



## Effect of Wrapping Papers on Physiological Changes and Shelf-life of Mango cv. Langra

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### Abstract

Effect of different wrapping postharvest treatments viz. T<sub>0</sub> (control treatment), T<sub>1</sub> (White paper), T<sub>2</sub> (Brown paper), T<sub>3</sub> (Tissue paper) and T<sub>4</sub> (News paper) on physical changes of mango var. Langra were analyzed. Among, the treatments, the maximum 5.25 days was required for ripening in Langra which was kept in white paper and minimum 3.573 days for ripening was recorded in control fruits of mango. The highest total soluble solid (18.60% Brix) was found at over-ripe in brown paper treated fruits and weight loss (16.07%) was occurred in controlled fruits of Langra whereas and the lowest (7.235 and 2.735%, respectively) was in recorded in tissue paper treated fruit at pre-ripe and 3 days after storage, respectively. The maximum shelf life 11.50 days was observed from the mango variety cv. Langra which was treated in brown paper and minimum 7.833 days was found in controlled fruits of Langra.

**Key words:** Wrapping paper, shelf life, mango

### Introduction

Mango is recognized as one of the choicest and is well accepted fruit all over the world and also acknowledged as the king of fruit (Shahjahan *et al.*, 1994). Previous results suggests that mango cultivars differ in flavour (Berardini *et al.*, 2005), nutritional characteristics (Ahmad *et al.*, 2007a) and storage behaviour (Kim *et al.*, 2007). In Bangladesh mango is considered to be the best of all indigenous fruits because of its excellent flavour, attractive fragrance, beautiful shades of colour, delicious taste and nutritional value. Like many other fruits, mango is highly perishable in nature. The fruits undergo many physiological and biochemical changes that lead to ripening and senescence. Shelf life of mango might be extended by stopping or slowing down these physicochemical changes. Due to lack of proper preservation technology, the post harvest loss of mango due to decay is considerable. To reduce this loss and to increase the shelf life, efforts are need to develop post harvest technologies which are not health hazardous and would suit climatic and socio-economic conditions of Bangladesh. Recently, Hassan (2010) reported that the postharvest loss of mango in supply chain was 27%. Hence, adequate measures should be taken to prolong shelf life of mangoes. Due to mishandling, inadequate storage or lack of postharvest technical knowledge, producers and traders have to face about 27% losses (Hassan, 2010), and loss of this perishable commodity is estimated up to 320.7 thousand tons annually with a value of Tk 3,000 lakh in the country (Haq, 2002). Although there are abundant literature dealing with the physic-chemical changes during ripening of mango, but limited information is available effect of wrapping paper materials in Langra. In the circumstances, the present study has been designed to obtain information on some physical changes and shelf life during

ripening with different postharvest wrapping paper treatments.

### Materials and Methods

An experiment was conducted at the laboratory of BAU Germplasm Centre, Dept. of Horticulture, Bangladesh Agricultural University, Mymensingh during May to August 2010. The experimental materials was mango variety namely Langra which were collected from Fruit Research Centre, Rajshahi. Maturity of mango was identified when the shoulders were in line with the stem end and the colour was green. The experiment was laid out in Completely Randomized Design (CRD) with 3 replications. Each replication was consist of 5 fruits. The harvested fruits were wrapped with white paper, brown paper, newspaper and tissue paper separately. Fruits after wrapping were stored at room temperature for observation and data collection. The procedure explained by Koolpluksee *et al.* (1993) was followed. Data on the following parameters were recorded. Each fruit was observed at 2 days interval to record the colour of the peel by estimation. Days required from harvesting to softening fruits and shelf life of mango fruits as influenced by different postharvest treatments was calculated by counting the days required to ripen fruits as to retaining optimum marketing and eating qualities. When the fruits were reached at pre-ripe, ripe and over ripe stage, general appearance and eating quality (taste and flavour) was assessed for organoleptic evaluation. Fruit weight was taken before and after hot water treatment. After treatment, fruits weight was recorded at 2 days interval and then weight loss was calculated and expressed as percentage. Total soluble solids (TSS) content of mango pulp was estimated using Abbe's Refractometer. A drop of mango juice squeezed from the fruit pulp was placed on the

prism of the refractometer, and TSS was recorded as %Brix from direct reading of the instrument. Temperature corrections were made using the temperature correction chart.

**Results and Discussion**

**Changes in peel colour**

Among all treatments, the result exhibited that newspaper improved peel colour of mango. After 12<sup>th</sup> days of storage newspaper developed Greenish yellow colour in mango fruits of Langra. On the other hand, white paper, brown paper and tissue paper

showed yellowish green, greenish yellow and trace of yellow, respectively at the 12 days after storage (Table 1). The increase in color development was probably due to its effects on stimulating the activity of some enzymes that are responsible for ripening of mango. The findings have support of Alves *et al.* (1998) in respect of polythene wrapping who reported low density polyethylene individual bag were more effective in reducing fruit colour development. The results of the present investigation also supports seal packaging retarded the development of peel colour (Straten and Oosthuysen, 1994).

**Table 1: Changes in peel colour of Langra fruits as influenced by different wrapping materials**

Treatments	Days after storage				
	0	3	6	9	12
T <sub>0</sub> (control)	Green	Green	Trace of yellow	Yellowish Green	-
T <sub>2</sub> (White paper)	Green	Green	Trace of yellow	Trace of yellow	Yellowish green
T <sub>3</sub> (Brown paper)	Green	Green	Trace of yellow	Yellowish green	Greenish yellow
T <sub>4</sub> (Tissue paper)	Green	Green	Green	Trace of yellow	Trace of yellow
T <sub>5</sub> (News paper)	Green	Green	Trace of yellow	Greenish yellow	Greenish yellow

**Ripening time**

The postharvest treatment of wrapping materials manifested highly significant differences in respect of time required for ripening. White paper treated fruits required maximum time (5.253 days) for ripening among the treatments followed by brown paper (4.290 days). On the other hand, the minimum ripening time (3.573 days) was need in control treatment (Table 2). In regard of polythene treatment mangoes tool longer ripening time is supported by Koolpluksee *et al.* (1993) who found mangoes kept in polythene or polypropylene bags perforated or not perforated and with or without ethylene absorbent delayed ripening. Polythene provides a protective covering which slowed down the rate of respiration and delayed ripening (Khumlert, 1992).

**General appearance**

The change in general appearance influenced high significantly by their post harvest treatments. At pre-ripe stage, the highest (3.093) rating for this parameter was demonstrated in news paper and the closest (3.063) of it was found in tissue paper treated fruits. At this stage the lowest score was recorded in control (2.668). At ripe and over-ripe stage, the scoring of general appearance showed the maximum (5.090 and 4.563, respectively) in news paper and white paper treated fruits, respectively and the minimum (4.667 and 3.242, respectively) was found both in control (Table 2). The results also revealed that the scoring gradually increased up to ripening after that it showed decline trend.

**Table 2: Main effect of postharvest treatments on ripening time, general appearance and eating quality of mango**

Postharvest treatments	Ripening time (days)	General appearance (1-9) at the stage of			Eating quality (1-9) at the stage of		
		Pre-ripe	Ripe	Over-ripe	Pre-ripe	Ripe	Over-ripe
T <sub>0</sub> (control)	3.573 c	2.668 c	4.677 c	3.242 b	2.450 d	6.337 a	4.083
T <sub>2</sub> (White paper)	5.253 a	2.997 c	4.990 b	4.563 a	2.858 c	5.438 c	4.508 b
T <sub>3</sub> (Brown paper)	4.290 b	3.050 bc	5.043 a	4.337 ab	2.920 b	5.472 c	4.558 b
T <sub>4</sub> (Tissue paper)	4.118 b	3.063 b	5.045 a	3.965 c	2.973 b	5.497 c	4.765 a
T <sub>5</sub> (News paper)	3.742 c	3.093 a	5.090 a	3.512 d	3.142 a	5.683 b	4.79 8 a
<b>Level of Significant</b>	**	**	**	**	**	**	**
<b>LSD<sub>(0.05)</sub></b>	0.4856	0.037	<b>0.0641</b>	<b>0.0641</b>	<b>0.0741</b>	<b>0.037</b>	<b>0.225</b>

**Eating quality**

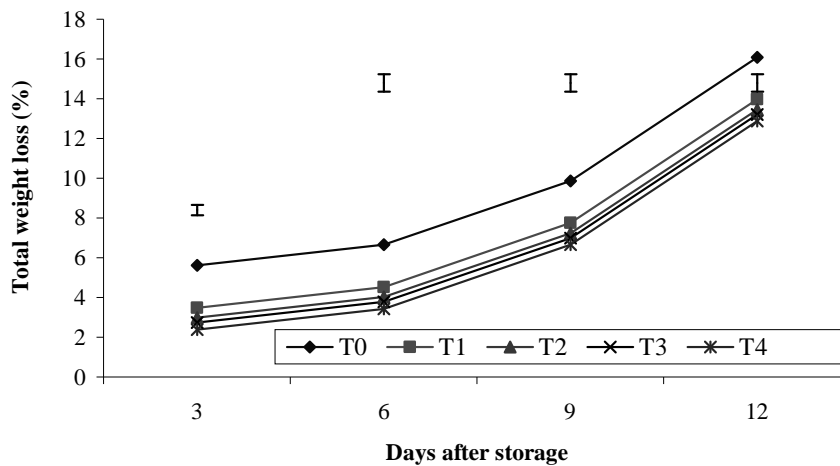
Statistically highly significant variation was exerted among the wrapping materials in respect of eating quality at all the stage of storage. At pre-ripe stage, newspaper showed the highest (3.142) rating value followed by (2.973) tissue paper treatment. On the contrary, control treated fruit of mango cv. Langra had the least score (2.450) of this parameter (Table 2). At the ripe and over-ripe stage, eating quality also showed highly significant variations whereas the maximum eating quality (6.337 and 4.798, respectively) rating value was noted in control and news paper treated fruit, respectively. Those stages, the lowest rating value for eating quality (5.438 and 4.083) was taken from the white paper and control treatments, respectively.

The results was similar to Srinivasa *et al.* (2002) who observed when fruits were kept in low density polythene bag showed off-flavour due to fermentation and fungal growth which has conformity with the present findings.

**Weight loss**

Wrapping materials demonstrated highly significant differences regarding weight loss at all days of storage. After 3 days of storage control treatment showed maximum weight loss and minimum weight losses were recorded in news paper treated fruits. At 3, 6, 9 and 12<sup>th</sup> days of storage, control treatment exhibited the highest weight loss (5.603, 6.648, 9.860 and 16.07%, respectively) and the lowest weight losses (2.395, 3.433, 6.652 and 12.870%, respectively) were noted in news paper (Fig. 1).

The weight loss gradually increased in mango with the advancement of storage and the weight loss was higher in control treated fruit of mango cv. Langra. This characteristic of Langra might be due to its genetical make-up. The reduction of weight loss could be due to the presence of physical barrier in gas diffusion through fruit stomata by which gas exchange takes place between internal tissues and external atmospheres.

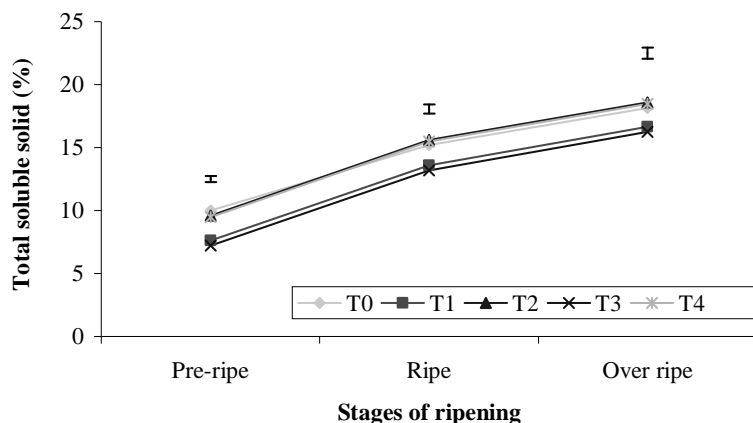


**Fig. 1: Main effect of postharvest treatments on weight loss of mango**

**Total soluble solid**

The different storage treatments used in the present investigation showed statistically highly significantly variations in relation to percent TSS at pre-ripe, ripe, and over-ripe stage. During pre-ripe stage, the untreated fruits had the highest TSS (9.993% Brix) value followed by (9.588% Brix) brown paper treated fruits. At ripe and over-ripe stage, brown paper treated fruits showed the highest TSS (15.60 and 18.60% Brix) value whereas the lowest (7.235, 13.20 and 16.24%

Brix) TSS value was recorded in tissue paper treated fruits. The findings revealed that percent total soluble solids increased sharply from pre-ripe to ripe fruits thereafter it decreased or slightly increased up to over-ripe fruits have got support of Joshi and Roy (1988) who mentioned that TSS increase initially and declined later on. Similar result was also observed by Barua (2003). This variation in TSS might be due to inherent general character.

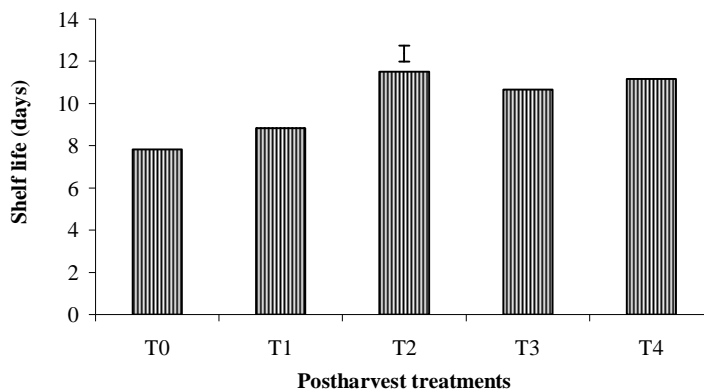


**Fig. 2: Main effect of postharvest treatments on total soluble solid of mango**

**Shelf life**

Different postharvest treatments used in the present study showed highly significant variation in storability of mango. The maximum shelf life (11.50 days) was observed in brown paper bagged fruits and the closest

(11.17 days) of it was obtained in newspaper bagged fruits whereas minimum shelf life was found in control treatment (7.83 days) (Fig. 3). The results of the present study have got support by Shahjahan *et al.* (1994) and Hasan *et al.* (1998).



**Fig. 3: Main effect of postharvest treatments on shelf life of mango**

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