

PERFORMANCE EVALUATION OF AVOCADO UNDER MURREE HILLS CLIMATIC CONDITION

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Abstract

Avocado owing to its great nutritional and medical benefits fetch higher price making it one of most economical important fruits. Avocado immense importance arouses the need of its evaluation to check its adaptability under different climatic conditions. A research trial on evaluation of six varieties of this economically important fruit was tested at Hill Fruit Research substation Station, Murree, Pakistan during 2017-2020. Studies on physical parameters i.e. fruit size, pulp to seed ratio weight of the fruit and weight of seed significantly higher in avocado selection 1 than that of other varieties under evaluation. Data revealed that V₂ (Selection II) and V₄ (Selection IV) were the early varieties with fruit maturity. V₁ (Selection I) gave maximum fruit length (16.27) and fruit weight (484) while V₅ (Selection 5) give the minimum fruit yield (110) while in V₄ (Selection IV), seed to pulp ratio is minimum (5.98).

Keywords: Avocado, climatic conditions, nutritional values, fruit maturity index

INTRODUCTION

Avocado (*Persea Americana*) belongs to family Lauraceae (is is a mono seeded berry fruit. It belongs to subtropical region, evergreen in nature and believed to be originated from Mexico (Knight and Origin, 1980; Prabha et al., 1980). Commonly referred as alligator pear it has also some local names like makhan phal or magas nashpaati. Avocado dates back to as old as 10,000 years, produced from tropical trees characterized by blackish-green colour with great nutritional value, buttery texture, and exceptional taste [Birnbbaum et al., 2003; Cervantes-Paz and Yahia,

2021). Avocado is considered as 'Green Gold' and has a great value because of its commercial importance (Anonymous, 2021). The fruit is climacteric in nature having green skin with large seed firmly embedded in the flesh. The plant is frost sensitive though mature trees can tolerate temperature as low as -4°C for short period however prolonged frost may result in reduced yield causing economic losses. The young plants need frost protection in early three years of plantation. During flowering months i.e April to July night temperature of $5-10^{\circ}\text{C}$ results in suppression of shoot growth and boost flowering (Anonymous, 2010).

According to the Bergh (1974) opening and closing of flowers follows a regular pattern when the average night minimum and day maximum temperature is above 21°C . With fluctuation in minimum and maximum temperature flower opening is delayed. Irrigation scheduling is also a prerequisite for successful avocado cultivation. Water stress may result in delayed avocado flowering (Chaikiattiyos et al., 1994, Abbas et al., 2020). Avocados may have originated in southern Mexico but were cultivated from the Rio Grande to central Peru long before the arrival of Europeans. They were then carried to nearly all parts of the tropical and subtropical regions. It was first brought to Singapore between 1830 and 1840 and introduced into Florida in 1833 and into California in 1871 (Anonymous, 2023). Vegetative propagation began in 1890. It reached India in 1892 and Pakistan in 1955. Currently avocados are commercially grown not only in the United States but throughout tropical America and the larger islands of the Caribbean.

The tree of avocado is evergreen all over the year. Its height reaches about 40-80 feet from the ground and has a lot of long branches. The shape of leaves is round oval and ovate and about length in 3-10 inches. The size of the avocado flower is small and greenish. Flowers have both male and female parts. The shape of avocado fruit may be round, ovate or pear-shaped and the skin of the fruit is different in color and appearance in all varieties. The skin may have more flexibility, smooth to scratchy and yellow-green, purplish-red or black in appearance. The flesh color of the avocado fruit is yellow-greenish to bright-yellowish and it is oily in texture when ripped but the inner surface will be fibrous. Avocado fruit contains one large seed i.e. ovate or oval-shaped and it makes the weight of fruit about 10 to 25 percent of the total weight. The amount of oil and moisture content are different in all varieties of the avocado and about a

maximum of 30 percent of oil is present in one fruit. Average ranges weighted from 450 g to 1.3 kg (Afzal et al., 2022).

Avocado produce million of flowers during its flowering period but like citrus most of them drop without producing any fruit. Avocado flowers are bisexual in nature means each flower consists of both male and female flowers. It showed the phenomenon of protogynous dichogamy which means there is a twice opening of each bisexual flower with intermediate closing (stern et al., 2021). The opening of flowers is very interesting phenomenon first time it opens as female (receptive stigmas) and next day as male (anthers dehiscence). About 1 % flowers succeed in setting fruits (Alcaraz et al., 2013, Alcarez and Hormaza, 2019)].

Consumer demand for the fruit is largely due to the health benefits associated with avocados, which have high amounts of monounsaturated fatty acids and antioxidants. Avocados provide thiamin, riboflavin, and vitamin A, and in some varieties the flesh contains as much as 25 percent unsaturated oil (Duarte et al., 2016). Avocados are not only helpful in antioxidants absorption from other foods, but they are also high in antioxidants (Gunnars, 2021; obah et al., 2016).

MATERIAL AND METHODS

The experiment was carried out to find better variety of avocado at lower altitude of Murree. The location of site is Hill Fruit Research Substation Tret Murree. The experiment was laid out according to Randomized Complete Block Design. (RCBD) having one replication with one plant / treatment.

Table 1: Chemical, Physical and Nutritional status of Soil

Parameters Analyzed	Results
Soil texture	Loam
Saturation	55%
pH	8.0
EC	0.85 dS m ⁻¹
Organic matter	0.79 %
Available P	3.5 mg kg ⁻¹
Available K	150 mg kg ⁻¹

Following treatments were used in the experiment:

V ₁ =	Selection I	V ₂ =	Selection II	V ₃ =	Selection III
V ₄ =	Selection IV	V ₅ =	Selection V	V ₆ =	Selection VI

Fifteen year old plants of avocado were selected as experimental material. Plants were planted on terraces. Different physio-chemical analysis was performed on fruit maturity. Experiment was conducted at lower altitude (3500 ft). Traits like flowering time, fruit set time, maturity time, skin colour, fruit length, fruit breadth, fruit weigh, seed weight, pulp to seed ratio, shelf life at ambient and refrigerated conditions were studied. Experiment was laid out according to Randomized Complete Block Design (RCBD). Collected data was analyzed statistically by using the Fishers analysis of variance and treatments were compared by using the Least Significant Difference (LSD) test at 5% probability level (Steel et al., 1997).

RESULTS AND DISCUSSION

Statistical analysis showed that different varieties showed statistically different behavior at 5 % probability level.

Flowering time was recorded in the 2nd Week of March in V₁, V₂ and V₄ and 3rd week of March in V₃ While it is in Ist week of April in case of V₅ and V₆. The fruit of all selections matured during the start of September. Green skin color of fruit was noted in V₂ and V₅ while it was recorded as purple in all other selections.

Data revealed that V₂ (Selection II) and V₄ (Selection IV) were the early varieties with fruit maturity. V₁ (Selection I) gave maximum fruit length (16.16) and fruit weight (469) while V₅ (Selection 5) give the minimum fruit yield (110) while in V₄ (Selection IV), seed to pulp ratio is minimum (4.0). The highest fruit weight of 469 grams was noted in V₁ followed by, V₃, V₄ and V₂ with fruit weight as 401, 374 and 233 grams respectively. Regarding fruit length V₁ was superior while V₅ was inferior. Regarding shelf life V₁ and V₄ were better as compared to other varieties.

Table 2 : Qualitative parameters of Avocado Fruit

Sr.#	Flowering time	Fruit set time	Maturity time	Skin color
V ₁	Mid Mar	Mid May	Start Sep	Purple
V ₂	Mid Mar	Start May	End Aug	Green
V ₃	End Mar	Mid May	Start Sep	Purple
V ₄	Mid Mar	Start May	End Aug	Purple
V ₅	Start Apr	Mid May	Start Sep	Green
V ₆	Start Apr	Mid May	Start Sep	Purple

Table 3: Effect of Variety on Fruiting Parameters of Avocado

Sr.#	Fruit length (cm)	Fruit breadth (g)	Fruit weight (g)	Seed weight (g)	Seed/ pulp ratio	Shelf life at ambient temperature	Shelf Life at Refrigerated temperature
V ₁	16.16 + 0.44	7.74 + 0.75	469.33 + 8.67	75.33 + 2.60	6.24 + 0.10	39.00 + 0.58	76.00 + 1.15
V ₂	5.33 + 0.60	2.50 + 0.32	233.33 + 8.82	26.00 + 1.15	8.98 + 0.10	30.00 + 0.58	56.33 + 0.88
V ₃	13.56 + 0.38	8.49 + 0.31	401.00 + 4.93	68.33 + 1.76	5.87 + 0.14	34.33 + 0.88	59.00 + 0.58
V ₄	15.63 + 0.68	7.25 + 0.46	374.00 + 7.77	62.67 + 2.60	5.98 + 0.20	37.33 + 0.67	65.00 + 0.8
V ₅	3.43 + 0.29	1.87 + 0.09	133.33 + 6.01	12.07 + 1.16	11.20 + 0.90	33.00 + 0.58	57.33 + 0.67
V ₆	11.56 + 0.48	7.43 + 0.44	95.67 + 7.22	64.33 + 3.48	6.18 + 0.27	38.33 + 0.58	60.00 + 1.15



Fig 1: Pictorial view of different avocado varieties

Post-harvest operations must be focused on the extended range of fruit storage by slowing down the process of senescence and also control the ripening of fruit when it is harvested at a mature stage or in the unripe stage. All the harvesting, handling, and transportation to the packing houses and all other operations are needed to be done carefully i.e. no chance of mechanical loss. Damages or injuries can accelerate the ripening of fruit and can affect negatively the appearance of fruit peeling cause browning and blemishes after and before storage. Commonly, avocados are very sensitive to spoiling during softening (Arpaia et al. 1987, Afzal et al., 2022), and then they should be transported carefully for displaying in the markets.

CONCLUSION

The purpose of evaluating the quality characteristics of Avocado is to create awareness regarding the worth of this economically important high value fruit crop in the area. Avocado being the rich source of cholesterol free fat from plant origin and its other attributes make it one of the most demanding fruit. The origin, climate and plant nutrition are the factors determining the avocado growth and quality. The value addition of Avocado is necessary to keep it for longer time period. Avocado Oil and Jam is highly nutritious product and it is also regarded as Vitamin E Powerhouse in addition to source of major vitamins and minerals. There is a dire need to produce Avocado on the large scale and it may be helpful in increasing export potential of the country.

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