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DETERMINATION OF POST HARVEST LOSSES AND SHELF LIFE OF TOMATO AS INFLUENCED BY DIFFERENT TYPES OF POLYTHENE AT REFRIGERATED CONDITION (10ºC)

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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 refrigerated condition (10^0C). The colors of polythene had significant influence on total weight loss, time required for color development, firmness, moisture percentage, dry matter percentage and shelf life of tomato. Black polythene was found to be superior to other colors of polythene in respect of all the parameters. Types of polythene had significant effect on all the parameters except shelf life (days). Sealed polythene was found to be the best in all the parameters except shelf life of tomato. There was significant variation among the treatments resulted from the combination of color and types of polythene in respect to all the parameters. Shelf life of tomato was the highest (34.09 days) with black perforated polythene. The highest firmness (96.75%), moisture (98.38%), dry matter (9.73%) was in black sealed polythene condition respectively. The best result was obtained from black polythene when combined with sealed condition.

Key words*: post harvest losses, shelf life, colors and types of polythene, refrigerated condition*

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). Tomato is rich in food value; 100 gm fresh tomato contains 3.5 gm carbohydrate, 0.98 gm protein, 0.50 gm ß carotene, 0.35 mg iron and 10-100 mg ascorbic acid (Rashid 1993). Tomato is also a rich source of amino acids and minerals such as Na, K, Fe, Ca, Mg, P, Bo, Zn, Cu, Mn etc. (Rick 1978). About 1.5 millions metric ton of tomato is produced in Bangladesh per year (BBS 2002). Seventy percent 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 and can not export to other countries from producing place. Maximum loss in quality and quantity of this crop occurs from harvesting to consumption (Kader 1992). Research in post harvest handling is confined in some developed countries although post harvest problems are common in developing countries like Bangladesh. Several technologies have been developed and adapted in the developed countries to overcome the problem of post harvest losses and therefore, the quality of produce has improved significantly. As agricultural crops respire continuously after harvest for which desiccation, wilting, shriveling and mechanical injury occurs there (Rahman *et al.* 1992). The problem of loss can be controlled by adapting suitable scientific method of packaging and storage and by establishing proper post harvest management. 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 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 temperature and relative humidity of the refrigerator were recorded daily with a digital temperature humidity meter. The average temperature of the refrigerator was 10ºC and relative humidity 65%. The materials used for the study were freshly harvested 500 g tomatoes for each treatment of the variety Ratan. The tomato fruits were collected from the Horticulture Research Center (HRC) of Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur. Tomato fruits were in breaker stages (i.e. the distal end of the fruit just turns yellowish ring) during the harvesting from the field. Tomato was harvested in the morning, immediately transferred to the laboratory room with careful

handling. 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. Data were collected at 3 days interval during the storage period. The shelf life (days), time for color development (days), weight loss (%), firmness (%), dry mater (%) and moisture (%) of marketable fruits were studied during the entire storage period. All the parameters were studied only up to 20 days at refrigerated condition (10^0C). 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

The results have been presented under the following headlines

Weight loss (%)

The colors of polythene had significant effect on weight loss. The highest weight loss (9.13%) was found in control treatment followed by (7.24%) transparent polythene and the lowest (5.65%) in black polythene (Table 1). Weight loss was higher in perforated polythene (Table 1). This might be due to the rate of transpiration and respiration was lower due to higher concentration of CO_2 and lower concentration of O_2 inside the sealed polythene bag. The rate of weight loss of tomato inside polythene bag was less than those stored in control. Significant variation was found due to the combined effect of different color and types of polythene bag at refrigerator temperature in respect of percent weight loss of tomato. While control treatment showed the highest (9.13%) and the lowest (5.41%) weight loss was observed in black sealed polythene (Table 2).

Time required for color development (days)

The number of days required for color development of tomato was significantly influenced by the color of polythene. Black polythene always increased the time for ripening of tomato. It was found that tomato required the highest time (22.80 days) in Black polythene followed by (21.26 days) in Blue polythene and the lowest time (16.60 days) in control treatment to develop color (Table 1). Types of polythene (perforated and sealed) showed significant effect on the ripening of tomato. Tomato in perforated polythene became red fully earlier than sealed polythene and it took 18.51 and 22.79 days, respectively (Table 1). The rate of transpiration and respiration was lower due to higher concentration of CO_2 and lower concentration of O_2 inside the sealed polythene bag. Significant variation was found due to the combined effect of different colors and types of polythene bag in refrigerator in respect of color development. Control treatment developed color after 16.60 days where as Black sealed polythene took 26.38 days (Table 2). The sealed condition it took always longer time compared to perforated condition. The effect was pronounced in Black polythene (22.80%) followed by Blue polythene (21.26%), Yellow polythene (19.60%), and White transparent polythene (18.95%) (Table 3). Noor *et al.* (1997) also found the similar result.

Firmness (%)

Color of polythene bag had significant effect on the firmness of tomato. The maximum firmness percentage (90.97%) was recorded in Black polythene followed by Yellow polythene (86.35%). The minimum (70.38%) firmness was recorded from control treatment (Table 1). Types of polythene had also significant effect on the

firmness of tomato (Table 1). Higher firmness (89.56%) was found in sealed condition. 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 (96.75%) was found in Black sealed polythene followed by (88.95%) in Yellow sealed polythene and the minimum firmness (70.38%) was recorded in control treatment (Table 2).

Moisture (%)

Color of polythene bag had significant effect on the moisture content of tomato. The maximum moisture percentage (97.73%) was recorded in Black and the minimum (84.57%) was found in control treatment (Table 1). Types of polythene had significant effect on the moisture content of tomato (Table 1). Sealed polythene gave higher moisture (96.72%) content. There was a significant variation among the treatments resulted from the combination of color and types of polythene in respect of moisture content of tomato. The highest moisture content (98.38%) was observed in Black sealed polythene (98.38%) followed by (97.08%) in Black perforated polythene and the minimum moisture content (84.58%) in control treatment (Table 2).

Dry matter (%)

The percent of dry matter in tomato was also significantly influenced by the color of polythene (Table 1). It was found that the highest dry matter (8.88%) in Black polythene, the second highest (7.98%) in Blue polythene and the lowest (3.02%) in the control treatment. Tomato in sealed polythene showed higher dry matter percentage than perforated polythene which were (7.63%) and (6.32%) respectively (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 was a significant variation due to the combined effect of different color and types of polythene bag in respect of dry matter content of tomatoes. Black sealed polythene showed the highest dry matter content (9.73%) whereas the lowest dry matter was found in control treatment (3.02 %) (Table 2).

Shelf life (days)

The shelf life of tomato fruits was significantly influenced by the color of polythene bag. The maximum shelf life (33.19 days) was recorded in Black polythene. The shelf life was the lowest (22.26 days) in control treatment (Table 1). Types of polythene had significant effect on the shelf life of tomato. Perforated polythene gave longer shelf life (28.55days). 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 (34.09 days) was observed in Black perforated polythene and the lowest shelf life (22.26 days) in control treatment (Table 2).

Table 1. Main effect of types and color of polythene on weight loss (%), time required for color development, firmness(%), moisture(%) and dry matter(%) at refrigerated condition (10ºC)

Treatment	Weight loss (%)	Time required for color development (Days)	Firmness (%)	Moisture (%)	Dry matter (%)	Shelf life (Days)
Types of polythene						
S1	6.21	22.79	89.56	96.72	7.63	27.16
S2	6.51	18.51	83.16	95.55	6.32	28.55
LSD 5%	0.20	0.58	0.76	0.38	0.19	0.57
Colors of polythene						
Control treatment	9.13	16.60	70.38	84.57	3.02	22.26
P1	5.65	22.80	90.97	97.73	8.88	33.19
P2	6.09	21.26	83.25	96.32	7.98	28.00
P3	6.72	19.60	86.35	95.15	6.42	25.65
P4	7.24	18.95	84.88	95.35	4.65	24.58
LSD 5%	0.31	0.91	1.20	0.60	0.30	0.91

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 wt. loss(%), Time required for color development, firmness(%), moisture(%), dry matter(%) and shelf life in refrigerated condition (10ºC)

Treatment	Weight loss (%)	Time required For color development (Days)	Firmness (%)	Moisture (%)	Dry matter (%)	Shelf life (Days)
Control treatments	9.13	16.60	70.38	84.58	3.02	22.26
P1S1	5.41	26.38	96.75	98.38	9.73	32.29
P1S2	5.89	19.22	85.20	97.08	7.99	34.09
P2S1	5.87	23.65	85.75	96.85	8.88	27.20
P2S2	6.31	18.87	80.75	95.79	7.09	28.81
P3S1	6.55	21.01	88.95	96.09	6.82	25.07
P3S2	6.89	18.20	83.75	94.22	6.03	26.22
P4S1	7.01	20.15	86.80	95.58	5.12	24.09
P4S2	7.48	17.75	82.97	95.12	4.18	25.08
LSD 5%	0.44	1.29	1.70	0.85	0.43	1.28

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 colors and types of polythene at Refrigerated condition (10ºC) is suitably effected.

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