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Study of Moringa Oleifera Leaf Fortified Pasta on its Cooking Quality and Sensory Analysis

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Abstract: ***The studies aimed to investigate the effect of incorporating Moringa oleifera leaf powder into pasta on its cooking quality and sensory attributes. Moringa oleifera, a highly nutritious plant, is known for its rich content of vitamins, minerals, and antioxidants. In this research, dried Moringa leaves were processed into a fine powder and added to the pasta dough during preparation. The cooking quality parameters evaluated included cooking time, water absorption, and cooking loss. The sensory analysis involved a panel of trained individuals who assessed various attributes such as colour, taste, texture, and overall acceptability of the cooked pasta. The study also compared the fortified pasta with a control sample, which did not contain Moringa leaf powder. The results showed that the addition of Moringa leaf powder did not significantly affect the cooking time or water absorption of the pasta. However, it resulted in a slight increase in cooking loss, indicating a potential decrease in pasta firmness. Sensory analysis revealed that the Moringa-fortified pasta had a distinct green colour and a mild herbal taste, which was well-accepted by the panellists. Additionally, the texture of the fortified pasta was found to be slightly different from the control, but still within acceptable limits. Overall, the study suggested that incorporating Moringa oleifera leaf powder into pasta can be a viable approach to enhance its nutritional value without compromising its cooking quality or sensory attributes. Further research may explore different ratios of Moringa powder to optimize the nutritional content while maintaining desirable pasta characteristics.***

Keywords: ***Moringa oleifera, cooking quality, sensory attributes, fortified, nutritious plant***

I. INTRODUCTION

Moringa oleifera leaf fortified pasta is a type of pasta that has been enriched or fortified with Moringa oleifera leaf powder. Moringa oleifera, also known as the drumstick tree or the miracle tree, is a highly nutritious plant native to parts of Asia and Africa. It is rich in health benefits and in nutritional value.

The leaves of the Moringa oleifera tree are packed with essential vitamins, minerals, and antioxidants, making them a valuable addition to the diet. They are a good source of vitamin C, vitamin A, iron, calcium, potassium, and protein, among other nutrients. By incorporating Moringa oleifera leaf powder into pasta, its nutritional profile is enhanced, offering an additional source of important nutrients. Fortified pasta is a method of adding nutrients to commonly consumed food products to address nutrient deficiencies or enhance their nutritional value. In the case of Moringa oleifera leaf fortified pasta, the addition of the powdered leaves increases the overall nutritional content of the pasta, providing an extra boost of vitamins, minerals, and antioxidants.

Consuming Moringa oleifera leaf fortified pasta can be an easy and convenient way to incorporate the benefits of Moringa into the diet. It offers an alternative for individuals who may not have access to fresh Moringa leaves or prefer a more convenient form of consumption.

It's important to note that the taste and texture of Moringa oleifera leaf fortified pasta may vary depending on the specific recipe and brand. Some manufacturers may mix the Moringa powder directly into the pasta dough, while others may use it as a coating or filling for stuffed pasta varieties. The cooking process may also influence the final taste and texture.

Overall, Moringa oleifera leaf fortified pasta is a creative and nutritious option that combines the convenience of pasta with the health benefits of Moringa leaves, offering a unique and flavourful addition to the world of pasta-based dishes.

A. Objectives

1) Development of moringa leaf fortified pasta.
2) To study the cooking quality, characteristics and sensory evaluation of the obtained product.
3) Preparation of Moringa oleifera leaf powder capsule.
4) To develop eco-friendly packaging material for moringa oleifera leaf fortified pasta.
5) Cost estimation of the prepared product.

II. MATERIALS AND METHODS

A. Collection And Selection Of The Material

In this study the raw materials are used like wheat flour, refined wheat flour and moringa leaf powder. The fresh and healthy leaves were collected from Moringa oleifera tree from Experimental farm, Gandhi Institute for Technology (GIFT). Good quality commercially available refined wheat flour, wheat flour, and other ingredients were purchased from local market of Bhubaneswar.

B. Moringa Oleifera Leaf Powder Preparation

To prepare moringa oleifera leaf powder initially, the fresh and healthy leaves from the tree were manually selected and collected, while damaged leaves are discarded as well. After collecting the leaf, wash properly in normal water for removing of dirt. After this the leaves are soaked in 1% of saline water for 5 minute to remove microbes. Then again washed in tap water. This step plays a substantial role in removal of dust, pathogens as well as microbes present on leaf surface. After that the excess water can be removed by spreading the leaves in sunlight for a brief period (5-6 days) till the removal of moisture present on the leaf. For drying of the leaf, we go for shade drying because high temperature can lead down breakage of protein present on the leaf. The leaves are turned once in a day with sterile gloves for uniform drying. We continued measuring of leaves until it became completely dry and continued the process with the time period of 24 hours. Leaves are completely dried on 6th day, first we crushed the leaf on hand after that finely grinned with the help of a blender. Immediate to this, the powder was quickly stored in an airtight container to avoid absorption of the surrounding moisture during or after grinding which may degrade its quality and nutrient content. The powder can be stored for around 4-6 months under the controlled condition in air tight containers which a reprojected from direct sunlight and humidity.

Fresh moringa oleifera leaf
(Fig-1)

Fresh moringa fortified powder
(Fig-2)

C. Pasta Preparation

Ingredients:
90 grams wheat flour, 10 grams moringa powder, Water (as needed)
Optional: salt or seasoning to taste
Equipment:
Hand-operated pasta maker, mixing bowl, Rolling pin, Knife or pasta cutter
Instructions:
In a mixing bowl, combine the wheat flour and moringa powder (ratio 9:1). We sieve them together to ensure even distribution. Then create a well in the centre of the dry mixture and gradually add water. Start with a small amount of water and mix it with the flour by using hands or a spoon. Continue adding water gradually until the dough comes together. Then adjust the water quantity as needed; the dough should be firm and not too sticky. Once the dough is formed, transferred it to a clean, lightly floured surface.To activate gluten on wheat flour knead the dough for 5-7 minutes. Then divide the dough into smaller portions. Dust the pasta maker with some flour to prevent sticking. To avoid sticking spread some wheat flour on the surface.Then pass the flattened dough through the pasta maker, starting with the widest setting. Crank the pasta maker handle to roll the dough through the machine. Fold the dough over itself and repeat the process. we repeat this process several times, gradually adjusting the pasta maker to a narrower setting each time until the desired thickness is achieved. Once the dough is rolled to the desired thickness, we choose the shape of pasta by using hand operated pasta maker. After cutting the pasta, carefully separate the strands and lightly dust them with flour to prevent sticking. The control and fortified pasta samples were dried in sun shade under 33 to 38 The dried pasta samples were packed in air- tight polythene bags and stored in a cool and dry place for further analysis and keep it for 3 months in room temperature.

Fig-3

Fig-4

(Moringa oleifera fortified pasta)

D. Cooking Quality Analysis

1) Cooking Quality

Cooking quality refers to the characteristics of a food product that are evaluated during the cooking process. It involves assessing various parameters to determine the overall acceptability and sensory properties of the cooked food. These parameters may vary depending on the type of food being cooked, but some common measurements include the optimum cooking time (OCT), cooked weight, cooking loss (solid gruel loss), and water absorption.

2) Cooking loss

Control-100% wheat flour
T1- 95% wheat flour+5% of moringa powder
T2- 90% wheat flour +10% moringa powder
T3- 85% wheat flour+15% of moringa powder

In the current study, the cooking quality of the pasta samples was evaluated using a standard procedure. Each sample, weighing 10 grams, was cooked in a vessel containing 300 milliliters of boiling water for the recommended cooking time. After cooking, the water used for boiling was collected in a glass beaker. From this, 25 milliliters of the cooking water was extracted and transferred to a pre-weighed glass petri dish. The dish, along with the extracted cooking water, was then placed in a hot air oven set at 105°C until all the liquid evaporated, leaving behind only the dried solids. The petri dish was weighed again to determine the weight of the dried solids. The difference in weight before and after evaporation provided the measurement of solid loss, which is commonly referred to as cooking loss. This approach allowed for the assessment of cooking loss in both the control pasta samples and the blended pasta samples, with a cooking time of 10 minutes, to investigate the influence of cooking time on solid gruel loss.

3) Cooking Weight

Using a precise methodology, 10 grams of both the control and fortified pasta samples were meticulously cooked in 100 milliliters of water for an optimal duration. The cooked pasta was then carefully drained using stainless-steel sieves, and its weight after draining was measured to determine the cooking weight.

E. Water Absorption

The water absorption was calculated by weighing the cooked pasta. The formula used to calculate the water absorption is
Water absorption (%) = [(Weight of cooked ingredient - Weight of dry ingredient) / Weight of dry ingredient] x 100
This formula expresses the percentage increase in weight due to the absorbed water.

F. Sensory Analysis

Sensory attributes analysis was carried out to assess the effects of incorporation of MLP in pasta by a panel of semi-trained members from the Gandhi Institute for Technology, Gangapada, Bhubaneswar. The pasta samples were cooked for the optimal cooking time for scaling these sensory attributes. The evaluation encompassed a meticulous assessment utilizing the 9 Point Hedonic scale Score System. This comprehensive approach involved scrutinizing the essential attributes of freshly prepared control and MLP fortified pasta samples, encompassing factors such as color, texture, taste, flavor, and the all-encompassing measure of overall acceptability (OAA). These samples were served in a random order to evaluate all the sensory attributes for each sample from 9-1-point scale, ranging from 'like extremely' to 'dislike extremely' respectively. Discover pasta perfection through an exclusive scale, deciphering the ultimate blend between control and fortified MLP pasta samples.

III. RESULTS AND DISCUSSION

Table 1: Sensory analysis of moringa pasta

samples	Appearance	Taste	Flavour	Colour	Texture	Overall acceptability
Control	5	6	5	6.5	6	5.7
T1	7	8	7	8	7	7.4
T2	8	8.5	8	9	8	8.3
T3	6	6.5	6	6	6.5	6.2

A. Appearance

The sensory evaluation of the Appearance of Moringa Pasta yielded interesting results. T2 sample received the highest score of 8, indicating that it was highly appreciated and fell into the "Like very much" category. Following closely, T1 sample obtained a score of 7, placing it in the "Like moderately" category. T3 sample received a score of 6, falling into the "Like slightly" category. On the other hand, the control sample received the lowest score of 5, suggesting a neutral response in the "neither like nor dislike" category. It is noteworthy that all types of pasta (T1, T2, T3) displayed significant differences in appearance when compared to the control pasta.

B. Taste

The Taste of Moringa Pasta was evaluated using a sensory scoring system ranging from 1 to 9, with 9 being the highest score. Among the samples tested, T2sample received the highest score of 8.5, falling into the "Like very much" category. T1 sample received a score of 8, also falling into the "Like very much" category. T3 Sample received a score of 6.5, indicating a preference in the "Like slightly" category. In comparison, the control sample received the lowest score of 6, also falling into the "Like slightly" category. These results indicate that all types of Moringa Pasta (T1, T2, and T3) exhibited significant differences in taste compared to the control pasta

C. Flavour

The sensory evaluation of Moringa Pasta's flavor resulted in a range of scores from 1 to 9. Among the samples, T2 exhibited the highest score of 8, indicating a strong preference and falling into the "Like very much" category. Following closely, T1 received a score of 7, placing it in the "Like moderately" category. T3, with a score of 6, fell into the "Like slightly" category. On the other hand, the control sample garnered the lowest score of 5, indicating a neutral response in the "neither like nor dislike" category. It is important to note that all variations of pasta (T1, T2, and T3) displayed significant differences in flavor compared to the control sample.

D. Colour

The sensory evaluation scores for the colors of Moringa Pasta ranged from 1 to 9. Among the samples, T2 received the highest score of 9, indicating that it was liked extremely. T1 received a score of 8, falling into the category of "Like very much," while the control sample received a score of 6.5, indicating a preference of "Like slightly." On the other hand, T3 obtained the lowest score of 6, also categorized as "Like slightly." It is important to note that there was a significant difference in color between all types of pasta (T1, T2, and control) when compared to the T3 sample.

E. Texture

The sensory evaluation of Moringa Pasta revealed varying texture preferences among the samples. The participants rated the texture on a scale of 1 to 9, with T2sample receiving the highest score of 8, indicating that they "Liked it Very much." Following closely behind, T1 sample achieved a score of 7, falling into the "Liked it moderately" category. T3 Sample received a score of 6.5, suggesting a preference in the "Liked it slightly" category. On the other hand, the control sample received the lowest score of 6, placing it in the "Liked it slightly" category as well.Interestingly, the texture of all the Moringa Pasta samples, T1, T2, and T3, significantly differed from the control pasta, implying noticeable variations in texture.

F. Overall acceptability

The sensory evaluation of Moringa Pasta's overall acceptability yielded a range of scores from 1 to 9. The highest score of 8.3, falling into the "Like very much" category, was obtained by the T2 sample. Following closely, the T1 sample received a score of 7.4, indicating a "Like moderately" rating. The T3 sample, with a score of 6.2, fell into the "Like slightly" category. On the other hand, the control sample received the lowest score of 5.7, indicating a neutral "neither like nor dislike" response. It is worth noting that all variations of pasta (T1, T2, T3) exhibited significant differences in overall acceptability when compared to the control pasta.

IV. PREPARATION OF MORINGA OLEIFERA POWDER CAPSULE

Materials required :
Moringa oleifera powder
Empty gelatin capsule
Small spatula
Clean, dry surface

Before starting preparation the workspace must be clean and hygiene. First Carefully open the empty gelatin or vegetarian capsules by pulling them apart, there will be two separate part one is body and another one is cap. Then Measure the Moringa oleifera powder using a small spatula or spoon, scoop up the desired amount of Moringa oleifera powder. For each capsule we have taken 1-2 gram of moringa leaf powder. After filling the empty capsule store the capsule on room temperature.

Fig-5 Fig-6
(Moringa oleifera powder capsule)

V. CONCLUSION

The study on moringa leaf fortified pasta has provided valuable insights into the potential benefits and feasibility of incorporating moringa oleifera into pasta products. The addition of moringa leaf powder to pasta resulted in a significant increase in nutritional content, particularly in terms of vitamins, minerals, and antioxidants. Moringa leaf powder is known for its high nutritional value, and fortifying pasta with this ingredient can contribute to a more nutritious and balanced diet.The study indicated that the inclusion of moringa leaf powder in pasta did not significantly affect the overall sensory attributes and acceptability of the product. Participants did not report any adverse changes in taste, aroma, or texture, suggesting that moringa-fortified pasta can be well-received by consumers.

Moringa leaf powder is associated with various potential health benefits, including anti-inflammatory and antioxidant properties. By incorporating this powder into pasta, consumers can potentially derive these health benefits while enjoying a familiar and convenient food product.Moringa-fortified pasta presents an opportunity for food manufacturers to cater to the growing demand for functional foods and wellness-oriented products. Highlighting the nutritional benefits and sustainability aspects of moringa in marketing campaigns can attract health-conscious consumers and contribute to market differentiation.

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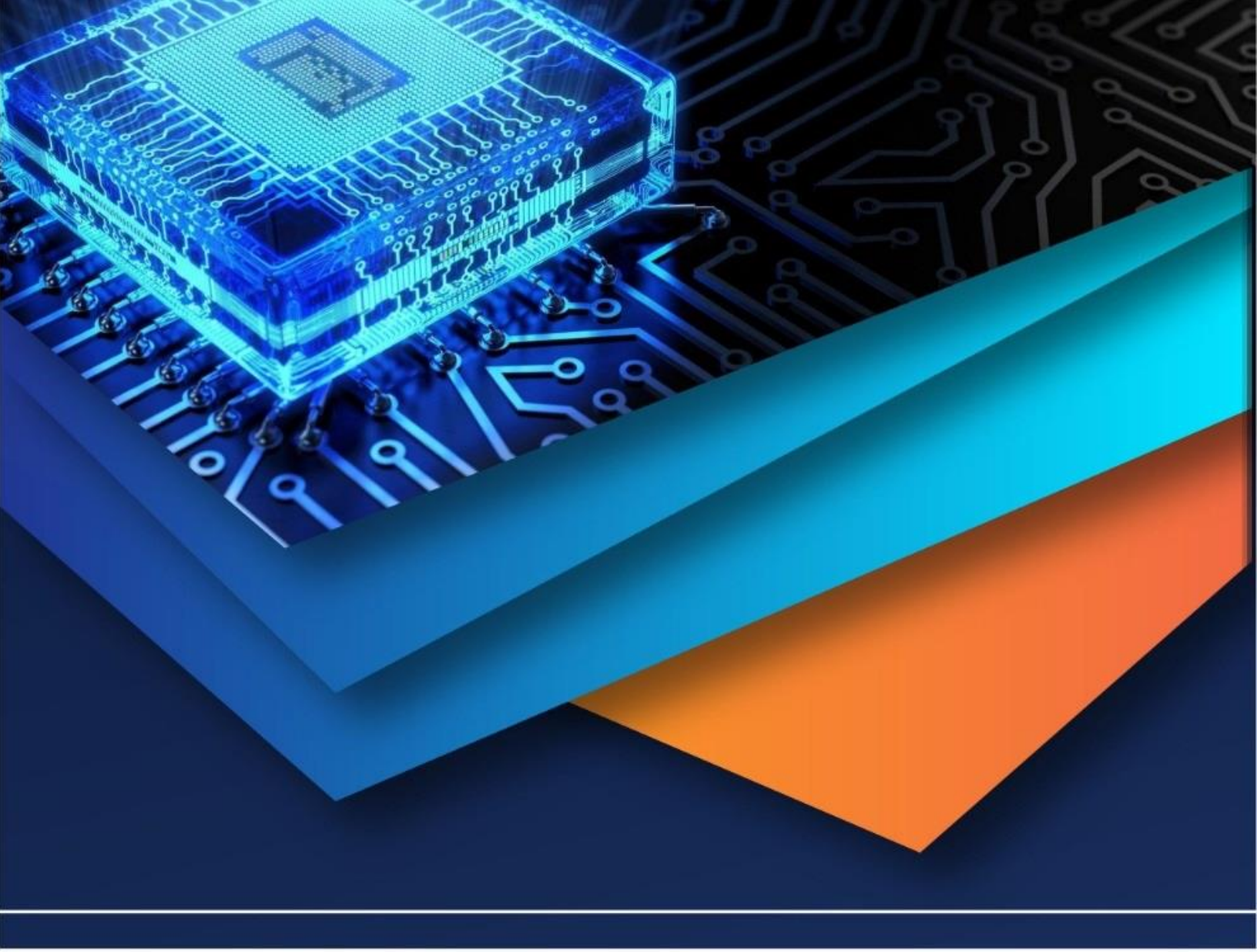

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