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Influence of ingredients and pressure cooking on the textural properties of Moringa pods

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Abstract

Moringa oleifera (Drumstick) is one of the most nutrient-rich food sources that is readily available and reasonably priced. It helps prevent diabetes, boosts the immune system and reduces liver damage. The purpose of this study is to determine the textural properties of raw and pressure cooked Moringa pods treated with different ratios of water and table salt (T1, T2, T3, T4, T5, T6, T7, T8 and T9). Hardness and chewiness had higher values for raw pods as cooking makes the pods soft, whereas springiness and cohesiveness showed higher values for T1 and T2 respectively. From this research it is concluded that T1 and T2 showed better results.

Keywords: Nutritious, anti-diabetic, table salt and chewiness

1. Introduction

The tradition of the sambar has given rise to a number of humorous urban legends in the southern region of India especially in the state of Tamil Nadu. *Moringa oleifera*, sometimes known simply as moringa, is a perennial deciduous tropical plant that is a member of the family *Moringaceae*. It is very abundant in a wide variety of bioactive chemicals. Moringa is an essential component of many herbal medicines that are used to treat reproductive disorders; however, the vegetable also has other health benefits, particularly in the management of blood sugar levels, anemia, and a number of lifestyle diseases (Z. F. Ma *et al*., 2020) [6], which is also proven its use in skincare (Sagona *et al*., 2020) [11]. Tender pods are produced in quantities ranging from 1.1 to 1.3 million tonnes annually in India (Islam *et al*., 2021) [4]. Since that time, moringa has been widely recognized as one of the crops with the highest economic value, especially in poor nations because to its many applications in the food, industrial, agricultural, and pharmaceutical industries. During the dry season in the tropics, ruminants might benefit from a protein supplement from leaves and green pods. Leaves might also be utilized as a source of protein for non-ruminants and humans owing to their high amino acid profiles (Melesse *et al*., 2012) [7].

Cooking techniques together with the proportion of ingredients may modify the texture of the product. Textural characteristic's may be improved by altering the way food is prepared and cooked, according to recent research. Fresh-cut veggies with a firm and crisp texture are widely sought after by customers because they are associated with freshness and wholesomeness (Tripathi & Variyar, 2018) [13]. There are a variety of interactions and changes that occur as a result of these two phases. As a result, it is vital for both scientific research and the consumer to know how to prepare and cook a limited number of healthful vegetables in order to obtain the best textural attributes during mastication. In spite of the many research on *Moringa oleifera's* nutritional properties, no study has been done to examine the effects of pressure cooking on texture and human feel. Pressure cooking's impact on textural features and how it alters them when combined with a variety of other ingredients and water was the focus of this investigation.

2. Materials and Methods

2.1 Procurement and sample preparation

The fresh PKM1 variety of Moringa was procured from local market at Thanjavur. The moringa were cleaned, washed, wiped with dry cloth and stored in refrigerator for further experiments. Portable drinking water and table salt were used for cooking. A pressure cooker (Prestige, India 2L-capacity) fixed with a pressure gauge (0-30 psi) was used for cooking.

An induction stove is used as a heat source for pressure cooking of moringa pods.

2.2 Pressure cooking of moringa

The moringa pods were cut into chewable sizes (3.5-4.5 cm) were used for cooking. The cut pieces and desired moringa-water ratio and salt as per the experimental design (Table. 1) were taken in the pressure cooker. The moringa was cooked for 10 minutes. The pressure maintained during cooking was 2 psi. Cooking time parameter was maintained constant during the experiment.

Table 1: Pressure cooking variables, its levels and treatment names

S. No	Solid/water ratio(w/v)	Table salt (g)	Time	Treatments
1.	1:0.5	1.5	10 min	T1
		2		T2
		2.5		T3
2.	1:1	1.5		T4
		2		T5
		2.5		T6
3.	1:2	1.5		T7
		2		T8
		2.5		T9

2.3 Texture profile analysis

After being cooked, every moringa pod was allowed to cool at room temperature (around 30±2 °C). The texture profile analysis was carried out in Texture Analyser Stable Micro Systems TA. HD plus. P/75 mm diameter flat plunger was used to measure the compression strength of the sample. Two bite test was performed to analyse the following parameters- hardness, springiness, gumminess and chewiness. Texture analyser was operated at pre-test speed of 1.00 mm/sec, post-test speed of 2.00 mm/sec, strain 5% and 2 counts. Compression testing-the probe approaches the sample from a calibrated speed with the pre-test speed (1.00 mm/sec); packed it to half of its original height with test speed and the probe goes back to its original position with the post-test speed (2.00 mm/sec). Once the test was completed the destructed sample was expelled and then and the stage surface was cleaned with tissue for the next test. The sample was compressed twice in order to mimic the mastication process (Nwosisi *et al.*, 2019) [9].

3. Results and Discussion

Textural data for raw Moringa and different treatments of pressure cooked Moringa with difference in solid: water and table salt concentration gives relatively various results. Compared to hardness, and chewiness, springiness and cohesiveness is seen higher. Comparing all the nine treatments with raw Moringa T1 and T2 showed higher value for springiness and cohesiveness.

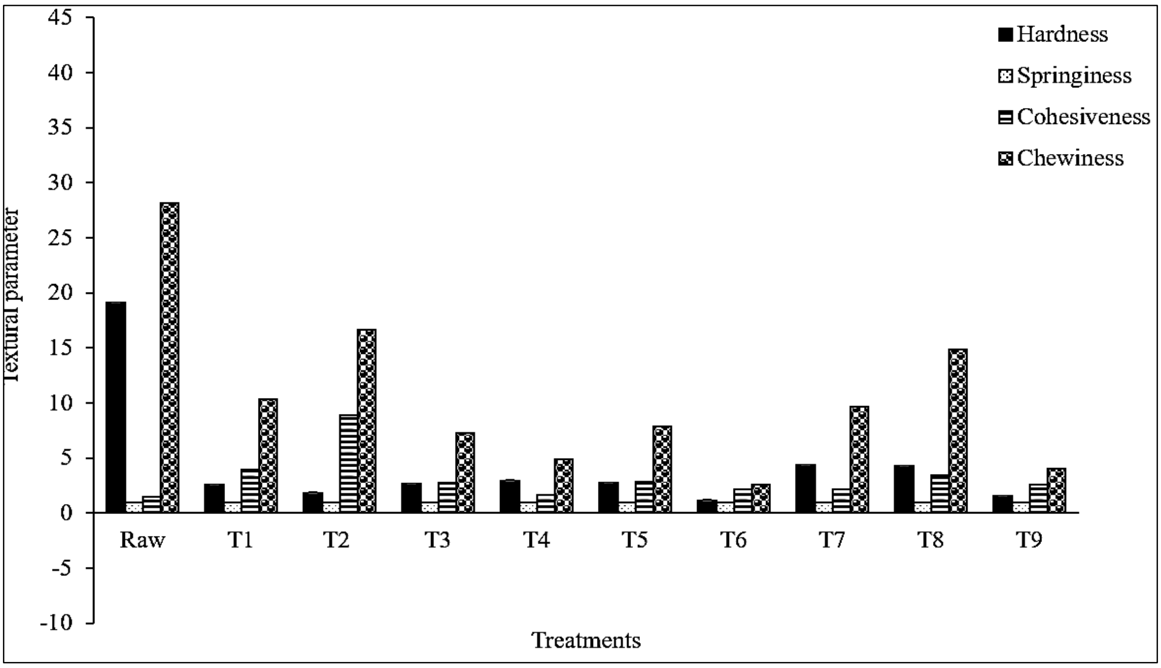

Fig 1: Effect of moringa-water ratio and amount of table salt on textural parameters of raw and pressure cooked moringa pods

3.1 Hardness

The hardness of the raw and cooked moringa with varied treatments was evaluated and varied in the range of 19.11 N to 1.56 N. Hardness was observed to be higher in the case of raw moringa pods due to its higher nature of tenderness and no effect of treatment on it. As was to be anticipated, the heating period resulted in a reduction in the hardness of all of the samples. The hardness values were in the order of treatments RAW>T7>T8>T4>T3>T1>T2>T9>T6. Due to the pressure inculcated by the steam during cooking on moringa pods, loosening the cell walls leading to accumulation of more water in the cells there by softening the texture. Rinaldi *et al.*, (Rinaldi *et al.*, 2021) [10] reported there might be decrease in hardness of the sample after cooking, due to the destruction of cell membrane. Pulp being major internal constituent which softened during the cooking process resulted in decreased hardness. When vegetable tissues are processed at high temperatures (greater than 90 °C), the firmness of the tissue is lost in a biphasic manner. This means that the firmness of the tissue is lost rapidly in the first few minutes of processing, and then more slowly over the duration of the processing time, as hardness and firmness are almost co-related. During cooking a mass transfer occurs parallelly to the inside tissue layers and once overall cells reach around 50 °C cell turgor is almost lost (Farahnaky *et al.*, 2012) [2]. Besides addition of salt leads to formation of tender skin, due to the replacement of magnesium and calcium ions with sodium ions which are bounded to pectin (Crosby., 2012) [1].

3.2 Cohesiveness

The expression of cohesiveness may be seen in the tensile force. For this reason, it is defined as the ration of positive force area peaks during first and second compression. Cohesiveness varied in the range of 8.93N to 1.46 N and lowest was found in the case of raw moringa. Cohesiveness is the condition of a material in which the individual particles adhere to one another and clump together to create a continuous mass. As a result, an increase in cohesion may result in a reduction in flow-ability. In general mastication process the optimum moment of swallowing is when the cohesive force of food becomes maximum. Thus, treatment T2 is the better indicator for swallowing of food. The internal resistance of the structure of foods may be measured by their cohesiveness. To put it another way, cohesion might be thought of as a material's inherent capacity to adhere to itself (X. Ma & Ryu, 2019) [5]. So, increased sticky nature of pulp has been developed due to the starch gelatinization and protein-protein interaction, leading to increase in cohesiveness. However, no significant ($p<0.05$) trend was observed. The ones which kept better cohesiveness owing to a functional and resistant lamella media, which oppose a turgor pressure as seen in case of hardness, that tries to pull plant cells towards a spherical shape, so separating them at the angles from neighboring cells. This allows the cells to remain more aligned with one another. Swelling pressure possibly is due to lower accessible water for starch gelatinization, lowering the strength of intercellular adhesion and subsequently enhancing cohesiveness. However, there are no profound studies on effect of salt concentration and cooking on cohesiveness. Iborra-Bernad *et al*., (2014) [3] reported the similar trend of cohesiveness in case of purple-flesh potato.

3.3 Springiness

Springiness showed a non-significant ($p<0.05$) trend towards the treatment and it varied in the range of 0.998 to 1 N with little variation. The highest values of springiness were observed in case of raw and treatment T1. The values for springiness seemed to be inconsistent with one another. This tendency, as (Mohensenin, 1970) [8] has pointed out, may be the result of some residual deformation that occurred after the first loading and unloading cycle. The biological materials that have been examined up to this point have not shown any evidence of perfect springiness. The presence of pores or air spaces, weak ruptured cells on the surface, microscopic cracks in brittle materials, or other discontinuities, caused by initial settings in TPA. This complicated development may be due to a variety of factors, including temperature (which affects cell wall softening through middle lamella solubilization) and the presence of an external supply of water (which increases swelling pressure by gelatinization of the starch) (Iborra-Bernad *et al*., 2014) [3]. Similar nature of results was found in case of pumpkin cubes (Rinaldi *et al*., 2021) [10], beetroot and turnip (Taherian & Ramaswamy, 2009) [12]. By the observation it can be concluded that the springiness had a very complex behavior than other textural attributes. In addition, the effect of salt concentration and its effect on springiness is still unknown.

3.4 Chewiness

As it is well known that chewiness is the product of hardness, springiness and cohesiveness. Chewiness can be simply termed as the total energy required to masticate until desired consistency is achieved and suitable for swallowing. Chewiness showed a non-significant trend ($p>0.05$) within the various treatments. Chewiness was found to be highest in case of raw iterating 28.12 N to following the lowest in case of treatment T9 with 4 N. Observing the present data obtained from TPA the properties that effected hardness showed similar impact on chewiness as hardness is the function of chewiness. Observing in the broader manner the cooked samples are swallowable comfortably than raw because cooking led to softening of tissue and decreased hardness. The pressure due to the formation of steam inside pressure cooking may induce more penetration of water to the inside tissue layers leading to more softening. It can be attributed by both as function of temperature and pressure as seen in the case of harness. Because of the rise in ionic strength and the consequent gelation and binding of the particles that make up the mass, sodium chloride has a solubilizing effect on proteins. This action lasts until the mass reaches the desired consistency and texture. This effects might have altered the different textural attributes leading to change in chewiness eventually.

4. Conclusion

The solid: water ratio, sodium chloride concentration and pressure cooking had an influence on the textural properties of Moringa pods. Based on the results obtained from the textural analysis of raw and pressure cooked Moringa pods at different treatments (T1, T2, T3, T4, T5, T6, T7, T8 and T9), hardness and chewiness showed higher values for raw pods than pressure cooked pods. Incase of springiness both raw and T1 (1:0.5-1.5) showed higher values and for cohesiveness T2 (1:0.5-2) showed higher values.

5. Reference

1. Crosby G. The science of good cooking: Master 50 simple concepts to enjoy a lifetime of success in the kitchen. America’s Test Kitchen, 2012.
2. Farahnaky A, Azizi R, Gavahian M. Accelerated texture softening of some root vegetables by Ohmic heating. Journal of Food Engineering. 2012;113(2):275-280. https://doi.org/10.1016/j.jfoodeng.2012.05.039
3. Iborra-Bernad C, García-Segovia P, Martínez-Monzó J. Effect of vacuum cooking treatment on physicochemical and structural characteristics of purple-flesh potato. International Journal of Food Science & Technology. 2014;49(4):943-951. https://doi.org/10.1111/ijfs.12385
4. Islam Z, Islam SMR, Hossen F, Mahtab-Ul-Islam K, Hasan MR, Karim R. *Moringa oleifera* is a Prominent Source of Nutrients with Potential Health Benefits. In International Journal of Food Science. Hindawi Limited, 2021. https://doi.org/10.1155/2021/6627265
5. Ma X, Ryu G. Effects of green tea contents on the quality and antioxidant properties of textured vegetable protein by extrusion-cooking. Food Science and Biotechnology. 2019;28(1):67-74. https://doi.org/10.1007/s10068-018-0437-7
6. Ma ZF, Ahmad J, Zhang H, Khan I, Muhammad S. Evaluation of phytochemical and medicinal properties of Moringa (*Moringa oleifera*) as a potential functional food. South African Journal of Botany. 2020;129:40-46. https://doi.org/10.1016/j.sajb.2018.12.002
7. Melesse A, Steingass H, Boguhn J, Schollenberger M,

Rodehutscord M. Effects of elevation and season on nutrient composition of leaves and green pods of *Moringa stenopetala* and *Moringa oleifera*. Agroforestry Systems. 2012;86(3):505-518. https://doi.org/10.1007/s10457-012-9514-8

8. Mohensenin NN. Physical Properties of Plant and Animal Material. New York: Gordon and Breach, 1970.
9. Nwosisi S, Nandwani D, Ravi R. Texture profile analysis (TPA) of organic sweetpotato (Ipomoea Batatas) cultivars as affected by different processing methods. Journal of Microbiology, Biotechnology and Food Sciences. 2019;8(6):1254-1259. https://doi.org/10.15414/jmbfs.2019.8.6.1254-1259
10. Rinaldi M, Santi S, Paciulli M, Ganino T, Pellegrini N, Visconti A, *et al*. Comparison of physical, microstructural and antioxidative properties of pumpkin cubes cooked by conventional, vacuum cooking and sous vide methods. Journal of the Science of Food and Agriculture. 2021;101(6):2534-2541. https://doi.org/10.1002/jsfa.10880
11. Sagona WCJ, Chirwa PW, Sajidu SM. The miracle mix of Moringa: Status of Moringa research and development in Malawi. South African Journal of Botany. 2020;129:138-145. https://doi.org/10.1016/j.sajb.2019.03.021
12. Taherian AR, Ramaswamy HS. Kinetic Considerations of Texture Softening in Heat Treated Root Vegetables. International Journal of Food Properties. 2009;12(1):114-128. https://doi.org/10.1080/10942910802312207
13. Tripathi J, Variyar PS. Effect of gamma irradiation on the shelf-life and physico-chemical quality of ready-to-cook (RTC) drumstick (*Moringa oleifera*) pods. LWT. 2018;88:174-180. https://doi.org/10.1016/j.lwt.2017.10.014