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DETERMINATION OF POST HARVEST LOSSES AND SHELF LIFE OF TOMATO AS INFLUENCED BY DIFFERENT TYPES OF POLYTHENE AT ROOM TEMPERATURE (28ºC)

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ABSTRACT

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An experiment was carried out in the laboratory of the Department of Horticulture in Sher-e-Bangla Agricultural University, Dhaka to asses the post harvest losses and shelf life of tomato during the period from 15 March to 25 April 2006. The experiment comprised of two factors i.e. several colors of polythene bag (*viz*. Control, Black Polythene, Blue polythene, Yellow polythene and White transparent polythene) and different types of polythene (*viz*. sealed and perforated) at room temperature (28ºC). Black polythene was found to be superior to other colors of polythene in respect of all the parameters. Sealed polythene was better in all the parameters except shelf life of tomato. There was significant variation among the treatments resulted from the combination of colors and types of polythene in respect to all the parameters except firmness percentage. Again the highest firmness (%), moisture (%) and dry matter (%) were in black sealed polythene (25.8%), (85.36%) and (7%) at room temperature (28ºC). The best result was obtained from black polythene when combined with sealed condition.

Key words: *post harvest losses, shelf life of tomato, colors and types of polythene, room temperature*

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.) belongs to the family Solanaceae which is one of the most universally known, widely consumable nutritious and widely grown vegetable in the world. Its position in the whole world is after potato and sweet potato both in area and production (FAO 1995). It is native to the Peruvian and Mexican region and was introduced in this sub-continent during the British period. About 1.5 millions metric tons of tomato is produced in Bangladesh per year (BBS 2002). But 70% of them is produced during the winter season in some particular places of Bangladesh. Due to lacking of appropriate post harvest technologies and transport system we can not supply properly the fresh tomatoes in all the places of our country from producing place. We have poor infrastructure and knowledge for the post harvest management techniques of tomato and we have no better refrigerating system all over the country due to lack of proper electricity. So we have to practice to storage tomato at room temperature with several kinds of polythene. Maximum loss in quality and quantity of this crop occurs from harvesting to consumption (Kader 1992). Some of the latest methods in packaging and storage of fruits and vegetables for extending storage life include, modified atmospheric packaging (MAP), controlled atmospheric packaging (CAP) and modified humidity packaging (MHP) etc. But in Bangladesh, no studies have been done regarding the above mentioned techniques, because these are highly expensive and need technical skills. Considering the above-mentioned facts, the present investigation was under-taken to determine post harvest losses and shelf life of tomato as influenced by different colors and types of polythene and room temperature.

MATERIALS AND METHODS

The present investigation was carried out in the laboratory of the Department of Horticulture in Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka during the period from 15 March to 25 April 2006. The average temperature of the storage room was 28ºC and relative humidity 52.15%. The materials used for the study were freshly harvested 500 g tomatoes for treatment of the variety Ratan. The tomato fruits were collected from the Horticulture Research Center (HRC) of Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur. The trail was laid out in Randomized Block Design (RCBD) having two factors, factor A: Several colors of polythene bag, Factor B: Different types of polythene (Sealed + Perforated). The colors of factor A were: Control treatment (Without polythene), P1- Black polythene, P2- Blue polythene, P3- Yellow polythene, P4- White transparent polythene. The types of factor B were: S1-Sealed condition, S2-Perforated condition. Thus, there were (4 x 2 + control) = 9 treatments combinations. The combinations were as follows: Control treatment (Without polythene), P1S1: Black Polythene + Sealed condition, P2S1: Blue polythene + Sealed condition, P3S1: Yellow polythene + Sealed condition, P4S1: White transparent polythene + Sealed condition, P1S2: Black Polythene + Perforated condition, P2S2: Blue polythene + Perforated condition, P3S2: Yellow polythene + Perforated condition and P4S2: White Transparent polythene + Perforated condition. Tomato fruits were in breaker stages (i.e. the distal

end of the fruit just turns yellowish ring) during the harvesting from the field. Tomatoes were harvested in the morning, immediately transferred to the laboratory room with careful handling. Data were collected at 3 days interval during the storage period. The shelf life (days), time for color development (days), weight loss (%), firmness (%), dry matter (%) and moisture (%) of marketable fruits were studied the entire storage period. All the parameters were studied only up to 20 days in room temperature. The weight losses of the sample were recorded at every 3 days during the storage period. The peel color of fruit was recorded by matching with a standard color chart. Development of various spots on the peel of fruits and softening and rotting of fruits were also recorded. Firmness was measured by comparing the tomato with a fresh ripen one; it was done by free hand at end of shelf life in each treatment. From the total no. of tomatoes in each treatment, the firmness of each tomato was observed and calculated in percent. Weight of known amount of tomato pulp (samples) was taken 20 days after storage by an electric balance and dried at 70ºC until the weight becomes constant. Moisture percent and dry matter percent of tomato was calculated. The shelf life was calculated by counting the days required to attain the beginning of rotting of fruits. The data recorded on different parameters were statistically analyzed using MSTAT software to find out the significance of variation resulting from the experimental treatments. The mean for the treatments were calculated and analysis of variance for each of the characters was performed by F (variance ratio) test. The differences between the treatment means were evaluated by LSD test at 5% probability.

RESULTS AND DISCUSSION

Changes in physical characteristics of tomato fruit, weight loss (%)

The colors of polythene were found to have significant effect on weight loss of tomato. The highest weight loss (19.45%) was found in tomatoes without polythene, the second highest (13.48%) in transparent polythene and the lowest (11.05%) in Black polythene (Table 1). This result has similarities with the findings of Noor *et al.* (1997). Weight loss was higher in perforated polythene (Table 1). This might be due to the rate of transpiration was lower in sealed polythene bag. This finding agrees with the report of Syamal (1981). There had also a significant variation due to the combined effect of different colors and types of polythene bag at room temperature (28ºC) in respect of percent weight loss of tomatoes. Treatment control showed the highest weight loss (19.45%) where as it was the lowest (8.22%) in Black sealed polythene (Table 2).

Time required for color development (days)

The number of days required for color development after harvest of tomato was significantly influenced by the color of polythene. It was found that the tomato (Breaker stage) required the highest (14.73 days) time in Black polythene, the second highest time (14.15days) in Blue polythene and the lowest (9.11days) in control treatment for complete ripening (Table 1). Types of polythene had a significant effect on the ripening of tomato. However, tomato in perforated polythene became fully red earlier than sealed polythene and it took 12.12 and 14.78 days, respectively (Table 1). This might be due to higher concentration of CO_2 and lower concentration of O_2 inside the sealed polythene bag. There had a significant variation due to the combined effect of different color and types of polythene bag at room temperature (28ºC) in respect of time required for color development or ripening of tomato. Control treatment showed the sign of full ripening after 9.11 days where as Black sealed treatment took 15.37 days (Table 2).

Firmness (%)

Color of polythene bag had significant effect on the firmness of the tomato at the end of shelf life in each treatment. The maximum firmness percentage (24.85%) was found in Black polythene followed by Blue polythene (21.14%), Yellow polythene (19.79%), and White transparent polythene (18.57%). The lowest firmness was found (10.46%) in control treatment (Table 1). Types of polythene had significant effect on the firmness of tomato. Higher firmness (22.33%) was recorded in sealed condition and lower (19.96%) in perforated condition (Table 1). There was a significant variation among the treatments resulted from the combination of color and types of polythene in respect of firmness of tomato. The highest firmness (25.80%) was observed in Black sealed polythene followed by (23.89%) in Black perforated polythene and the lowest firmness (10.46%) in control (Table 2). Ketelaere *et al.* (2004) found the similar result in their studies.

Moisture (%)

Color of polythene had significant effect on the moisture content of the tomato. Tomato in Black polythene had the highest (84.13%) moisture percentage and the lowest (79.26%) moisture was recorded from control treatment (Table 1). Types of polythene also had significant effect on the moisture content of tomato. Higher moisture content (84.08%) was recorded in sealed condition and lower (81.86%) was recorded in perforated condition (Table 1). There was a significant variation on the moisture content of tomato among the treatments resulted from the combination of color and types of polythene in respect of moisture content of tomato. The highest moisture content (85.36%) was recorded Black sealed polythene followed by (84.70%) in Blue sealed polythene and the minimum moisture content (79.26%) in control (Table 2). Kim *et al.* (1996) showed the similar trends of result in their studies.

Dry matter (%)

The percent of dry matter in tomatoes was significantly influenced by the color of polythene. It was found that the highest (6.69%) dry matter resulted from Black polythene whereas the lowest (2.99%) was found in control treatment (Table 1). Types of polythene had a significant effect on the dry matter content of tomatoes. Tomato in sealed polythene had higher dry matter percentage (6.03%) than perforated polythene (4.97%) (Table 1). This might be due to the lower rate of transpiration and higher concentration of CO_2 and lower concentration of O_2 inside the sealed polythene bags. There had a significant variation due to the combined effect of different color and types of polythene bag at room temperature (28ºC) in respect of dry matter content of tomatoes. Black sealed treatment showed the highest dry matter content (7.00%) followed by Yellow perforated polythene (4.19%) whereas the lowest dry matter was found in control treatment (2.99%) (Table 2).

Shelf life (days)

The shelf life of tomato fruits was significantly influenced by the color of polythene bag. It was recorded that Black polythene had a higher storability than any other color of polythene. The maximum shelf life (19.15 days) was recorded in Black polythene followed by Blue polythene (15.14 days). The shelf life was the minimum (12.31 days) for control treatment (Table 1). Types of polythene had significant effect on the shelf life of tomatoes. The perforated polythene gave the longer shelf life (16.39 days) sealed polythene (15.98 days) (Table 1). There was a significant variation among the treatments resulted from the combination of color and types of polythene in respect of shelf life of tomato. The highest shelf life (19.52 days) was recorded in Black perforated polythene and the lowest shelf life (12.31 days) in control treatment (Table 2). Subburamu *et al.* (1990) found almost similar result in their studies.

Table 1. Effect of types and colors of polythene on weight loss (%), time required for color development, firmness(%), moisture(%), dry matter(%) and shelf life of tomato at room temperature (28ºC)

Treatment	Weight loss (%)	Time required for color development (Days)	Firmness (%)	Moisture (%)	Dry matter (%)	Shelf life (Days)
Types of polythene						
S1	9.44	14.78	22.33	84.08	6.03	15.98
S2	14.92	12.12	19.96	81.86	4.97	16.39
LSD 5%	0.99	1.32	0.99	0.66	0.33	1.32
Color of polythene						
Control treatment	19.45	9.11	10.46	79.26	2.99	12.31
P1	11.05	14.73	24.85	84.13	6.69	19.15
P2	11.67	14.15	21.14	82.85	4.28	15.14
P3	12.59	12.94	19.79	83.20	5.38	15.17
P4	13.48	12.01	18.57	81.73	6.18	14.49
LSD 5%	1.57	2.09	1.57	1.04	0.52	2.09

Where S1-Sealed condition, S2-Perforated condition, P1-Black polythene, P2-Blue polythene, P3-Yellow polythene, P4-White transparent polythene

Table 2. Combined effect of types and color of polythene on weight loss, time required for color development, firmness (%), moisture(%), dry matter (%) and shelf life of tomato at room temperature (28ºC)

Treatment	Weight loss (%)	Time required for color development (Days)	Firmness (%)	Moisture (%)	Dry matter (%)	Shelf life (Days)
Control treatment	19.45	9.11	10.46	79.26	2.99	12.31
P1S1	8.22	15.37	25.80	85.36	7.00	18.79
P1S2	13.89	14.08	23.89	82.89	6.37	19.52
P2S1	8.95	15.03	22.40	84.70	4.47	14.92
P2S2	14.39	13.26	20.40	81.01	4.10	15.36
P3S1	9.64	14.72	21.29	83.86	6.58	14.54
P3S2	15.53	11.17	18.29	82.54	4.19	15.80
P4S1	10.99	14.01	19.85	82.46	6.58	14.08
P4S2	15.97	10.00	17.28	81.01	5.78	14.91
LSD 5%	2.22	2.95	2.22	1.48	0.74	2.95

Where S1-Sealed condition, S2-Perforated condition, P1-Black polythene, P2-Blue polythene, P3-Yellow polythene, P4-White transparent polythene

CONCLUSION

It may be concluded that the treatment of post harvest losses and shelf life of tomato as influenced by different types and colors of polythene at Room temperature (28ºC) is suitably effected.

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