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QUALITY OF LITCHI *(Litchi chinenesis* Sonn) FRUITS AS EFFECTED BY EXPOSURE TO SUNLIGHT UNDER THE AGROCLIMA TIC CONDITIONS OF DERA ISMAIL KHAN

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To study the quality of litchi *(litchi chinensis.* Sonn) fruit as effected by exposure to sunlight on the tree, five cultivars viz; Purbi, Bedana, Bombai, Serai and Gola were collected from the orchard of Fruit and Vegetable Developernent Board (FVDB),D.I.Khan. Fruits of each cultivar were picked from exposed and unexposed portions of the trees and were subjected to physio-chernical analysis. All the parameters studied were significantly different at p = 0.05. The results indicated that exposed fruits were less acidic. rich in Vitamin C, total sugars and reducing sugars as well as soluble solids. The unexposed fruits were found heavier in weight. stone, peel and pulp along with more total acidity (%) and non-reducing sugars.
Keywords: Litchi. litchi chinensis, sunlight, epicarp, pulp, total sugars.

INTRODUCTION

The litchi *(Litchi chinensis* Sonn.) is a tropical fruit and belongs to the family Sapindaceae. It is considered as one of the best fruits due to its taste and nutritive value. Originally it was found in China nearly 2000 years ago. The spread of litchi from China to the other parts of the world was slow probably due to its peculiar climatic requirements. Other countries where it has been spread are Indonesia, Australia, USA. New Zealand, South Africa. India and Bangladesh.

It is cultivated best on well drain loam soils and thrives best under moist sub tropical climate. It prefers slightly acidic pH and frost free conditions. The temperature should not exceed beyond 40-45"c in summer and below the freezing point in winter. The production of better quality fruit is of paramount significance to attract the consumer preference. The important quality parameters in litchi fruit are total soluble solids, pH, acidity, sugars and Vitamin C content. These quality traits are affected by a number of factors including plant growth, light intensity, heat or solar interception. aeration and fruit exposure to sun-light.

Besides a rich source of vitamin C. litchi contains a fair amount of phosphorus, calcium, iron, vitamins A and B. Litchi fruit contains 15.9 percent seed, 9.6 percent pericarp, 74.5 percent edible portion. 78.2 percent moisture, 1.2 percent acid, 0.97 percent oil, 0.94 percent protein, 0.69 percent ash, 6.89 percent free reducing sugars, 6.68 percent hydrolyzable sugars and 13.75 percent total sugars (*Ahmad;* /956). Cabin (1954) also reported that the chemical composition of litchi revealed that it had the edible portion 74.5 percent, moisture 78.5 percent, citric acid 1.2 percent, ash 0.69 percent and sugar 13.57 percent. Sharma *et al* (1990) applied different dozes ofN,P and K in all combination to Litchi tree found and that the lower fertilizer doze resulted in better tree vigor, higher fruit yield and higher fruit TSS contents. Harding *et al.,(* 1938) reported that oranges from outside branches which were well exposed to sunlight contained significant higher ascorbic acid as compared to shaded fruits. Same results were also reported by Murphy (1938). The citrus fruits when exposed to sun light resulted an increased soluble solids (Brix), sugars and vitamin C content *(Rehman et al.,* /984). The qualitative aspects of litchi fruit as influenced by the exposure to sunlight have not yet been studied in N.W.F.P. The present Work was, therefore, undertaken to compare the important quality characteristics of exposed fruit grown in D.I.Khan. This study will be helpful to provide guide lines to the farmers for planting the orchard and in picking the mature fruits.

MATERIALS AND METHODS

The experiment was carried out to study the effect of exposure to sunlight on the quality of litchi fruit. The fruits of five cultivars of litchi i.e Purbi, Bedana, Bornbai, Serai and Gola were collected from the orchard of Fruit and Vegetable Development Board, D.I.Khan, in 2000. The experiment was replicated thrice using two factors in RCBD with varieties and exposure. The following parameters were studied.

I. Physical Characteristics:

Average fruit size (cm), average weight per fruit (gm), pulp or edible portion and pulp percentage were determined.

2. Chemical Characteristics.

Total acidity of the extracted juice was determined according to Ruck (1978), whereas pl-l, vitamin C and TSS were determined according to A.O.A.C. (1984). Total and reducing sugars were estimated by Lane and Eynon method (1923) as described in A.O.A.C. (1984). Non reducing sugar was calculated as:

Non Reducing Sugar = (% Total Sugars - % Reducing Sugars) x 0.95

STATISTICAL ANALYSIS:

Data on various parameters were recorded and analysed statistically using computer programme, (MSTAT-C) for the design management and analysis prescribed research (Bricker, 1991).

RESULTS AND DISCUSSION

I. PHYSICAL CHARACTERISTICS:

Average Fruil Size (cm):

Table 1 indicates the effect of sunlight on the fruit weight and was found highly significant. The fruits of the variety Serai were the heaviest (17.4 I gm) followed by Gola with average fruit weight of 16.76 gm. The lowest fruit weight (11.43 gm) was observed in case of cv. Bombai. The weight of unexposed fruits was comparatively higher (14.0 I gm) than exposed fruits. Higher fruit weight under unexposed condition in citrus fruit was also observed by Khalil *et al* (1978), Rehman *et al (1984).*

Table 1. Physical characteristics of litchi as affected by exposure to sunlight.

Cultivars	Average fruit weight (gm)	Exocarp weight (gm)	Stone/Seed weight (gm)	Pulp/Flesh weight (gm)
Purbi	12,48 C	1,38 0	3.75 B	7,48 B
Bedana	11,680	1,43 C	3,40 0	7,47 B
Bombai	11,43 E	1.31 E	2.88 E	7.22 B
Serai	17,41 A	3.15 A	4.03 A	10.22 A
Gola	16.76 B	2.19 B	3.57 C	10.85 A

Any two means in the column having common letter(s) are non-significant at 5% level.

PeellExocarp vl'eight (gm).

Results for this trait are mentioned in Table I which were significant at 5% level. Among the varieties, Serai was at top for the exocarp weight as its average peel weight was 3.15 gm, followed by Gola with the average pericarp weight 2.19 gm. Minimum peel weight (1.31 gm) was noted in variety Bombai. The peel or pericarp weight was greater when the fruit was not exposed (1.91 gm) to sunlight.

Slone weight (gm):

Persual of Table 1 revealed that means obtained for average stone weight differed significantly at 5% level. Maximum stone weight of 4.03 gm was observed in Serai and was followed by Purbi with stone weight of 3.75 gm, whereas the minimum (2.88 gm) was recorded in Bombai. Study showed that exposed factor had no significant effect on stone weight.

PulP/Flesh weighl (gm):

Greater amount of pulp (10.85 gm) was recorded in variety Gola followed by cv. Serai. Statistically both the varieties were similar to each other. The lowest pulp weight (7.22 gm) was observed in variety Bombai. The pulplflesh weight of the fruits when not exposed to sunlight was greater as shown in the Table I.

Chemical Characteristics

Tolal acidity (%).

It is evident from Table 2 that the total acidity (%) recorded was significantly different due to varieties and exposure to sunlight. Variety Serai contained maximum percentage of total acidity (2.50%), followed by Bombai (1.91 %. The least total acidity (0.98%) was noted in variety Bedana. Total acidity (%) of the fruit under unexposed condition was greater. These results are similar to the findings of Rehman *et at.* (1984).

pH ofthe fruils:

Bedana was found to be less acidic as it had the maximum pH value (Table 2). The variety Serai was more acidic. The pH values of unexposed fruits were greater, which shows that unexposed fruits were less acidic.

Vitamin C (mg/IOO gm o[pulp):

The data recorded for Vitamin C content are presented in Table 2. The differences were highly significant at 5% level. Among five varieties the fruit of Bedana cultivar contained maximum Vitamin C content (59.76 mg/l 00 gm) whereas the variety Gola was ranked second (57.27 mg/l 00 gm). The minimum vitamin C content was observed in the Serai with 45.63 mg/l 00 gm. Fruits when exposed to sunlight had more vitamin C content. These results had also been advocated by Harding *cl al* (1938), Murphy (1938) and Rehman *et al* (1984).

Tolal Sugars:

It is evident from Table 2 that means observed for total sugars percentage are significant for both the factors. Total sugar percentage was the highest (11.56) in fruits of cv. Bedana followed by the cv. Gola (10.94 percent). The least percentage of total sugars was recorded in cv. Bombai as 8.53. The table revealed that fruits of litchi under exposed conditions had greatert percentage of total sugars. Rehman *cl al (* 1984) also reported similar results in citrus fruits.

Reducing Sugars:

Results shown in Table 2 are highly significant for both the factors at 5% level. Variety Bedana was at the top position with maximum percentage (7.11) of reducing sugar, next was Gola with reducing sugars of 6.20%. The least reducing sugars (4.75%) was recorded in Bombai variety. The sunlight effect on the fruit quality with reference to reducing sugars percentage revealed that fruits exposed to sunlight had greater percentage of reducing sugars.

Table 2. Chemical Characteristics of fruits of different cultivars of Litchi as affected by exposure to sunlight.

Cultivars	pH	Total acidity(%)	Vitamin C mg/l 00 grn pulp
Purbi	3.70 C	1.68 C	52.61 C
Bedana	4.31 A	0.98 E	59.76 A
Bombai	3.55 C	1,91 B	47.77 D
Serai	2.93 D	2.50 A	45.63 E
Gola	3.98 B	I,13D	57.27 B
Exposed	3.68 A	1.53 B	52.71 A
Unexposed	3.71 A	1.57 A	52.50 B

Cultivars	Total Sugars (%)	Reducing Sugars (%)	N. Reducing Sugars (%)	TSS (%)
Purbi	10,40 C	6.07 C	4.33 C	12.91 C
Bedana	11,56 A	7.11 A	4,45 B	14.11 A
Bombai	08.53 E	4.75 E	3.78 E	09.97 E
Serai	08.89 D	4.99 D	3.90 D	10.24 D
Gola	10.94 B	6.20 B	4.75 A	13.83 B
Exposed	10.10 A	5.87 A	4.23 B	12.25 A
Unexposed	10.03 B	5.78 B	4.25 A	12.17 B

Anv two means in the column havinz common Ietteris) are non-significant at 5% level.

Non-Reducing Sugars:

Mean differences for the non-reducing sugars are presented in the Table 2, which are significant for the variety and exposure to sunlight. The results showed that Gola variety had the maximum non-reducing sugars (4.75%) followed by the variety Bedana containing 4,45 percent non-reducing sugars. The lowest percentage of non-reducing sugars (3.78) was recorded in variety Bombai. The results indicated that fruits under shady condition had greater percentage of non-reducing sugars (4.25) as compared to exposed fruits (4.23%).

Total soluble solids percentage eTSS %):

The data recorded for the above mentioned trait are presented in Table 2. Mean difference are highly significant for both the factors. The results indicated that the variety Bedana had the maximum total soluble solids percentage (14.1 I). The next to follow was Gola with 13.83 percent ofTSS. Variety Bombai with 9.97 percent total soluble solids contained the lowest TSS amongst all. Fruit under exposed condition had maximum percentage of total soluble solids (12.25) as compared to fruits under shady condition. Similar results were also reported by Rehman *et al (* 1984).

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