Minireview Article

Popular Products of Sesame (*Sesamum indicum* L.) Consumed in India and their Quality Concern

ABSTRACT

Sesame is the most commonly consumed oilseed in all parts of India. It is eaten as a whole seed, ground, roasted, powdered, oil, or defatted meal in preparation for traditional and modern ready-to-eat food items. It is used in household recipes, bakery items like biscuits, buns, and bagel bread, preparing weaning foods, ready mixes etc. Sesame seeds available in different varieties are a rich source of macro and micro nutrients. The food products of sesame are available easily in rural and urban markets with a range of variety and forms. They are easily accessible and affordable for every income group. Consumers should be aware of the quality concerns of these sesame products, which are generally sold in open packaging, causing health problems. They are sometimes not prepared hygienically, leading to microbial contamination of food products and causing ill effects. So this review is about the nutritional value of different ready-to-eat homestead and commercial sesame products available in the market and the quality concern, *i.e.*, nutritional and microbiological, regarding these products. Besides the quality attributes, their production under safe, hygienic conditions, packaging, and storage should be ensured to avoid health hazards.

Keywords: Sesame, products, nutritional quality, quality concern

1. INTRODUCTION

India is the second leading producer of sesame (*Sesamum indicum* L.) globally [1, 2]. The crop majorly grows in states including Uttar Pradesh, Rajasthan, Madhya Pradesh, Gujarat, Andhra Pradesh, West Bengal and Telangana. Different varieties of sesame seeds in India include white, brown, and black [3].

Sesame is an excellent source of nutrients, making it a good functional food source. Sesame seeds are the "queen of oilseeds" among oilseeds because they are an excellent source of macro and micronutrients [1, 3, 4, 5, 6]. Sesame is a common ingredient in many food dishes and is widely utilized in the pharmaceutical, nutritional, cosmetic, and other industries [7, 8].

2. NUTRITIONAL QUALITY OF SESAME

Nutritionally sesame is high in energy, protein, calcium, iron, and zinc [3, 4, 9, 10, 11]. Sesame is used in different forms in various food preparations worldwide. In India, many sweet and savory food preparations includes *khaman dhokla, pulao*, snacks like chilli *paneer*, honey chilli potato, *chutneys* and sweet dishes like *gajak, revadi, chikki, tilpatti, laddoos, barfi* etc. are prepared using sesame as a main ingredient or as garnishing. Combining sesame seed meals with either cereals or pulses results in value-added foods

that can help improve daily diets at nutritionally affordable prices. It enhances dietary diversity and helps fight malnutrition [12, 13]. Due to the high quantity of unsaturated fatty acids (such as linoleic acid, oleic acid, palmitoleic acid, stearidonic acid, and traces of linolenic acid) and beneficial fatty acids (such as gamma-tocopherol, sesamin, and sesamol), sesame seeds are used to make oil [14]. Folic acid is abundant in sesame seeds. It is consumed as sprouts and microgreens, and is a source of antioxidants [15, 16]. Due to the presence of lignans like sesamolin and sesamin, sesame is a functional food [6, 17]. Sesame oil is utilized as an antioxidant and an antibacterial agent [6, 18, 19, 20]. The sesame oil cake, a by-product of sesame, is a good source of protein [21] and is used in culinary and confectionery foods [22]. Most crops lack the amino acids valine, tryptophan and methionine and whereas sesame seeds are rich in these nutrients [1, 20] and if used in combination, improve the nutritional quality of the food.

3. QUALITY CONCERN FOR CONSUMERS

Sesame seeds are nutritionally superior and are widely used in different preparations. They are energy dense as sugar or jaggery is added in many preparations of sesame, which provides warmth to the body. Sesame seeds are used in various sweet, savory products and the garnishing or sautéing of food dishes. *Gajak, tilpatti, revadi*, *til laddoos*, biscuits, *barfi* etc are popular and convenient ready-to-eat products of sesame mainly eaten during the winter season in India [23]. Various homestead and commercial food products of sesame are available in the rural and urban markets. On specific festivals, several sesame preparations like *til laddoo* on *Makar Sankranti*, *tilkuta* on *til chauth*, *til rewari* on harvesting festival *Lohri* etc. are consumed, used as an exchange for gifts and ready-to-eat choices in travel.

Sesame seeds are rich in protein, calcium, iron, magnesium and other micronutrients (Table 1) [3, 4, 23, 24, 25] and are an excellent source of wholesome food. These products can cater to every age group significantly growing population, including adolescents and young children. Weaning foods are also prepared by combining sesame seeds to fulfill the nutritional needs economically weaker section [26].

Table1. Nutritional quality of sesame (white) and different food products of sesame available in the market

Sesame product	Macro Nutrients						Micro Nutrients		
	Moisture (g)	***Protein (g)***	***Fat (g)***	***Ash (g)***	***Fibre (g)***	***Carbohydrate (g)***	***Iron (mg)***	***Calcium (mg)***	***Zinc (mg)***
Sesame seed [3]	3.3	21.7	43.05	4.13	16.99	10.83	15.04	1238	7.7
Gajak [23]	3.01	13.65	33.0	3.17	2.09	45.69	6.39	1123.49	
Revadi [23]	3.4	14.75	33.57	2.41	2.13	43.75	6.20	1050.94	
Tilpatti [23]	2.91	13.05	32.92	2.39	1.80	46.89	5.33	997.83	
Biscuits [24]	3.67	11.92	16.72	2.87	4.46	64.03	1.55	82.02	1.65
Barfi [25]	23.67	6.52	21.58	1.93	4.43	44.9		520.50	

Sesame seeds are processed before making any food product. They are prepared mostly with milk products like *khoa* or *mawa* as *ladoos, barfi* etc. or with jaggery or sugar. Sesame seeds are either roasted or ground and are added with sugar or jaggery as the main ingredient. However, it has been reported that the small-scale manufacturers generally do not follow hygienic practices during processing and manufacturing leads to heavy microbial load [23].

During the preparation of *gajak* with jaggery, melted jaggery is generally folded on a wooden pole, mixed with roasted sesame seeds, and beaten on the floor with a wooden hammer for mixing. Similarly, in the preparation of *revadi*, sesame seeds in small and flat drops of sugar or jaggery syrup are spread on the floor and dried. Due to hygroscopic nature of jaggery, it is highly prone to microbial contamination which may cause the products' deterioration [23, 27, 28, 29]. The general condition of hygiene and cleanliness is deplorable at the site of preparation of the products. Most of the manufacturers stored the products in open trays. *Thelewalas* (road-side mobile vendors) also store such products in open trays or glass boxes; small shopkeepers do not pack these products but keep them in covered boxes, while the big shopkeepers and departmental stores packed them in polythene bags. Many vendors sell the products of sesame available in open packaging, which leads to microbial contaminated food and unsafe to consume [23, 30]. Therefore, in order to prevent the development of mycotoxins, storage and processing and packaging of sesame food products must be properly regulated using standard methods which will prevents them from biodeterioration [29, 30, 31, 32].

4. CONCLUSION

Sesame used in various homestead and commercial ready-to-eat food products which are available in the market are energy dense and rich in micronutrients. Since the poor hygienic conditions followed during the preparation of these food products at unorganized and small scale manufacturing levels, the microbial quality becomes a serious concern. They are contaminated due to unhygienic practices during their preparation and storage. Nevertheless, if the microbiological quality is not adequately maintained during the manufacturing process, it can cause great harm to the health of consumers. Looking at the nutritional importance of sesame as a food, correct processing methods in a hygienic unit with proper packaging and storage should be done following standard protocol to avoid health hazards.

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