Plant Archives Vol. 24, Special Issue (GABELS), 2024 pp.626-629 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2024.v24.SP-GABELS.097

PACKAGING EFFECTS ON SHELF-LIFE AND QUALITY OF TOMATO (*LYCOPERSICON ESCULENTUM* MILL.) IN STORAGE

Garima Tiwari[1], Harish Chandra Yadav[2*], Virendra Kumar Patel[3], Pushpendra[2], Anand Singh,[2] Saurabh[4] and Satish Yadav[1]

[1]Integral Institute of Agricultural Sciences and Technology (IIAST), Integral University Lucknow. (U.P.) – 226026, India
[2]Department of Fruit Science, College of Horticulture, Banda University of Agriculture and Technology, Banda. (U.P.) – 210001, India
[3]S.D.J.P.G. College, Chandeshwar, Azamgarh. (U.P.) – 276128, India
[4]College of Community Science Banda University of Agriculture and Technology, Banda (U.P.) – 210001, India
*Corresponding author e-mail: harishyadav9453@gmail.com

ABSTRACT

Present experiment the "Packaging effects on shelf-life and quality of tomato (*Lycopersicon esculentum* Mill.) in storage" was conducted at the Department of Agriculture, Integral Institute of Agricultural Science and Technology, Lucknow (U.P.) during 2019-2020. The different packaging materials were used for evaluation of postharvest shelf-life extension in tomato in storage condition. The packaging materials out of four levels (i.e. paper bag, polythene bag, gunny bag, corrugated boxes and control); the polythene bag was found to be more beneficial followed by corrugated boxes and paper bags compared to gunny bag.

***Keywords*:** Paper bag, polythene bag, gunny bag and corrugated boxes, shelf life, Ascorbic acid.

Introduction

Tomato (*Lycopersicon esculentum* Mill.) is a member of the solanaceae family which is famous for medicinal, nutritional point of view like egg-plant, potato tubers and tomatoes, and chili, botanically this fruit is known as berry (Salunkhe *et al*., 2005). Tomato is taken as the versatile commodity that can be eaten fresh, included in foods to increase their flavor, taste and aroma and can also be processed to various forms of products as well (Bhowmik *et al*., 2012). Tomato contains essential as well as beneficial components like carbohydrates, fiber, minerals, protein, fat, glycoalkaloids, phytosterols etc. (Davies *et al*., 1981). Several essential vitamins like vitamin A, vitamin C, vitamin E, folic acid and several water-soluble vitamins are also present in tomato (Beecher, 1998).

The post-harvest (post production) and marketing system is a chain of interconnected activities from the time of harvest to the delivery of the food to the consumer, often referred to as "farm to fork" (Zorya *et al*., 2011). Post-harvest losses refer to the measurable quantitative and qualitative food loss in the postharvest system (Aramyan and van Gogh, 2014). However, tomato fruit has short storage life due to its high moisture content and deteriorates very fast after harvest (Kaur *et al*., 2020) leading to high postharvest losses. Moreover, tomato is a seasonal crop, and when there is seasonal glut, large percentage of it is lost by improper postharvest handling and processing. Depending on the humidity and temperature it ripens very soon, ultimately resulted in poor quality as the fruit become soft and unacceptable (Ullah, 2009).

Proper post-harvest handling is important in maintaining the quality and ensuring safety of the fruit while being brought to consumers on time, and in meeting buyers' specifications and trade requirements. A range of different-sized polybags with perforated holes makes them ideal for food use. Bags which are made of burlap are known as gunny bags or burlap

bags. Although these sacks were developed to ship and transport several agricultural commodities. Burlap is basically a fabric which is woven and made from natural fibers such as jute. These sacks are eco-friendly as it is made of natural fabrics. Moreover, as it is densely woven, it can be quite difficult to destroy these bags. As it features extreme strength and durability, it is used widely for carrying heavy weights. Corrugated fiberboard or corrugated cardboard is a type of packaging material consisting of a fluted corrugated sheet and one or two flat linerboards. It is made on "flute lamination machines" or "corrugators" and is used for making corrugated boxes. A paper bag is a bag made of paper, usually kraft paper. Paper bags can be made either with virgin or recycled fibers to meet customers' demands.

Materials and Methods

Study entitled "Packaging effects on shelf-life and quality of tomato (*Lycopersicon esculentum* Mill.) in storage" was conducted at the Department of Agriculture, Integral Institute of Agricultural Science and Technology, Lucknow (U.P.) during 2019-2020. All the facilities necessary for experiment, including labor were made available in the department. Even sized, uniform and fully matured fruits of tomato were harvested from college farm and brought to the laboratory for the purpose of experiment. Bruised, undersized and immature fruit were discarded. Selected fruits were washed under tap water. Paper bags, polyethylene bags, jute bags and Corrugated Fiber Boxes (CFB) were used for the purpose of packaging. Experiment was planned using Completely Randomized Design (CRD) with 5 treatments (T_1-Polythene bags, T_2-Gunny bags, T_3-Corrugated boxes, T_4-Paper bags, T_0-Absolute control) and three replications; therefore, there were 15 treatment combinations. The data was statistically analyzed using ANOVA (analysis of variance) technique of Cochran and Cox (1950). Observations were recorded on 0, 5, 10 and 15th days of storage.

Results and Discussion

The observations recorded of the present study of tomato during storage have been given with sequence. Data pertaining to the effect of different packaging materials on physical characteristics of tomato during storage, physiological loss in weight, are presented as under the data on weight loss of tomato fruits during storage as influenced by various, packaging materials.

The weight loss of tomato was increased as the storage period increased in all treatments. However, increase in physiological loss in weight was significantly reduced as a result of various treatments under study $T_3>T_1>T_2$. On 15th days of storage the minimum (3.42%) and maximum (15.86) weight loss was recorded. These results are substantiated with Rajput *et al.* (2008) and Sammi and Masud, T. (2007).

The rotting of tomato was increased with the advancement of storage period in all packaging treatments. However, the percent rotting was significantly affected by various treatments. On 15th day of storage, Polythene bag (P) resulted the minimum rotting (16.41%) as compared to maximum (31.76%) in Gunny bag. Similar results were supported by the findings of Mehta *et al.* (1987) and Wills *et al.* (1981).

The shelf life of tomato was enhanced in all packaging treatment. However, the shelf life was significantly affected by all the treatments. Polythene bag (P_1) resulted the maximum shelf life (15.6days) as compared to absolute control (7 days), which was noted minimum as reported by Mignani *et al.* (1995).

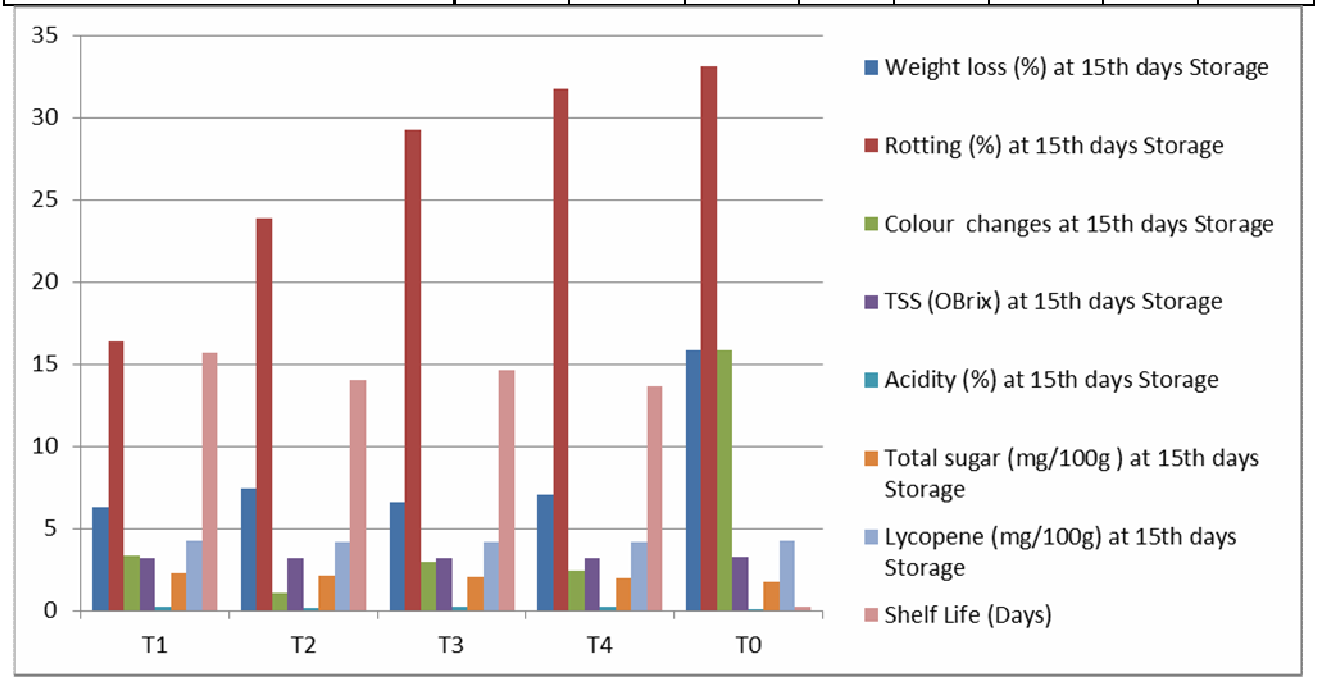
The different packaging material affects the colour of fruits during storage. However, the maximum pink tomatoes were seen in perforated polythene bags (P_1) treated group and maximum dark red tomatoes were seen in absolute control group. Similar finding was reported by Ritenour and Narciso (2006).

The TSS content of fruit in creased with advancement of storage period in all the packaging treatments. The rate of increase in TSS content was non-significant. The minimum TSS content (3.22º Brix) was recorded in perforated polythene bag (P_1) packaging up to 15 day of storage, which was non-significantly lower than absolute control (3.27º Brix). The results are in agreement with the finding of Sadler *et al.* (1990), Wang and Morris (1993).

The total sugar content decreased in all the treatments as the storage period. However, among all the treatments, the Polythene bag (P_1) was found to be superior over rest treatments. On 15th day of storage, maximum total sugar (2.28 mg/100gfruit) was recorded in Polythene bag treatment while minimum (1.80 mg/100g fruit) in absolute control. The effect of packaging materials was non-significant. The results are in agreement with the finding of Sompoch and Chanthaporn (2006).

Table 1: Effect of different packaging materials on physiological and chemical characteristics of tomato fruits during storage.

Treatments	Weight loss (%) at 15th days Storage	Rotting (%) at 15th days Storage	Colour changes at 15th days Storage	TSS (°Brix) at 15th days Storage	Acidity (%) at 15th days Storage	Total sugar (mg/100g) at 15th days Storage	Lycopene(mg/100g) at 15th days Storage	ShelfLife (Days)
T_1-Polythene bag	6.34	16.41	3.33	3.22	0.27	2.28	4.23	15.67
T_2-Gunny bag	7.41	23.89	1.11	3.24	0.21	2.15	4.22	14.00
T_3-Corrugated boxes	6.60	29.22	3.00	3.24	0.24	2.09	4.21	14.67
T_4-Paper bag	7.08	31.76	2.44	3.24	0.22	1.96	4.21	13.67
T_0-Absolute control	15.86	33.12	15.86	3.27	0.13	1.80	4.25	0.23
S. EM+	0.13	0.21	0.13	0.05	0.00	0.03	0.07	0.66
CD at 5%	0.40	0.61	0.40	0.15	NS	0.113	NS	NS



Conclusion

On the basis of result obtained in the present investigation. It may be concluded that application of different packaging materials can be used for extending postharvest shelf life of tomato during storage. In case of packaging materials out of four levels (i.e. paper bag, polythene bag, gunny bag and corrugated boxes), the polythene bag was found to be more beneficial followed by corrugated boxes and paper bags compared to gunny bag.

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