Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(5): 2863-2866
Received: 10-07-2020
Accepted: 19-08-2020

VM Parmar
Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

KM Karetha
Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

Corresponding Author:
VM Parmar
Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh, Gujarat, India

Physical and biochemical analysis of dragon fruit species from different regions of Gujarat

VM Parmar and KM Karetha

Abstract
An investigation was carried out at Department of Horticulture, Junagadh Agricultural University, Junagadh during the year 2019-20. The experiment was laid out in Completely Randomized Design with Factorial concept comprising eight treatment combinations with three replications. The treatments comprised of four level of regions (R) *viz*., R_1 =West Gujarat Zone, R_2 = North Gujarat Zone, R_3 = Middle Gujarat Zone, R_4 = South Gujarat Zone and two level of species (S) *viz*., S_1 = *Hylocereus undatus* (White pulp) and S_2 = *Hylocereus polyrhizus* (Red pulp). The result revealed that among species *Hylocereus undatus* (S_1) recorded maximum value for physical parameters like fruit length (9.51 cm), fruit diameter (7.19 cm) and fruit weight (265.86 g). After estimation of biochemical parameters results showed that *Hylocereus polyrhizus* (S_2) having highest TSS (11.60 ºBrix), total sugar (9.19 %) as well as reducing sugar (5.07 %) content. While, *Hylocereus undatus* (S_1) having highest non-reducing sugar (4.36 %), acidity (0.45 %) and ascorbic acid (9.95 mg/100 g) content. Whereas effect of regions as well as interaction effect found non-significant on all physical and biochemical parameters of dragon fruit.

Keywords: Dragon fruit, species, region, physical, biochemical

Introduction
A pitaya or pitahaya is the fruit of several cactus species, most importantly of the genus *Hylocereus* (Sweet pitayas). Pitaya originated principally from the tropical and subtropical forest regions of Latin Americas, including North, Central and South America (Crane and Balerdi, 2005; Luders and McMahon, 2006) [3, 8]. Fruit is named as pitaya because of the bracts or scales on the fruit skin and hence the name of pitaya meaning ‘‘The scaly fruit’’.

Dragon fruit belongs to family of Cactaceae and grows best in dry, tropical or subtropical climates where annual rainfall ranges from 20-50 inch per year. It is an epiphyte plant that requires a peat land and a warm and humid environment. One to three grayish brown to black spines can be found on adult branches and they are 2-4 mm long. Flowers are white inside and greenish yellow with purple dyes on the outside are 25-30 cm long and 15-17 cm wide. Dragon fruits are scented and open at night and last one for only night. It was cultivated in many countries including Australia, Cambodia, China, Malaysia, Thailand, Sri Lanka (Mizrahi and Nerd, 1999; Nobel and de la Barrera, 2002) [9, 11].

Dragon fruit is a small fruit climbing cactus that has received worldwide recognition as an ornamental plant for its large, scented and night blooming flowers. Since pre-Columbian times, it has been very common in its native countries and consumed by the general population. It is a non-climacteric fruit covered with rosy red skin studded with green scales and its white pulp contains many small black seeds (Le-Bellec *et al.*, 2006) [7]. From the original areas, about 100 years ago, the French brought it into Vietnam, where it was exclusively grown for the king as ornamental crop (Luders and McMahon, 2006) [8]. Vernacular names of dragon fruits are ‘Strawberry pear’, ‘Night blooming cereus’, ‘Belle of the night’ and ‘Queen of the night’.

In India these fruits are mainly available in metro-politician cities like Mumbai, Chennai, Kolkata, Delhi, *etc.* imported from Vietnam, Singapore, Sri Lanka and from many South East Asian countries. Nowadays, these fruits are cultivated in many regions like Rajkot, Jamnagar, Ahmedabad, Kutch, Surat, Porbandar and Vadodara in Gujarat.

No detailed study concerning physical and biochemical properties of dragon fruit have been performed up to now in Gujarat. With regard to preserving and processing dragon fruit, some physical and biochemical properties of dragon fruits are very important. Therefore, in the current study, research was conducted to investigate physical and biochemical properties of the dragon fruits, by comparing the two species widely grown in four different regions of Gujarat.

Material & Methods
The present investigation was carried out at Department of Horticulture, Junagadh Agricultural University, Junagadh during the year 2019-20.

The experiment was laid out in Completely Randomized Design (CRD) with Factorial concept comprising eight treatment combinations with three replications. The treatments comprised of four level of regions (R) from where these species are brought for the investigation *viz*., R_1 =West Gujarat Zone, R_2 = North Gujarat Zone, R_3 = Middle Gujarat Zone, R_4 = South Gujarat Zone and two level of species (S) which is two different species with different pulp color *viz*., S_1 = *Hylocereus undatus* (White pulp) and S_2 = *Hylocereus polyrhizus* (Red pulp). Physical and biochemical parameters were recorded on twenty dragon fruits per treatment.

Physical Parameters

Fruit length was measured from stem end to bract end in centimeters with the help of vernier calliper. Fruit diameter was measured from the centre of the fruits in centimeters with the help of vernier calliper. Fruit weight was taken at harvest and recorded in gram by using electrical weighing balance. To assess the Physiological Losses in Weight (PLW) observation was recorded at harvest day and last day of shelf life. Decay loss of fruit mainly due to over ripening and ultimately it was judged on the basis of visual observation. Shelf life of fruit was recorded by keeping the fruits at room temperature *i.e.* ambient storage condition. Shelf life of fruit was considered as number of days from harvesting to marketable fruit or optimum eating. Physiological loss in weight and decay loss were calculated by following formula.

$$\text{PLW (\%)} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

$$\text{Decay loss (\%)} = \frac{\text{Number of rotted fruits}}{\text{Total number of fruits}} \times 100$$

Biochemical Parameters

The total soluble solids content in the pulp of ripe fruits was recorded with the help of digital refractometer. The total sugar of the filtrate was estimated by standardized Fehling's solution A and B using methylene blue as indicator. The titrametric method of Lane and Eyon as described by Rangana (1977) [13] was adopted for estimation of reducing sugar. Acidity was estimated according to the method described in A.O.A.C. (1970) [1]. The titremetric method for ascorbic acid described by Rangana (1979) [14] was adopted. Non-reducing sugar was calculated by following formula:

Non-reducing sugar (%) = Total sugar (%) – Reducing sugar (%) Various characters under study were statistically analysed by using analysis of variance technique for Completely Randomized Design (CRD) with Factorial concept as described by Panse and Sukhatme (1985) [12].

Results & Discussion

Physical parameters

Fruit length (cm)

The significant difference observed between dragon fruit species and recorded longest fruit length in species S_1 (*Hylocereus undatus*) (9.51 cm) than species S_2 (*Hylocereus polyrhizus)* (7.66 cm). The result was supported by Topuz *et al.* (2005) [15] in orange and Ertekin *et al.* (2006) [4] in plum and Kheiralipour *et al.* (2008) [6] in apple and Mohd (2010) in dragon fruit.

Effect of regions as well as interaction effect was found non-significant on fruit length of dragon fruit.

Fruit diameter (cm)

In case of fruit diameter highest fruit diameter was found in species S_1 (*Hylocereus undatus*) (7.19 cm) than species S_2 (*Hylocereus polyrhizus)* (7.14 cm). The result was supported by Topuz *et al.* (2005) [15] in orange and Ertekin *et al.* (2006) [4] in plum and Kheiralipour *et al.* (2008) [6] in apple.

Effect of regions as well as interaction effect was found non-significant on fruit diameter of dragon fruit.

Fruit weight (g):

Highest fruit weight was found in species S_1 (*Hylocereus undatus*) (265.86 g) than species S_2 (*Hylocereus polyrhizus)* (260.27 g). The result was supported by Topuz *et al.* (2005) [15] in orange and Ertekin *et al.* (2006) [4] in plum and Kheiralipour *et al.* (2008) [6] in apple and Mohd (2010) [10] in dragon fruit.

Effect of regions as well as interaction effect was found non-significant on fruit weight of dragon fruit.

Physiological Loss in Weight (%)

Among all treatments effect of regions, species as well as interaction effect was found non-significant in case of Physiological Loss in Weight of dragon fruit.

Decay loss (%)

Among all treatments effect of regions, species as well as interaction effect was found non-significant in case of decay loss of dragon fruit.

Shelf life (days)

Among all treatments effect of regions, species as well as interaction effect was found non-significant in case of shelf life of dragon fruit.

Table 1: Effect of different regions and species on physical parameters of dragon fruit

Sr. No.	Treatment	Physical parameters					
		Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	PLW (%)	Decay loss (%)	Shelf life (days)
Regions (R)							
R_1	West Gujarat Zone	8.75	7.17	263.15	10.94	64.16	9.52
R_2	North Gujarat Zone	8.46	7.17	263.46	11.60	63.05	9.81
R_3	Middle Gujarat Zone	8.30	7.15	262.88	11.15	67.54	9.67
R_4	South Gujarat Zone	8.83	7.17	262.79	11.85	66.00	9.21
	S.Em.±	0.138	0.021	2.633	0.230	1.589	0.145
	C.D. at 5%	NS	NS	NS	NS	NS	NS
Crop Species (S)							
S_1	*Hylocereus undatus*	9.51	7.19	265.86	11.27	64.16	9.55
S_2	*Hylocereus polyrhizus*	7.66	7.14	260.27	11.51	66.21	9.56
	S.Em.±	0.098	0.015	1.862	0.163	1.124	0.102

	C.D. at 5%	0.29	0.04	5.58	NS	NS	NS
Interaction (R x S)							
	S.Em.±	0.196	0.030	3.724	0.326	2.248	0.205
	C.D. at 5%	NS	NS	NS	NS	NS	NS
	C.V.%	3.95	0.72	2.45	4.96	5.97	3.71

Biochemical parameters

TSS (ºBrix)

The significant difference observed between dragon fruit species and highest total soluble solids was recorded in species S_2 (*Hylocereus polyrhizus*) (11.60 ºBrix) while lowest in species S_1 (*Hylocereus undatus*) (9.40 ºBrix). The similar kind of findings were recorded by Islam *et al.* (2012) [5] in dragon fruit and Ali *et al.* (2004) [2] in apple.

Effect of regions as well as interaction effect was found non-significant on TSS of dragon fruit.

Total sugar (%)

The significant difference observed between dragon fruit species and highest total sugar was recorded in species S_2 (*Hylocereus polyrhizus*) (9.19 %) while lowest in species S_1 (*Hylocereus undatus*) (8.62 %). The similar kind of findings were recorded by Islam *et al.* (2012) [5] in dragon fruit and Ali *et al.* (2004) [2] in apple.

Effect of regions as well as interaction effect was found non-significant on TSS of dragon fruit.

Reducing sugar (%)

The significant difference observed between dragon fruit species and highest reducing sugar was recorded in species S_2 (*Hylocereus polyrhizus*) (9.19 %) while lowest in species S_1 (*Hylocereus undatus*) (8.62 %). The similar kind of findings were recorded by Islam *et al.* (2012) [5] in dragon fruit and Ali *et al.* (2004) [2] in apple.

Effect of regions as well as interaction effect was found non-significant on TSS of dragon fruit.

Non-reducing sugar (%)

The significant difference observed between dragon fruit species and highest non-reducing sugar was recorded in species S_1 (*Hylocereus undatus*) (4.36 %) while lowest in species S_2 (*Hylocereus polyrhizus*) (4.12 %). The similar kind of findings were recorded by Islam *et al.* (2012) [5] in dragon fruit and Ali *et al.* (2004) [2] in apple.

Effect of regions as well as interaction effect was found non-significant on TSS of dragon fruit.

Acidity (%)

The significant difference observed between dragon fruit species and highest acidity was recorded in species S_1 (*Hylocereus undatus*) (0.45 %) while lowest in species S_2 (*Hylocereus polyrhizus*) (0.42 %). The similar kind of findings were recorded by Islam *et al.* (2012) [5] in dragon fruit and Ali *et al.* (2004) [2] in apple.

Effect of regions as well as interaction effect was found non-significant on TSS of dragon fruit.

Ascorbic acid (mg/100 g)

The significant difference observed between dragon fruit species and highest ascorbic acid content was recorded in species S_1 (*Hylocereus undatus*) (9.95 mg/100 g) while lowest in species S_2 (*Hylocereus polyrhizus*) (9.54 mg/100 g). The similar kind of findings were recorded by Islam *et al.* (2012) [5] in dragon fruit and Ali *et al.* (2004) [2] in apple.

Effect of regions as well as interaction effect was found non-significant on TSS of dragon fruit.

Table 2: Effect of different regions and species on biochemical parameters of dragon fruit

Sr. No.	Treatment	Biochemical parameters					
		TSS (ºBrix)	Total sugar (%)	Reducing sugar (%)	Non-reducing sugar (%)	Acidity (%)	Ascorbic acid (mg/100 g)
Regions (R)							
R_1	West Gujarat Zone	10.61	8.93	4.63	4.30	0.44	9.75
R_2	North Gujarat Zone	10.60	8.87	4.66	4.22	0.44	9.75
R_3	Middle Gujarat Zone	10.52	8.92	4.67	4.24	0.43	9.73
R_4	South Gujarat Zone	10.27	8.90	4.69	4.21	0.44	9.76
	S.Em.±	0.090	0.160	0.038	0.063	0.007	0.191
	C.D. at 5%	NS	NS	NS	NS	NS	NS
Crop Species (S)							
S_1	*Hylocereus undatus*	9.40	8.62	4.26	4.36	0.45	9.95
S_2	*Hylocereus polyrhizus*	11.60	9.19	5.07	4.12	0.42	9.54
	S.Em.±	0.064	0.113	0.027	0.044	0.005	0.135
	C.D. at 5%	0.19	0.34	0.08	0.13	0.01	0.41
Interaction (R x S)							
	S.Em.±	0.128	0.185	0.054	0.089	0.010	0.270
	C.D. at 5%	NS	NS	NS	NS	NS	NS
	C.V.%	2.11	3.57	2.02	3.63	3.77	4.81

Conclusion

On the basis of results obtained from the present investigation, it can be concluded that significant difference found between dragon fruit species on physical andbiochemical parameters whereas effect of regions as well as interaction effect found non-significant on all physical and biochemical parameters of dragon fruit.

References

1. AOAC. Official Method of Analysis. Association of official analytical chemists, Washington, D. C., 1970; 16:37.
2. Ali MA, Raza HA, Khan MA, Hussain MA. Effect of different periods of ambient storage on chemical composition of apple fruit. International Journal of Agriculture and Biology. 2004; 6(2):568-571.

3. Crane JH, Balerdi CF. Pitaya growing in the Florida home landscape. 2005; 21:1-9.
4. Ertekin C, Gozlekci S, Kabas O, Sonmez S, Akinci I. Some physical, pomological and nutritional properties of two plum (*Prunus domestica* L.) cultivars. Journal of Food Engineering, 2006; 75(4):508-514.
5. Islam MZ, Khan MTH, Hoque MM, Rahman MM. Studies on the processing and preservation of dragon fruit (*Hylocereus undatus*) jelly. The Agriculturists. 2012; 10(2):29-35.
6. Kheiralipour K, Tabatabaeefar A, Mobli H, Rafiee S, Sharifi M, Jafari A *et al*. Some physical and hydrodynamic properties of two varieties of apple (*Malus domestica* Borkh L.). International Agrophysics. 2008; 22(3):225-229.
7. Le-Bellec F, Vaillant F, Imbert E. Pitahaya (*Hylocereus* spp.): a new fruit crop, a market with a future. Fruits, 2006; 61:237-250.
8. Luders L, McMahon G. The pitaya or dragon fruit (*Hylocereus undatus*). Agnote, 2006; 778:1-4.
9. Mizrahi Y, Nerd A. Climbing and columnar cacti: new arid land fruit crops. Perspectives on New Crops and New Uses, 1999, 358-366.
10. Mohd MH. Diversity of *Fusarium semitectum* associated with red-fleshed dragon fruit in Malaysia, University Sains, Malaysia, 2010.
11. Nobel PS, de la Barrera E. Stem water relations and wet CO_2 uptake for hemiepiphytic cactus during short term drought. Environment and Experimental Botany. 2002; 48:129-137.
12. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. 3rdEd, ICAR publication, New Delhi, 1985, 361.
13. Rangana S. Manual of analysis of fruit and vegetable products. Tata McGraw Hill Pub. Co. Ltd., New Delhi, 1977.
14. Rangana S. Manual of analysis of fruit and vegetable products. Tata McGraw Hill Pub. Co. Ltd., New Delhi, 1979.
15. Topuz A, Topakci M, Canakci M, Akinci I, Ozdemir F. Physical and nutritional properties of four orange varieties. Journal of Food Engineering. 2005; 66(4):519-523.