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## Standardization of the recipe of dragon fruit ready-to-serve (RTS) blended with pineapple

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**Abstract**

The present study carried out to develop a dragon fruit RTS blended with pineapple. The juice used in the study were those obtained from dragon fruit and pineapple blended in different proportions such as T1 (90:10), T2 (80:20), T3 (70:30), T4 (60:40), T5 (50:50) and T6 (40:60). The RTS were evaluated for their quality throughout the storage period. Dragon fruit RTS blended with pineapple treatment T3 having 70% dragon fruit juice: 30% pineapple juice recorded the highest organoleptic score for color, taste, flavor, appearance, and overall acceptability. The RTS, TSS, acidity, total sugar, reducing sugar, increased continuously during the storage period. While TSS and acid ratio, pH, ascorbic acid, and non-reducing sugar decrease during the storage period at refrigerated condition. The decrease in organoleptic acceptability due to the change in the composition of these parameters and biochemical changes during storage.

**Keywords:** Dragon fruit, blended RTS, Pineapple

**1. Introduction**

Dragon fruit (*Hylocereus* spp.) is a perennial, epiphytic tropical climbing cactus belongs to the Cactaceae family and the *Hylocereus* genus with a triangular fleshy jointed stem (Cheah *et al.*, 2016; Tripathi *et al.*, 2014 and Gunasen *et al.*, 2006) [3, 13, 6]. It is a dicotyledonous flowering plant, Caryophyllales order, belonging to the Cactoidea subfamily. Dragon fruit is native to Central and South America's tropical and subtropical climates (Mirzahi *et al.*, 1997; Thulaja, 1999; Zee *et al.*, 2004) [9, 12, 16]. It's also known as strawberry pears, night-blooming cereus, queen of the night and Honolulu Queen, belle of the night and cinderella plant and pitaya and pitahaya in Latin America (Martin *et al.*, 1987) [8].

The fruit weight ranges from 300 to 800 g and 40 to 100 fruits are produced per year by each plant. Normally, one plant produces 15 to 25 kg of fruit (Tripathi *et al.*, 2014) [13]. These are low acid foods with pH values ranging from 4.4 to 5.1. (Gunaseena *et al.*, 2007; Stintzing *et al.*, 2003) [6]. The edible part of dragon fruit (64.50% of total fruit wt.) contains moisture 82.5-83% protein 0.16-0.23%, fat 0.21-0.61%, calcium 6.3-8.8 mg, phosphorus 30.2-36.1 mg, iron 0.5-0.61 mg, vitamin-C 8-9 mg (Tripathi *et al.*, 2014) [13]. Dragon fruit is rich in sodium (Na), high amount of fiber (2-4%, w/w), potassium (3.2-4 g/L) and antioxidants (42.4±0.04 mg of gallic acid equivalents/100 g of flesh) (Wu *et al.*, 2006) [15]. Fruit had a titratable acidity of 0.20 to 0.30 mg lactic acid equivalents, and a TSS of 8-12°Brix, as per biochemical analysis (Karunakaran *et al.* 2014) [7]. In addition, red pitaya is a strong source of proline (1.1-1.6 g / L) and also contains large amounts of essential fatty acid in red pitaya seeds (linoleic acid, 51%) (Ariffin *et al.*, 2009) [1].

Pineapple (*Ananas comosus* L.) is derived from Central and Southern Brazil, North Argentina and Paraguay (Baker and Collins, 1939) [2]. It is a healthy source of carotene and ascorbic acids and is moderately high in vitamin B and vitamin B2. Minerals such as calcium, magnesium, potassium, and iron, as well as phosphorus, are also available (Rashmi *et al.*, 2005) [10]. The 100 g of pineapple pulp contains 87.3 g water, 0.54 g protein, 13.7 g carbohydrates, 16 mg calcium, 11 mg phosphorus, 0.28 mg iron, 12 mg magnesium, 130 IU vitamin A, 0.079 mg vitamin B1, 0.031 mg vitamin B2, 24 mg ascorbic acid, and gives 52 calories of energy (Hossain *et al.*, 2015) [5].

The main purpose of fruit processing is to provide customers with wholesome, healthy, nutritious, and appropriate food throughout the year. Dragon fruit can be processed into various products like juice, jam, jelly, candy, RTS, nectar, syrup, squash, ice cream, yogurt, pastry, spread, ketchup, and wine, etc.

Its flower buds are used in soups and salads, and they can also be eaten as a vegetable. Fruit seed and peel can be used to make different pharmaceuticals, colorants, and cosmetics.

## 2. Materials and Methods

### 2.1 Preparation of dragon fruit juice

The fully ripen, well matured fresh dragon fruits were selected for the preparation of RTS. The fruits were washed with tap water to remove dirt and dust particles. dragon fruit is cut into two halves and then its peels are removed and pulp

is separated from peel along with seeds, then pulp is grinded by grinder into fine substance.

### 2.2 preparation of pineapple juice

Ripe mature pineapples were selected, fruit was peeled with a stainless steel knife or peeler and then cut into slices and the core was removed. Then the slices of pineapple were passed through the mixer and the extracted juice was strained by muslin cloth.

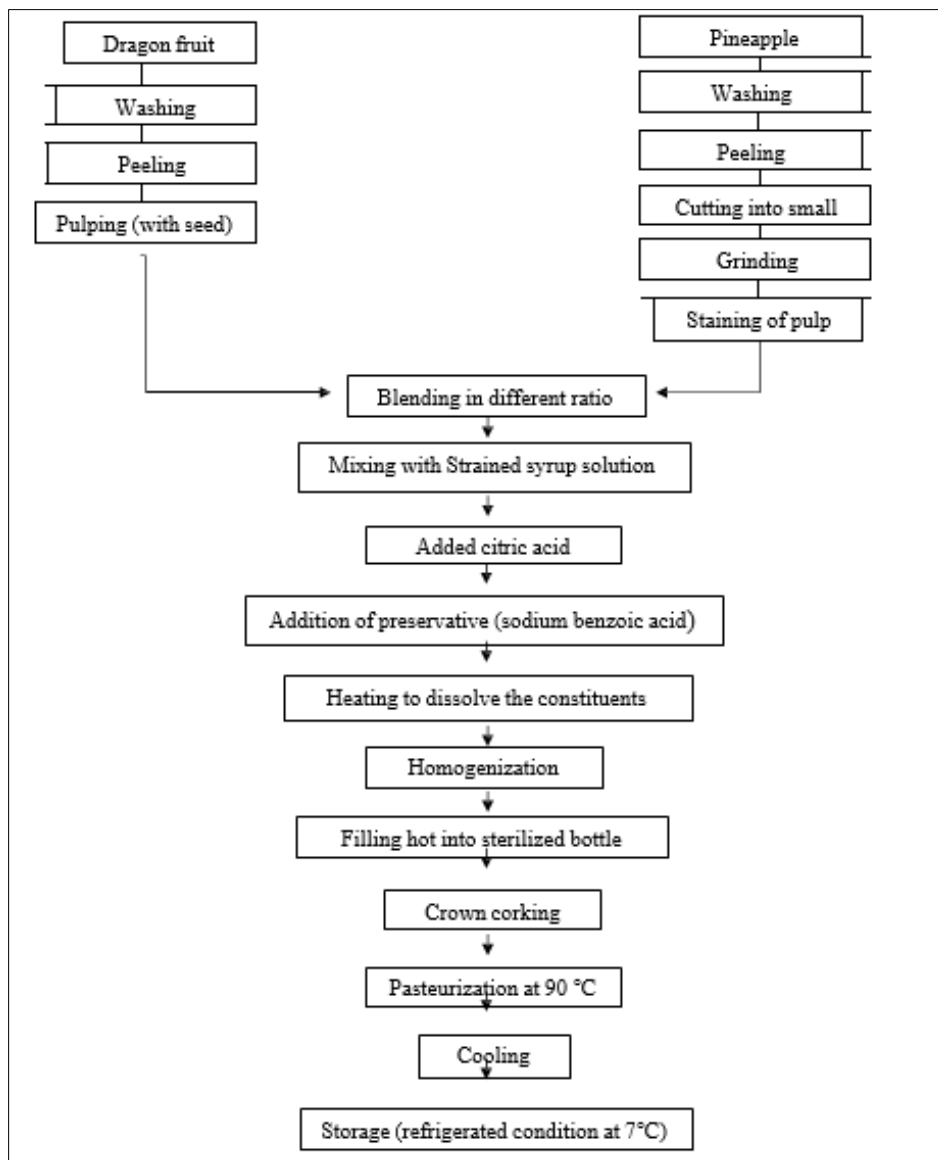


Fig 1: Flow Chart for preparation of dragon fruit RTS blended with pineapple

### 2.3 Mixing the ingredients together

10% pulp was taken for RTS preparation after pulp separation, respectively. By adding the required amount of water in one and all replication, the end product volume was balanced. The measured amount of sugar is mixed in the pulp to retain its TSS and acidity is maintained by adding the required amount of citric acid in the final product by 0.3 percent.

### 2.4 preparation of dragon fruit - pineapple blended RTS

The dragon fruit and pineapple blended RTS recipe is made up of 10% pulp, 0.3% acidity, and 15% TSS, with variable concentrations of blending ratios of dragon fruit and

pineapple, such as T1 (90:10), T2 (80:20), T3 (70:30), T4 (60:40), T5 (50:50) and T6 (40:60).

### 2.5 Storage

The bottles of dragon fruit blended RTS with pineapple were stored under refrigerated condition at 7 °C for further analysis upto 120 days 5 Observation will be recorded.

### 2.6 Statistical analysis

The investigations were using a Completely Randomized Design, with a total of six treatment combinations replicated three times. Each treatment's replication consists of five bottles.

### 3. Result and Discussion

#### 3.1 Total Soluble Solids (°Brix)

At the time of preparation non-significant difference was observed in TSS percent of blended RTS with all the treatment having TSS of 15%. The TSS content of the dragon fruit blended RTS with pineapple increased from 0 days (15%) to 120 days of storage (16.83%), which may be due to hydrolysis of polysaccharides into monosaccharide and oligosaccharides.

#### 3.2 Titrable acidity (%)

The acidity value was (0.46%) recorded maximum in T6 contain 40% dragon fruit juice: 60% pineapple juice. While the acidity was (0.34%) recorded minimum in T1 contain 90% dragon fruit juice: 10% pineapple juice. The acidity was increase throughout the storage period upto 120 days. The increase in acidity of RTS during 120 days of storage may be due to formation of organic acids by degradation of ascorbic acid as well as pectin hydrolysis. It is also due to formation of acids from sugar.

#### 3.3 TSS and acid ratio

The TSS and acid value was (43.15) recorded maximum in T1 contain 90% dragon fruit juice: 10% pineapple juice. While the acidity was (33.53) recorded minimum in T6 contain 40% dragon fruit juice: 60% pineapple juice. The TSS Acid Ratio shows decreasing trend it might be due to increase in TSS and acidity of RTS and blended RTS.

pH The pH content of the dragon fruit blended RTS with pineapple decreased from the day of preparation to 120 days of storage. The PH value of RTS and blended RTS with pineapple was (4.68) recorded maximum in T6 contain 40% dragon fruit juice: 60% pineapple juice respectively. While the PH was (3.82) recorded minimum in T1 contain 90% dragon fruit juice: 10% pineapple juice.

#### 3.4 Ascorbic acid

The ascorbic acid was decrease throughout the storage period upto 120 days. The ascorbic acid value of RTS and blended RTS with pineapple was (9.9 mg/100 g) recorded maximum in T6 contain 10% pulp, 15% TSS, 0.3% acidity, and treatment T6 contain 40% dragon fruit juice: 60% pineapple juice respectively. While the ascorbic acid was (8.45 mg/100g) recorded minimum in treatment T1 contain 90% dragon fruit juice: 10% pineapple juice respectively.

#### 3.5 Total sugar

The total sugar was increase throughout the storage period upto 120 days. The total sugar value of RTS and blended RTS with pineapple was (13.24) recorded maximum in T6 contain 40% dragon fruit juice: 60% pineapple juice. While the total sugar was (12.48) recorded minimum in treatment T1 contain 90% dragon fruit juice: 10% pineapple juice respectively.

#### 3.6 Reducing sugar

The reducing sugar was increase throughout the storage period upto 120 days. The total sugar value of RTS and blended RTS with pineapple was (4.84) recorded maximum in treatment T6 contain 40% dragon fruit juice: 60% pineapple juice respectively. While the reducing sugar was (4.37) recorded minimum in treatment T1 contain 90% dragon fruit juice: 10% pineapple juice respectively.

#### Non – reducing sugar

The non-reducing sugar was decrease throughout the storage period upto 120 days. The non- reducing sugar value of RTS and blended RTS with pineapple was (8.4) recorded maximum in treatment T6 contain 40% dragon fruit juice: 60% pineapple juice respectively. While the non- reducing was (8.11) recorded minimum in T3 contain 12% pulp, 10% TSS, 0.3% acidity, and treatment T1 contain 90% dragon fruit juice: 10% pineapple juice respectively.

**Table 1:** Impact of various recepie treatment on TSS of dragon fruit RTS blended with pineapple during storage at refrigerated condition.

| Treatment                                       | TSS                       |       |       |       |       |       |
|---|---------------------------|-------|-------|-------|-------|-------|
|   | Storage periods (in days) |       |       |       |       |       |
|   | 0                         | 30    | 60    | 90    | 120   | mean  |
| T1(90% dragon fruit juice: 10% pineapple juice) | 15                        | 15.28 | 15.51 | 16.01 | 16.83 | 15.72 |
| T2(80% dragon fruit juice: 20% pineapple juice) | 15.02                     | 15.25 | 15.36 | 15.98 | 16.80 | 15.68 |
| T3(70% dragon fruit juice: 30% pineapple juice) | 15                        | 15.22 | 15.35 | 15.96 | 16.60 | 15.62 |
| T4(60% dragon fruit juice:40% pineapple juice)  | 15.03                     | 15.18 | 15.31 | 15.83 | 16.49 | 15.56 |
| T5(50% dragon fruit juice: 50% pineapple juice) | 15.05                     | 15.16 | 15.30 | 15.60 | 16.50 | 15.52 |
| T6(40% dragon fruit juice:60% pineapple juice)  | 15.06                     | 15.14 | 15.26 | 15.48 | 16.20 | 15.42 |
| Mean  | 15.02                     | 15.2  | 15.34 | 15.81 | 16.57 | 15.58 |
| C.D at 5%                                       | NS                        | 0.014 | 0.012 | 0.014 | 0.013 |       |
| S.Em±   | 0.009                     | 0.005 | 0.004 | 0.004 | 0.004 |       |
| C.V   | 0.104                     | 0.53  | 0.42  | 0.49  | 0.45  |       |

**Table 2:** Impact of various receipe treatment on acidity of dragon fruit RTS blended with pineapple during storage at refrigerated condition.

| Treatment                                       | Acidity                   |       |       |       |       |      |
|---|---------------------------|-------|-------|-------|-------|------|
|   | Storage periods (in days) |       |       |       |       |      |
|   | 0                         | 30    | 60    | 90    | 120   | Mean |
| T1(90% dragon fruit juice: 10% pineapple juice) | 0.30                      | 0.32  | 0.35  | 0.38  | 0.39  | 0.34 |
| T2(80% dragon fruit juice: 20% pineapple juice) | 0.33                      | 0.34  | 0.36  | 0.39  | 0.42  | 0.36 |
| T3(70% dragon fruit juice: 30% pineapple juice) | 0.35                      | 0.37  | 0.38  | 0.40  | 0.43  | 0.38 |
| T4(60% dragon fruit juice:40% pineapple juice)  | 0.37                      | 0.39  | 0.41  | 0.44  | 0.46  | 0.41 |
| T5(50% dragon fruit juice: 50% pineapple juice) | 0.39                      | 0.42  | 0.44  | 0.47  | 0.50  | 0.44 |
| T6(40% dragon fruit juice:60% pineapple juice)  | 0.41                      | 0.43  | 0.46  | 0.49  | 0.52  | 0.46 |
| Mean  | 0.35                      | 0.37  | 0.4   | 0.42  | 0.45  | 0.39 |
| C.D at 5%                                       | 0.014                     | 0.015 | 0.014 | 0.017 | 0.015 |      |
| S.Em±   | 0.005                     | 0.005 | 0.005 | 0.005 | 0.005 |      |
| C.V   | 2.148                     | 2.127 | 1.933 | 2.181 | 1.782 |      |

**Table 3:** Impact of various recipe treatment on TSS and acid ratio sugar of dragon fruit RTS blended with pineapple during storage at refrigerated condition.

| Treatment                                       | TSS and acid ratio        |       |       |       |       |       |
|---|---------------------------|-------|-------|-------|-------|-------|
|   | Storage periods (in days) |       |       |       |       |       |
|   | 0                         | 30    | 60    | 90    | 120   | Mean  |
| T1(90% dragon fruit juice: 10% pineapple juice) | 50                        | 47.75 | 44.31 | 43.27 | 43.15 | 45.69 |
| T2(80% dragon fruit juice: 20% pineapple juice) | 45.45                     | 44.85 | 42.66 | 40.97 | 40    | 42.78 |
| T3(70% dragon fruit juice: 30% pineapple juice) | 42.85                     | 41.13 | 40.39 | 39.90 | 38.60 | 40.58 |
| T4(60% dragon fruit juice:40% pineapple juice)  | 40.54                     | 38.92 | 37.34 | 35.97 | 35.84 | 37.72 |
| T5(50% dragon fruit juice: 50% pineapple juice) | 38.46                     | 36.09 | 34.77 | 33.19 | 33.00 | 35.1  |
| T6(40% dragon fruit juice:60% pineapple juice)  | 36.58                     | 35.20 | 33.17 | 31.59 | 31.15 | 33.53 |
| Mean  | 42.31                     | 40.65 | 38.77 | 37.48 | 36.95 | 39.23 |
| C.D at 5%                                       | 0.852                     | 0.303 | 0.424 | 0.021 | 0.018 |       |
| S.Em±   | 0.274                     | 0.097 | 0.136 | 0.007 | 0.006 |       |
| C.V   | 1.117                     | 0.413 | 0.607 | 0.031 | 0.027 |       |

**Table 4:** Impact of various recipe treatment on pH of dragon fruit RTS blended with pineapple during storage at refrigerated condition.

| Treatment                                       | pH                        |       |       |       |       |      |
|---|---------------------------|-------|-------|-------|-------|------|
|   | Storage periods (in days) |       |       |       |       |      |
|   | 0                         | 30    | 60    | 90    | 120   | Mean |
| T1(90% dragon fruit juice: 10% pineapple juice) | 3.92                      | 3.90  | 3.86  | 3.78  | 3.66  | 3.82 |
| T2(80% dragon fruit juice: 20% pineapple juice) | 4.10                      | 4.08  | 4.00  | 3.91  | 3.80  | 3.97 |
| T3(70% dragon fruit juice: 30% pineapple juice) | 4.32                      | 4.30  | 4.24  | 4.19  | 4.10  | 4.23 |
| T4(60% dragon fruit juice:40% pineapple juice)  | 4.50                      | 4.43  | 4.35  | 4.28  | 4.16  | 4.34 |
| T5(50% dragon fruit juice: 50% pineapple juice) | 4.63                      | 4.56  | 4.44  | 4.31  | 4.23  | 4.43 |
| T6(40% dragon fruit juice:60% pineapple juice)  | 4.82                      | 4.76  | 4.70  | 4.60  | 4.53  | 4.68 |
| Mean  | 4.38                      | 4.33  | 4.26  | 4.17  | 4.08  | 4.24 |
| C.D at 5%                                       | 0.015                     | 0.013 | 0.013 | 0.013 | 0.012 |      |
| S.Em±   | 0.005                     | 0.004 | 0.004 | 0.004 | 0.004 |      |
| C.V   | 0.188                     | 0.172 | 0.175 | 0.179 | 0.167 |      |

**Table 5:** Impact of various recipe treatment on ascorbic acid of dragon fruit RTS blended with pineapple during storage at refrigerated condition.

| Treatment                                       | Ascorbic acid             |       |       |       |       |      |
|---|---------------------------|-------|-------|-------|-------|------|
|   | Storage periods (in days) |       |       |       |       |      |
|   | 0                         | 30    | 60    | 90    | 120   | Mean |
| T1(90% dragon fruit juice: 10% pineapple juice) | 8.71                      | 8.55  | 8.42  | 8.30  | 8.12  | 8.45 |
| T2(80% dragon fruit juice: 20% pineapple juice) | 8.92                      | 8.80  | 8.50  | 8.32  | 8.26  | 8.56 |
| T3(70% dragon fruit juice: 30% pineapple juice) | 9.16                      | 9.10  | 9.02  | 8.90  | 8.76  | 8.98 |
| T4(60% dragon fruit juice: 40% pineapple juice) | 9.30                      | 9.20  | 9.11  | 9.01  | 8.90  | 9.1  |
| T5(50% dragon fruit juice: 50% pineapple juice) | 9.92                      | 9.81  | 9.70  | 9.52  | 9.41  | 9.67 |
| T6(40% dragon fruit juice: 60% pineapple juice) | 10.10                     | 10.01 | 9.92  | 9.80  | 9.71  | 9.9  |
| Mean  | 9.35                      | 9.24  | 9.11  | 9.11  | 8.86  | 9.11 |
| C.D at 5%                                       | 0.014                     | 0.016 | 0.015 | 0.015 | 0.013 |      |
| S.Em±   | 0.004                     | 0.005 | 0.005 | 0.005 | 0.004 |      |
| C.V.  | 0.083                     | 0.097 | 0.094 | 0.092 | 0.080 |      |

**Table 6:** Impact of various recipe treatment on total sugar of dragon fruit RTS blended with pineapple during storage at refrigerated condition.

| Treatment                                       | Total sugar               |       |       |       |       |       |
|---|---------------------------|-------|-------|-------|-------|-------|
|   | Storage periods (in days) |       |       |       |       |       |
|   | 0                         | 30    | 60    | 90    | 120   | Mean  |
| T1(90% dragon fruit juice: 10% pineapple juice) | 12.40                     | 12.43 | 12.48 | 12.52 | 12.60 | 12.48 |
| T2(80% dragon fruit juice: 20% pineapple juice) | 12.55                     | 12.58 | 12.62 | 12.70 | 12.76 | 12.64 |
| T3(70% dragon fruit juice: 30% pineapple juice) | 12.63                     | 12.66 | 12.72 | 12.81 | 12.88 | 12.74 |
| T4(60% dragon fruit juice:40% pineapple juice)  | 12.72                     | 12.80 | 12.86 | 12.92 | 13.00 | 12.86 |
| T5(50% dragon fruit juice: 50% pineapple juice) | 12.90                     | 13.00 | 13.08 | 13.12 | 13.20 | 13.06 |
| T6(40% dragon fruit juice:60% pineapple juice)  | 13.10                     | 13.15 | 13.22 | 13.33 | 13.41 | 13.24 |
| Mean  | 12.71                     | 12.77 | 12.83 | 12.9  | 12.97 | 12.83 |
| C.D at 5%                                       | 0.015                     | 0.012 | 0.014 | 0.014 | 0.013 |       |
| S.Em±   | 0.005                     | 0.004 | 0.004 | 0.005 | 0.004 |       |
| C.V   | 0.066                     | 0.052 | 0.060 | 0.061 | 0.057 |       |

**Table 7:** Impact of various receipt treatment on reducing sugar of dragon fruit RTS blended with pineapple during storage at refrigerated condition.

| Treatment                                       | Reducing sugar            |       |       |       |       |      |
|---|---------------------------|-------|-------|-------|-------|------|
|   | Storage periods (in days) |       |       |       |       |      |
|   | 0                         | 30    | 60    | 90    | 120   | Mean |
| T1(90% dragon fruit juice: 10% pineapple juice) | 4.24                      | 4.29  | 4.36  | 4.43  | 4.55  | 4.37 |
| T2(80% dragon fruit juice: 20% pineapple juice) | 4.33                      | 4.37  | 4.43  | 4.54  | 4.62  | 4.45 |
| T3(70% dragon fruit juice: 30% pineapple juice) | 4.38                      | 4.44  | 4.52  | 4.63  | 4.75  | 4.54 |
| T4(60% dragon fruit juice: 40% pineapple juice) | 4.43                      | 4.53  | 4.60  | 4.75  | 4.80  | 4.62 |
| T5(50% dragon fruit juice: 50% pineapple juice) | 4.50                      | 4.59  | 4.69  | 4.80  | 4.90  | 4.69 |
| T6(40% dragon fruit juice: 60% pineapple juice) | 4.66                      | 4.72  | 4.81  | 4.96  | 5.06  | 4.84 |
| Mean  | 4.42                      | 4.49  | 4.56  | 4.68  | 4.78  | 4.58 |
| C.D at 5%                                       | 0.012                     | 0.012 | 0.012 | 0.012 | 0.012 |      |
| S.Em±   | 0.004                     | 0.004 | 0.004 | 0.004 | 0.004 |      |
| C.V   | 0.152                     | 0.149 | 0.145 | 0.143 | 0.138 |      |

**Table 8:** Impact of various receipt treatment on non - reducing sugar of dragon fruit RTS blended with pineapple during storage at refrigerated condition.

| Treatment                                       | Non - Reducing sugar      |       |       |       |       |      |
|---|---------------------------|-------|-------|-------|-------|------|
|   | Storage periods (in days) |       |       |       |       |      |
|   | 0                         | 30    | 60    | 90    | 120   | Mean |
| T1(90% dragon fruit juice: 10% pineapple juice) | 8.16                      | 8.14  | 8.12  | 8.09  | 8.05  | 8.11 |
| T2(80% dragon fruit juice: 20% pineapple juice) | 8.22                      | 8.21  | 8.19  | 8.16  | 8.14  | 8.18 |
| T3(70% dragon fruit juice: 30% pineapple juice) | 8.25                      | 8.22  | 8.20  | 8.18  | 8.13  | 8.19 |
| T4(60% dragon fruit juice: 40% pineapple juice) | 8.29                      | 8.27  | 8.26  | 8.17  | 8.14  | 8.22 |
| T5(50% dragon fruit juice: 50% pineapple juice) | 8.40                      | 8.41  | 8.39  | 8.32  | 8.30  | 8.36 |
| T6(40% dragon fruit juice: 60% pineapple juice) | 8.44                      | 8.43  | 8.41  | 8.37  | 8.35  | 8.4  |
| Mean  | 8.29                      | 8.28  | 8.26  | 8.21  | 8.18  | 8.24 |
| C.D at 5%                                       | 0.011                     | 0.012 | 0.012 | 0.014 | 0.015 |      |
| S.Em±   | 0.004                     | 0.004 | 0.004 | 0.004 | 0.005 |      |
| C.V   | 0.075                     | 0.083 | 0.082 | 0.092 | 0.099 |      |

#### 4. Conclusions

Results of study concluded that the dragon fruit blended RTS with pineapple 70% dragon fruit juice and 30% pineapple juice got the highest organoleptic score were storage upto 120 days. During storage TSS, acidity, total sugar, reducing sugar, increased in the storage period. While TSS and acid ratio, pH, ascorbic acid, and non- reducing sugar decrease in storage period may be due to biochemical reaction.

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