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ASSESSMENT OF PHYSICO-CHEMICAL AND ORGANOLEPTIC PROPERTIES OF DRAGON FRUIT AND EUREKA LEMON BLENDED CRUSH

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ABSTRACT

The present investigation was carried out to prepare fruit crush by combining fruit pulp of dragon fruit and Eureka lemon with sugar and acid. The storage studies of blended fruit crush packed in glass bottles showed significant changes in chemical properties during three months of storage. TSS, total sugars, reducing sugars and titratable acidity all surged dramatically from 55.00 to 56.49°B, 41.88 to 43.09%, 30.15 to 31.36% and 1.00 to 1.29%, respectively, while pH plummeted significantly from 2.71 to 2.43 in dragon-eureka lemon blended crush during storage. Total sugars, reducing sugars and pH were maximum in crush containing 100% dragon fruit pulp, while titratable acidity was maximum in crush with 90% eureka lemon and 10% dragon fruit pulp. Moreover, Colour, aroma, body and taste showed not much significant difference (P=0.05) in sensory attributes during entire storage of 3 months.
Keywords **:** Dragon fruit, Eureka lemon, Crush, Sensory attributes

Introduction

Fruits are regarded as valuable food commodity with potential health benefits, being rich source of carbohydrates, vitamins, antioxidants and minerals, which are essential for an active and healthy life. Dragon fruit *(Hylocereus sp.*) is a non-climacteric fruit belonging to the family Cactaceae and also known as *Pitaya.* Its colour ranges from dark red to pink, with green overlapping across the surface. There are three most common varieties of the dragon fruit *i.e. Hylocereus undatus*, *Hylocereus costaricensis* and *Hylocereus megalanthus* (Jalgoankar *et al*., 2018). Dragon fruit is a rich source of serum protein, fibre, vitamins and minerals, all of which are essential components of a human diet and has a substantial amount of antioxidant activity (Le Bellec *et al*., 2006). Furthermore, the presence of betacyanin in fruit shell makes it a promising natural pigment (Kim *et al*., 2011).

Eureka lemon (*Citrus limon* Burm. f.), which is primarily grown in the United States, Argentina, Spain, Italy and Mexico, is the third most popular citrus fruit after orange and mandarin, with an expected production of 21.5 million tons (Serna-Escolano *et al*., 2024). It is high in vitamin C content which gave a solid protection against various diseases and contributes to a strong immune system and also contains phytochemicals, flavonoids giving it a greater antioxidant boost (Kour *et al*. 2021). Its accessibility and consistent availability make the Eureka lemon a beloved choice for home cooks and professional chefs alike, contributing to its status as a staple in kitchens around the world.

Even though dragon fruit has high nutritional value, but due to its poor taste, it has not been widely accepted by consumers. Thus, blending of dragon fruit pulp with eureka lemon juice will modify the taste and supplement blended beverages with vitamins, minerals, besides improving its overall acceptability. Keeping this aspect in view, the work was initiated to standardize appropriate combination of dragon fruit and eureka lemon blends for preparation of crush, and

also to assess the changes in chemical constituents and overall acceptability of the blends during storage.

Material and Methods

The dragon fruit pulp (100, 85, 70, 55, 40, 25 and 10%) and eureka lemon (0, 15, 30, 45, 60, 75 and 90%) juice were blended with each other in different ratios for developing crush. The specified amount of sugar and citric acid was introduced into warm water, forming a solution that was then filtered through muslin cloth. This resulting solution was combined with the Dragon-Eureka lemon blend to uphold its total soluble solids at 55°B and maintain a 1% acidity level. The prepared crush was subsequently filled into presterilized glass bottles, sealed with crown corks and subjected to a 30-minute processing in boiling water. After immediate cooling, the bottles were labeled and stored at room temperature (25-38℃). The blended crush underwent analysis at regular intervals of 0, 1, 2 and 3 months, encompassing physicochemical and organoleptic assessments.

Total soluble solids of the crush were estimated at ambient temperature with the help of Abbe's Refractometer (Ranganna, 2014). The acidity of the crush was assessed following the method outlined by Ranganna (2014). The pH was determined by using pH meter calibrated with a standard buffer solution of pH as described by AOAC (2012). The Lane and Eynon volumetric method, described by Ranganna (2014), was utilized for determining the content of sugars. A nine-point hedonic rating scale, as outlined by Amerine *et al.* (1965), was used for sensory evaluation. The data collected was analyzed using a factorial completely randomized design (CRD) to interpret the results through analysis of variance, as described by Gomez and Gomez in 1984.

Results and Discussion

Total soluble solids

The mean TSS content of the blended crush significantly decreased from 55.99 to 55.42°B due to decrease in the concentration of dragon fruit as it has higher TSS concentration. Over the storage period of three months, the total soluble solids of the dragon and Eureka lemon blended crush increased (Figure 1) from 55.00 to 56.49°B. This increase in total soluble solids might be attributed to the partial hydrolysis of starch and other complex carbohydrates into simple sugars, as well as the conversion of other insoluble fractions into soluble ones. These results were in conformation with the findings of Pangotra *et al*. (2018) and Sharma *et al*. (2023) who all observed a similar increase in total soluble solids during the storage of phalsa blended crush and pineapple-mango blended crush, respectively.

Titratable acidity

Increasing the lemon juice content in the blends significantly raised the mean titratable acidity from 1.07% in treatment T_1 (100: 0::Dragon:Eureka lemon) to 1.29% in T_7 (10:90::Dragon:Eureka lemon). Similar increment in acidity with incorporation of lemon juice was observed by Deepa and Karetha (2022). The acidity of the blended crush significantly increased from 1.00 to 1.29% over the storage period (Table 1). This rise in acidity could be attributed to the formation of organic acids due to the decomposition of polysaccharides or the breakdown of pectic substances. These findings were consistent with those of Rohila (2016) in guava blended crush and Deepa and Karetha (2022) in dragon-lime blended squash.

pH:

The treatment T_1 (100:0: Dragon:Eureka lemon) had the highest pH of 3.01, indicating lower acidity, which was statistically followed by T_2 (85:15:: Dragon:Eureka lemon) with pH value of 2.89 (Table 2). In contrast, T_7 (10: 90: Dragon:Eureka lemon) had the lowest pH of 2.15. The pH of the blended crush found to be significantly decreased from 2.71 to 2.43, after three months of storage. This might be due to the inclusion of lemon juice in the crush as well as the development of acetic acid and lactic acid under ambient circumstances, causing lowered pH levels and higher acidity, which were inversely correlated. The aforementioned results were congruent with those of Foke *et al*. (2018) and Mahar *et al*. (2021).

Reducing sugar

The highest and lowest mean reducing sugar contents were reported as 30.92% for treatment T_1 (100: 0: Dragon:Eureka lemon) and 30.12% for T_7 (10:90::Dragon:Eureka lemon) (Table 3). This drop could be attributed to the Eureka lemon's lower reducing sugar concentration. Deepa and Karetha observed similar findings (2022). Over three-months of storage period, the reducing sugar content increased from 30.15 to 31.36%. Over the course of the storage period, the reducing sugars in each treatment grew steadily. This increase can be attributed to the conversion of non-reducing sugars to reducing sugars through the hydrolysis process, which occurs at a higher rate in room conditions due to faster reaction rates. The current findings were also consistent with the previously reported study of Gupta (2019) and Rohila (2016) in karonda-beetroot RTS and guava blended crush, respectively.

Total sugars

The total sugars (Figure 2) varied significantly with both treatments and storage period. The highest mean total sugars (42.86%) recorded in treatment T_1 (control), while the lowest (41.90%) was observed in treatment T_7 (10: 90: dragon: eureka lemon). These results were similar to the findings of Patil *et al*. (2023). With advancement in storage period, total sugars in the treatments increased from 41.88 to 43.09%. This rise might be due to the hydrolysis of insoluble polysaccharides and the inversion of sugars. The increase was associated with the levels of reducing sugars and total soluble solids. The results were in accordance with the findings of Rohila (2016) and Rahman *et al*. (2024) who worked on guava blended crush and mulberry-aloe vera nectar, respectively.

Sensory properties

The treatment means varied significantly as shown in Figure 3, with the highest mean colour, aroma, body and taste score of 8.42, 8.29, 8.16 and 8.27, respectively in treatment T_3 (70: 30: Dragon: Eureka lemon) and the lowest score of 7.12, 6.88, 6.66 and 7.00 in treatment T_1 (100:0::Dragon: Eureka lemon), respectively. The mean score for colour, aroma, body and taste decreased from 7.97 to 7.48, 7.77 to 7.40, 7.68 to 7.24 and 7.82 to 7.48, respectively after three months of storage period. This decline in sensory score with the advancement of storage period, might be due to break down of pigments and oxidative loss of pigments, high level of acid that reacts with the product causing unpleasant volatile odour or slight fermentation of beverage and gas production (Rashid *et al*., 2018), degradation of pectin and loss of sugar-acid balance (Hamid and Thakur, 2017). The findings closely resembled those of Pradeepa *et al*. (2021) in dragon fruit squash, Sinha (2021) in dragon fruit blended RTS and Gupta *et al*. (2024) in herbal nectar.

Conclusion

According to the findings of this study, the most widely accepted crush made with blending of dragon fruit and eureka lemon is nutritionally rich. The chemical parameters such as TSS, titratable acidity, reducing sugars and total sugars increased while pH decreased slightly with prolonged storage period. The crush was highly accepted organoleptically and safe to consume during the entire storage of 3 months. As a result, once the dragon fruit and eureka lemon blended crush is marketed, the produced crush has a higher chance of being consumed. It can be concluded that the recipe for preparation of blended crush with 70% dragon fruit and 30% eureka lemon was found to be ideal regarding all the aspects of sensory parameters.

Table 1: Effect of treatment and storage period on titratable acidity (%) of Dragon-Eureka lemon blended crush

Treatments	Storage period (months)				Mean
	0	1	2	3	
T_1 (100:0::Dragon:Eureka lemon)	1.00	1.04	1.11	1.14	**1.07**
T_2 (85:15::Dragon:Eureka lemon)	1.00	1.08	1.16	1.19	**1.11**
T_3 (70:30::Dragon:Eureka lemon)	1.00	1.14	1.20	1.25	**1.15**
T_4 (55:45::Dragon:Eureka lemon)	1.00	1.17	1.24	1.28	**1.17**
T_5 (40:60::Dragon:Eureka lemon)	1.00	1.22	1.30	1.36	**1.22**
T_6 (25:75::Dragon:Eureka lemon)	1.00	1.26	1.35	1.39	**1.25**
T_7 (10:90::Dragon:Eureka lemon)	1.00	1.29	1.41	1.45	**1.29**
Mean	**1.00**	**1.17**	**1.25**	**1.29**	

Effects – C.D.(p=0.05) Treatments 0.04 Storage– 0.03 Treatments x Storage – 0.08

Table 2: Effect of treatment and storage period on pH of Dragon-Eureka lemon blended crush

Treatments	Storage period (months)				Mean
	0	1	2	3	
T_1 (100:0::Dragon:Eureka lemon)	3.15	3.07	2.98	2.83	**3.01**
T_2 (85:15::Dragon:Eureka lemon)	3.00	2.94	2.87	2.74	**2.89**
T_3 (70:30::Dragon:Eureka lemon)	2.90	2.81	2.75	2.61	**2.76**
T_4 (55:45::Dragon:Eureka lemon)	2.70	2.63	2.55	2.39	**2.57**
T_5 (40:60::Dragon:Eureka lemon)	2.58	2.50	2.44	2.34	**2.47**
T_6 (25:75::Dragon:Eureka lemon)	2.40	2.32	2.20	2.12	**2.26**
T_7 (10:90::Dragon:Eureka lemon)	2.27	2.21	2.11	2.03	**2.15**
Mean	**2.71**	**2.64**	**2.56**	**2.43**	

Effects – C.D.(p=0.05) Treatments 0.02 Storage– 0.01 Treatments x Storage – 0.03

Table 3: Effect of treatment and storage period on reducing sugars of Dragon-Eureka lemon blended crush

Treatments	Storage period (months)				Mean
	0	1	2	3	
T_1 (100:0::Dragon:Eureka lemon)	30.56	30.61	31.02	31.50	**30.92**
T_2 (85:15::Dragon:Eureka lemon)	30.41	30.49	30.90	31.42	**30.80**
T_3 (70:30::Dragon:Eureka lemon)	30.29	30.35	30.79	31.35	**30.69**
T_4 (55:45::Dragon:Eureka lemon)	30.17	30.22	30.65	31.28	**30.58**
T_5 (40:60::Dragon:Eureka lemon)	30.04	30.10	30.52	31.16	**30.45**
T_6 (25:75::Dragon:Eureka lemon)	29.83	29.96	30.33	31.99	**30.53**
T_7 (10:90::Dragon:Eureka lemon)	29.73	29.80	30.15	30.80	**30.12**
Mean	**30.15**	**30.22**	**30.62**	**31.36**	

Effects – C.D.(p=0.05) Treatments– 0.03 Storage– 0.02 Treatments x Storage – 0.06

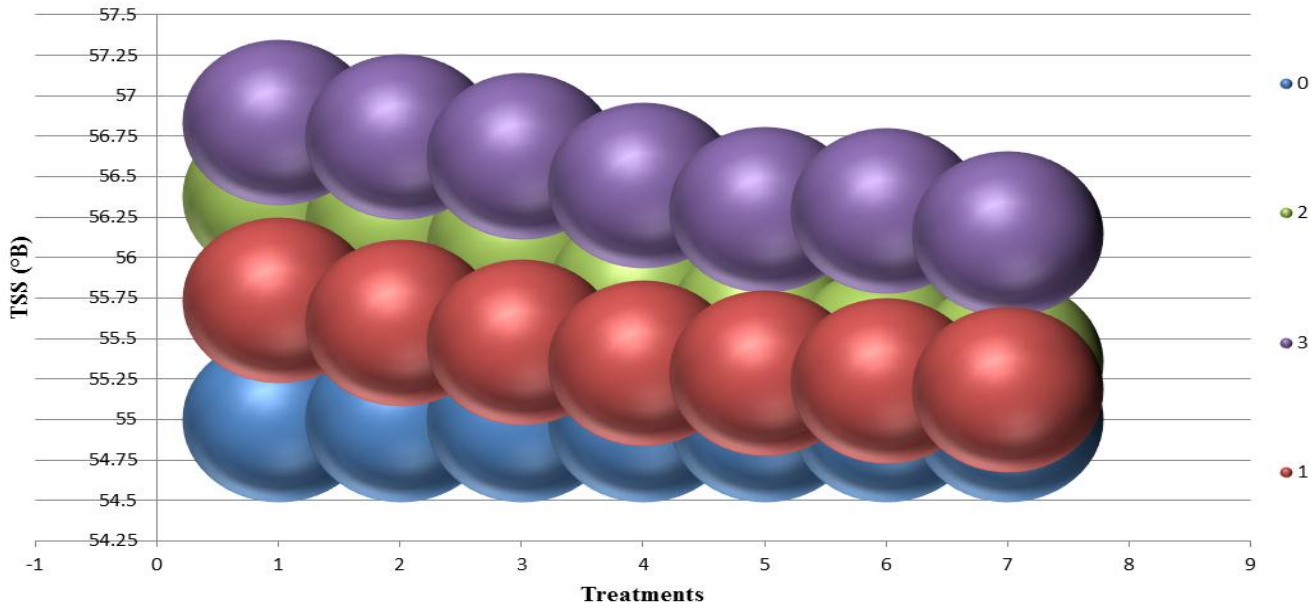

Fig. 1: Effect of treatment and storage period on total soluble solids (°Brix) of Dragon-Eureka lemon blended crush

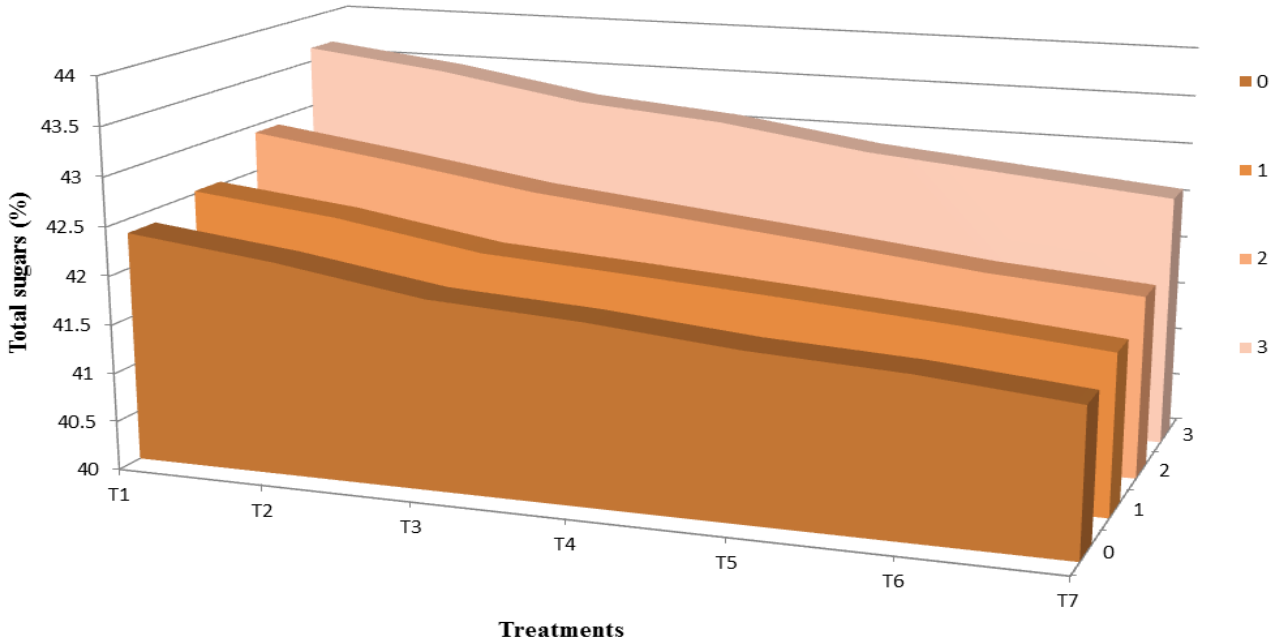

Fig. 2: Effect of treatment and storage period on total sugars (%) of Dragon-Eureka lemon blended crush

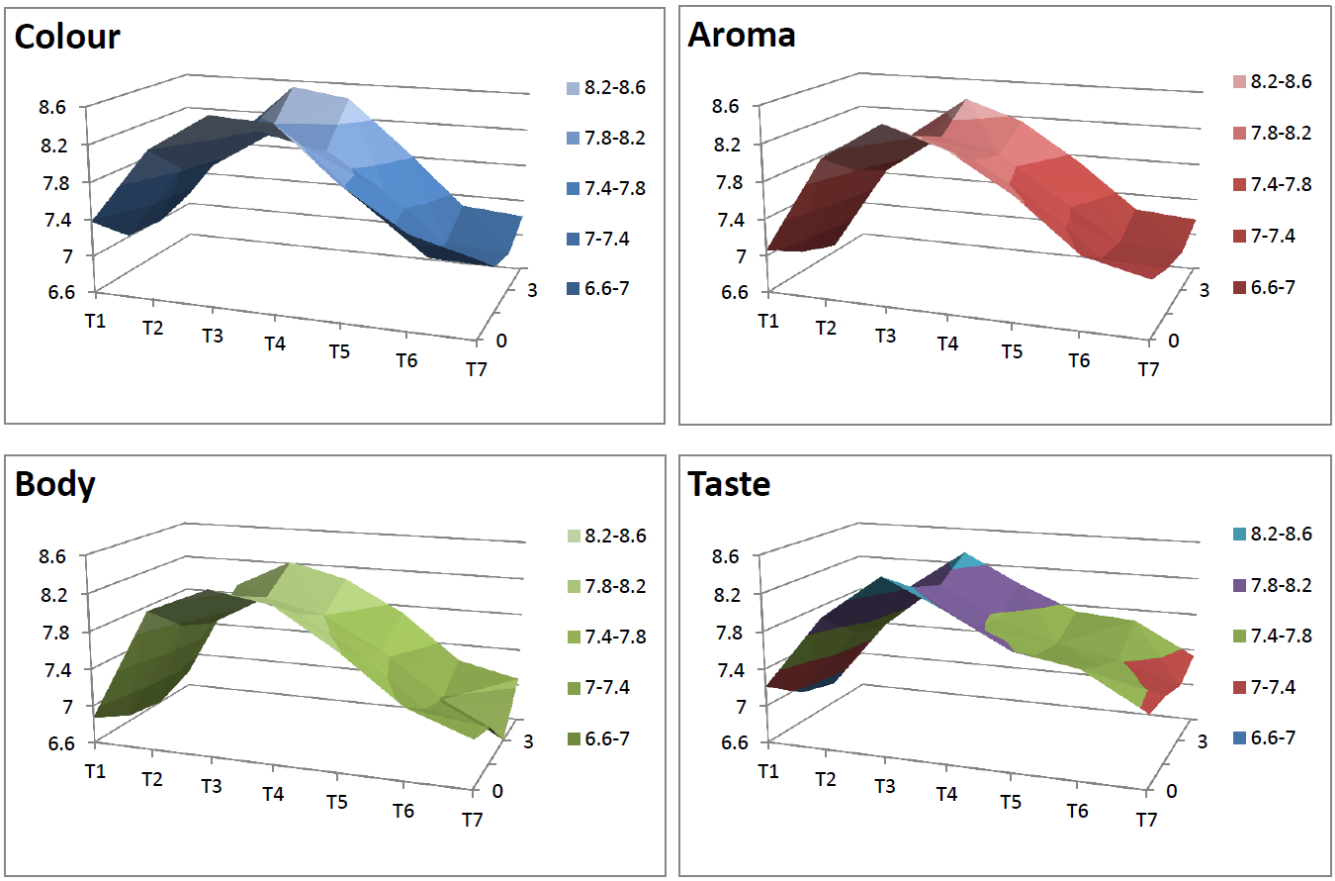

Fig. 3: Effect of treatment and storage period on sensory properties of Dragon-Eureka lemon blended crush

References

Amerine, M.A., Paigborn, R.M. and Rosesser, E.B. (1965). *Principles of Sensory Evaluation of Food*, Academic Press, New York, U.S.A. p 23-45.

AOAC. 2012. *Official Methods of Analysis*. 19th edition. Association of Official Analytical Chemists, Washington, D. C.

Deepa, K. and Karetha, K.M. (2022). Studies on quality of dragon fruit and lime juice blended RTS beverage. *The Pharma Innovation Journal*, **11**(8), 750-753.

Foke, V., Zambare, A., Gaikwad, D.M. and Alhat, N. (2018). Studies on ready to serve (RTS) beverage from dragon fruit. *International Journal of Processing and Post Harvest Technology*, **9**(2), 55-59.

Gomez, K.A. and Gomez, A.A. (1984). *Statistical Procedure for Agricultural Research* (edn 2nd), A Wiley-Interscience Publication, John Wiley and Sons, New York. p 680.

Gupta, N. (2019). Studies on preparation of blended karonda-beet root ready to serve beverage. *Indian Journal of Horticulture*, **76**(4),735-740.

Gupta, S., Sood, M., Gupta, N., Bandral, J.D. and Kour, D.P. (2024). Impact of herbs on nutritional and organoleptic attributes of nectar developed using bottle gourd (*Lagenaria siceraria*). *Plant Archives*, **24**(1), 1511-1516.

Hamid, H. and Thakur, N.S. (2017). Development of appetizer (spiced squash) from mulberry (*Morus alba* L.) and its quality evaluation during storage. *Journal of Applied and Natural Science*, **9**(4), 2235-2241.

Jalgoankar, K., Mahawar, M.K., Kale, S., Kale, P.N., Bibwe, B., Dukare, A., Kannujia, P. and Singh, V. (2018). Response surface optimization for development of dragon fruit based RTS. *Journal of Applied and Natural Science*, **10**(1), 272-278.

Kim, H., Choi, H. K., Moon, J.Y., Kim, Y.S. and Mosaddik, A. (2011). Comparative antioxidant and anti-proliferative activities of red and white pitayas and their correlation with flavonoid and polyphenol content. *Journal of Food Science*, **76**, 38-45.

Kour, P., Gupta, N. and Singh, J. (2021). Utilization of Eureka Lemon Peel for Development of Value Added Product. Journal of Scientific & Industrial Research. 80, 181-185

Le Bellec, F., Vaillant, F. and Imbert, E. (2006). Pitahaya (*Hylocereus* spp.), A new fruit crop, a market with a future. *Fruits*, **61**(4), 237-250.

Mahar, D., Mishra, R., Sharma, S.P. and Sushila. (2021). Standardization of the recipe of dragon fruit ready-to-serve (RTS) blended with pineapple. *The Pharma Innovation Journal*, **10**(12), 567-571.

Pangotra, B.B., Gupta, N., Bandral, J.D., Sood, M. and Singh, J. (2018). Formulation and evaluation of phalsa-pear blended beverage. *The Pharma Innovation Journal*. **7**(10), 25-29.

Patil, A.C., Chavan, U.D., Jadhav, P.J., Kotecha, P.M. and Patil, M.R. (2023). Studies on preparation of toffee from dragon fruit. *The Pharma Innovation Journal*, **12**(2), 609-612.

Pradeepa, T., Naik, K.R., Srinivas, N., Naika, M.B.N. and Praveenakumar, S.G. 2021. Standardization of protocol

for dragon fruit (*Hylocereus polyrhizus* L.) squash. *The Pharma Innovation*, **10**(5), 522-525.

Rahman, R., Gupta, N., Hameed, F. and Ganie, S.A. (2024). Development of functional mulberry-Aloe vera blended nectar and its quality evaluation during storage. *International Journal of Advanced Biochemistry Research*. **8**(9), 666-673.

Ranganna, S. (2014). *Handbook of Analysis and Quality Control for Fruit and Vegetable Products* (2nd ed.), Tata McGraw Hill Publishing Co. Ltd., New Delhi.

Rashid, R., Bhat, A., Dayal, A., Sood, M. and Sharma, S. 2018. Studies on storage stability of guava RTS. *The Pharma Innovation Journal*, **7**(5), 230-233.

Rohila, H. (2016). *Development and Evaluation of Nectar and Crush from Bael-Guava blends*. M.Sc. Thesis, CCS Haryana Agricultural University, Hisar, India.

Serna-Escolano, V., Giménez, M.J., Zapata, P.J., Cubero, S., Blasco, J. and Munera, S. 2024. Non-destructive assessment of 'Fino' lemon quality through ripening using NIRS and chemometric analysis. *Postharvest Biology and Technology*, **212**, 112870.

Sharma, A., Mishra, S. and Brar, R.S. (2023). Study on development and storage of blended pineapple (*Ananas comosus* L.) mango (*Mangifera indica* L.) crush. *International Journal of Plant and Soil Science*, **35**(14), 377-384.

Sinha, D.K. (2021). *Studies on Standardization of Juice and TSS Composition and Storage Behaviour of Ready to Serve Beverage Prepared from Dragon Fruit (Hylocereus polyrhizus* L.). M.Sc. Thesis, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India.