RESEARCH PAPER:

Correlation and regression studies on storage characteristics of some banana varieties

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SUMMARY

The banana cultivars *viz.*, Williams, Zeling and Grand Nain were packed in polyethylene bags with ventilation and stored at room temperature (32±2^{0}C), cold storage (20±2^{0}C) and deep freezer (4±2^{0}C).Changes in storage characteristics were recorded at 3 days intervals till the fruit's condition turned to rejectable stage. Correlation and Regression analysis of storage characteristics *viz.*, PLW, TSS, moisture and total sugar with storage days at various temperatures was done in the present investigation. The result clearly indicated that there existed a positive correlation between storage characteristics and storage days at various temperatures.

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Banana (*Musa* sp.) is one of the oldest fruit known to mankind. Bananas are cultivated in over 100 countries. Temperature plays important role in ripening process of banana and for 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. Therefore, the present study was undertaken to establish correlation among storage characteristic in banana.

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 quality parameter like PLW, TSS, moisture and total sugar 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.

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RESULTS AND DISCUSSION

The estimates of correlation and regression analysis are presented in Table 1.In the present investigation, the high value of correlation R^2 indicated the high degree of relationship between dependent (storage characteristics) and independent (storage days) variable.

Physiological loss in weight (PLW):

PLW of banana fruits increased with increase in storage duration in all banana varieties at various temperatures. This may be due to transpiration and respiration losses. he 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 existed a high degree of relationship between dependent (PLW) and independent (storage days) variable (Fig. 1).

Total soluble solids (TSS):

The TSS of banana fruits increased with increase in storage duration in all varieties at 32, 20and 4^{0}C. This may be due to conversion of complex polymers into simple substances. During 4^{0}C storage, there was fall in TSS after 21 days of storage possibly because of decomposition of carbohydrates into CO_2 and H_2O. These results are in agreement with the

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=1.05+0.633X (R^2 =0.94)	Y=1.39+ 0.031X (R^2 =0.92)
	Z	Y=2.81+0.40X (R^2 =0.95)	Y=1.61+0.72X (R^2 =0.97)	Y=1.70+0.042X (R^2 =0.86)
	G	Y=3.94+0.39X (R^2 =0.92)	Y=1.23+0.77X (R^2 =0.97)	Y=1.44+0.035X (R^2 =0.89)
20	W	Y=2.69+0.26X (R^2 =0.95)	Y=0.33+0.46X (R^2 =0.90)	Y=1.38+0.02X (R^2 =0.99)
	Z	Y=4.36+0.28X (R^2 =0.90)	Y=0.70+0.58X (R^2 =0.89)	Y=1.48+0.02X (R^2 =0.97)
	G	Y=3.50+0.31X (R^2 =0.94)	Y=0.24+0.592X (R^2 =0.89)	Y=1.38+ 0.02X (R^2 =0.97)
4	W	Y=2.13+0.63X (R^2 =0.96)	Y=3.87+0.04X (R^2 =0.56)	Y=1.02+0.03X (R^2 =0.99)
	Z	Y=1.24+0.55X (R^2 =0.96)	Y=3.60+0.02X (R^2 =0.42)	Y=1.34+0.02X (R^2 =0.98)
	G	Y=0.90+0.51X (R^2 =0.99)	Y=3.69+0.01X (R^2 =0.53)	Y=1.33+0.02X (R^2 =0.98)

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

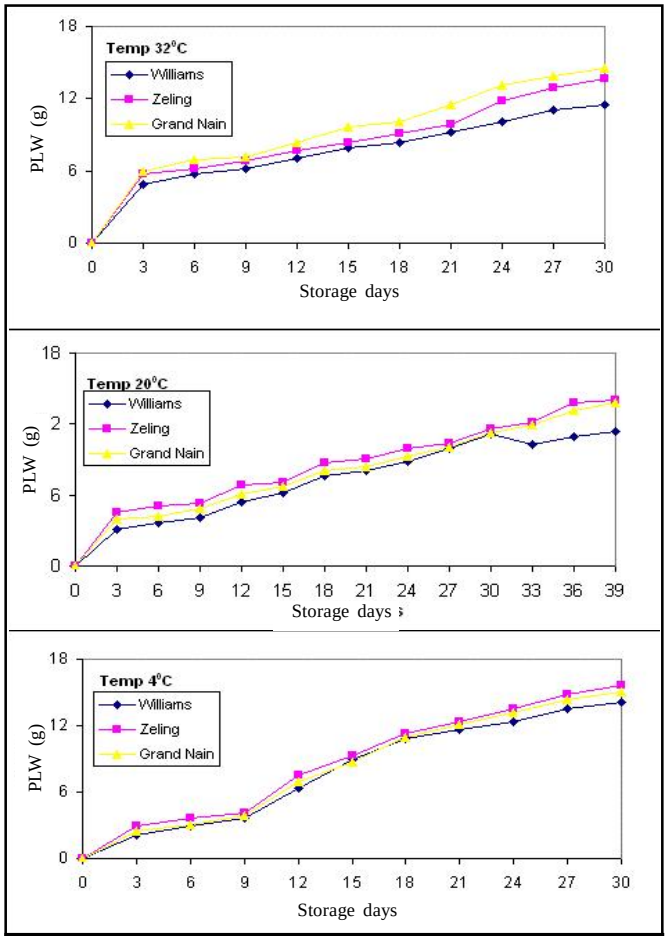

Fig. 1 : Changes in PLW against storage days for various varieties of banana

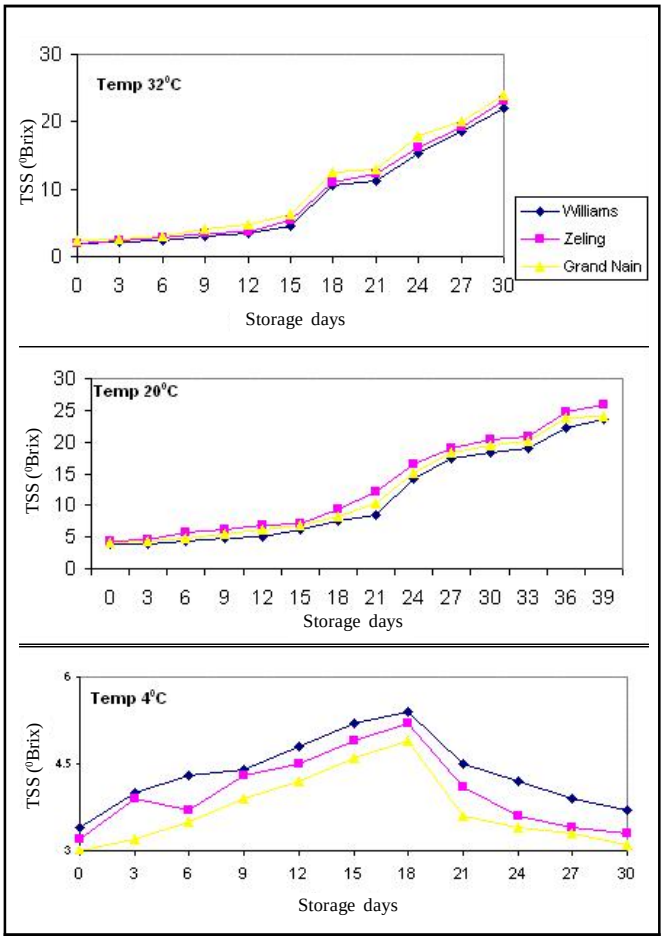

Fig. 2 : Changes in TSS against storage days for various varieties of banana

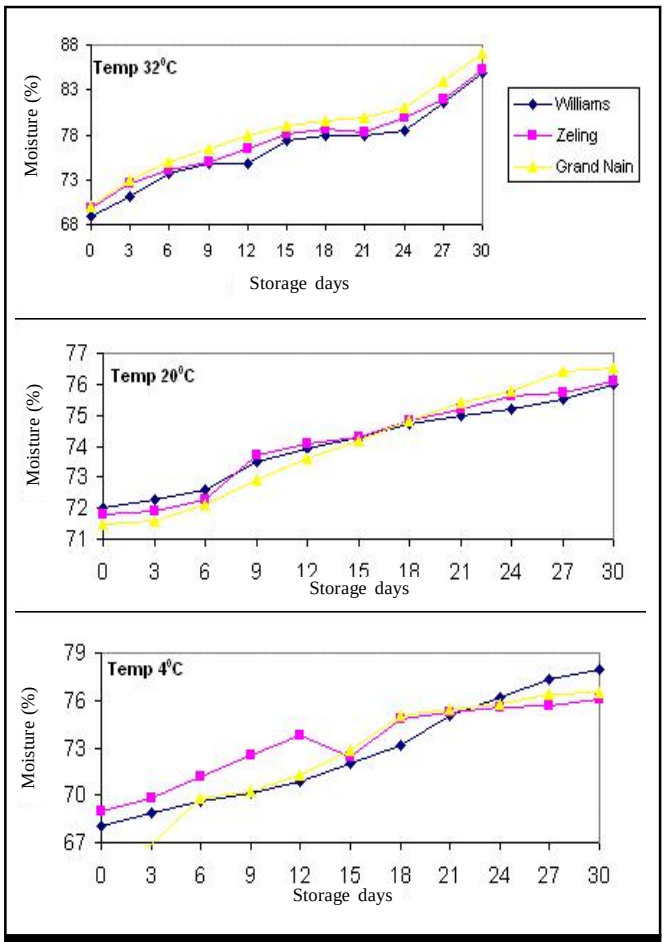

Fig. 3 : Changes in Moisture percentage against storage days for various varieties of banana

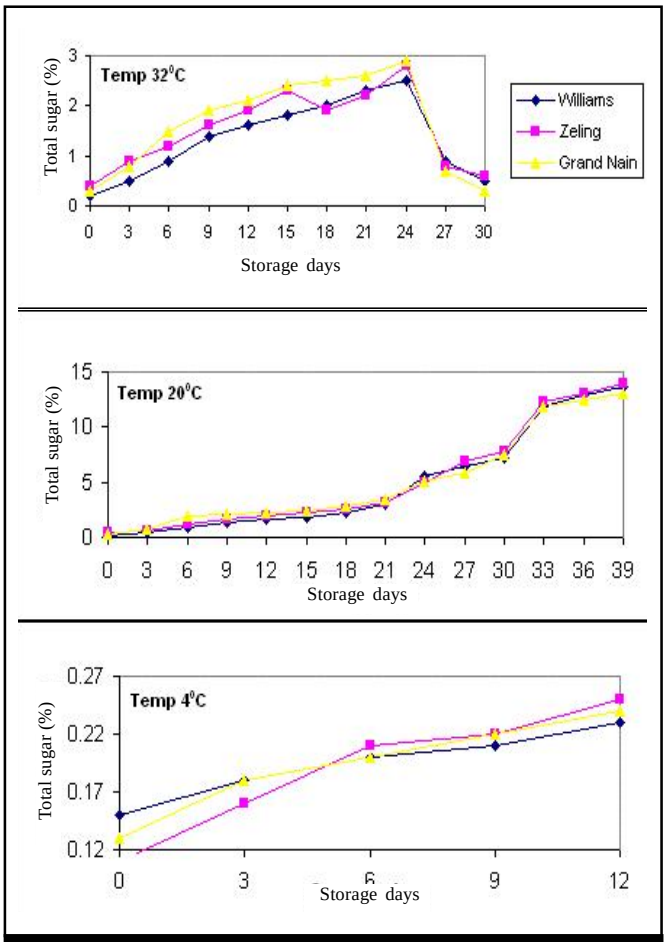

Fig. 4 : Changes in Total sugar percentage against storage days for various varieties of banana

finding of Madamba *et al.* (1977). The relationship between TSS and storage days was found to be linear upon regression analysis for samples kept at 32 and 20°C. The high value of coefficient of correlation R^2 (0.89 to 0.99) indicated that there existed a high degree of relationship between dependent (TSS) and independent (storage days) variable. For 4°C, value of coefficient of correlation R^2 (0.42 to 0.53) indicated that there existed a moderate degree of relationship between dependent and independent variables (Fig. 2).

Moisture:

Moisture of banana fruits increased with the increase in storage duration in all varieties. This may be due to movement of water from peel to pulp. There was sudden rise in moisture percentage after 21 days of storage at 32°C. This was because of high temperature which may cause almost total transfer of moisture from peel to pulp thereby deterioration of banana fruit and fruit becoming pulpy. During storage of 20°C, banana fruits showed uniformity in increase in moisture percentage. At 4°C, due to occurrence of chilling injury, the fruit became black and watery as a result of increase in moisture percentage during storage (Fig. 3).

The relationship between moisture and storage days was found to be linear upon regression analysis for all the samples. The high value of coefficient of correlation R^2 (0.89 to 0.99), indicated that there was existence high degree of relationship between dependent (moisture percentage) and independent (storage days) variables. Similar finding were reported by Awan and Ndubizu (1978) and Dhoot *et al.* (1984).

Total sugar:

There was increase in total sugar percentage as ripening advanced in all the varieties during storage at 32, 20 and 4°C.This may be due to conversion of starch into sugar. During 32°C storage, there was decrease in total sugar percentage after 24 days due to deterioration of fruit (Fig. 4). During storage at 20°C, total sugar percentage remained approximately the same for Williams, Zeling and Grand Nain upto 21 days of storage.

This might be due to slow progress in ripening of fruit. At 4^0C, there was increase in total sugar percentage only upto 12 days of storage. There may be breakdown of sugar into alcohol due to fermentation.

The relationship between total sugar percentage and storage days was found to be linear upon regression analysis for all the samples. The high value of coefficient of correlation R^2 (0.60 to 0.87) indicated that there existed a high degree of relationship between dependent (total sugar percentage) and independent (storage days) variables.

Thus, the present investigation clearly indicated that there exited positive correlation between storage characteristics and storage days at various temperatures. These results are in agreement with the finding of Aziz *et al*. (1976) and Carvalho *et al*. (1990).

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