A Review: Study of Nutritional Properties of Mango Seed and Utilization in Food Industry

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Abstract - The large amount of waste generated by the food industries causes serious environmental problems as well as economic losses if not properly utilized. Mango (Mangifera indica L.) is one of the world's most important tropical fruits. Byproducts such as peel and kernel are produced during mango processing. Depending on the mango variety, the seed accounts for 20% to 60% of the total fruit weight, while the kernel within the seed accounts for 45% to 75% of the total seed weight. Moisture, crude protein, ash, crude fiber, and carbohydrate are all found in mango seed kernel. The potassium, magnesium, phosphorus, calcium, and sodium content of mango seed kernel was high. Mango seed kernel amino acid content was higher in valine and phenylalanine. Mango seed contains vitamin A, vitamin E, vitamin K, vitamin B1, vitamin B2, vitamin B6, vitamin B12, and vitamin C. These findings also revealed that mango seed is higher in vitamin content. Use mango kernel powder in different proportions in the preparation of chakali, biscuits, chapati, and panjiri to determine the acceptable level of incorporation.

***Key Words*:** Mango, Kernel, Amino acid, Vitamin, Mango kernel powder,

1.INTRODUCTION *(Size 11, Times New roman)*

The mango (Mangifera indica L.) is one of the world's most important tropical fruits, Because of its delicious flavor and aroma, as well as its high nutritional value. Mango (Mangifera indica) is a perennial crop in the Anacardiaceae family. It is grown almost everywhere in the world's tropical and subtropical regions, and it is the most popular fruit in India. It is known as Aam, Amba, and Ambra in Hindi. When ripe, the fruits are egg-shaped or kidney-shaped with smooth, leathery skin and range in color from light or dark green to clear yellow. Because mango is a seasonal fruit, about 20% of the fruit is processed into puree, nectar, leather, canned slice, chutney, juices, ice cream, fruit bars, and pies. (A. K. Rai, *et al*., 2020)

Mango seed estimates that between 35 and 60 percent of the processed fruit is discarded as waste; in the case of the seed, more than a million tons of mango seeds are produced as wastes each year and are currently not employed for any commercial reasons. Scientists are interested in the mango seed since it has been discovered to be a biowaste that contains a significant number of bioactive substances.

2. **Mango waste utilization:**

Although the rational use of mango seed as an ingredient in balanced animal feed is well documented, the majority of this by-product is considered waste and becomes a source of pollution in the environment. Because the mango seed kernel is discarded as waste, the availability and cost factor in generating cheap and effective plant-based natural antioxidants will be negligible. It will also play a significant role in the utilization of mango seed waste generated globally. The proper use of mango seed as a raw material or a food additive could generate economic gains for industry while also helping to reduce nutritional deficiencies, promote health, and reduce the environmental implications of this waste. (Cristian Torres-Leona, *et.al*.,2016)

3. Mango seed kernel : The mango seed is comprised of kernel (68%), shell (29%) and test (3%). In figure no. 1 shows the morphology of mango fruit. Mango kernel is a good source of starch and fat. A preliminary study

showed that the seed represents from 20% to 60% of the whole fruit weight, depending on the mango variety and the kernel inside the seed, which represents from 45% to 75% of the whole seed (Maisuthisakul and Gordon, 2009).

4. Proximate composition of mango kernel :

The results of proximate analysis of mango seed kernel are shown in Table 1. According to the findings, mango seed kernel contains crude protein, oil, ash, crude fiber, and carbohydrate. Variation in characteristic yield can be attributed to differences in plant variety, cultivation climate, ripening stage, harvesting time of the seed's kernels, and extraction method.

5. Mineral composition of mango kernel :

Mango seed kernel was high in potassium, magnesium, phosphorus, calcium and sodium. Potassium is an essential nutrient and has an important role is the synthesis of amino acids and proteins (Malik and Srivastava, 1982). Calcium and magnesium play a significant role in photosynthesis, carbohydrate metabolism, nucleic acids and binding agents of cell walls (Scalbert, 1991). Calcium assists in teeth development (Brody, 1994). Magnesium is essential mineral for enzyme activity, like calcium and chloride; magnesium also plays a role in regulating the acid-alkaline balance in the body. Phosphorus is needed for bone growth, kidney function and cell growth. It also plays a role in maintaining the body's acid-alkaline balance (Fallon and Enig, 2001).

6. Amino acid content in mango seed kernel :

In amino acids content of mango seed kernel valine and phenylalanine achieved higher values compared to the FAO/WHO reference (World Health Organization, 1985) followed by threonine, lysine and tyrosine which were somewhat equaled to the reference. On the other hand, arginine and glutamic acids revealed the highest values of all non-essential amino acids in mango seed kernel content. (Kittiphoom, S.2012)

7. Vitamins content in mango seed kernel :

The vitamins content in mango seed are 15.27 (IU) vitamin A; (1.30 mg/100 g) vitamin E; (0.59 mg/100 g) vitamin K; (0.08 mg/100 g) vitamin B1; (0.03 mg/100 g) vitamin B2; (0.19 mg/100 g) vitamin B6; (0.12 mg/100 g) vitamin B12 and (0.56 mg/100 g) vitamin C. These results also showed that mango seed is richer in vitamins. (Kittiphoom, S.2012).

8. APPLICATIONS

8.1 Chakli :

(Poul SS and Dr. Babar KP, 2018),studied the nutritional and functional profiling of mango seed powder and its application in Chakali Mango seed powder is high in protein, fat, and energy. Bulk density, water absorption capacities, and oil absorption capacity were revealed by the functional properties. The mango seed is used to extract starch. Mango seed powder is used in high-value products such as biscuits, cookies, and bread. Chakali is a type of traditional fried snack that can be made with a variety of ingredients. Chakali is a popular product made primarily of gram flour, rice flour, and other grains.

8.2 Biscuit :

I.S. Ashoush and M.G.E. Gadallah studied the effect of Mango Peels Powder (MPP) and Mango Kernels Powder (MKP) at different replacing levels (5, 10, and 15%) on the rheological, proximate, physical, sensory, and antioxidant properties of biscuits was investigated in this study. A farinograph study of MPP and MKP composite flour revealed an increase in water absorption (WA) from 60 to 69.8%. The addition of mango peel and kernel powder increased the crude fiber content of biscuits from 0.22-16.79%. Their phenolic content rose from 0.43

mg/g to 10.28 mg/g. Sensory performance revealed that substituting up to 10% mango peel powder and up to 5% mango kernel powder resulted in biscuits with acceptable mango taste and flavor.

8.3 Chapati and Panjiri:

AMRITPAL KAUR AND JASWINDER KAUR BRAR studied to determine the best way to use mango seed kernels. Two products, Chapati and Panjiri, were prepared with a 10-40% level of mango seed kernel flour and tested for sensory attributes. The incorporation of 30% mango seed kernel flour in Chapati and 40% in Panjiri was organoleptically acceptable. When compared to control samples, the energy, crude fat, and total ash content of supplemented products were significantly higher (p0.01). Calcium and iron content increased significantly (p0.01). Antioxidant activity was found to be significantly increased (p0.01) with the addition of mango seed kernel flour, with a 22% increase in antioxidant activity for Chapati and a 27% increase in antioxidant activity for Panjiri.

Table -1: Proximate content in mango kernel :

Sr. No	Characteristics	References	
		Nzikon et al.,2010	Changso, 2008
1.	Moisture content (%)	45.2	40.5
2.	Crude protein (%)	6.36	1.43
3.	Fats (%)	13.0	4.92
4.	Crude fiber (%)	2.02	3.96
5.	Ash content (%)	3.2	0.83
6.	Total carbohydrate	32.24	48.19

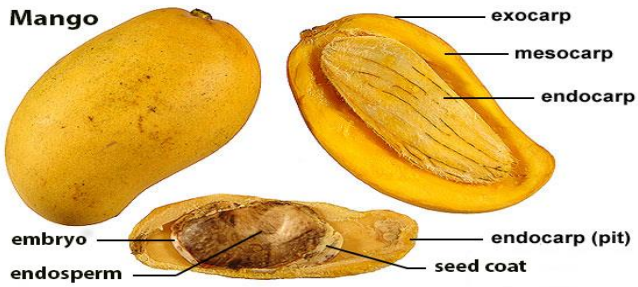

Fig -1: Morphology of mango fruit

9. CONCLUSIONS

Based on the reviews above, it is possible to conclude that Mango seed is a potential source of nutritional food ingredients due to the high quality of its fat and protein, as well as the high content of amino acids and vitamins. It is necessary to conduct research on the nutritional and sensory effects of incorporating mango seed extracts into foods. It is also critical to implement outreach strategies with the business sector in order to maximize this residue's nutritional and functional potential. Mango fruit by-products can be concluded to be potential sources of natural food ingredients. Scientists face a significant challenge in recovering and utilizing valuable compounds from mango byproducts.

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