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Effect of total soluble solid during storage of litchi fruits under different temperatures

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ABSTRACT

Litchi (Litchi chinenesis Sonn.) is the most important fascinating sub-tropical fruit which deteriorates rapidly within 24 hours after harvest, if stored at ambient temperature (14^0C and 32^0C). Shahi variety of litchi was taken as a sample for evaluation of total soluble solid (TSS). The graded litchi was treated with different chemicals i.e. Sulphites, Borex and Bavistin. The treated and untreated litchis were packed in in different packaging materials. It was observed that the TSS (^{0}Brix) of litchi fruits increased the storage period increased. Total soluble solids reducing sugar, non-reducing sugar and total sugar increased up to 10 days of storage of there after declined.

Key words: Litchi, total soluble solid (TSS), Borax, Bavistin and Sulphur fumigation.

INTRODUCTION

Litchi is belongs to the subtropical evergreen fruit cropfruit with high commercial value for its white tasty flesh and attractive red color of anthocyanins at full maturity (Holcroft and Mitcham, 1996). At present India ranks second in the world next to China both in respect to area as well as in production. Litchi fruits are prized for their excellent quality characteristics, pleasant flavor and fascinating colour.

The quality of litchi for commercial propositions can be judged best by considering its physical compositions like regular shape, good size, attractive colour, sweet taste, pleasant flavor and greater pulp stone ratio in particular and chemical compositions like total soluble solids, acidity and ascorbic acid content of the fruit, these are very few cultivars available in the country and none of these possesses all the desirable characters. Litchi fruit consists of 60 per cent juice, 8 per cent rag, 19 per cent skin varied depending upon the varieties and the climate under which it is grown. It is considerably rich in sugar and varies from 6.74 to 18.00 per cent with the average of 11.85 per cent. Besides sugar it contains protein (0.3%), minerals, calcium and phosphorus (0.7%) vitamin 'C' (64 gm/100 gm pulp), A, B and B_2. As far as storage durability of litchi fruits is concerned, this is highly perishable.

Post harvest loss of fresh fruit is one of the vital problems of the tropical countries like India. A large quantity of highly nutritious fruits becomes waste due to lack of proper post harvest handling. To increase the storage duration and maintain the value level of nutrients as well as quality, several scientist and conducted experiments to overcome the problem.

Among them, Gaur and Singh (1987) observed that the specific gravity and TSS content were greatest and aromas were best when fruits treated with sodium hypochlorite were stored in perforated polyethylene powders. Whereas

Sarkar (1995) observed that fruit in cold storage had lower PWI and longer storage life than growth regulator fruits and untreated control fruits. Organoleptic quality rating of fruits decreased during storage with all treatments but TSS content increased during storage with most treatment. Jiang (1997) noted that the appearance and quality of fruit were assessed during storage at ambient conditions after 2, 4 and 6 days when litchi fruits soaked in 1 per cent $NaHSO_4$ containing 0.1, 0.5 and 1 per cent HCI for 2.30 min. the use of 0.5 per cent HCI for 8 min. gave the best red colour and fruit quality.

MATERIALS AND METHODS

Different types of chemicals were used to preserve the litchi fruit for storing long time duration and maintaining its qualities. Grade-I samples of Shahi variety were taken and treated with different chemicals i.e. T_1 = sulphur fumigation, T_2 = Borex and T_3 =Bavistin. The treated and untreated litchi were packed in different packaging materials like perforated polythene polythene bag, plastic box, papter cortoon, wooden box and basket and stored at different temperature i.e. 14^0C and 32^0C.

Determination of Total Soluble Solids (^{0}Brix)

The total soluble solids of fruits (^{0}Brix) were estimated with the help of hand refractometer in all treatments in alternate day. To determine the TSS of litchi fruits, its juice was extracted from fruit and taken upon a glass slab. After that with the help of refractometer, the TSS of fruits was recorded by visualizing clear cross mark inside graduated scale of refractometer.

RESULTS AND DISCUSSION

The total soluble solids of treated and untreated litchi fruits and the products were recorded with the help of hand refractometer at temperatures at temperatures 14^0C and 32^0Cduring storage.

Total Soluble Solids (^{0}Brix) during Storage at 14^0C

The observation for total soluble solids contents of the fruits were recorded during storage and the collected data were presented in Table 1 and illustrated in Fig. 1.

The critical study of the data indicated that the total soluble solids contact of the litchi when storage in different packaging materials (i.e. polythene bag, plastic box, paper cartoon, wooden box and bamboo basket) and different treatments (i.e. Sulphur fumigation, Borex and Bavistin), during storage at 14^0C. It was found that the total soluble solids (^{0}Brix) in the litchi samples with T_4 treatment was 19.20, whereas it was 20.26 in T_2, 19.90 in T_3 treatment and 17.75 in untreated after final day of storage period.

Table – 1. Total soluble (^{0}Brix) of different treated litchi fruits during at temperature 14^0C and 32^0C

Treatment With different packaging materials	Storage period days													
	Temperature at 14^0C											Temperature at 32^0C		
	1	3	5	7	9	11	13	15	17	19	21	1	3	5
T_1	14.35	15.27	16.10	16.95	17.75	-	-	-	-	-	-	16.05	17.25	-
T_2	15.50	16.80	17.90	18.80	19.23	20.26	-	-	-	-	-	17.65	18.20	-
T_3	14.40	15.23	16.20	17.00	17.90	18.45	19.90	-	-	-	-	16.86	17.13	-
T_4	13.90	14.75	15.20	16.00	16.50	17.00	17.50	18.10	18.30	18.80	19.20	15.90	16.62	-

Where,

T_1 = Untreated litchi with different packaging materials
T_2 = Borex treated litchi with different packaging materials
T_3 = Bavistin treated litchi with different packaging materials
T_4 = Sulphur fumigation (SO_2) treated litchi with different packaging materials.

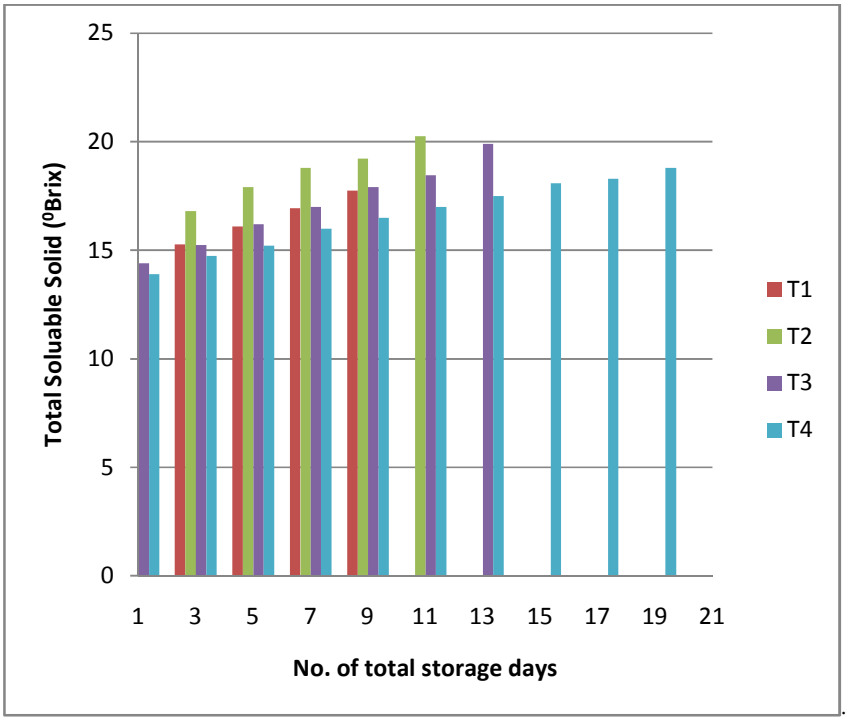

Fig. – 1. Total soluble (^{0}Brix) of different treated litchi fruits during at temperature 14^{0}C

The following linear relationships were obtained between T.S.S. and storage period having the highest value of goodness of fit (R^2).

Untreated litchi	=	Y = 0.424X + 13.964 (R^2 = 0.9994)	 1
Borex treated litchi	=	Y = 0.4856X + 15.102 (R^2 = 0.9641)	….. 2
Bavistin Treated Litchi	=	Y = 0.4393X + 13.939 (R^2 = 0.9922)	….. 3
Sulpphur Fumigation treated litchi	=	Y = 0.26X + 13.931 (R^2 = 0.9877)	…… 4

Where,

Y = Total soluble solids (^{0}Brix)
X = Storage period, days

Total soluble Solids (^{0}Brix) during Storage at 32^{0}C

The observation for total soluble solid content of the fruits presented in Table 1 and illustrated in Fig. 2.

The critical study of the data indicated that the total soluble solids content of the litchi, when stored in different packaging materials (i.e. polythene bag, plastic box, paper cartoon, wooden box and bamboo basket) and different treatments (i.e. Sulphur fumigation, Borex and Bavistin) during storage at temperature. It was found that the TSS (^{0}Brix) in sulphur fumigation treated litchi was 17.83, Borex treated 18.20, Bavistin treated 17.13 and untreated litchi 17.25 after final day of storage period.

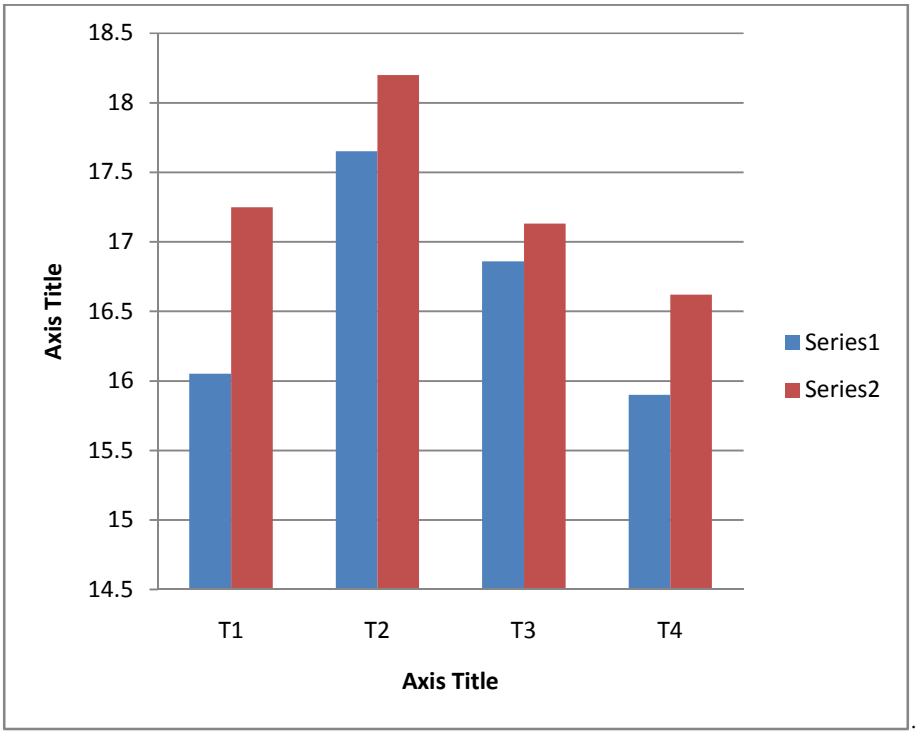

Fig. – 2. Total soluble (^{0}Brix) of different treated litchi fruits during at temperature 32^{0}C

The following linear relationships were obtained between TSS and storage period having the highest value of goodness of fit (R^2).

Untreated litchi	=	Y = 0.577X + 15.475 (R^2 = 0.974)	……5
Borex Treated litchi	=	Y = 0.275X + 13.375 (R^2 = 0.986)	……6
Bavistin treated litchi	=	Y = 0.4825X + 16.725 (R^2 = 0.925)	……7
Sulphur fumigation treated litchi	=	Y = 0.4825X + 15.335 (R^2 = 0.979)	……8

Where,

Y = Total soluble solids (^{0}Brix)

X = Storage period, days

CONCLUSION

On the basis of above result, it is clear that the TSS of litchi fruits increases as the storage period increases. But the rate of increasing is initially high and gradually decreases. When litchi fruits stored in different packaging method, at 14^{0}C and 32^{0}C, it was found that the TSS (^{0}Brix) was maximum 20.26 at 14^{0}C. After 11 days of storage and 19.61 at 32^{0}C after 5 days of storage period in Borex treated litchi and minimum 17.75 at 14^{0}C after 9 days of storage and 17.83 at 32^{0}C after 5 days of storage period in sulphur fumigated litchi fruits.

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