732.
doi: <https://doi.org/10.20546/ijcmas.2019.809.199>