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STUDIES ON POST HARVEST SHELF LIFE OF TUBEROSE (*POLIANTHES TUBEROSA*)

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Abstract

Tuberose (*Polianthes tuberosa*) is one of the most important loose flower as well as cut flower crops in tropical and sub-tropical regions of the world including India. It belongs to the family Agavacaeae and originated in Mexico. It is a perennial herbaceous plant usually produces flowering spikes almost round the year, but it blooms profusely during summer and rainy seasons. Under normal condition in the market, tuberose flowers do not retain for more than a day and show a sign of browning or rotting on the second day when the temperature rises in the summer months. As a result of rapid deterioration, unsold flowers are discarded and the loss due to spoilage is worth several lakhs of rupees a year. Thus, there is a vast scope for improvement in technologies adopted, which will yield tremendous export potential. Hence, the investigations was made in the Department of Horticulture, Faculty of Agriculture, Annamalai University to find out the effect of different thickness of polyethylene packaging (100, 200 and 300 gauge) and different per cent of ventilation (0, 0.25 and 0.50 per cent) on post harvest shelf life of tuberose flowers under room (ambient) condition. The experiment was conducted in completely randomized black design (CRD) with 13 treatments and three replications. Each replication three numbers of polyethylene bags of 20 × 26 cm size with various size of thickness of polyethylene bags are used depends upon the treatment schedule were utilized. In each polyethylene bags 15g of tuberose flowers were placed and sealed with polyethylene sealer. For unpacked control, the flowers were kept in trays. The study revealed that for all the attributes, packing of polyethylene bags without ventilation recorded better result over ventilated polyethylene bags. Among the various packaging materials used to improve the post harvest life of tuberose, 300 gauge polyethylene bags without ventilation was found to be the best by reducing the physiological loss in weight (PLW), cumulative physiological loss in weight (CPLW), maintaining the freshness and improved shelf life of 4 days. It was followed by high density polyethylene bags without ventilation, while the unpacked control recorded the least values for the above characters.

Keywords **:** Shelf life, tuberose, freshness index and packaging

Introduction

Tuberose (*Polianthes tuberosa*) is one of the most important loose flower as well as cut flower crops in tropical and sub-tropical regions of the world including India. It belongs to the family Agavacaeae and originated in Mexico. It is a perennial herbaceous plant usually produces flowering spikes almost round the year, but it blooms profusely during summer and rainy seasons. Waxy white flowers of tuberose impregnate the surroundings with their sweet lingering fragrance. The larger yield of tuberose flowers is consumed in the form of loose flowers followed by cut flowers and extraction of concrete. Loose flowers of tuberose are largely used for making garlands, floral ornamentals, hair decoration, offering at religious, social and official functions, etc. For loose flower utilization its single petalled cultivars are preferred over the Double petalled cultivars. Tuberose florets (loose flowers) retain their freshness only for one to two days under ordinary condition, thus bring down their market value. (Khongwir *et al.*, 2017). As price of these loose flowers are determined by market demand, quantity of production and freshness of flowers, it is subjected to market glut. Presently single petalled tuberose flowers are grown for loose flower trade with obsolete technologies and lack of improved method of harvesting, packing, storing and transporting. Under normal condition in the market, it shows a sign of browning or rotting within one or two days, when the temperature rises in the summer months. A single day enhancement of shelf life is an important issue to extend the availability for consumer (Kumar, 2002). As a result of rapid deterioration, unsold flowers are discarded and the loss due to spoilage is several lakhs rupees per year. Thus, there is a vast scope for improved technologies adopted, which will yield tremendous export potential. Among the various packing methods for increasing the post harvest life of loose flower, packaging with various thickness of polythene bags with various percentage of ventilation play a major role. It plays a vital role for extending the vase life of loose flower and easy transportation. Polythene bag Packing was found to maintain optimum humidity and proper balance of CO_2 and O_2 (Carbon-di-oxide and Oxygen) concentration which in turn, slows down the process of respiration and evapotranspiration and ultimately improved the shelf life of flowers (Thompson, 1971; Marchall and Nolin, 1990).

Materials and Methods

The experiment was conducted in the laboratory of the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalainagar. The tuberose flowers were obtained from the well maintained private garden near Thiruvannamalai during the entire period of study. The tuberose flowers harvested during the early hours of the day were used for this study. This study was conducted to find the effect of different thickness of polythene bag packaging and various percentage of ventilation on the shelf life of tuberose. The experiment was conducted in completely randomized black design (CRD) with three replications. Each replication six numbers of polythene bags of 20 × 26 cm size with various thickness are used depends upon the treatment schedule were utilized. In each polythene bags 15g of tuberose flowers were placed and sealed with polythene sealer. For unpacked control, the flowers were kept in trays. The treatment schedule is given below,

T_1 - control.
T_2 - 100 gauge polythene bag without ventilation.
T_3 - 100 gauge polythene bag with25 per cent ventilation.
T_4 - 100 gauge polythene bag with50 per cent ventilation.
T_5 - 200 gauge polythene bag without ventilation.
T_6 - 200 gauge polythene bag with25 per cent ventilation.
T_7 - 200 gauge polythene bag with 50 per cent ventilation.
T_8 - 300 gauge polythene bag without ventilation.

T_9 - 300 gauge polythene bag with 25 per cent ventilation.
T_{10}- 300 gauge polythene bag with 50 per cent ventilation.
T_{11}- High density polythene bag without ventilation.
T_{12} - High density polythene bag with25 per cent ventilation.
T_{13} - High density polythene bag with 50 per cent ventilation.

The observations on Physiological loss of weight (PLW), Cumulative physiological loss of weight, Freshness index (FI) and Shelf life were recorded. Data under different characters were analyzed statistically as suggested by Panse and Sukhatme (1976).

Result and Discussion

Physiological loss in weight and cumulative Physiological loss in weight:

In tuberose flowers different thickness of polythene bag packaging and different percentage of ventilation significantly influenced over non-packaged control flowers for physiological loss in weight and cumulative loss in weight. Among the various treatments T_8 recorded the least physiological loss in weight with the value of 3.76, 3.56 and 2.36 per cent on 2nd, 3rd and 4th day while CPLW on 4th day was 9.68 % this was followed by $T_{11}$with the value of 5.19, 4.25 and 2.72 per cent of physiological loss in weight on 2nd, 3rd and 4th day while CPLW on 4th day was 12.16 per cent. The maximum Physiological loss in weight (33.93, 24.72 and 10.25 respectively on 2nd, 3rd and 4th day) and CPLW (68.90% at 4thday) was observed with T_{1}- control. This was mainly due to direct relationship between evapotranspiration and the number of vents (Anandaswamy *et al*., 1963). Further the reduction in the permeability of the bags for the moisture and air thereby reducing the physiological loss of weight (PLW), which leads to the reduction in the loss of moisture as well as respiration of the produce (Forney *et al.* 1989). These are in line with the findings reported earlier by Nirmala Srinivas and T.V. Reddy, (1993) in jasmine, Sharma *et al.* (1991) in grapes, Singh *et al.* (1992) in Ber and Pota *et al.* (1987) in pomegranate.

Freshness Index:

In tuberose flowers different thickness of polythene bag packaging and different percentage of ventilation significantly influenced the control flowers for freshness index. Among the treatments T_8 recorded highest freshness index on 4th day (69.74 %). This was followed by T_9 and T_{11} with the value of 57.07 %. Maximum loss of freshness index was observed with control (T_1) with 19.69 %. This is mainly due to packaging was found to maintain optimum humidity and proper balance of CO_2 and oxygen concentration which, slows down the process of respiration and evapotranspiration leads to higher freshness index (Hardenburg, 1971). Similar findings were reported by Kanbe *et al.* (1975) in apples.

Shelf life:

Different thickness of polythene bag packaging and different percentage of ventilation significantly influenced over on non-packed control flowers for shelf life in tuberose flowers. The highest shelf life was obtained with T_8 with the value of 4 days. This was followed by T_{11} with the value of 3.66 days while the least shelf life (1.66 days) was noticed with control. This may be due to the reduction in the loss of moisture as well as respiration causing reduced ethylene action and delayed senescence (Halevy and Mayak, 1981). Similar result was reported by Lukaszewska (1981) in dahlia.

Conclusion

Among the various thickness of polythene bag packaging and different percentage of ventilation for improving the shelf life of tuberose, 300 gauge polythene bags without ventilation (T_8) recorded the higher shelf life of 4 days.

Table 1 : Effect of different thickness of polythene bag packaging on physiological loss in weight (%) of tuberose

Treatment details	2nd day	3rd day	4th day
T_1- Control	33.93	24.72	10.25
T_2 - 100 gauge Polythene bag without ventilation	10.46	06.46	03.73
T_3 - 100 gauge Polythene bag with 25 per cent ventilation	13.85	07.32	05.43
T_4 -100 gauge Polythene bag with 50 per cent ventilation	16.53	08.18	06.08
T_5 -200 gauge Polythene bag without ventilation	06.52	04.95	02.94
T_6 - 200 gauge Polythene bag with 25 per cent ventilation	08.42	05.73	03.35
T_7 - 200 gauge Polythene bag with 50 per cent ventilation	11.23	06.58	03.87
T_8 - 300 gauge Polythene bag without ventilation	03.76	03.56	02.36
T_9 - 300 gauge Polythene bag with 25 per cent ventilation	06.89	05.01	03.13
T_{10} - 300 gauge Polythene bag with 50 per cent ventilation	08.69	05.82	03.47
T_{11} - High density Polythene bag without ventilation	05.19	04.25	02.72
T_{12} - High density Polythene bag with 25 per cent ventilation	09.06	05.97	03.50
T_{13} - High density Polythene bag with 50 per cent ventilation	12.11	06.72	04.05
SED	0.63	0.18	0.09
CD(P=0.05)	1.27	0.38	0.18

Table 2 : Effect of different thickness of polythene bag packaging on cumulative physiological loss in weight (%) of tuberose

Treatment details	2^{nd} day	3^{rd} day	4^{th} day
T_1- Control	33.93	58.65	68.90
T_2 - 100 gauge Polythene bag without ventilation	10.46	16.92	20.65
T_3 - 100 gauge Polythene bag with 25 per cent ventilation	13.85	21.17	26.60
T_4 -100 gauge Polythene bag with 50 per cent ventilation	16.53	24.71	30.79
T_5 -200 gauge Polythene bag without ventilation	06.52	11.47	14.41
T_6 - 200 gauge Polythene bag with 25 per cent ventilation	08.42	14.15	17.50
T_7 - 200 gauge Polythene bag with 50 per cent ventilation	11.23	17.81	21.68
T_8 - 300 gauge Polythene bag without ventilation	03.76	07.32	09.68
T_9 - 300 gauge Polythene bag with 25 per cent ventilation	06.89	11.90	15.03
T_{10} - 300 gauge Polythene bag with 50 per cent ventilation	08.69	14.51	17.98
T_{11} - High density Polythene bag without ventilation	05.19	09.44	12.16
T_{12} - High density Polythene bag with 25 per cent ventilation	09.06	15.03	18.53
T_{13} - High density Polythene bag with 50 per cent ventilation	12.11	18.83	22.88
SED	0.63	0.92	0.96
CD(P=0.05)	1.27	1.84	1.93

Table 3 : Effect of different thickness of polythene bag packaging on freshness index (%) of tuberose

Treatment details	2^{nd} day	3^{rd} day	4^{th} day
T_1- Control	100	30.41	19.69
T_2 - 100 gauge Polythene bag without ventilation	100	67.74	43.75
T_3 - 100 gauge Polythene bag with 25 per cent ventilation	100	60.52	35.81
T_4 -100 gauge Polythene bag with 50 per cent ventilation	100	57.07	32.12
T_5 -200 gauge Polythene bag without ventilation	100	75.40	60.07
T_6 - 200 gauge Polythene bag with 25 per cent ventilation	100	72.07	53.33
T_7 - 200 gauge Polythene bag with 50 per cent ventilation	100	66.74	42.56
T_8 - 300 gauge Polythene bag without ventilation	100	80.43	69.73
T_9 - 300 gauge Polythene bag with 25 per cent ventilation	100	74.08	57.04
T_{10} - 300 gauge Polythene bag with 50 per cent ventilation	100	71.44	50.41
T_{11} - High density Polythene bag without ventilation	100	78.40	65.07
T_{12} - High density Polythene bag with 25 per cent ventilation	100	70.53	48.72
T_{13} - High density Polythene bag with 50 per cent ventilation	100	65.40	40.41
SED	NS	0.86	1.69
CD(P=0.05)	NS	1.73	3.41

Table 4 : Effect of different thickness of polythene bag packaging on shelf life (days) of tuberose

Treatment details	Shelf Life
T_1- Control	1.66
T_2 - 100 gauge Polythene bag without ventilation	2.66
T_3 - 100 gauge Polythene bag with 25 per cent ventilation	2.33
T_4 -100 gauge Polythene bag with 50 per cent ventilation	2.00
T_5 -200 gauge Polythene bag without ventilation	3.33
T_6 - 200 gauge Polythene bag with 25 per cent ventilation	3.00
T_7 - 200 gauge Polythene bag with 50 per cent ventilation	2.66
T_8 - 300 gauge Polythene bag without ventilation	4.00
T_9 - 300 gauge Polythene bag with 25 per cent ventilation	3.33
T_{10} - 300 gauge Polythene bag with 50 per cent ventilation	3.00
T_{11} - High density Polythene bag without ventilation	3.66
T_{12} - High density Polythene bag with 25 per cent ventilation	3.00
T_{13} - High density Polythene bag with 50 per cent ventilation	2.66
SED	0.15
CD(P=0.05)	0.31

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