

Standardization and Value Addition of Millet Based Ready to Eat (RTE) Snack with an Uncommon Green Leafy Vegetable (*Aerva lanata*)

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ABSTRACT

Ready to eat foods have attracted the consumers globally. In food industry, it is a fast-growing sector due to its convenience, appearance, price, taste and attractiveness. India is country with diverse climatic conditions and favors the growth of many plant species. *Aerva lanata* is an uncommon green leafy vegetable with good cultural, pharmacological and nutritional importance. The present developed the jowar based ready to eat snack with *Aerva lanata* leaf powder at different formulations (0,5,10 and 15%) and analyzed for sensory analysis. Based on the sensory analysis, 10% leaf powder incorporated snack was selected for the further study. The product was analyzed for sensory and quality parameters during storage at 0-, 30- and 60- days interval. The study conclude that the product can be stored for 60 days without any changes in quality and sensory

characteristics. The products based on local food system will be best by the consumers, cost effective and improves the nutritional security in rural areas.

Keywords *Aerva lanata*, Jowar chakli, Sensory, Consumer evaluation.

INTRODUCTION

Ready to eat foods have attracted the consumers globally. In food industry, it is a fast-growing sector due to its convenience, appearance, price, taste and attractiveness. The increased demand is due to urbanisation, changed lifestyle and food habits. In India, the market value of ready to eat foods has stood at 261 million in 2017 and is predicted to increase 647 million in 2023. Currently, there are a number of RTE foods are available in the market like sweet, salted, fried, canned food, Fast food, baked food, dried or preserved food, extruded food. Among which, traditional cereal consumption is dominated by various foods like bakery, extruded foods, instant snacks, breakfast cereals, biscuits and bars. Its shelf stable, lightweight, nutritionally enhanced, easy to shop and store characteristics of these foods are responsible for the human consumption and high acceptance by the consumer. Therefore, India is in a growing phase and moving towards ready to eat and ready to cook food products instead of traditional cooking options

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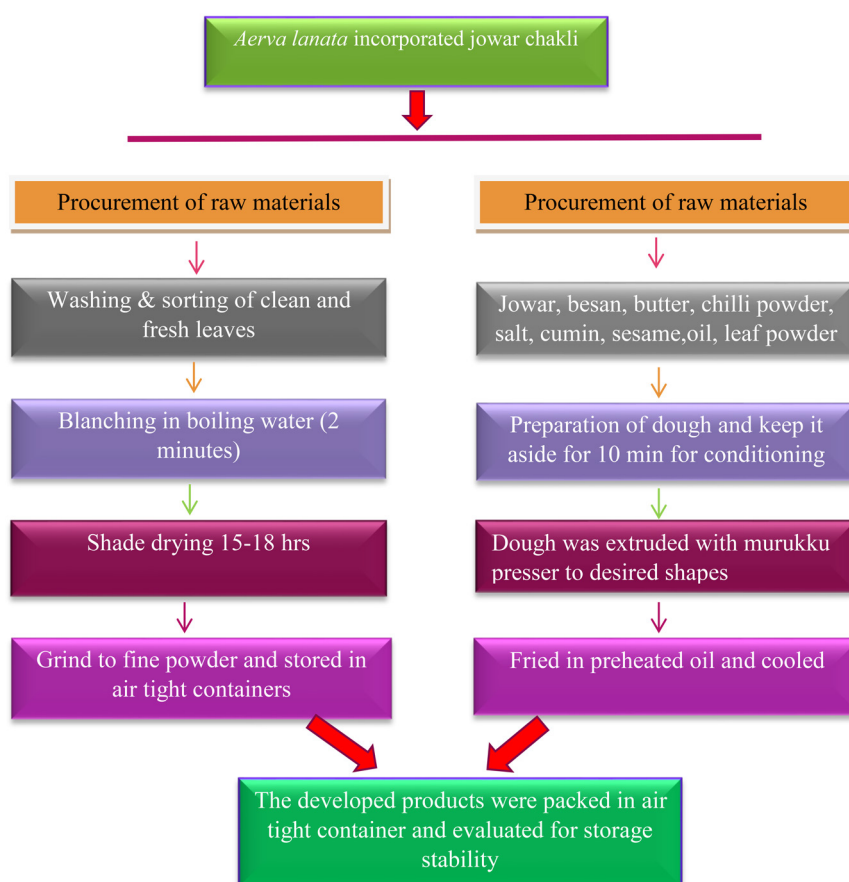


Fig. 1. Process description of *Aerva lanata* incorporated jowar chakli.

(Temgire *et al.* 2021).

Globally, uncommon green leafy vegetables are always overlooked than the cultivated green leafy vegetables. The uncommon green leafy vegetables are easily available from the nature, does not require any management costs and can tolerate to adverse climatic conditions. There are about 7000 edible uncommon green leafy vegetable species was used as food in the human history. These plants are still using in some countries like India, China, Thailand and Bangladesh consume hundreds of uncommon green leafy vegetable species. India is country with diverse climatic conditions and favors the growth of many plant species. Currently, 600 uncommon green leafy vegetable species documented were important source of food and nutritional security, medicine, cultural

and economic importance in India (Kar *et al.* 2013).

Aerva lanata belongs is also called stone breaking plant. It belongs to Amaranthaceae family and the family consists of about 2300 species and 169 genera. *A. lanata* (L) Juss Ex. is a perennial shrub usually grown in waste lands of India and other parts of the world (Subramanian *et al.* 2019). Nutritional content on dry weight basis per 100 g was : Ash 31.2%, moisture-6.38%, crude protein 22.6%, fat 6.43%, crude fiber 6.75%, carbohydrate 26.6%. Mineral content of leaves per 100 g was : Calcium 51.7 mg, sodium 39.4 mg, potassium 47.9 mg, magnesium 41.50, zinc 44.7 mg, iron 11.0 mg, phosphorus 187 mg and manganese 1.04 mg (Omeyeni and Adeyene 2009).

Aerva lanata is also used in the treatment of vari-



Fig. 2. Developed products.

ous disease conditions such as kidney stones, diuretic, anthelmintic, antidiabetic, treatment in lithiasis, to arrest hemorrhage during pregnancy and for uterus clearance after delivery. Nasal bleeding, cough and fractures was treated by plant extracts. Seeds were used in bronchitis, rheumatism and flowers were used for diarrhoea, dysentery and bronchitis (Omotoso *et al.* 2017). Sorghum has good nutritional and functional properties and so it can be sued for a wide range of food applications (Abah *et al.* 2020).

Incorporation of uncommon greens to RTE snacks improves palatability, variety, nutritional status and adds health benefits. The products based on local food system will be best by the consumers, cost effective and improves the nutritional security in rural areas. So, the present study is aimed to develop RTE snack with naturally grown leafy vegetables and to evaluate the product organoleptic characteristics and storage stability.

MATERIALS AND METHODS

Collection of leaves

A survey was conducted in selected three villages on Nalgonda district, Telangana state to collect data usage of uncommon green leafy vegetables. From the collected data, the most commonly used uncommon green leafy vegetable *Aerva lanata* was selected for the value addition. The fresh leaves of *Aerva lanata* was collected from the fields of Nalgonda district. The edible portions of selected leaves were washed,

blanched, shade dried and powdered. The leaf powder is added to jowar chakli dough at different proportions (0, 5, 10 and 15%) and subjected sensory analysis.

Process description

The process description of product was given in Figs. 1 and 2. All the required ingredients were weighed individually according to the proportions were mixed together with butter added hot water and kneaded until it forms smooth dough. Then the prepared dough was kept aside for 10 min for conditioning. Prepared dough was then extruded to desired shape with the help of chakli pressor. Prepared chakli was deep fried in preheated oil and allowed to cool. After cooling chakli was stored in air tight containers.

Sensory analysis

A semi-trained panel of 15 members from PGRC, PJTSAU using 9 point hedonic scale evaluated the developed instant chutney powder for color, texture, flavor, taste and overall acceptability. Scores were

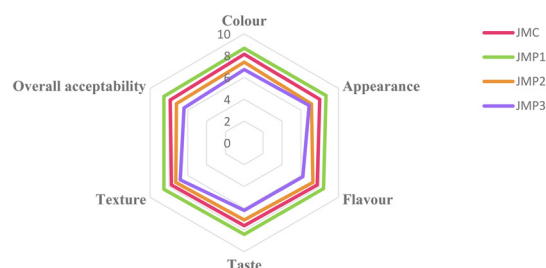


Fig. 3. Mean sensory scores of value added jowar chakli.

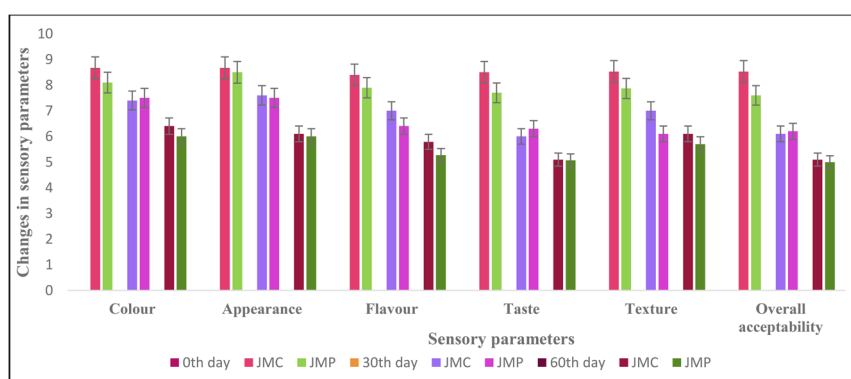


Fig. 4. Changes in sensory characteristics of developed products during storage.

based on a hedonic scale of 1 to 9 where : 1=I dislike extremely (very bad) and 9 = I like extremely (excellent). The samples were presented in plates coded with three-digit numbers in individual booths in sensory evaluation lab. Panelists rinsed their mouth with water after testing each sample (Meilgaard *et al.* 1999).

Storage studies

The final selected samples for consumer evaluation were subjected to storage studies by packing them in PE pouches and stored for 90 days. The shelf stability of developed products was evaluated for their moisture content (AOAC 2005), water activity (Abramovie *et al.* 2008), free fatty acid content (Sadasivam and Manickam, 2018) and sensory parameters (Meilgaard *et al.* 1999) on 0th, 30th, 60th and 90th day of storage.

RESULTS AND DISCUSSION

Sensory evaluation of *Aerva lanata* leaves incorporated jowar chakli

The mean sensory scores for color, appearance, flavor, taste, texture and overall acceptability of *Aerva lanata* leaves incorporated jowar chakli ranged between 6.73 (JMP₃) to 8.67 (JMP₁), 6.87 (JMP₃) to 8.40 (JMP₁), 6.20 (JMP₃) to 8.40 (JMP₁), 6.20 (JMP₃) to 8.40 (JMP₁), 6.80 (JMP₃) to 8.53 (JMP₁) and 6.40 in (JMP₃) to 8.53 (JMP₁) (Figs. 3 and 4).

It was observed that JMP₁ was found best in all attributes like color, appearance, flavor, taste, texture, overall acceptability than control and other samples. Based on the scores obtained 10% *Aerva lanata*

Table 1. Sensory evaluation of products during storage.

Sample	Color	Appearance	Flavor	Taste	Texture	Overall acceptability
0 th day						
JMC	8.67±0.13	8.67±0.13	8.40±0.19	8.50±0.21	8.53±0.13	8.53±0.16
JMP	8.10±0.16	8.50±0.19	7.90±0.21	7.70±0.25	7.87±0.21	7.60±0.22
30 th day						
JMC	7.40±0.16	7.60±0.28	7.00±0.28	6.00±0.25	7.00±0.23	6.10±0.31
JMP	7.50±0.16	7.50±0.17	6.40±0.22	6.30±0.22	6.10±0.26	6.20±0.22
60 th day						
JMC	6.40±0.22	6.10±0.22	5.79±0.25	5.10±0.27	6.10±0.27	5.10±0.29
JMP	6.00±0.31	6.00±0.17	5.27±0.35	5.07±0.33	5.70±0.33	5.00±0.26

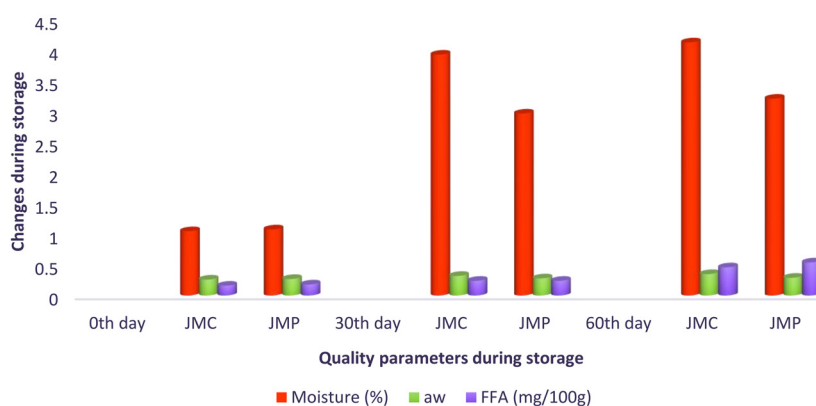


Fig. 5. Changes in quality parameters of developed products during storage.

leaves incorporated jowar chakli was selected for the further study.

Storage studies of developed products

Shelf life refers to the end of product acceptability and is the time at which majority of consumers are displeased with the product. The 10% *Aerva lanata* leaves incorporated jowar chakli (JMP) along with their control products (JMC) were selected based on the sensory scores for the storage studies. Storage stability of selected products were evaluated based on the sensory evaluation, water activity, moisture and free fatty acid content. The details of change in sensory quality, water activity, moisture and free fatty acids were observed at every 30 days intervals. The results were analyzed and the mean values of each response variable at every 30 days of storage was presented in Tables 1, 2.

Sensory evaluation of *Aerva lanata* incorporated jowar chakli : The results of sensory evaluation of the murukku during storage was reported in Table 1. On the initial day, the murukku were recorded high scores for all sensory attributes i.e color, appearance, taste, flavor and overall acceptability. However, the profile changed considerably after 60 days of storage for murukku. There was a significant decrease in the sensory characteristics of ($p < 0.05$) murukku after 30 days of storage. The results showed that the *Aerva lanata* incorporated jowar chakli can be stored up to 30 days at room temperature.

Change in quality parameters of *Aerva lanata* incorporated jowar chakli on storage

Moisture : The results of change in moisture content of murukku during storage was presented in Table 2 and presented in Fig. 5. The moisture content of murukku during storage ranged from 1.05 to 4.13% in JMC and 1.08 to 3.21% in JMP. Initially moisture content of JMC was less compared to JMP. During storage moisture content of JMP was found less compared to JMC. The samples (both JMC and JMP) showed gradual increase in moisture content during 0 to 60th day of storage.

Water activity (a_w) : The water activity of murukku ranged from 0.26 to 0.35 in JMC and 0.27 to 0.29 in JMP. Water activity of control was high compared to JMP. The addition of *Aerva lanata* may be responsible

Table 2. Change in quality parameters of stored products.

Sample	Moisture (%)	a_w	FFA (mg/100g)
0 th day			
JMC	1.05±0.00	0.26±0.00	0.16±0.00
JMP	1.08±0.00	0.27±0.00	0.18±0.00
30 th day			
JMC	3.93±1.99	0.32±0.00	0.24±0.00
JMP	2.97±0.03	0.28±0.00	0.24±0.00
60 th day			
JMC	4.13±0.01	0.35±0.00	0.46±0.01
JMP	3.21±0.01	0.29±0.00	0.54±0.005

for decreased water activity in JMP sample.

Free fatty acids : The free fatty acid content of JMC was increased from 0.16mg to 0.46mg/100g during 60 days of storage. Whereas free fatty acid content of JMG increased from 0.18 mg to 0.54 mg/100g on 60 days of storage.

The *Aerva lanata* incorporated instant chutney powders and jowar chakli can be best stored for 60 and 30 days respectively with good sensory and nutritional characteristics.

CONCLUSION

The present study developed the *Aerva lanata* incorporated jowar chalki and analyzed for the storage and sensory parameters. The value addition of *Aerva lanta* is into food products is a great approach as it a traditional naturally grown green leafy vegetable and so, it can be better accepted by the people. It increases dietary diversity and palatability.

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