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Amla flake: Survey on consumer acceptance and development by using microwave energy

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Abstract

Experiments were conducted to study the market response about the Microwave dried Amla Flakes. The pieces (5 mm ± 5%) are dried by the process of Microwave Drying at power of 20W to 80W. The Amla Flakes were packed in LPDE packaging material. A survey was conducted with a set of questions in order to observe what people think about the consumption of Amla flakes like 'How they got to know about it?', 'When they usually consume it?' etc. It was observed that mostly people consume Amla Flakes in-between their meals and also that, they prefer home-made flakes more compared to market produced. Generally, people got to know about Amla Flakes from their Family, Friends and Relatives. Amla Flakes were found to be Sweet, Sour and Bitter at the same time by many. Furthermore, it was observed that Amla Flakes developed at 40W was liked the most by the panelists. People consume it on daily basis and they find it beneficial for the health.

Keywords: consumer survey, microwave power, amla flake, sensory evaluation

Introduction

Amla (*Phyllanthus emblica*) in India is considered to be one of the most popular fruit and it is given the name of apple of tropical parts, it is considered to be an excellent trade fruit. Amla fruit is generally pear shaped and depending on cultivar, their sizes vary from 2.5 to 10 cm in diameter and weight 50 to 500 g. The flesh may be pink, white or yellow, either with seed or seedless. Amla is a native to Mexico and it is also available throughout South America, Europe, Africa and Asia as it is able to grow in all subtropical areas.

The estimated post-harvest loss per hectare in India is about 49% (Sehgal, 1999) [8]. Amla prices become very low during main season and sometimes farmers have to pay to throw away their produces because of higher perishable nature of the produce. Fresh Amla has 92 to 94% moisture and it can be stored for 2 to 4 weeks at 0 °C (Mudgal and Pandey, 2007) [5]. Like many other fruits, Amla is highly perishable and is responsible for postharvest losses in handling, transportation and storage, resulting in economic losses.

Drying is one of the methods used to prolong the shelf life of Amla. Various drying methods including osmotic dehydration have been studied on Amla. In general, dehydration often causes loss of qualities such as color, appearance, texture, flavor and nutritional value. Microwave energy was used to develop the potato chips with tomato flavor has shown good consumer acceptability. (Kothakota, A. *et.al*, 2013) [4].

Drying of fruit and vegetables demands special attentions as there are considered important sources of vitamins and minerals essential for mankind. Dried fruits and vegetables have gained commercial importance and their growth on commercial scale has become an important sector of agricultural industry. Fruit and vegetable have certain morphological features quite distinct from other natural materials that greatly influence their behavior during drying and preservation. Fruits are generally characterized by high sensitivity, (i.e., color, flavor, texture and nutritional value subject to thermal deterioration) and shrinkage of materials during drying. The required amount of thermal energy to dry a particular product depends on many factors such as initial moisture content, desired final moisture content, temperature and relative humidity of drying air and air flow rate. Banana chips (Pandya, R., & Yadav, K. C., 2014) [6] and Guava slices (Sharma, R., & Yadav, K. C. 2017) [9] were dehydrated and developed by using microwave energy.

The use of microwaves in drying of fruits has increased in the last few decades, mainly due to more accurate process control, good MW penetration into fruit tissues and shorter processing times. Microwave drying provide low process temperatures and faster water evaporation, offering shorter drying times and higher quality of dried product compared to other drying

methods. The role of microwaves is to heat the water molecules in the product and these molecules migrate from the interior to the surface of the product, whereas hot air is supposed to remove free water at the surface (Sanga *et al.*, 2000)^[7].

To overcome the limitations of other slow drying processes, MW drying can significantly shorten the drying process by virtue of the following unique advantages: (1) adjustment of energy absorption level by the wet products automatically-moisture-leveling effect of microwaves; (2) possible selective heating of the interior portions- microwave focusing effect; (3) rapid energy dissipation throughout the material; (4) relatively minor migration of water-soluble constituents; (5) lower product temperatures in combination with vacuum; and (6) more efficient drying in the falling rate period (Feng and Tang, 1998)^[2]. To overcome some of the limitations of single MW drying, several strategies have been studied as follows: (1) combining MW drying with a great variety of other drying methods, (2) applying MW energy in a pulsed manner to maximize drying efficiency since continuous heating does not accelerate the rate of water removal when the process is mass transfer controlled (Gunasekaran, 1999)^[3].

Many researchers have successfully dried vegetables with high heat-sensitive compositions, and fruits with high sugar contents. In all cases the drying time is reduced significantly, and in most cases the quality of the dried food products is improved or kept the same as compared with only MW-dried or conventionally dried products (Zhang *et al.*, 2003)^[11].

Hence, a survey was conducted to see the response of people about dried Amla Flakes and the observations are discussed in the paper.

Material and Methods

The experiment was carried out in the department of food processing engineering at SHUATS, Prayagraj.

Questionnaire for the survey

The following questions will be sent to people via mail and the response will be recorded through 'Google docs'

1. Profession/Employment status

- Home-maker
- Employed
- Self-employed
- Student

2. Do you consume amla flake?

- Yes
- No

c) Maybe

3. How often you consume amla flake?

- Daily
- Weekly
- Monthly
- Rarely

4. When do you generally consume amla flake?

- Breakfast
- Snacks
- In-between meals
- While travelling
- Anytime

5. Where do you prefer to buy amla flake?

- Grocery store
- Supermarket
- I prefer home-made amla flakes

6. What is the information source for purchasing amla flakes?

- Advertisement
- Family, Friends, Relatives
- Social Media
- Doctor Consult

7. How it feels in the mouth?

- Sweet
- Sour
- Bitter
- All of the above

8. Do you find it effective for human health?

- Yes
- No
- Don't know

Experimental Plan for making Gooseberry Flakes

The mature amla fruits cv. 'Chakaiya' of uniform and similar size were obtained from a private orchard of Nathdwara District in a single lot. These were washed under tap water to remove adhering dust and reduce the surface microflora. These were dipped in boiling water for 4 min. for enzymatic inactivation and softening of tissues. The selected material was sliced to 5 mm thickness. About 200 g of the sliced sample was taken for drying. The fruit slices were dried using microwave drying at a power of 60W.

Table 1: Experimental Plan

S. No	Parameter	Level	Description
01	Thickness of Gooseberry flakes	5mm± %5	Uniform size
02	Microwave power	4	20W, 40W, 60W, 80W
03	Packaging	1	LDPE

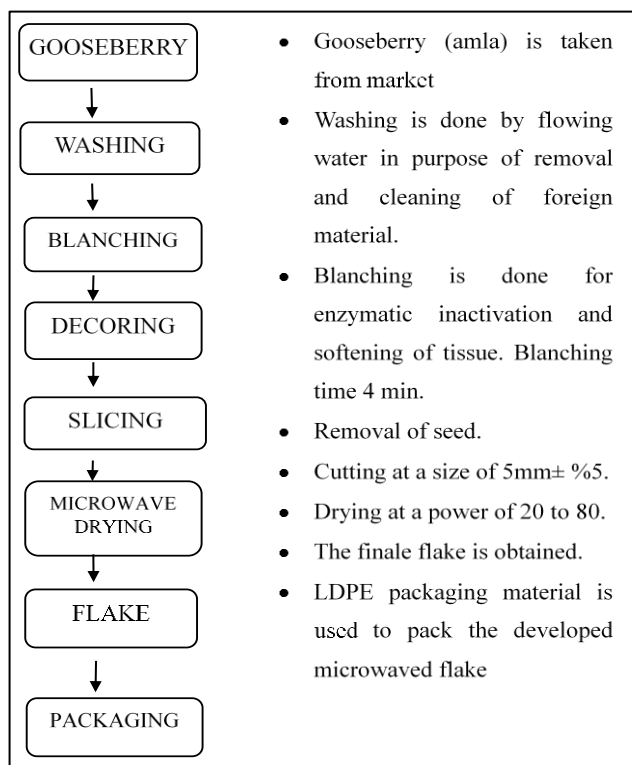


Fig 1: Process chart for development of microwaved flakes

doctors and 15% saw it on social media. From Fig. 7, 46% found amla flakes to be sweet, sour and bitter at the same time, 29% found it sour. From Fig. 8, 90% respondents think amla flakes are effective on human health, 5% don't think it is and 5% are confused.

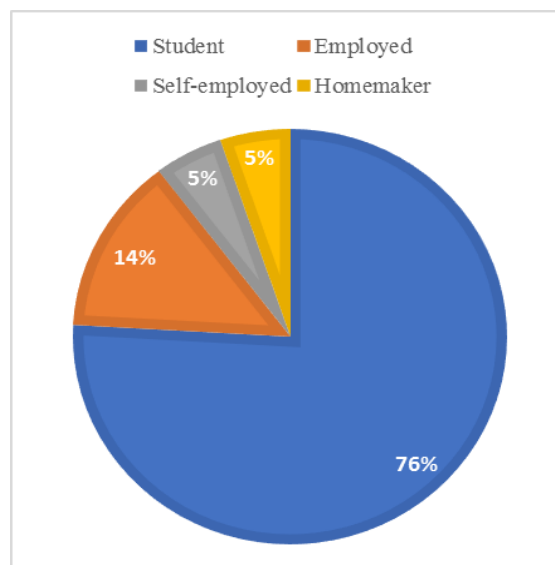


Fig 1: Profession/Employment Status

Sensory Analysis of developed microwaved flake

Sensory analysis also referred as – organoleptic evaluation. It provides objective information on how products are experienced by the consumer which involves evaluation of aroma, appearance, taste and texture. It can be used for quality control, determining shelf-life etc. The most widely used scale for measuring food acceptability is the 9-point hedonic scale where 9 categories range from “dislike extremely” to “like extremely”.

Table 2: 9-Point hedonic scale

Scale	Preference
1.	Dislike extremely
2.	Dislike very much
3.	Dislike moderately
4.	Dislike slightly
5.	Neither like nor dislike
6.	Like slightly
7.	Like moderately
8.	Like very much
9.	Like extremely

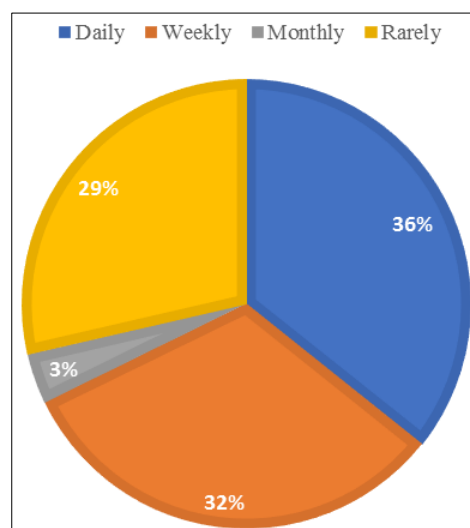


Fig 2: How often you consume amla flake?

Results and Discussions

The response of the survey is shown in the fig. 1, 2, 3, 4, 5, 6, 7 and 8. On the critical evaluation of Fig. 1, 76% of the respondents were students, 14% were employed and 5% were self-employed and home-maker each. From Fig. 2, 36% of the respondents consume it on daily basis, 32% consume it on weekly basis, 3% consume it on monthly basis and 29% consume it rarely. From Fig. 4, 44% of them generally consume amla flakes in-between their meals, 19% consume while travelling, 18% take it as snacks and 15% consume it anytime. From Fig. 5, 54% of the respondents prefer home-made amla flakes instead of market produced, 25% buy it from Grocery store and 21% purchase from supermarket. From Fig. 6, 67% of them got to know about amla flakes from their family, friends and relatives, 18% were consulted by

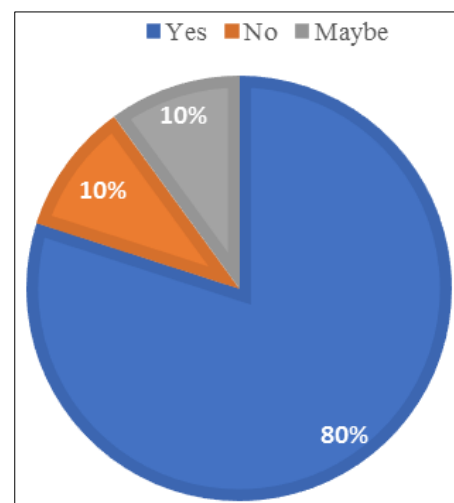


Fig 3: Do you consume amla flake?

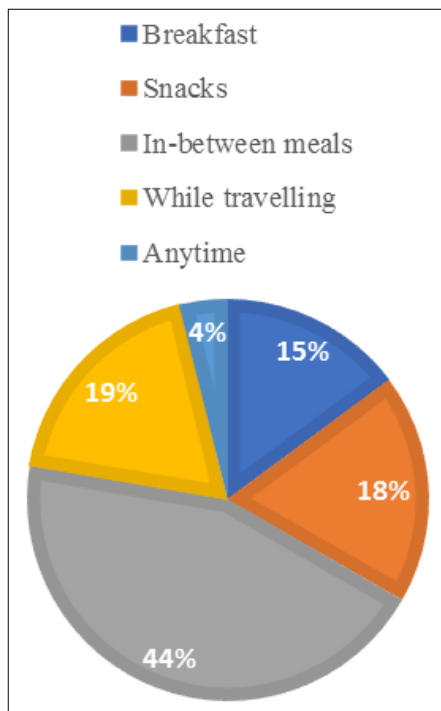


Fig 4: When do you generally consume amla flake?

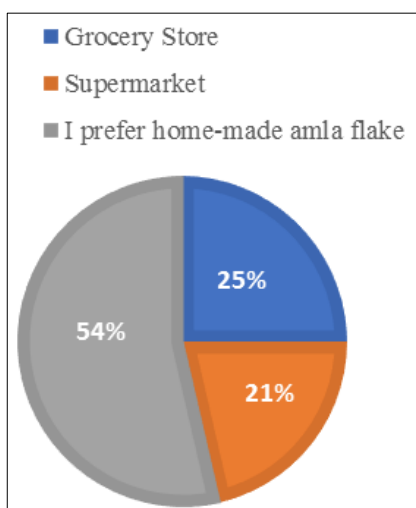


Fig 5: Where do you prefer to buy amla flakes?

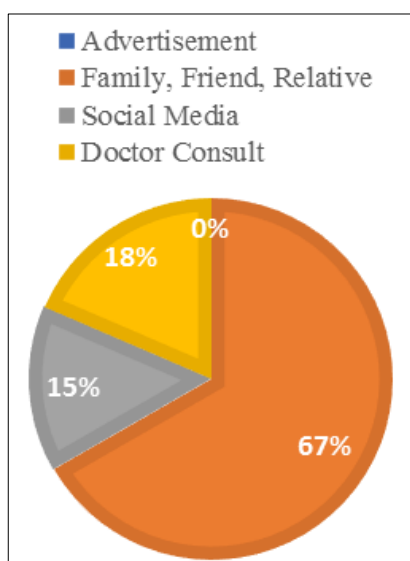


Fig 6: What is the information source for purchasing amla flake?

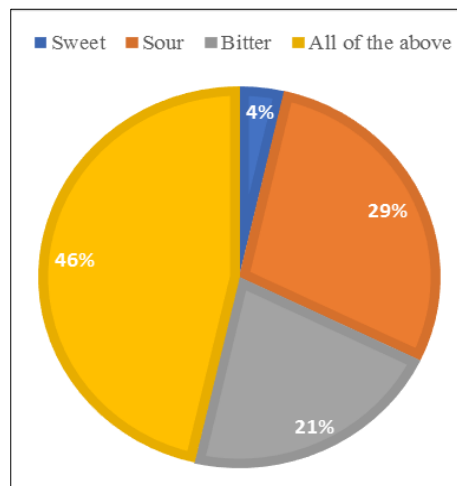


Fig 7: How it feels in the mouth?

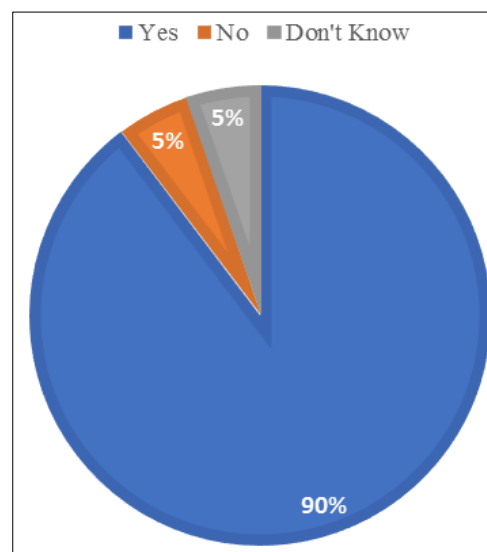


Fig 8: Do you find it effective for human health?

Sensory Evaluation of developed Amla Flakes

Sensory profile of food product is a major concern for the consumer’s acceptability of product. The Amla quality was assessed by a panel of judges. Each sample was evaluated by the on a 9-point hedonic scale. The Amla samples were evaluated for quality characteristics such as color, taste, texture, aroma, appearance and overall acceptability. The result of sensory quality of Amla sample is shown in Table 3. Color, Taste, Aroma, Texture, Appearance, Overall Acceptability was affected by the increase in microwave power whereas the Amla flake developed at 40W microwave power scored highest in overall acceptability.

Table 3: Sensory Evaluation of developed Amla Flakes

Sample	Colour	Taste	Aroma	Texture	Appearance	Overall Acceptability
20W	6.3	6.2	6.6	6.6	6.1	6.2
40W	7.3	6.5	6.4	6.2	6.3	6.7
60W	6.3	5.6	5	5.5	6.3	6.2
80W	4.0	4.1	4.6	4.2	4.2	4.6

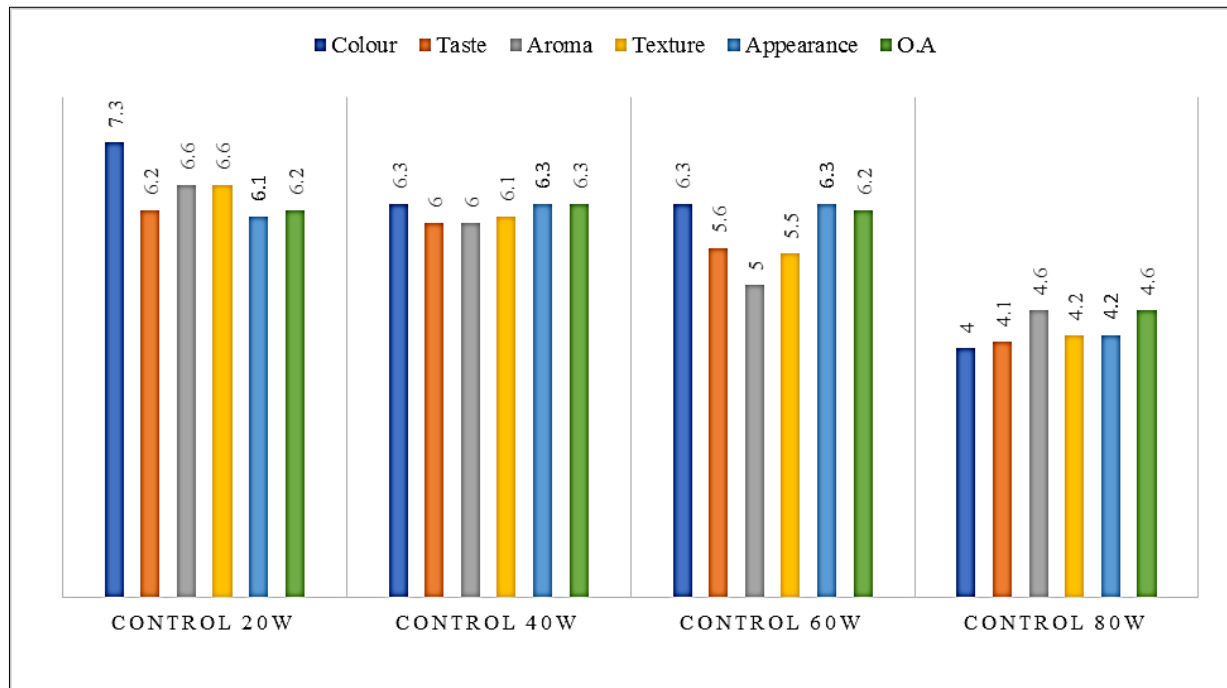


Fig 9: Graphical representation of sensory evaluation of developed Amla Flakes

Conclusion

In conclusion, it was observed that mostly people consume Amla Flakes in-between their meals and also that, they prefer home-made flakes more compared to market produced. Amla Flakes developed at 40W microwave power was highly acceptable by the panellists.

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