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RESEARCH ARTICLE

Increasing shelf life of Dragon fruit by maintaining at optimum temperature

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ABSTRACT

Since fruits and vegetables are highly perishable, we must store them at a specific temperature. Because of the high field heat trapped in it and the higher moisture content, the rate of transpiration is also very high, and because they are living commodities, they undergo respiration. This generates a significant amount of heat as well as ethylene. Ethylene is a ripening hormone that aids in the ripening of fruits. As a result of these metabolic changes, fruits ripen quickly and spoil. The aim of this paper is to keep fruit from spoiling by storing it at the proper temperature. The aim of this study is to prolong the shelf life of Dragon fruit by ensuring that it is stored at the proper temperature. The dragon fruit is held at three different temperatures for this experiment, and the variations in Brix percent observed over time are analyzed. After a 24-day experiment, an optimum temperature of 4°C (1°C) was revealed, which provided the best quality fruit with the best colour and taste retention. Furthermore, there is no nutritional deficit.

Keywords: Brix percentage, dragon fruits, postharvest, ripening, shelf life

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INTRODUCTION

Dragon fruit (Hylocereus polyrhizus) is also known as pitaya Roja (Spanish), strawberry pear. The fruit is a fresh berry with a yellow, red, or pink peel and a diameter of 4.5 inches (11cm). Dragon fruit pulp can be pink, white, red, or magenta depending on the species. Seeds are tiny and plentiful. It has a variety of Hylocereus undatus (white flashed), Hylocereus polythizus (red flashed) and Hylocereus Magalanthus (yellow flashed fruit).

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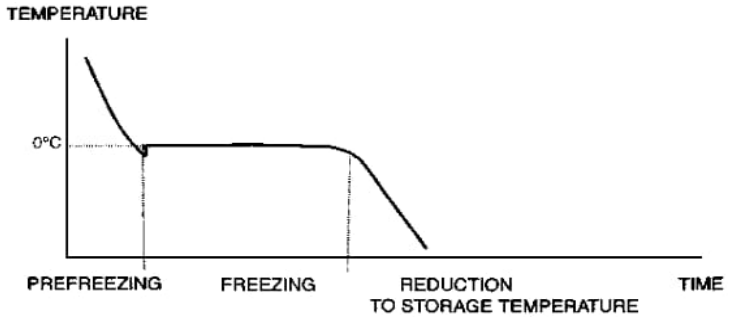
The optimum storage temperature was discovered in this experiment. The dragon fruit is held at three different temperatures for this study, and the Brix percent is measured. This temperature is above the chilling point and is ideal for storing. The shelf life of Dragon fruit will be extended by several weeks. Shelf life is defined as the recommended time duration or fresh (harvested) products can be kept.

Respiration of plant tissue it leads to ethylene Liberation and accelerate the refining process. Vegetable and fruit kept at low temperature it slowdown repairing. It can be concluded that if the fruit and vegetable are stored at right storage condition shelf life can be increased by 300% to 800% (Danish Technological Institute Packaging and Transport, 2008).

If the transpiration rate is reduced, it will also reduce the respiration rate at low temperature. When the respiration rate is low it also reduces the ethylene production. But if the temperature is below optimum temperature of any fruit it may cause chilling injury (Ahmad et al., 2006). Chilling refers to the adverse effect on plant and their product result in reduced quality and loss of product utilization when exposed to lower temperature below optimum temperature. For 28 days, peaches (Oku-bao) was held at four different temperatures: 0°C, 2°C, 5°C, and 8°C. It is concluded that it produces the highest results (best quality) at 0 degrees and poor fruit quality at 8 degrees. This demonstrates that at high temperatures, the rate of decay is higher. (Sun, Lijun et al., 2018; Lui, Shenge et al., 2018). All statistical data were analyzed by one-way analysis of variance (ANOVA). The least significant difference (LSD) test was used to compare the means. Differences with a significance level of $P<0.05$ were considered significant. Ber (*Ziziphus mauritiana* Lamk.) was held at various storage temperatures of 5 degrees Celsius, 15 degrees Celsius, and 22 degrees Celsius for 3, 6, 9, and 12 weeks in this study (Tembo et al., 2008). This experiment determines the best storage conditions for fruit in order to keep it fresh. Weight loss is also a consideration.

By keeping fruits and vegetables at a low temperature, we can prevent them from spoiling. We may prolong the life of fruits and prevent them from spoiling if the storage temperature and humidity are managed properly. If the temperature and humidity are not properly controlled, it will undergo undesirable changes such as colour change, odour, shivillage, and microstructure change. This is due to changes in shelf life or tissue breakdown. Its life is extended if we mean proper humidity, temperature, and storage structure.



Schematic diagram of the freezing process (Temp v/s time)

Factors-Storage Life

(i) Pre-harvest factor

(ii) Post-harvest factor

Pre-harvest factor refers to factors/conditions in the field where plant material is may influence the shelf life. Plant density refers to the distance between two plants and includes seed variety. Pre-harvesting considerations include irrigation (no irrigation when the fruit is ripening), insecticides, and fertilizers. Post-harvest factor refers to the condition that once the fruit and vegetable are harvested after their harvesting a lot of heat is produced within the fruit it is known as field heat. This field is important to be removed, the process by which we remove the field heat is PRE-COOLING. Pre-Cooling Types are Cooling in room, Forced air cooling, Hydro cooling, Hyperbaric cooling, Ice cooling etc.

MATERIALS AND METHODS

Experimental Site

Fresh Dragon Fruit was purchased directly from a local farmer in the Bastar district of Chhatishgarh. This study was conducted at the Heliwal cold storage pvt. Ltd. Jagdalpur, Chhatisgarh.

Parameter consideration

We can extend the shelf life of fruits by keeping them at a lower temperature. Temperature, humidity, pH measurement, sugar content (Brix percent), weight, and other parameters can be used to determine the quality of fruit.

Initial preparation

To begin, take a dragon fruit and record all relevant data, such as pH (using a pH metre), temperature (using a thermometer), sugar content (using a Refractometer), and weight (using a scale) (weighing machine). The Dragon fruit is divided into three classes for this experiment. For study, sample-1 is held at 4 degrees Celsius, sample-2 at 8 degrees Celsius, and sample-3 at 12 degrees Celsius.

Table-1 Data Collection

NUMBER OF DAYS	BRIX%		
	SAMPLE-1 (4℃)	SAMPLE-2(8℃)	SAMPLE-3 (12℃)
Day-1	14	14	14
Day-3	14	13	12
Day- 6	13	12	11
Day-9	12	10	9
Day-12	10	9	8
Day-15	9	8	6
Day-18	8	6	-
Day-21	6	-	-
Day-24	4	-	-

Pre-Cooling

Then, prior to storing the product for refrigeration cooling, a pre-cooling method was used, in this case, the hydro cooling technique and room cooling for 6 to 8 hours. After that, the fruits can be kept in the refrigerator.

Brix percentage

To determine the rate at which fruit spoils, a graph of sugar content versus the number of days can be plotted. We determined the optimum temperature for dragon fruit by conducting this experiment. The Brix scale is defined as number of gram of Cane sugar contained in per 100 ml of water. Brix %=Actual sugar concentration

RESULTS AND DISCUSSION

Plot between Sugar Content (Brix%) V/S Days

Here is the graph plotted between number of days on x-axis and Brix % on y axis (Fig 1). Brix percentage is measured by refractometer device. The Refractometer was used to measure the sugar content of dragon fruit. At the time of harvesting, sugar content is less when it is unripe. After a few days of ripening its sugar content will increase. This can be measured by using effective matter and analyzed by making a plot of Sugar Content V/S Days.

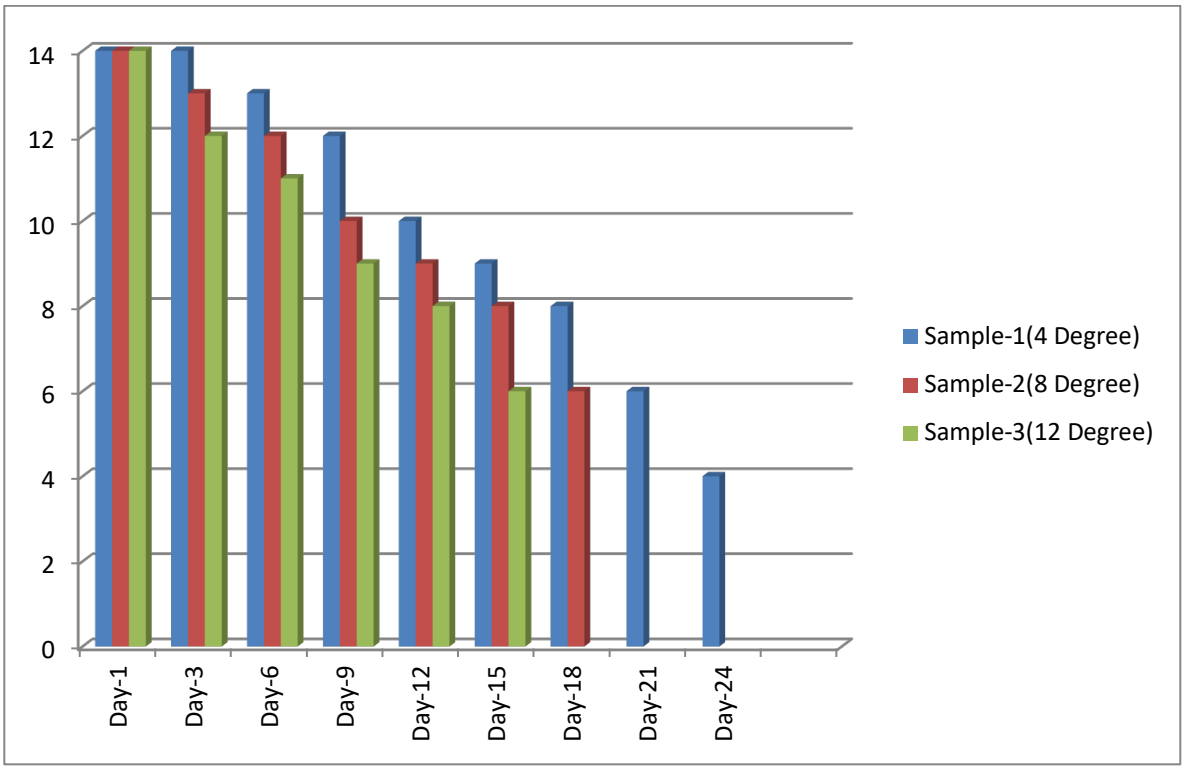


Figure 1: TSS content of fruit

Evaluation of Optimized sample

According to the results of the above experiment, the dragon fruit of Sample-1, which was held at 4-°C, lasted for a longer period of time. Dragon fruit has a 24-day shelf life when stored at 4°C in the refrigerator, 18 days when kept at 8°C, and 15 days when kept at 12°C (Fig 2).

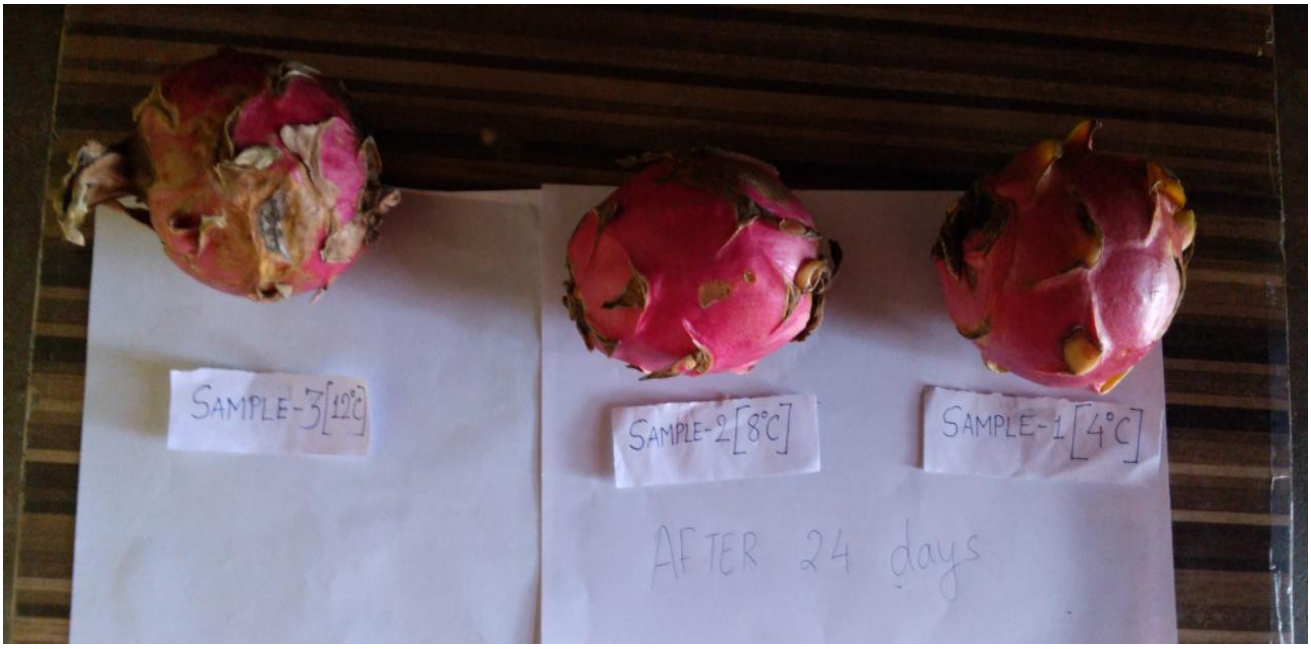


Figure 2: Experimental sample after 24 days

Optimized Temperature Obtained In Sample-1(4℃)

From this, it is observed that sample-1 (4 °C) has the best result (Fig 3 and 4). As a result, we can infer that maintaining the optimal temperature of 4°C (±1°C) can extend the shelf life of Dragon fruit. It will keep for 3-5 weeks at 4°C.

On Day-1 the BRIX% = 14 (excellent quality of fresh fruit)

On Day-12 the BRIX% = 10 (Good quality)

On Day-18 the BRIX% = 08 (Average quality)

On Day-24 the BRIX% = 04 (Started decaying)

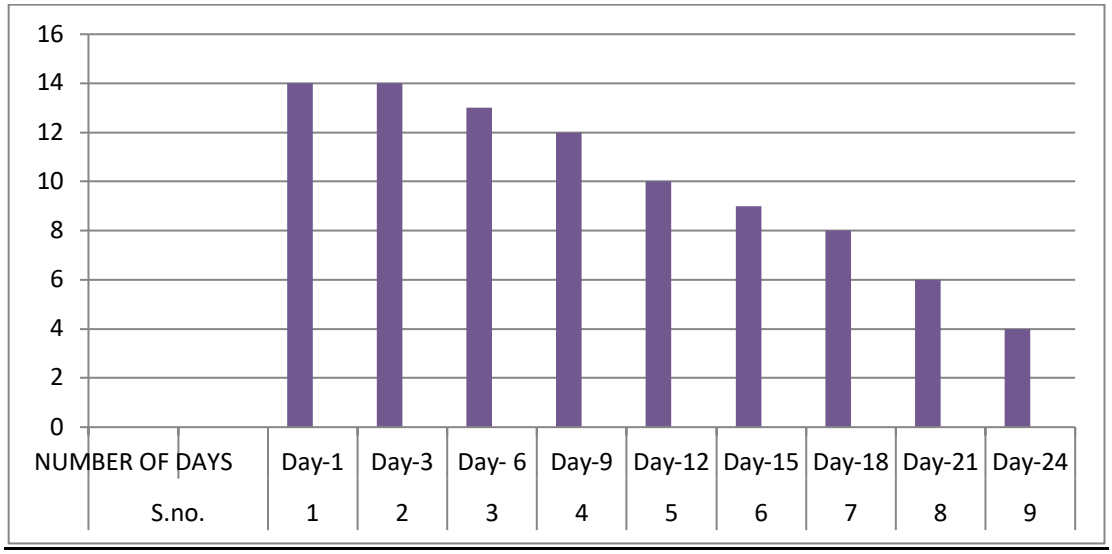


Figure 3: Sample-1(4℃) kept for 24 days

Figure 4: Cross Section of Good quality and bad quality Fruits

CONCLUSION

Present study showed that maintaining Dragon fruit at an optimum temperature of 4℃ its shelf life is extended. Optimum storage temperature is always above chilling injury temperature of fruit. Early morning is the best time for harvesting dragon fruit. Because the sun has been not able to warm the air of produce and hence low level of metabolic heat, respiration rate also reduced. Hence, the life of dragon fruit can be increased. Maintaining dragon fruit at low temperature we can get several advantages like Nutrition loss is negligible, Freshness of commodity is retained,Color is retained,Constituent does not change, there is no microbial contamination,Respiration is not there.So because of above advantages shelf life is longer. Hence, it will help the farmers as well as traders to boost business. By this productivity rate and storage quality will be increased.

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