



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; SP4: 01-03

Amandeep Singh
Department of Agriculture,
D.A.V College, Abohar, Punjab,
India

Navdeep Gandhi
Department of Agriculture,
D.A.V College, Abohar, Punjab,
India

Diksha Tinna
Department of Agriculture,
D.A.V College, Abohar, Punjab,
India

(Special Issue- 4)
National Seminar
“Role of Biological Sciences in Organic Farming”
(March 20, 2019)

Effect of plant age and ripening stage on physical and chemical characters of Pear

Amandeep Singh, Navdeep Gandhi and Diksha Tinna

Abstract

A study was conducted to determine the impact of different plant age and maturity stages on physical and chemical characteristics of pear. The pear fruits were harvested from three different age groups i.e 8-10 years, 14-15 years and 19-20 years respectively at different ripening stages i.e premature and mature stage. The study was carried out in Agriculture Lab, D.A.V College, Abohar during the academic year 2018. These fruit samples were evaluated for its physical and chemical characteristics. Various physical parameters such as fruit length, fruit breadth and fruit weight were evaluated. The chemical parameters such as TSS and Titratable acidity of fruits were also evaluated. Total of 18 samples were taken from all age groups and at different maturity stages (6 samples from each age group at two stages). It was concluded that pear fruit samples showed significant increase in its physical and chemical characters in all age groups during maturity. The fruit samples from 19-20 years old plants with maturity showed best quality characteristics.

Keywords: Pear, Plant age, Ripening stages, physical and chemical characters

1. Introduction

Pear (*Pyrus communis*) is one of the superior temperate fruit belongs to rosaceae family having good taste and flavour. In India, pear is grown for consumption as a fresh fruit. The main pear producing countries in the world are China, Italy, USA, Japan, France and Turkey. In India, pear occupies the second place among temperate fruits both in area and production [1]. According to National Horticulture Board (2014), Punjab state produced about 63040 MT of pear from an area of 2787 hectare having productivity of 22.68 MT/ha. Area under pear cultivation in Punjab increased from 2706 hectare in 2011-12 to 2787 hectare in 2012-13, where production increased from 61113 MT to 63040 MT [2]. Soft flesh selections of pear made in Punjab by PAU, Ludhiana are Red Blush (high yield and TSS 15.1°Brix), Punjab Nectar (high yield and very juicy), Punjab Gold (large fruits of good quality) and Punjab Beauty which has upright growth, moderate vigour, precocious regular bearing and good yield. Fruit medium sized, firm, becomes less gritty when mature and mellowed when ripe, maturity 3rd week of July. (Singh & Saxena) [3]. Fruit firmness and skin color is one of the important indicators for both quality and maturity of pears. Fruit weight and soluble solids can be used in order to determine the best time of harvest of pears. The volume and density of pear fruits can also play an important role in numerous technological processes and in the evaluation of product quality. Fruit firmness is also often used for fruit quality assessment. Many studies have been reported on the effect of plant age and ripening stage on physical and chemical properties of different fruit species, such as Kinnow (Kochhar *et al.*) [4] and Grapefruit (Ozeker) [5]. The present research aimed to investigate the effect of plant age and ripening stage on physical and chemical properties of pear fruits and then establishing convenient reference tables by using physical and chemical data for pear mechanization and processing.

2. Materials and Methods

The study was confined to analyze the effect of plant age and ripening stage on physical and chemical characters of pear. The pear fruits were harvested from pear orchard situated at Seed Farm, Abohar. Six samples from different ages (8-10 years, 14-15 years and 19-20 years) at

Correspondence

Amandeep Singh
Department of Agriculture,
D.A.V College, Abohar, Punjab,
India

different ripening stages (premature and mature stage) of fruits were harvested. These fruit samples were brought to Agriculture Lab, D.A.V College, Abohar. These fruit samples were evaluated for its physical and chemical characteristics i.e. fruit length, fruit breadth, fruit weight, TSS, Titratable acidity. Average length and breadth of samples were measured using vernier caliper and was expressed in millimeters, fruit weight was evaluated with the help of digital weighing balance and expressed in grams, The total soluble solids (TSS) were determined with the help of hand refractometer and was expressed in °Brix. Titratable acidity of each fruit was measured the concentration of titratable hydrogen ions contained in the fruit juices samples by neutralization with strong base solution at fixed pH.

Treatments

Age of pear plants studied

- **T₁**: Pears of 8-10 years old plant.
- **T₂**: Pears of 14-15 years old plant.
- **T₃**: Pears of 19-20 years old plant.

Stages of pear fruits studied

- **S₁**: Premature stage.
- **S₂**: Mature stage.

No. of replications: 3

3. Results and Discussions

3.1 Physical Characteristics

3.1.1 Fruit length

Fruit length of pear showed a significant increase in all age groups during ripening of the fruit. It has been observed that fruits from 8-10 year old plants showed maximum fruit length i.e 56.45 mm and fruits from 14-15 year old plants showed minimum fruit length i.e 56.32 mm. Among the stages, the maximum fruit length has been recorded in mature fruits i.e 62.76 mm and minimum fruit length has been recorded in premature fruits i.e 49.67 mm. The findings of this research are similar with that of Verma and Kushwaha [6] who studied the effect of maturation on physico-chemical characteristics of Gola Pear. He found that the fruit length of mature stage was more i.e 5.67 cm and it decreases at ripening stage i.e 5.25 cm.

3.1.2 Fruit breadth

Fruit breadth also depicted a significant rise in pear fruits in all age groups during maturity. It has been observed that maximum fruit breadth was recorded in fruits of 19-20 year old plants i.e 53.00 mm and minimum fruit breadth was recorded in fruits of 14-15 year old plants i.e 50.86 mm. Among the ripening stages, mature fruits had maximum breadth i.e 57.91 mm and premature fruits had minimum breadth i.e 46.39 mm. The findings of this research are similar with that of Morakinyo and Bamgboyé [7] while studying the effect of age on some physical properties of oil palm fruit lets in relation to different age of plants such as 20, 30 and 50 years old plants. Breadth of fruits of Dura and Tenera of 50 years old was more as compared to breadth of fruit from 20 years old and 30 years old plant.

3.1.3 Fruit weight

The Table 4.3 shows the observations recorded in present study in pear depicting the changes in fruit weight in different

age groups and changes in fruit weight at different maturity stages. It was clearly observed that 19-20 year old plants had maximum weight among different age group orchards i.e 87.96 g and 8-10 year old plants had minimum weight i.e 75.55 g. Among the ripening stages, mature fruits had maximum weight i.e 100.49 g and premature fruits had minimum weight i.e 62.71 g. The findings of this research are similar with that of Haq and Rab [8] who studied on the characterization of Physico-chemical attributes of Litchi fruit in relation to age. The result shows that the average weight of fruits obtained from 20 years old tree has maximum weight i.e 20.44 g as compared to fruit obtained from 10 years old tree i.e 20.05 g.

3.2 Chemical Characteristics

3.2.1 Total Soluble Solids

From the experiment, it has been observed that the calculated average TSS of fruit obtained from 19-20 years old plant was 13.63 (°Brix), fruit from 8-10 years old plant was 9.11 (°Brix) and fruit from 14-15 years old plant was 13.53 (°Brix). From the investigation, maximum TSS was recorded in fruit obtained from 19-20 years old plant and minimum TSS was recorded in fruit obtained from 8-10 years old plant i.e. 9.11 (°Brix). It was found that TSS of pear changed from 11.66 to 12.51% at physiological maturity and ripening period. The findings of this research are similar with that of Cangi *et al.* [9] who studied kiwi fruit at various maturity stages and found that TSS of kiwifruit changed from 7.43 to 14.67% at physiological maturity and ripening period respectively.

3.2.2 Titratable acidity

From the above table, it has been observed that the average calculated acidity percentage of fruit from 8-10 years old plant was 0.53 %. From the above investigation, it has been recorded that fruit from 14-15 years old plant having more acidity percentage i.e. 0.56 % than that of fruit obtained from 8-10 years old plant i.e. 0.53 % and 19-20 years old plant i.e. 0.55 %. Mature fruit showed more acidity percentage i.e. 0.58 % as compared to premature fruits 0.52 %. The findings of this research are similar with that of Khalid *et al.* [10] who studied tree age and canopy position affect rind quality, fruit quality and rind nutrient content of 'kinnow' Mandarin. He found that the acidity (%) of fruits increases with the increase in the age of the tree.

4. Observations and Tables

Table 4.1: Impact of Tree age and ripening stage on fruit length (mm)

Stage	Age			
	8-10 Year	14-15 Year	19-20 Year	Average
Premature	53.41	49.95	45.67	49.67
Mature	59.49	62.70	66.09	62.76
Average	56.45	56.32	55.88	

Table 4.2: Impact of Tree age and ripening stage on fruit breadth (mm)

Stage	Age			
	8-10 Year	14-15 Year	19-20 Year	Average
Premature	48.45	46.73	44.01	46.39
Mature	56.75	54.99	62.00	57.91
Average	52.60	50.86	53.00	

Table 4.3: Impact of Tree age and ripening stage on fruit weight (g)

Stage	Age			
	8-10 Year	14-15 Year	19-20 Year	Average
Premature	64.30	61.83	62.00	62.71
Mature	86.80	100.76	113.93	100.49
Average	75.55	81.29	87.96	

Table 4.4: Impact of Tree age and ripening stage on TSS (^oBrix)

Stage	Age			
	8-10 Year	14-15 Year	19-20 Year	Average
Premature	9.06	12.90	13.03	11.66
Mature	9.16	14.16	14.23	12.51
Average	9.11	13.53	13.63	

Table 4.5: Impact of Tree age and ripening stage on Titratable acidity (%)

Stage	Age			
	8-10 Year	14-15 Year	19-20 Year	Average
Premature	0.51	0.53	0.52	0.52
Mature	0.56	0.59	0.59	0.58
Average	0.53	0.56	0.55	

5. Conclusion

The results concluded from the present investigation are that the pear fruit samples collected from the different age groups showed a significance growth pattern in physical and chemical characters. The physical characters like fruit length, fruit breadth and fruit weight increased gradually as the age of the plants increases except the fruit length which decreased as the age of plants increases and all these parameters also increases during ripening of the fruit. The chemical characters like TSS and Titratable acidity also increased gradually as the age of the plants increases and these parameters also increases during ripening of the fruit.

So, it has been concluded from the research that the 19-20 years old orchard is best for quality pear production and best time for harvesting is at maturity stage in the month of August. This research being done on physical and chemical characteristics would help farmers to estimate the best aged orchards and the appropriate maturity indices for quality production of pear.

6. References

1. Websites: <http://www.Wikipedia.org>.
2. National Horticulture Board. www.nationalhorticultureboard.com per statistic per area and production statistic, 2014.
3. Singh R, Saxena SK. Handbook of Fruits, National Book Trust, India, 2008, 230.
4. Kochhar A, Gandhi N, Brar V. Impact of Tree age and ripening stages on physical characteristics of kinnow (*Citrus reticulata* Blanco). Int J Adv Res Sci Engg. 2017; 6(10):1822-26.
5. Ozeker E. Determination of fruit characteristics of “Marsh Seedless” grapefruit cultivar in Izmir (Turkey). Pak J Biol Sci. 2000; 3(1):69-71.
6. Verma A and Kushwaha A. Effect of maturation on physico-chemical characteristics of ‘Gola’ Pear (*Pyrus pyrifolia*) fruit. Intl J Curr Microbiol App Sci. 2018; 7:2985-95.
7. Morakinyo TA, Bamgbose AI. Effects of age on some physical properties of oil palm fruitlets. Agric Eng Int. 2015; 17(3):342-52.
8. Haq IU, Rab A. Characterization of physico-chemical

attributes of litchi fruit and its relation with fruit skin cracking. J Animal Plt Sci. 2012; 22(1):142-47.

9. Cangi R, Altuntas E, Kaya C, Saracoglu O. Some chemical and physical properties at physiological maturity and ripening period of kiwifruit ('Hayward'). Afri J Biotech. 2011; 10(27):5304-10.
10. Khalid S, Malik AU, Saleem BA, Khan AS, Khalid MS, Amin M. Tree age and canopy position affect rind quality, fruit quality and rind nutrient content of 'kinnow' mandarin (*Citrus nobilis* Lour × *Citrus deliciosa* Tenora). Scientia Horticulturae. 2012; 135:137-44.