Impact of different drying methods on sensory properties of osmotic dehydrated pineapple slices

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ABSTRACT

Drying is an essential process in the preservation of agricultural products. Various drying methods are employed to dry different agricultural products. Each method has its own advantages and limitations. Choosing the right drying system is thus important in the process of drying agricultural products. Drying reduces the possibilities of the contamination by insects and microorganisms so that product is prevented. An experimental study was performed to determine the Sensory Evaluation of pineapple slices subjected to drying in open sun drying, cabinet tray dryer at 50°C, 60°C and 70°C and hot air oven at 50°C, 60°C C and 70°C with osmotic treatment indicated that T1 (Control), T2 (50°C Brix) and T3 (60°C Brix). The result obtained showed that a product osmo- treated 60°brix at 50°C tray dried shows the better texture, flavor, color, taste and overall acceptability.

Key words: Hot air oven, Open sun drying, Osmotic dehydration, Pineapple, Sensory evaluation, Tray dryer.

INTRODUCTION

Pineapple is the most important fruit of India and many developing countries due to its export values. Generally, the pineapples are exported as the canned-fruit, concentrated juice and dried pineapple slices. Although there are a number of pineapple products in the market, the food industry still keeps developing new product from pineapple. The benefit of new product development is the elevation of the fresh pineapple demand and consequently help reducing the pineapple loss caused by the microorganisms, chemical and enzymatic reactions during the peak of harvesting season (Nicoleti et al., 2001 and Gabas et al., 2007). Dried pineapple slices is an interesting product because of its long shelf life at ambient temperature, convenience to use and low transportation expenditure. Pineapple slices can be consumed as an instant juice powder or a flavoring agent. So far, there have been merely few studies about the production of pineapple slices (Jittanit et al., 2010).

The osmotic dehydration process and influence of its process variables such as pretreatment, temperature of sugar solution and additives on the mass transfer in osmotic dehydration of fruits (Chaudhari et al., 2015). Osmotic dehydration is considered as a pre-treatment for pineapple with the final aim of obtaining high quality dried fruit products. Up to 40% of agricultural produce is wasted in developing countries, mainly due to the lack of storage and processing facilities, as well as to a limited knowledge of processing technologies (Brahim, 2000). Osmotic dehydration is widely used to remove part of the water content of fruit to obtain a product of intermediate moisture or as a pre-treatment before further processing and drying (Lenart, 1996 and Torreggiani, 2004).

Drying is the most common form of food preservation and extends the shelf life of the food. The major objective in drying agricultural products is the reduction of the moisture content to a level, which allows safe storage over an extended period. Also, it brings about substantial reduction in weight and volume, minimizing packaging, storage and transportation costs (Ashish, et al., 2012). In the Mediterranean countries the traditional technique of fruit and vegetable drying is by using the sun. This technique has the advantages of simplicity and the small capital investments, but it requires long drying times that may have adverse consequences to the product quality, the final product may be contaminated from dust and insects, suffer from enzyme and microbial activity. In order to improve the quality, the traditional sun drying technique should be replaced with industrial drying methods. By keeping the view to avoid disadvantages it is necessary to use the other mechanical drying methods like cabinet tray dryer, hot air oven etc. (Singh, et al., 2012; Kumar, et al., 2017).

One of the most used methods to quantify consumer acceptance is the 9-point hedonic scale. The 9-point hedonic scale, first published by (David Peryam 1957), has been used in both academic and industrial consumer researches in western cultures, especially in America and Europe. This hedonic scale has an equal number of positive and negative categories with intervals of equal size (Montgomery and Eisler 1974; Anderson, 1976; Schrisheim and Gardiner, 1992).

Demands for sensory methodology and technology have grown tremendously around the world, due mainly to the advent of total quality. In addition, the need for understanding people as consumers is something that has

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been constantly growing and becoming a target of all food industry. Sensory analysis fits into this context as an analytical tool used to translate the link between food products and the consumer, expressing numerical values that can be analyzed and verifying its accuracy through statistical support. Nowadays, most large consumer food companies have departments dedicated to sensory evaluation. Only human sensory data provide information on how consumers perceive or react to food products in real life. (Schiffman, 1996).

**MATERIALS AND METHODS**

**Raw material:** The local variety of fresh pineapple was purchased from the Meerut market and was used in the experiments. The cleaned product was then weighed and 300 g samples were made for each method of drying.

**Osmotic treatments:** Fresh pineapple was washed to remove soil particles attached on the surface. Then sorted cleaned pineapple was cut into 4.5 mm thickness. The sliced pineapple was subjected to osmotic treatment. Then pineapple slices were dipped in osmotic solution having sugar concentration ranging from 50 to 60 °Brix at 45°C temperature for 180 minute. The slices was removed from the solution and the surface moisture was removed by blotting paper after this slices were subjected to drying in open sun, hot air oven at temperature of (50°, 60° & 70°C) and Cabinet tray drier at air temperature of (50°, 60° & 70°C). The dried pineapple slices were packed in HDPE (high density polyethylene) for sensory evaluation.

**Organoleptic evaluation of dehydrated pineapple slices:** Organoleptic evaluation of dehydrated pineapple slices prepared and evaluation was carried out in this experiment. The 9 point Hedonic Scale was used to compare the control with the formulated samples. Sensory evaluation was conducted in sensory evaluation laboratory, Department of agricultural engineering. The panelists were selected solely on the basis of interest, time available and lack of allergies to food ingredients used in study.

On every occasion, the panelists were provided with coded disposable paper cups containing the sample pineapple slices under investigation. Sensory evaluation was carried out under ambient conditions. A comfortable area without distractions (isolated booths) under fluorescent lighting and controlled temperature was used. Water was supplied to clean the pallets between the evaluations of two samples.

Samples were tested for different parameters like color, taste, texture, flavor, and overall acceptability. All these tests including the testing for consumer acceptance was done by sensory panelist according to 9 point hedonic scale for sensory evaluation as described by (Peryam and Giradot 1952).

**Sensory evaluation score card:**

Product: Osmotically treated pineapple slices.

Name of the Panel Member:
Date:
You have been given three (3) samples made from pineapple untreated and treated at different brix 50,60° of sucrose solution. Kindly, taste the samples and rate them based on your personal feel as given in the table below. Please try to make an honest expression your feeling in order to help us make the product better suited for the target consumer.

| Hedonic Rating Scale: |
|-----------------------|
| Sl. No. | Feeling/Attribute | Rating |
| 1. | Like Extremely | 9 |
| 2. | Like Very Much | 8 |
| 3. | Like Moderately | 7 |
| 4. | Like Slightly | 6 |
| 5. | Neither Like Nor Dislike | 5 |
| 6. | Dislike Slightly | 4 |
| 7. | Dislike Moderately | 3 |
| 8. | Dislike Very Much | 2 |
| 9. | Dislike Extremely | 1 |

Scorecard:

| Attribute | Score |
|-----------|-------|
| Taste | 1 |
| Color | 2 |
| Flavor | 3 |
| Texture | 4 |
| Overall Acceptability | Signature |

Source: Singh et al., (2015)
RESULTS AND DISCUSSION

Sensory evaluation: Sensory quality is evaluated on three parameters i.e. taste, color, flavor texture and overall acceptability. The score ranged from 1 to 9 which represented “Like extremely” to “dislike extremely”, the dried powder samples were tasted by 10 judges. The sensory evolution pineapple slices (open sun drying, cabinet tray drying and hot air oven drying) scoring was done to work out the overall acceptability of the product for the consumer. Color and texture were scored by visualization of eyes, flavor was scored by smelling and taste was scored by tasting the dried pineapple slices samples. The average score recorded by judges was considered, presented and discussed under suitability quality attributes.

Sensory evaluation of open sun dried pineapple slices: Sensory evaluation for the osmotically dehydrated pineapple slices was conducted using three test samples treated at different brixes. These samples were tested with the help of a 10 member panel and the results are furnished below in Table 1. From the sensory evaluation analysis, it is clearly understood that in terms of color sample of 60 °brix is best, in terms of texture and taste sample of 60 °C brix at 50 °C is accepted. Hence, at the end of sensory evaluation it can be conclude that sample of 60 °brix is having better edge over the other samples.

Sensory evaluation of cabinet tray dried pineapple slices: Sensory evaluation for the osmotically dehydrated pineapple slices was conducted using three test samples treated at different brixes and temperatures. These samples were tested with the help of a 10 member panel and the results are furnished below in Table 2. From the sensory evaluation analysis, it is clearly understood that in terms of color sample of 60 °brix at 50 °C is best, in terms of texture and taste sample of 60 °C brix at 50 °C and finally in terms of overall acceptability sample of 60 °brix at 50 °C is accepted. Hence, at the end of sensory evaluation it can be conclude that sample of 60 °C brix at 50 °C is having better edge over the other samples and temperatures.

Sensory evaluation of hot air oven dried pineapple slices: Sensory evaluation for the osmotically dehydrated pineapple slices was conducted using three test samples treated at different brixes and temperatures. These samples were tested with the help of a 10 member panel and the results are furnished below in Table 3. From the sensory evaluation analysis, it is clearly understood that in terms of color sample of 60 °brix at 50 °C is best, in terms of texture and taste sample of 60 °C brix at 50 °C and finally in terms of overall acceptability sample of 60 °brix at 50 °C is accepted. Hence, at the end of sensory evaluation it can be conclude that sample of 60 °C brix at 50 °C is having better edge over the other samples and temperatures.

Table 1: Effect of treatments on sensory analysis of pineapple slices in open sun drying.

| Quality parameter | Attributes | T_{0} (Control) | T_{1} (50 °Brix) | T_{2} (60 °Brix) |
|-------------------|------------|-----------------|-----------------|-----------------|
| Sensory analysis  |            |                 |                 |                 |
| Color             | 7.5        | 8.4             | 8.8             |
| Texture           | 7.1        | 7.8             | 8               |
| Taste             | 6.3        | 7.5             | 7.8             |
| Flavor            | 7.1        | 8               | 8.3             |
| Overall acceptability | 7        | 7.9             | 8.2             |

Table 2: Effect of treatments on sensory analysis at 50 °C, 60 °C and 70 °C of pineapple in cabinet tray drying.

| Quality parameter | Temperatures | 50 °C | 60 °C | 70 °C |
|-------------------|--------------|-------|-------|-------|
| Sensory analysis  |              |       |       |       |
| Attributes        | T_{0} | T_{1} | T_{2} | T_{0} | T_{1} | T_{2} | T_{0} | T_{1} | T_{2} |
| Color             | 7.9 | 8.5 | 9 | 7.5 | 8.3 | 8.8 | 7.3 | 8 | 8.5 |
| Texture           | 7.3 | 8 | 8.2 | 7.1 | 7.9 | 8 | 6.9 | 7.7 | 7.8 |
| Taste             | 6.5 | 7.9 | 8 | 6.3 | 7.7 | 7.8 | 6.1 | 7.5 | 7.6 |
| Flavor            | 7.3 | 8.3 | 8.5 | 7.1 | 8.1 | 8.3 | 6.8 | 7.8 | 8 |
| Overall acceptability | 7.2 | 8.1 | 8.4 | 7 | 8 | 8.2 | 6.7 | 7.7 | 7.9 |

Table 3: Effect of treatments on sensory analysis at 50 °C, 60 °C and 70 °C of pineapple in hot air oven drying.

| Quality parameter | Temperatures | 50 °C | 60 °C | 70 °C |
|-------------------|--------------|-------|-------|-------|
| Sensory analysis  |              |       |       |       |
| Attributes        | T_{0} | T_{1} | T_{2} | T_{0} | T_{1} | T_{2} | T_{0} | T_{1} | T_{2} |
| Color             | 7.8 | 8.4 | 8.9 | 7.4 | 8.3 | 8.7 | 7.2 | 8.1 | 8.5 |
| Texture           | 7.2 | 8 | 8.3 | 7 | 7.8 | 7.9 | 6.8 | 7.5 | 7.6 |
| Taste             | 6.4 | 7.8 | 8.4 | 6.2 | 7.6 | 7.7 | 6 | 7.4 | 7.5 |
| Flavor            | 7.2 | 8.3 | 8.3 | 7 | 8 | 8.2 | 6.7 | 7.7 | 8 |
| Overall acceptability | 7.1 | 8.1 | 8.4 | 6.9 | 7.9 | 8.1 | 6.6 | 7.7 | 7.8 |

Hence, at the end of sensory evaluation it can be conclude that sample of 60 °brix is having better edge over the other samples.
acceptability sample of 60°brix at 50°C is accepted. Hence, at the end of sensory evaluation it can be conclude that sample of 60°brix at 50°C is having better edge over the other samples.

CONCLUSION

This study was done on pineapple slice that is treated at different brix of sucrose i.e. 50° and 60°brix at (50°C, 60°C and 70°C) in tray drying, hot air oven drying and sun drying different analysis was carried out such as organoleptic analysis. The study concluded on sensory evaluation of the dehydrated pineapple at various osmotic treatments. The treatment of sugar solution at 60°Brix secure maximum score on the basis of taste, color, flavor, texture and overall acceptability that means the pineapple osmosis at 60°Brix sugar solution and drying at 50°C in tray dryer gave good quality dehydrated pineapple slices. Sucrose solution at 60°brix in cabinet tray drying at 50°C temperature shows the better organoleptic characteristic.

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