DIFFERENT SEEDS IN FOOD INDUSTRY: HEALTH BENEFITS AND INDUSTRIAL APPLICATIONS

Savita Bhardwaj*, Bharat Kapoor**, Yendrembam K. Devi1 and Dhriti Kapoor**

1*Department of Botany, School of Bioengineering and Biosciences, Lovely Professional University, Delhi-Jalandhar Highway, Phagwara (Punjab), India.
2**Department of Tourism and Hospitality, Guru Nanak Dev University, Amritsar (Punjab), India.
3Department of Entomology, School of Agriculture, Lovely Professional University, Delhi-Jalandhar Highway, Phagwara (Punjab), India.

# Contributed Equally

Abstract

Good health comes from good diet is a well-recognized fact by consumers. Lipids are crucial constituents of the human diet therefore, have significant benefit to consumers and food industry. Seed oils are one of the important parts of the human diet due to the occurrence of important essential oils, tocopherols and phytosterols. Chia seeds, flaxseeds and sunflower seeds have gained the attention of nutritionists and are emerging plant-derived nutraceuticals because of presence of various constituents i.e. dietary fibre, proteins, vitamins, omega-3 fatty acids, antioxidants, phenolic compounds and indispensable nutrients and recognized as important functional foods, use to make products as seed and oil to supplement foodstuffs with linolenic acid. This review mainly provides an insight into role of different seeds in food industry; their health benefits and industrial applications.

Key words: Health, diet, nutraceutical, functional food.

Introduction

Food security occurs when whole population have appropriate, secure and nutritive diet that fulfills their dietary prerequisite and food desire for vigorous growth, well maintained physical, communal and economic lifespan (Prathyusha et al., 2019; Panghal et al., 2018; Pandey et al., 2019; Iid et al., 2020). Presently, the need of healthy life is elevating the exploration for functional foods and nourishing food stuffs that are associated with good vigor (Ullah et al., 2016; Srivastava et al., 2014; Kumar et al., 2020). Food industry companies have greater requirement of food products that can fulfill the need of consumers for a vigorous life (Pinakin et al., 2018; Sharma et al., 2020). In this context, functional food appears as an important asset that not only decline malnutrition and provide essential nutrients but also enhance consumers physical and mental health and stop nutrition-linked ailments (Menrad, 2001; Nagpal et al., 2012; Chhikara et al., 2019) and these foods also appear as resourceful and promising assets to deliver fitness profits (Hao and Beta, 2012; Rosma et al., 2016).

Salvia hispanica L. frequently acknowledged as chia, is an annual oilseed herbaceous crop, belongs to the family Lamiaceae, indigenous to the Mexico and northern Guatemala (Ixtaina et al., 2008). Chia seeds are recently considered as imperative part of human diets and are progressively consumed all over the globe because of their nutritional composition (Melo et al., 2019) and considered as a beneficial agricultural crop. Chia seeds are used as a dietary supplement and continuous efforts are made by researchers to promote it as functional food due to the occurrence of alpha linolenic acid in it (Gazem and Chandrashekariah, 2016).

Linum usitatissimum normally called as flaxseed, is a prehistoric imperative global annual herbaceous seed crop belonging to the Linaceae family. Flaxseed is consumed by people all around the globe from the early period of the ancient civilizations (Rubilar et al., 2010). Flaxseed is widely used in functional foods (Yasmeen et al., 2018) and taken either as diet moiety or as an additive to make food products (Panaite et al., 2017; Kaur et al., 2019) because of its exceptionally high content nutritional composition i.e. α-linolenic acid (Singh et al., 2012), dietary fiber, proteins, phytoestrogens and due to its

*Author for correspondence: E-mail: dhriti405@gmail.com
beneficial pharmaceutical value (Gutte et al., 2015). *Helianthus annuus* commonly known as sunflower, belongs to the Asteraceae family is a profitable agricultural crop and its seed oil is among the utmost required oils in all around the globe (Kumar and Thakur, 2014: Salas et al., 2015).

**Different seeds used in food industry**

**Chia seeds**

Chia seeds have great impact on people who take it in diet routine and are recognized as super nutritional foods (Sreeremya, 2017). The chia is major oilseed crop which contains high amounts of ω-3 fatty acids, gluten free protein, dietary fibre, vitamins (Vitamin B1, B2, B3, B9, Vitamin C and vitamin A), minerals (calcium, phosphorus, potassium and magnesium), wide range of polyphenolic compounds i.e. chlorogenic acid, protocatechuic acid, gallic and p-coumaric acids, quercetin, caffeic acid, rutin, apigenin, kaempferol, myricetin and antioxidants (Cahill, 2003; Ullah et al., 2016). The proportion of protein, fat, carbohydrate and dietary fibre ranged from 15 to 25%, 30–33%, 41%, 18-30% respectively in chia seeds (Ixtaina et al., 2008).

Chia seed recognition as a brand-new diet by the European legislature caused greater application of it in variety of foods and also have therapeutic properties by producing high amounts of essential oil that is used for the manufacture of ω-3 capsules (Ullah et al., 2016). Chia seeds are consumed as entire, pulverized and also as gel and oil and consumed as alternatives for eggs and fat due to the hydrophilic nature of seeds (Felisberto et al., 2015; Ding et al., 2018; Gallo et al., 2018). 25% level of substitution of oil or eggs in cakes by Chia seed gel has an beneficial appearance on sensory facets of the product for instance color, taste, and texture but at 50–75% level of substitution of oil in bread, adverse alteration was detected in concentration and inclusive superiority of the baked foodstuffs (Borneo et al., 2010). Chia seeds flour also appeared as a moiety to prepare pasta in place of wheat flour and they evaluated that pasta made with a proportion of chia flour had a more nutritive value in comparison to those who prepared with wheat flour alone, attributed to the occurrence of greater levels of protein, nutrients and dietary fibre and also found that pasta with 7.5% level of chia flour displayed admirable nutritional properties and acknowledged as the maximum acceptance index in the matter of flavor (Oliveira et al., 2015).

Gruel prepared from chia seeds also used for manufacture of ice-cream as a substitute of emulsifiers and stabilisers. Gluten-free, ω-3 and fibre rich chips are made from chia flour when taken in various ratios i.e. 5%, 10%, 12% and 15% and found that chips made from 5% of flour had maximum consumer acceptability (Campos et al., 2016). Chips made with 5% of flour showed no deviation in the taste, color, flavor, texture and inclusive fondness of the product in comparison to commercially prepared chips (Coorey et al., 2012). Chia mucilage can also be used to prepare breads and chocolate cakes which can supersede up to half proportion of fat without altering the overall attributes of the product and this chia mucilage is a novel substitute for replacing fat from foodstuffs and useful for maintaining overall nutritional and quality characteristics of food products (Fernandes and Salas-mellado, 2017). Recently, use of chia seeds into milk commodities such as curd and ice-cream has also enhanced (Chavan et al., 2017).

**Flaxseed**

Presently, flax seeds are seeking attention of scientific and medical journals because of presence of several medicinally and biologically important active constituents hence, considered to being termed as quintessential functional food (Koz³owski et al., 2014) and recognized as functional food due to occurrence of three important active constituents i.e. α-linolenic acid, lignans and dietary fibre (Verma et al., 2017). Flaxseed contains high amounts of polyunsaturated omega 3 and 6 fatty acids,
mucilage, polyphenolic compounds, natural waxes, vitamins (A, B, E), minerals, squalene, protein, lignan, oil and soluble fibre (Zhang et al., 2008; Sharma et al., 2019). Processing of linseed to manufacture various industrial products, not only makes it a vital crop for humanity but is also recognized as the bio-economy crop of the recent decade (Kaur et al., 2018).

The increasing demand of flaxseeds as functional food caused enhancement in the consumers requirement for its foodstuffs and it is regarded as functional food and nutraceutical due to flaxseed low ω-6/ω-3 proportion. Recently, they are used in making cakes, multigrain breads, organic products, salad dressings, soups, biscuits, crackers and in ready-to-eat breakfast cereals and drinks (Coskuner and Karababa, 2007; Ayelign and Alemu, 2016) and is also used in dairy products, curd, and bread toppings and also traded as soft-gel capsules as a diet moiety (Dunford et al., 2015). Flaxseed is incorporated as a nourishing moiety in making bakery products and in making some dietary products (Yasmeen et al., 2018). In United States, its flour is practiced industrially to manufacture bread. In Ethiopia, its seeds are generally cooked, pulverized, combined with condiments and H₂O, served with Injera and breads, used for preparing food, edible oil and also taken as porridge and beverage known as chillika (Negash et al., 2012). Flaxseed meal is gluten free and its protein amount along with the gelling or binding characteristics of its soluble fibre is used for making gluten free baked products or thickening agent and also attributed as a moiety to prepare baked foodstuffs instead of eggs (Eyres and Eyres, 2014).

**Sunflower seed**

*Helianthus annuus* L. is a useful oilseed crop cultivated all around the globe (Kandakov et al., 2012) and have various medicinal properties making it a nutritious food and medicine globally. Sunflower seeds contain high amounts of mineral nutrients, antioxidants, vitamins, unsaturated fats, proteins, dietary fibres, selenium, folate, and various phytochemicals. Sunflower seed oil has moderate taste, light color, and high oxidative firmness hence, recognized as a quality oil which is used to make several foodstuff products and these products have high nutritious value due to the seed processing technology. There is a large amount of crude protein and ether extract in sunflower cake which is left after its oil extraction (San and Villamide, 2000). When sunflower cake (10 and 20%) is used for making chapatti’s and biscuits, there is a noteworthy enhancement in the amount of protein, fat and fiber values (Srilatha and Krishnakumari, 2003). Incorporation of sunflower seeds to different amounts in bread enhanced the flavor, taste and the overall nutrient profile of the bread and can substitute wheat flour up to 16% (Skrbic and Filipcev, 2008). Oil of sunflower seeds is sold for retailing and domestic eating, for instance, in industry, it is extensively used for frying (snack foods), encapsulation of volatile oils and flavor compounds, formulation of emulsions, sauces and margarines and also an admirable flavor carrier (Dunford, 2016).

**Conclusion**

Functional foods are one of the utmost, promising and vigorously evolving aspect of food industry (Patel, 2013). Consumers demand for oilseeds (chia, flaxseed and sunflower seed) as food products such as breads, cakes, cookies, cereal bars and many more, for healthy benefits has elevated due to various food industry applications. The nutritional aspects of these seeds can be improved for increasing its consumption in daily diet to both international commodities and rural population. Due to the presence of several beneficial nutrients in seeds of chia, flaxseed and sunflower, their cultivation should be improved in agriculture and worldwide. Growing these oilseed commodities into staples are proposed to retrieve population from succumbing to starvation.

**References**


Coorey, R., A. Grant and V. Jayasena (2012). Effects of chia flour incorporation on the nutritive quality and consumer acceptance of chips. *J. Food Res.,* 1(4):.

1067-1073.


