INTRODUCTION

Sprouts are shoots of germinated seeds, which are excellent sources of proteins, vitamins, and minerals [1]. They can be used the clean food in salads, soups, stews, and casseroles in the past few decades from Far Eastern countries to parts of the Western world [2]. The common types of seeds used for sprouting are alfalfa, arugula, broccoli, cabbage, lentil, mung bean, radish, rice, rye, soybean, sunflower, and wheat seeds [3]. As the sprouts are consumed at the beginning of the growing phase, their nutrient concentration remains very high [4]. In naturopathy, sprouts have the medicinal benefits; they can be promoting health aspects and safety evaluation [5]. The U.S. Food and Drug Administration has published several recommendations to consumers regarding consumption of sprouts [6]. The sunflower *Helianthus annuus* is the core of medicinal values which is used as food and medicine worldwide [7].

NOMENCLATURE

*H. annuus* is commonly found to be grown in Africa, Australia, and Asia [10]. The vernacular name of *H. annuus* is also known as (English) sunflower, (Africaks) sonneblom, (Albanian) lule dielli, (Arabic) abbad esh shams, azriyun (Brazil) girassol, (Catalan) corona de rei, heliantem, (Chinese) hua, xiang mu hua, (Croatian) girasola, (Croation) džirasol, jednogodišnji sunkorekt, krumpir morski, (Czech) slunečnice roční, (Danish) almindelig solsikke, (Dutch) eikelse zonnebloem, (Estonian) harilik pävalla, (Finnish) aurinkokukka, (French) grand soleil, soleil, tournesol, (German) echte sonnenblume, (Greek) kalamidaki, (Hindi) murah kiri, (Hungarian) napraforgó, (India) belaphal, surjunkh, (Indonesia) bunga matahari, (Italian) corona del sole, girasole, (Japanese) himawari, koujitsuki, (Korean) hae ba ra gi, (Latvian) vasaras saulgrieze, (Lithuanian) tikroji saulėgrąža, (Malaysia) bunga matahari, (Norwegian) solsikke, solvendel, (Persian) aftabi, azriyun, (Philippines) mirasol, (Polish) słonecznik roczny, słonecznik zwyczajny, (Portuguese) gigante, girassol, (Russian) podsolnechnik, (Samoan) mata o le k, (Spanish) alizzet, copa de júpiter, (Swahili) alizeti, (Swedish) solros, (Thai) tanh dtà-wan, (Turkish) ay çik, gün çikç, (Vietnamese) hoa mặt trời [11].

FACTORS INDUCED SPROUTING

Xing et al. [12] study the effects of light spectral energy distribution of the light emitting diode on the growth and quality of *H. annuus* sprouts. Fluorescent light was used as the control. The results showed that on the condition of light intensity 23 μmol m⁻²s⁻¹, photoperiod 14 hrs/day, and temperature 25 ± 2°C, red light could significantly increase the cotyledon area, the hypocotyl diameter, the starch content and the chlorophyll a to carotenoid ratio of sunflower sprouts. Besides, compared with other treatments, red light could improve the content of chlorophyll a, total chlorophyll, and carotenoid remarkably. Blue light obviously increased the accumulated amount of dry weight, soluble protein, and the activity of antioxidant enzymes. Yellow light could
Fig. 1: How to grow the Helianthus annuus sprout (a) seed measurements; (b) soaking time; (c) damp towel; (d) germination; (e) sprouting tray; (f) before sun exposure; (g) after sun exposure; (h) grow-up sprout; (i) two-leaf stage inhibit the elongation of roots and promote the accumulation of free amino acid. Under the light of ultraviolet B, hypocotyl length, and the activity of antioxidant enzymes were improved significantly. Overall, red light was more beneficial for the culture of sunflower sprouts.

PHYOCHEMICAL SUBSTANCES

The sprout of *H. annuus* consists of the important constituents of pharmacological activities. Phenolic compounds: The phenolic compounds are caffeic acid, chlorogenic acid, caffeylquinic acid, glucoside, glucopyranoside, cyanine, gallic acid, protocatechuic, coumaric, ferulic acid, and sinapic acids [13-15]. Flavonoids: Various flavonoids isolated from this plant are heliannone, quercetin, kaempferol, luteolin, apigenin [16]. Pigments: The pigments in sunflower are chlorophyll, carotene, and xanthophyll [17]. Fatty acids: The fatty acids composition in cotyledons are linoleic, palmitic, stearic acid, and oleic acids [18-20]. Vitamins: It contains a high concentration of vitamin A, B, C, and E and also niacin. Minerals: The minerals isolated from this plant are calcium, iron, magnesium, phosphorus, potassium, selenium, and zinc [21].

TRADITIONAL USES

In a review, Saini and Sharma [8] described the traditional uses of *H. annuus* like food and source of different diseases treatment. It is used for antiaging [17], antidiabetic [22-24], antimicrobial activity [25,26], and antioxidant [19,27]. It also uses the other parts of this plant in the prevention of hepatic disease [28], nephrolithiasis [29], and heart disease [30]. Besides of the medicinal uses, the environmental protection by biodegradation [31] and phytoremediation was studied by this plant [32,33] and also in biodiesel production plant [34,35].

ANTIOXIDANT ACTIVITY

The process of germination of edible seeds to produce sprouts increases their nutritive value [4]. Several studies have reported higher levels of nutrients in sprouts compared to the un-germinated seeds [15,36-38]. Moreover, the sprouts are valuable dietary components as the sources of antioxidative phytochemicals [19,39], however, information that of sunflower sprout is scarce. A comprehensive search of major databases included Sciedirect, Springerlink, PubMed, and Google Scholar was conducted during the period 2005-2015 to retrieve available information about the antioxidant property of sunflower, *H. annuus* sprout. Different combinations of keywords as well as synonyms for keywords were used during the searches. Information on phytochemical activities was also retrieved and may be of interest; however, the primary focus of this review is not on those activities.

In 2009, Pasko et al. [39] reported higher total phenolic and flavonoid content in sprouts compared to seeds, suggesting that synthesis of antioxidants during germination may occur. It is thought that seeds mainly act as a reservoir for the development of the sprouts [40]. Next year, Casals and Zevallos [37] evaluated the 13 edible seeds for the level of phenolic compounds and the antioxidant activity at different germination states (dormant, imbibed, and 7d sprouts). Selected seeds included alfalfa, broccoli, fava, fenugreek, kale, lentil, mung bean, mustard, onion, radish, soybean, sunflower, and wheat. The authors reported the phenolic and total antioxidant capacity showed the general trend distribution of 7d sprouts > dormant seeds > imbibed seeds. In addition, 7d sunflower sprouts had the higher total antioxidant capacity (40,202 µg Trolox g⁻¹) compared to other seeds (1456-25,991 µg Trolox g⁻¹). Moreover, in 2012, Baczek-Kwinta and Sala [19] reported the antioxidant activities of sunflower sprout were 1.2 chlorogenic acid equivalent g⁻¹ of free radical scavenging activity, 0.3 chlorogenic acid equivalent g⁻¹ of ferric reducing antioxidant power, 2.49 mg g⁻¹ of chlorophyll, 4.75 g⁻¹ of flavonoid, and 130 µg g⁻¹ of anthocyanin. In recent year, 2014, Pajak et al. [15] reported total phenolic content in the seeds and sprouts of sunflower were 4 and 9 mg g⁻¹ gallic acid equivalent. They also reported the flavonoids content in the seeds and sprouts of sunflower were 25 and 45 mg g⁻¹ quercetin equivalent. *H. annuus* contains several kinds of the phenolic profile.

CONCLUSION

Why you need to add the sprouts in your daily meal because they are a lot of benefits. They contain fewer calories but are excellent sources of nutrients, easily grow so you can do by yourself without any soil or sunlight. Recent researches found that sprouts have essential therapeutic benefits and have the ability to protect consumers from diseases. *H. annuus* is the source of various chemical constituents which are used for the treatment of many fatal or life-threatening diseases. Sunflower sprouts are a quintessental seed sprouting variety because of their large size, tasty, chlorophyll-rich leaves and succulent white stems. Sunflower sprouts are not only delicious but they are also quite nutritious and are rich in a number of vitamins and minerals as well as amino acid, fatty acid and fiber.

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REFERENCES


