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## Morphology of Litchi Fruit as Effected by Exposure to Sunlight and Fruit Orientation

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### Abstract

To study the quality of Litchi (*Litchi chinensis* sonn.) fruit as affected by exposure to sunlight and fruit orientation on tree, five cultivars viz; Purbi, Bedana, Bombai, Serai and Gola were collected. Fruits of each cultivar were picked from exposed, unexposed, upper half and lower half portions of the trees. The unexposed fruits were found heavier in weight, stone, peel and pulp. The fruits at Lower half were found heavy in weight, pericarp and flesh. However, stone weight was found to be more in fruits collected from upper half portion of the tree. As unexposed fruits were massive therefore, it is advisable to pick these fruits first if chemical parameters are not included in selection. Hence it is concluded that picking should be started from those fruits which are positioned at the lower half portion of the tree in order to collect fruits of superior quality first.

### Introduction

The production of better quality fruit is of paramount significance to attract the consumer preference. The position of fruit and aspect of the fruit on a particular tree has considerable influence on the quantity and quality of fruit. Amongst these exposure to sunlight and orientation of the fruit on the tree play a marvelous role in influencing the quality of the fruit. The aspect, exposure and height by influencing the light intensity, heat or solar interception, reception, aeration etc may help in improving the photosynthetic activities of plant and thereby the yield potential and ultimately the quality of the fruit. The significance of the effect of exposure as well as fruit orientation on the quality of Citrus for various parameters, under specific agro-climatic conditions and its possible use in horticultural crops has been advocated by many workers like Ghosh and Mitra (1990), Underhill and Wong (1990), Mitchell *et al.* (1992), Badiyala (1993), Rehman *et al.* (1982), Rehman *et al.* (1984) Chaitrakulsub *et al.* (1988) and Ray and Munshi (1990). As the information regarding the orientation of fruit on the tree and exposure to sunlight on the quality of fruit are lacking relating to this fruit. Therefore, the present investigation was initiated to study the physical characteristics of fruit of different cultivars of litchi grown under the agro-climatic conditions of D.I.Khan and also to know the effect of exposure to sunlight and position of the fruit on the tree on the quality of litchi fruits.

### Materials and Methods

The investigation to figure out the effect of exposure to sunlight and orientation on the quality of litchi fruit was conducted during the year 1995. The fruits of five cultivars of litchi viz. Purbi, Bedana, Bombai, Serai and Gola were collected from the orchard of Fruit and Vegetable Development Board, Dera Ismail Khan. Trees of same size and age (about ten year old) were selected for the study. The fruits of each cultivar were picked from the exposed,

unexposed as well as upper half and lower half positions of the same tree. Data on various parameters were recorded and analysed statistically using computer program (MSTATC) for the design management and analysis of prescribed research (Bricker, 1991).

### Results and Discussion

#### Exposure to sunlight

**Average fruit weight (g):** The fruits of the variety Serai were the heaviest among the varieties studied which was followed by Gola. Whereas the lowest fruit weight was observed in Bombai. The effect of exposure to sunlight was found to be highly significant. The weight of unexposed fruits was comparatively higher than exposed fruits. The interaction among varieties and aspect was also significant. The fruits of Serai possessed greater weight when its fruit was unexposed to sunlight (Table 1). Average fruit weight of unexposed fruits of all varieties tested was greater. Exposure to sunlight had negative effect on fruit weight. Greater weight of fruits which were unexposed. Higher fruit weight under unexposed condition in citrus fruit was observed by Khalil *et al.* (1978), Rehman *et al.* (1984). Randhawa (1945) reported lower fruit weight under unexposed condition. These differences might be due to environment and or varieties.

**Peel/Pericarp weight (g):** Variety Serai ranked first for pericarp weight as its average peel weight was 3.15 g. Variety Gola ranked second with the average pericarp weight of 2.19 g. Minimum peel weight was noted in variety Bombai. The results indicated that pericarp weight of unexposed fruit was comparatively greater. Similarly interaction studies revealed that Serai has greater peel weight when its fruit was unexposed (Table 1). The peel or pericarp weight was also greater when the fruit of litchi was not exposed to sunlight. Interaction studies revealed that variety Serai has greater pericarp weight under unexposed condition.

Table 1: Average fruit weight as affected by exposure to sunlight and orientation.

Varieties	Exposure			Orientation		
	Exposed	Unexposed	Mean	U-half	L-half	Mean
<b>Average fruit weight</b>						
Purbi	12.38	12.58	12.48c	12.61	11.78	12.20c
Bedana	11.61	11.74	11.68d	11.42	16.10	13.76b
Bomabi	11.42	11.44	11.43e	16.78	12.80	14.58b
Serai	17.36	17.45	17.41a	11.74	11.41	11.57c
Gola	16.71	16.82	16.76b	17.36	16.67	17.02a
Mean	13.89b	14.01a	--	13.98a	13.66a	--
<b>Peel/pericarp weight</b>						
Purbi	1.35	1.41	1.35d	1.37	1.42	1.40d
Bedana	1.43	1.43	1.43c	1.33	3.16	2.24b
Bomabi	1.31	1.32	1.31e	2.20	1.37	1.78c
Serai	3.14	3.17	3.15a	1.44	1.32	1.38d
Gola	2.17	2.21	2.19b	3.16	2.17	2.66a
Mean	1.88a	1.91a	--	1.89a	1.88a	--
<b>Stone weight</b>						
Purbi	3.74	3.76	3.75b	3.74	3.36	3.55c
Bedana	3.44	3.36	3.40d	2.88	4.05	3.46d
Bomabi	2.87	2.89	2.88e	3.57	3.75	3.66b
Serai	4.05	4.01	4.03a	3.37	2.89	3.13e
Gola	3.54	3.68	3.57c	4.01	3.56	3.79a
Mean	3.53a	3.52a	--	3.51a	3.52a	--
<b>Pulp/flesh weight</b>						
Purbi	7.50	7.45	7.48b	7.61	6.99	7.30d
Bedana	6.95	7.98	7.47b	7.23	10.22	8.72c
Bomabi	7.21	7.22	7.22b	11.02	7.19	9.10d
Serai	10.16	10.27	10.22a	6.95	7.20	7.07e
Gola	10.69	10.01	10.88a	10.21	11.00	10.61a
Mean	8.50a	8.79a	--	8.59a	8.51a	--

Mean followed by similar letter do not differ significantly at  $P < 0.05$ .

**Stone weight (g):** Perusal of Table 1 revealed that maximum stone weight was observed in Serai, followed by Purbi. Mean values recorded for exposure factor did not differ significantly. The exposure showed that stone weight of exposed fruit was greater as compared to the fruits positioned at northern side (unexposed) (Table 1). Study showed that exposure factor had no significant effect on stone weight. However stone weight was greater under exposed condition. The interaction studies showed that variety Serai had heavy stone in its fruit when exposed to sunlight.

**Pulp/flesh weight (g):** Means observed for the pulp weight were significantly different for varieties (Table 1) and non-significant for exposure and interaction. Greater amount of pulp was recorded in variety Gola as Serai which was at par with Gola. Most of the varieties have the flesh weight with value more than 7.00 g. However, these varieties were not significant. Results, indicated that exposure factor has non-

significant effect on the pulp/flesh weight. However, maximum pulp was noted in fruits which were exposed to sunlight. The pulp/flesh weight of the fruits when not exposed to sunlight was observed greater. But differences in their mean values were non-significant.

#### Orientation

**Average weight (g):** As for as the average weight of different cultivars is concerned variety Gola remained at the top followed by Bombai. The variety Bedana and Bombai did not differ significantly. Interaction studies showed that fruits positioned at the lower half had greater fruit weight. The fruit of variety Gola positioned at lower half had average fruit weight of 17.36 g. Whereas, the fruit of Bombai variety had weight when located at lower half portion of the tree. Results indicated that fruits positioned at lower half portion of the tree had greater average fruit weight against the fruit at upper half. These results are in conformity with the findings of Rehman *et al.* (1982) who

reported higher fruit weight in citrus fruits located at the lower half portion. However, Randhawa (1945) and Mustafa (1961) contradicted and concluded that orientation has no effect on the fruit weight. The difference in results might be due to changes in climatic conditions.

**Peel/pericarp weight (g):** Means for the peel/pericarp weight are presented in Table 1, which differ significantly. For variety factor, cultivar Gola contained the maximum pericarp weight and variety Bedana with pericarp ranked second for the same trait. The lowest peel weight was noted in variety Serai. It was observed from the means given in the Table 1 that fruit located at the lower half component of the tree had greater pericarp weight i.e. 13.98 g. It is clear from interaction study that The maximum pericarp weight was observed in variety Gola when its fruits were at lower half part of the tree. Peel or pericarp weight of litchi fruit was significantly affected by orientation. The average fruit peel was recorded greater when the fruits were located at the lower half portion of the tree.

**Stone weight (g):** Variety Gola showed higher stone weight with respect to other four varieties (Table 1). Next to Gola, higher stone weight was observed in Bombai variety. The interaction between the variety and orientation was significant. The results showed that fruits positioned at the upper half portion of the tree had the greater stone weight. Seed or stone weight of the fruits positioned at the upper half part of the tree was noted greater. These results do not coincide with the findings of Mustafa (1961) who observed no affect of orientation on the quality of mango fruits.

**Pulp weight (g):** It is evident from Table 1 that maximum pulp/flesh weight was recorded in variety Gola followed by Bombai. Significant effect of orientation was observed in fruit positioned at lower half with more pulp than the fruits at the upper half part of the tree. Best combinations (interaction) regarding pulp weight and orientation was observed in variety Bombai when its fruit oriented at lower half. The findings of this research revealed that the fruit located at the lower half region of the tree had comparatively greater pulp or flesh in their fruits as compared to fruits positioned at the upper half portion of the tree. These findings are similar to the findings of Van Horn (1936) whereas Mustafa (1961) found no effect of orientation on the fruit quality. Soil variation, fertility, varietal differences may be responsible for this contrast. It can be concluded that exposure to sunlight and its orientation on the tree have tremendous effect on the quality of the litchi fruit (*Litchi chinensis* Sonn.). Exposure reduced the fruit weight, peel weight, and also affected the pulp quantity in fruit but increased the stone weight. The fruit positioned at the upper half portion of the tree had heavy stone, and fruits at the lower half were heavy in weight, peel and pulp. Although unexposed fruits have

more pulp as well as fruit weight, but exposed fruits were found to be reached other parameters. If other parameters i.e chemical aspects are given importance then exposed fruits are advisable to pick first. It is also imperative to start picking from fruits positioned at the lower half as orientation influences most quality parameters. Further studies are suggested to see the effect of various picking dates on the quality of fruit to figure out optimum harvesting date for different cultivars of litchi.

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