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Development of moringan leaves pickle and its shelf life study

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Abstract
A study was undertaken where Moringa leaves as whole were processed in to pickle respectively. For processing of pickle using the following raw materials viz., Moringa leaves, garlic, chili powder, cumin seeds, mustard powder, salt, curry leaves, Dania powder, oil, ginger, mustard seeds. The various biochemical and organoleptic properties were also evaluated and they were found to meet the standards set pickle. Chemical parameters viz., moisture, protein, CHOS, crude fiber, fat, ash, acidity of moringa leaveswere observed. Moringa oleifera leaves having high moisture content (75.9) and less acidity (0) at 0^{th} day. When compared to 10^{th} day to 30^{th} day moisture content of the pickle was decreased and acidity was increased. Thus, they are highly perceivable and can be commercialized. Finally we have concluded the product of Moringa oleifera leaves pickle is stored 30 days under room temperature without affecting the organoleptic qualities.

Keywords: moringa leaves, pickle, cancer, moisture, acidity

Introduction
The *Moringaoleifera*is a significant medicinal plant belonging to the family Moringaceae. The *M.oleifera*is recognized for its vast therapeutic properties since ancient times. It is also known as drumstick tree or horseradish tree; the leaves are very beneficial and offer important source of beta-carotene, vitamin C, protein, iron, and potassium. It has very high nutritional properties that would be useful as a food supplement, especially in those relegated communities. Besides its nutritional and medicinal applications, *M.oleifera*is very useful as an alley crop in the agro-forestry industry. It is useful not only for human beings but also for animals and also in various industrial applications. Besides *Moringa oleifera* being processed into a medicine, it contains acetone which can be prepared into herbal formulation which is an effective anti-malaria bio agent.

One of the reasons that the many health benefits of herbal plants like *Moringa oleifera* are so impressive is because they contain similar abilities to conventional drugs, only they don't pose the same level of risk for experiencing side effects. According to a report published in the *Asian Pacific Journal of Cancer Prevention*, moringa contains a mix of essential amino acids (the building blocks of proteins), carotenoid phytonutrients (the same kinds found in plants like carrots and tomatoes), antioxidants such as quercetin, and natural antibacterial compounds that work in the same way as many anti-inflammatory drugs. (Abdull Razis *et al.,* 2015)

Due to its anti-inflammatory properties, moringa has been used in ancient systems of medicine such as Ayurveda to prevent or treat stomach ulcers, liver disease, kidney damage, fungal or yeast infections (such as candida), digestive complaints, and infections (Shalini Kushwaha *et al.* 2014) [6]

Pickles are preserved by a combination of increased acidity (reduced pH), added salt, reduced moisture and added spices. The pickle is preserved by the high level of acidity. If higher levels of salt are used (up to 16%) the product is preserved by the high salt concentration rather than by fermentation and is known as a salt-stock pickle. Fruit and vegetables can be semi-processed and stored for many months by preserving in a high salt solution. They can be further processed into pickle later in the season.

2. Material & methods
Harvest some leaves from the Moringa tree collected from local place jagannadha puram, free from pest and diseases, injuries, bruises and blemishes. Rinse the leaves in clean water If possible, blanch the leaves before drying. To blanch the leaves, place them in boiling water for 3-5 seconds. After 3-5 seconds remove the leaves. Ingredients viz., salt, chilly powder, garlic, cumin seeds, mustard powder, mustard seeds, curry leaves, ginger, dania powder, oil were procured from local super market D-Mart.

Table 1: Raw material quantity for moringan leaves pickle

S. No	Ingredients	Quantity
1.	Moringa leaves	300 gms
2.	Salt	30 gm
3.	Chilly Powder	100 gm
4.	Garlic	10gm
5.	Cumin seeds	10 gm
6.	Mustard powder	20 gm
7.	Mustard seeds	10 gm
8.	Curry leaves	10 gm
9.	Ginger	10 gm
10.	Dania powder	5 gm
11.	Oil	200 mL

2.1 Process of making Moringa leaves pickle

1. Take fresh green color moringa leaves for making pickle
2. Wash carefully all the moringa leaves to remove dirt
3. Separate the florets from the moringa leaf
4. Then dry the leaves by keeping in sunlight for at least 8-10hrs till all the extra moisture dries up completely.
5. Take the oil in a pan heat very well and then fry the leaves by adding all the tempering ingredients (cumin seeds, curry leaves....Etc).
6. Mixing salt up to 15% to prevent microbial spoilage.
7. Transfer the pickle in a sterilized jar, keeping in sunlight for 4-6 days.
8. After that store the pickle at ambient temperature.

Moisture: Moisture of the pickle was analyzed by the hot air oven (AOAC 2001) method. Ten gram of sample was taken into an aluminum can and dried at a temperature of 100-105°C by keeping into hot air oven. The dry weight of the samples was recorded at an interval of 6 to 8hr hour until two consecutive reading become same. The moisture content was expressed in percentage.

$$Moisturecontent(\%) = \frac{Initialweight - Finalweight}{Initialweight} x\ 100$$

Fat: Fat was determined by soxhlet method (AOAC1990) 2 g of the sample was accurately weighed into a dry thimble and extracted using petroleum ether (60 - 800 boiling point) as solvent for 16 hr. The fat extract was collected in a previously weighted dry flat-bottomed flash and separated from the solvent by evaporating oven a hot water bath. The flask was dried in an oven at 80-100 $^{\circ}C$ and cooled till constant weight was achieved. Fat content of the sample was expressed as g/100 g of sample.

$$\% \text{ Fat/100g sample} = \frac{Final\ weight\ of\ beaker - Empty\ weight\ of\ beaker}{Weight\ of\ sample} x\ 100$$

Ash: The ash content was estimated according to the method described by AOAC 2000. 5 g of sample was accurately weighed into cleaned, dried, weighed, tare silica crucible (W2). The initial ashing was carried out over a low flame to char the sample. The crucible was then transferred to a muffle furnace maintained at 500-550˚C to get ash. The crucible was then cooled until a constant weight (W1) was achieved and expressed as g/100 g of sample

$$\% \text{ Ash content} = \frac{W1 - W2}{weight\ of\ the\ sample} x100$$

Crude fiber: 2 g of fat free sample was weighed in triplicate and digested with 200 mL of 1.25 mL of 1.25% sulphuric acid by gently boiling in a water bath for half an hour. The contents were filtered through a filter paper and then transferred to the same beaker. To this 200mL of sodium hydroxide was added. The contents were then digested again for half an hour, filtered and washed free of alkali using hot distilled water. The residue obtained was dried in a hot air oven over night at 600 ±15° for 30 minutes. The loss in weight after ignition represented the crude fibre content of the sample in the sample.

$$\text{Crude Fiber} = \frac{W2 - W1}{W0} * 100$$

Acidity: Weighed 25gm sample in conical flask and add 2 to3 drops of phenopthlene indicator pink colour is developed then titrate against with 0.02N NaoH end point is pink colour is disappeared noted the titer value.

$$\text{Acidity} = \frac{4.904\ X100X50XN}{100 - MOIX10Xsample\ weight}$$

Carbohydrates: Analytical issues with total carbohydrate determination, the total carbohydrate content of foods has, for many years, was calculated by difference, rather than analyzed directly. Under this approach, the other constituents in the food (protein, fat, water and ash) are determined individually, summed and subtracted from the total weight of the food.

3 Calculation

To determine the carbohydrates using the following formula was used

Total carbohydrate (CHO) = 100 - (Protein + Total Fat + Moisture + Ash

Protein: Weigh 500mg of the sample and grind well with pestle and mortar in 5-10 mL of the buffer. Centrifuge and use the supernatant for protein estimation. Pipette 0.2, 0. 4, 0. 6, 0. 8 and 1mL of the working standard into a series of hot tubes. Pipette out 0.1mL and 0.2mL of the sample and extract in another 2 test tubes. Makeup the volume in all test-tube. A tube with 1mL of water serve as blank. Add 5mL of reagent c to each tube including the blank. Mix well and allow to stand for 10min. Then add 0.1 mL of reagent g. Mix well and incubate at room temperature in the dark for 30 min. Blue colour developed. Then the reading is taken at 750nm. Draw a standard graph calculate the amount of protein in the sample. Express the amount of protein mg/g in 100 sample.

$$\text{Nitrogen content (\%)} = \frac{(\text{Sample TV} - \text{Blank TV}) \times \text{Normality of HCl} \times 14 \times 100}{\text{Weight of sample} \times 1000}$$

Percentage of protein = Nitrogen content × protein factor
Most proteins contain 16% of nitrogen, thus the protein factor translates to a value of 6.25. This protein factor was used in calculating protein in this study.

4. Results & Discussion

The moisture, protein, CHOS, crude fiber, fat, ash, acidity of moringa leaves ranged from 75.9-0.0(Fg.1). Moringa leaves having high moisture content (75.9) and less acidity (0)

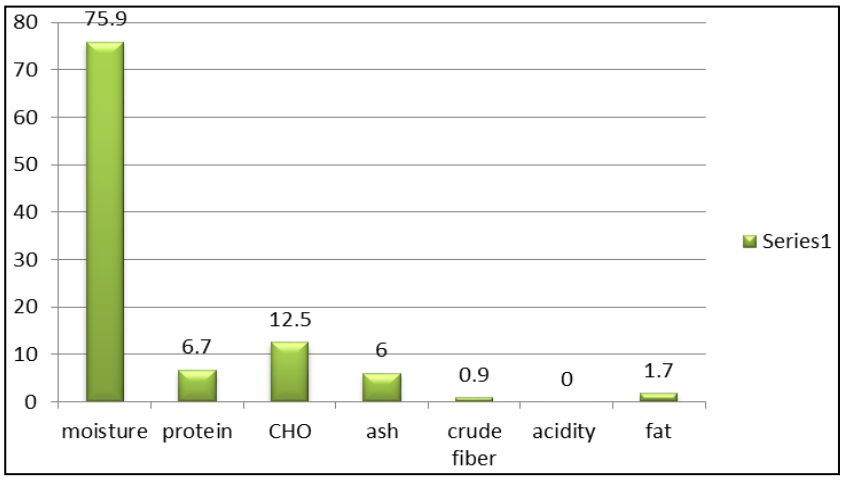

Fig 1: Fresh moringa leaves 0th day analysis

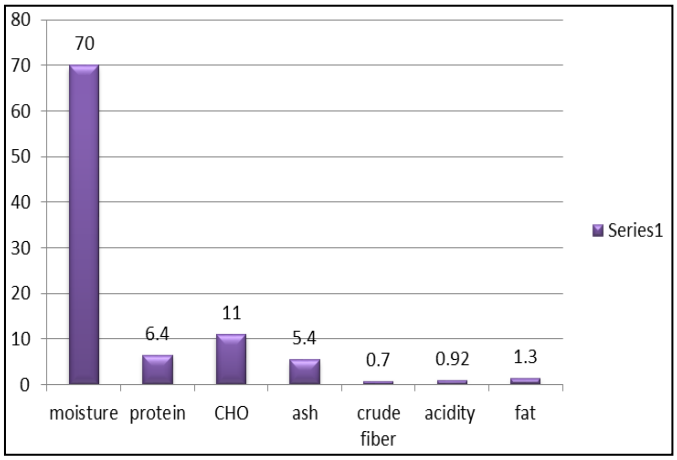

Fig 2: Moringa leaves pickle 30th day results

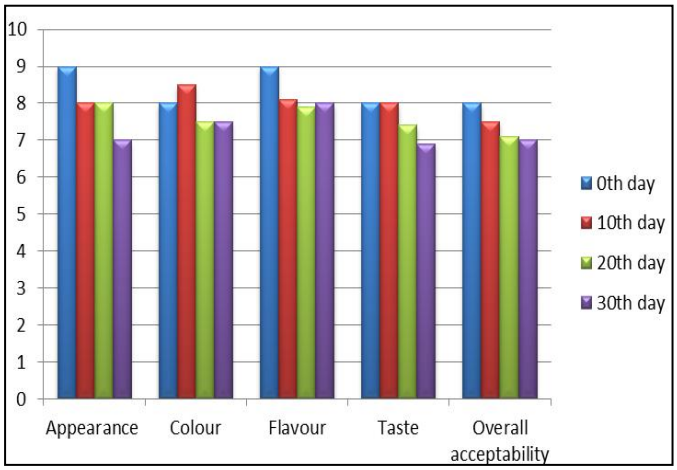

Fig 3: Moringa leaves pickle sensory characteristics

The moisture, protein, CHOS, crude fiber, fat, ash, acidity of moringa leaves ranged from 70-0.92(Fg.4). Moringa leaves having high moisture content (70) and less acidity (0.92).But when compared to fresh leaves acidity and 30th day pickle acidity was little bit increases and there is no difference between the 10th&20th day acidity results.

Fig 2: Moringa leaves pickle chemical analysis results

	0th day fresh leaves	10thday	20thday	30thday
moisture	75.9	74	73	70
protein	6.7	6.6	6.6	6.4
CHO	12.5	11.5	11	11
ash	6	5.8	5.6	5.4
crude fiber	0.9	0.8	0.8	0.7
acidity	0	0.9	0.9	0.92
fat	1.7	1.5	1.4	1.3

Fig 3: Moringa leaves pickle sensory characteristics results

Attribute	0thday	10th day	20th day	30th day
Appearance	9	8	8	7
Colour	8	8.5	7.5	7.5
Flavour	9	8.1	7.9	8.
Taste	8	8	7.4	6.9
Overall acceptability	8	7.5	7.1	7

Pickle sample was evaluated for sensory characteristics like color, appearance, flavor, taste, overall acceptability were decreased when increasing the shelf life period.

5. Conclusion

The present study recommends the prospect of more aggressive introduction and utilization of drumstick leaves by the food sector. It also implies that it may be worthwhile for industry to take up the production of drumstick leaf powder. Such promotion of drumstick leaf incorporation into the diet in India and other countries could go a long way towards not only alleviating micronutrient deficiencies, but also towards the development of functional foods for several chronic degenerative disorders. Leaves were also used for food fortification. *Moringa* leaves will be ready available to improve nutritional intake on a daily basis. Research efforts have continued to unearth the medicinal and nutritional potential of *M. oleifera*in several significant ways.

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