RESEARCH PAPER:

Physiological storage characteristics of some improved varieties of banana *Musa paradisiaca* L.

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SUMMARY

Three banana varieties *viz.*, Williams, Zeling and Grand Nain were packed in polyethylene bags with ventilation and stored at room temperature (32 ± 2^0C), cold storage (20 ± 2^0C) and deep freezer (4 ± 2^0C).Changes in storage characteristics were recorded at 3 days intervals till the fruit's condition turned to rejectable stage. There was increase in PLW, PLW/IW ratio and pulp/peel ratio with increase in storage period.

Key words :
PLW, PLW/IW ratio and pulp/peel ratio, Banana

Formerly, the word banana (*Musa* sp.) was applied to Nendran banana of Kerala which was however called Plantain by westenners. It belongs to the family "Musaceae" and botanically named "*Musa paradisiaca* L.". The word banana was applied to all table varieties. Bananas are cultivated in over 100 countries. The fruits are normally dispatched to the market immediately after harvesting and these ripen on their way to the destination. The field temperature reaches upto 45^0 C in most part of India in summer as a result burn injury occurs in fruits. On the other hand, particularly during winter season, the atmospheric temperature drops 10^0C in the Northern hilly and plain area. The temperature attained by the fruits during transit could vary from 10^0 C to 37^0 C, with the result there are variations in quality of ripen banana (Ranganna, 1992). Temperature plays important role in ripening process of banana and the development of optimum quality. To get banana fruit with good consumer acceptability and longer shelf-life, it is imperative to determine storage characteristic of banana at different temperatures.

MATERIALS AND METHODS

The available banana cultivars *viz.*, Williams, Zeling and Grand Nain were selected for the study. Bunches of these three cultivars of uniform size were harvested from keptive farm of Jain Foods Ltd. Jalgaon about 105 days after fruits set. Each fruit without any blemishes were cut from the bunches. Three lots were made from each variety. Banana fruits were packed in polyethylene bags (22.5 mm x 15mm and 40 micron thickness) with ventilation, having three samples of each variety in one bag.

One lot from each variety was kept at room temperature (32 ± 2^0 C), cold storage (20 ± 2^0 C) and deep freezer (4 ± 2^0 C). Changes in physiological characteristics like physiological loss in weight (PLW), PLW/ initial weight ratio and pulp/peel ratio were recorded at 3 days interval.

Observations were recorded till the rejectable condition of fruit. One sample from each variety was taken out for analysis, therefore, total 9 samples *viz.*, 3 from room temperature, 3 from cold storage and 3 from deep freezer were taken out.

The relationship between dependent variable (PLW, PLW/IW ratio and pulp/peel ratio) and independent variable (storage days) is given in Table 1.

RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Physiological loss in weight (PLW):

Fig. 1 shows a comparison of changes in PLW of banana of various varieties kept under various temperatures against storage days.

Physiological loss in weight of banana fruit increased with increase in storage duration in all varieties. This may be due to transpiration and resperation losses. It is in agreement with Carvalho *et al.* (1990) and Nagaraju and Reddy (1995). At 32^0C, maximum reduction in weight loss occurred in Grand nain (14.5 g) followed

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Table 1 : Relationship between storage characteristics (Y) and storage days (X) at various temperatures

^{0}C	V	Equations (PLW)	Equations (PLW / IW)	Equations (pulp/peel)
32	W	Y=4.47+0.27X (R^2 =0.83)	Y=0.0169+0.0093X (R^2 =0.87)	Y=1.39+ 0.031X (R^2 =0.92)
	Z	Y=2.81+0.40X (R^2 =0.95)	Y=0.0220+0.0112X (R^2 =0.83)	Y=1.70+0.042X (R^2 =0.86)
	G	Y=3.94+0.39X (R^2 =0.92)	Y=0.0294+0.0107X (R^2 =0.79)	Y=1.44+0.035X (R^2 =0.89)
20	W	Y=2.69+0.26X (R^2 =0.95)	Y=0.0093+0.0084X (R^2 =0.83)	Y=1.38+0.02X (R^2 =0.99)
	Z	Y=4.36+0.28X (R^2 =0.90)	Y=0.0191+0.0095X (R^2 =0.90)	Y=1.48+0.02X (R^2 =0.97)
	G	Y=3.50+0.31X (R^2 =0.94)	Y=0.0133+0.0092X (R^2 =0.93)	Y=1.38+ 0.02X (R^2 =0.97)
4	W	Y=2.13+0.63X (R^2 =0.96)	Y=0.0015+0.0106X (R^2 =0.98)	Y=1.02+0.03X (R^2 =0.99)
	Z	Y=1.24+0.55X (R^2 =0.96)	Y=0.0055+0.0117X (R^2 =0.97)	Y=1.34+0.02X (R^2 =0.98)
	G	Y=0.90+0.51X (R^2 =0.99)	Y=0.0002+0.0114X (R^2 =0.98)	Y=1.33+0.02X (R^2 =0.98)

where, V=varieties, W =Williams, Z = Zeling, G = Grand nain

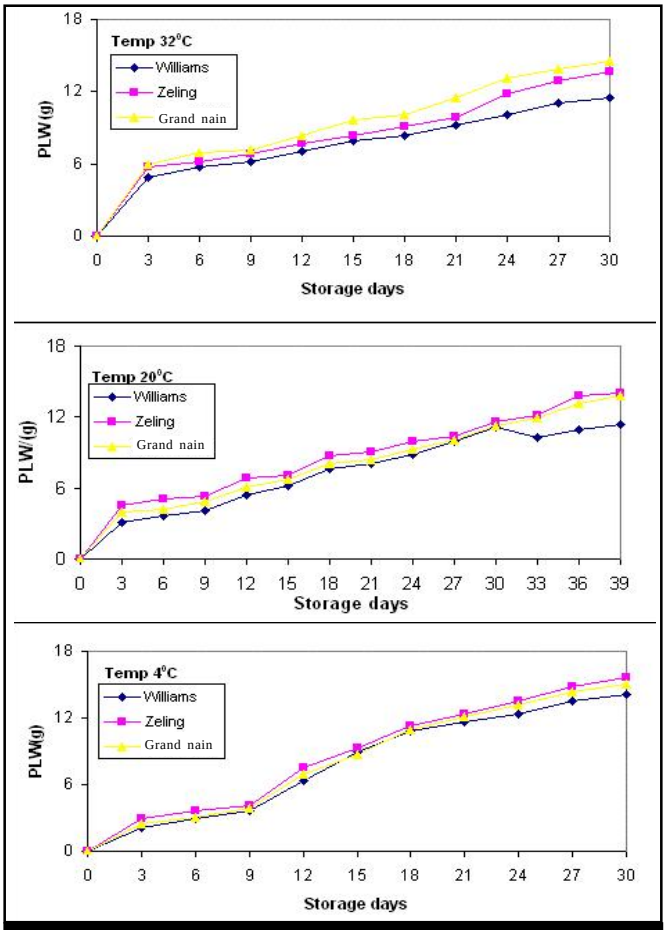

Fig 1 : Changes in PLW against storage days for various varieties of banana

by Zeling (13.7 g) and Williams (11.5 g) varieties. At 20^0 C, Zeling (14.0 g) showed maximum reduction in weight followed by Grand nain (13.8 g) and Williams (11.4 g) while at 4^{0}C, physiological loss in weight for Zeling, Grand nain and Williams were recorded as 15.7,15.1 and 14.1 g, respectively.

The relationship between PLW and storage days was found to be linear upon regression analysis for all samples. The high value of coefficient of correlation R^2 (0.83 to 0.99) indicated that there exist a high degree of relationship between dependent(PLW) and independent variables (storage days).

Physiological loss in weight (PLW) / Initial weight (IW) ratio:

To offset the difference in initial weight of an individual fruit of various banana varieties, the ratio of physiological loss in weight and initial weight was considered and analyzed.

Fig. 2 shows a comparison of changes in PLW/IW ratio against storage days at various temperatures for various on banana.

There was increase in PLW/IW ratio with increase in storage period. At 32^{0}C, PLW/ IW ratio for Williams, Zeling and Grand nain were recorded as 0.106, 0.123 and 0.128 for 30 days of storage, respectively while at 20^{0}C PLW/ IW ratio was obtained in Zeling (0.133) followed by Grand nain (0.128) and Williams (0.110) for

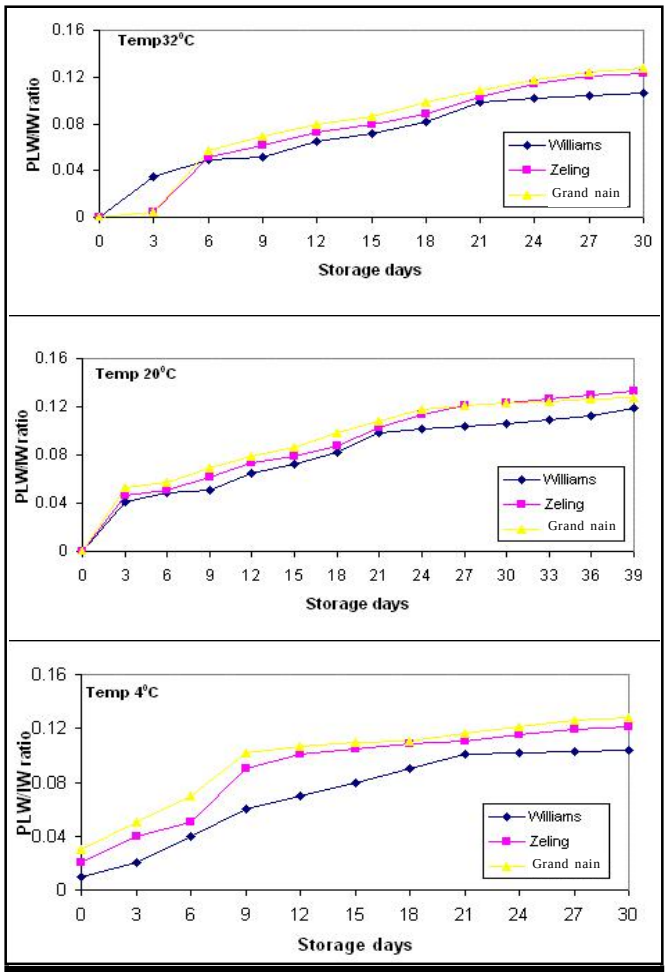

Fig. 2 : Changes in PLW/IW against storage days for various varieties of banana

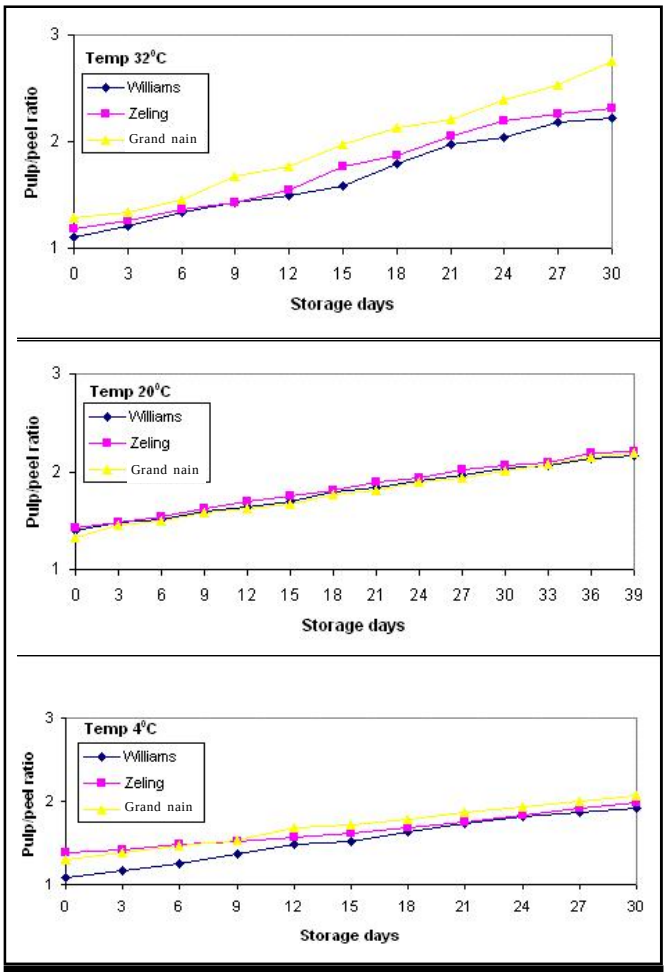

Fig. 3 : Changes in pulp/peel ratio against storage days for various varieties of banana

39 days of storage. At 4^0 C, Zeling (0.121) showed PLW/IW ratio followed by Grand nain (0.112) and Williams (0.104) for 30 days of storage. The high value of coefficient of correlation R^2 (0.79 to 0.98) indicated that there exist a high degree of relationship between dependent(PLW) and independent variables(storage days).

Pulp/ peel ratio:

Fig. 3 shows a comparison of changes in pulp/peel ratio against storage days at various temperatures for various varieties of banana.

Pulp/ peel ratio of banana fruits increased with the increase in storage period. This may be due to osmotic transfer of moisture from peel to pulp.

At 32^0 C, there was rise in Pulp/ peel ratio for Williams (1.11 to 2.22), Zeling (1.18 to 2.31) and Grand nain (1.29 to 2.75) while at 20^0 C, Pulp/ peel ratio increased from 1.4 to2.17 for Williams, 1.42 to 2.21 for Zeling and 1.33 to 2.19 for Grand nain. At 4^0 C, lower rate of increase in Pulp/ peel ratio for Williams (1.08 to 1.92), Zeling (1.38 to 1.98) and Grand nain (1.30 to 2.06) was possibly due to occurrence of chilling injury. In peel, chlorophyll was present.

When banana is stored at lower temperature, metallic parts of chlorophyll *i.e.* copper and nickel oxidizes and then bonds are lossen. Chlorophyll decomposed and became blackish. Similar observations were reported by Desai and Deshpande (1975).

Bose and Mitra (1990) reported an increase in pulp/peel ratio in fruits stored at different temperatures. They observed that the rate of increase in pulp/peel ratio increased with temperature as well as storage period. When fruit of banana were stored at 21-24^0 C for 15 days.

The high value of coefficient of correlation R^2 (0.89 to 0.99) indicated that there exist a high degree of relationship between dependent (PLW) and independent variables (storage days).

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