ABSTRACT

The effects of some processing technique on the proximate and antinutritional factors in Helianthus annus seeds were evaluated. The crude protein, ash content, fiber, folate and carbohydrate were estimated on raw, toasted and cooked samples of Helianthus annus milled seed. The antinutritional factors such as tannin, phytate and saponins were also determined in the raw and processed samples of the seed. The protein content of the raw and processed samples showed a significant increase (p<0.05). The processing treatments namely toasting at 180º C for 5, 10 and 15 minutes and boiling at 100ºC for 15, 25 and 35 minutes resulted in significant decrease (p<0.05) in fat content in both the raw and processed samples. A significant reduction (p<0.05) trend was observed in the level of antinutrients in various samples with processing time. The study revealed that there was improvement in the nutritional quality of the processed seed with the reduction in the antinutritional factors.

KEYWORDS: Helianthus annus, Proximate Composition, Antinutritional Factors, Boiled, Toasted

INTRODUCTION

Oilseeds such as Sunflower, Safflower, Soyabean, Rapeseed and Groundnut are annual plants. They are the largest source of vegetable oils even though most oil bearing tree fruits provide the highest oil yields like Olive, Coconut and Palm trees. (O’Brein et al., 2000, Gunstone, 2000). Increase in a small number of crops, including Sunflower, Soyabean and Rapeseed, account for the increase in world production oil. However, according to Food and Agriculture Organization (FAO), more traditional oil crops like groundnut and sesame seeds continue to be important in the food supply and food security of many countries (McKeith, 2005).

In agricultural economy of India, oilseeds are important next only to food grains in terms of area, production and value. The diverse agro-ecological conditions in the country are favourable for growing all the nine annual oilseeds, which include seven edible oilseeds, viz, groundnut, rapeseed, mustard, soybean, sunflower, sesame, safflower and Niger, and two non-edible oilseeds, viz castor and linseed. In the global context, India is one of the major producers of oilseeds which are the second major agricultural crop in terms of tonnage and value. Oilseeds are also considered suitable as alternative dietary protein sources due to its high protein content, high digestibility and relatively well balanced amino acid profile.

Sunflower (Helianthus annus L.) is an important oilseed crop in India popularly known as “Surajmukhi”. It is an important oilseed crop of the world and it ranks third in the production next to Groundnut and Soyabean. The world production of Sunflower seeds increased from 26 to 31 million metric tonnes between 2004 and 2006 (FAO, 2007). In India it was used mainly as ornamental crop but in recent past it became an important source of edible and nutritious oil. It is a major source of vegetable oil in the world and is used for a variety of cooking purposes. It contains about 48-53 per cent edible oil. The sunflower oil is considered premium to other vegetable oil as it is light yellow in colour, high in linoleic acid and absence of linolenic acid, possess good flavour and high smoke point. Sunflower oil is rich source of linoleic acid
which is good for heart patients. It is also a source of lecithin, tocopherols and furfural. It helps in washing out cholesterol deposition in the coronary arteries of the heart.

Oilseeds are used for different purposes: food (raw, roasted or boiled, cooking oil), animal feed (pressings, seeds, green material and straw) and industrial raw material and for medicinal purposes. They are a reasonable source of dietary mineral especially, potassium, calcium, phosphorus and magnesium their oil is an excellent source of mono and polyunsaturated fatty acids. They contain about 80% oleic and linoleic acid. The presence of anti-nutrients in plant protein sources for livestock feeding is a major constraint that reduces their full utilization. Employing appropriate and effective processing techniques could help to reduce the adverse effects of these anti-nutritive constituents in plant protein sources and thereby improve their nutritive value (Akande et al., 2010).

The present investigation was therefore designed to evaluate the effect of some processing techniques on the nutritional composition and the levels of antinutritional factors in raw and processed *Helianthus annus* seed samples.

**MATERIALS AND METHODS**

*Helianthus* seeds were purchased from the Local market of Muzzafarnagar, UttarPradesh, India.

**Preparation of Raw *Helianthus* Seed Sample**

*Helianthus* seeds were firstly sieved to remove unwanted matter such as sand, dirt etc and then milled using a local grinder to give the smooth seed samples.

**Preparation of Toasted Seed Samples**

*Helianthus* seeds were toasted in a dry pan at a temperature of 180º C. The seed meals were continuously stirred until a characteristic brownish coloured seeds were obtained for three different times i.e. 5 min, 10 min and 15 min. The samples were then milled to obtain three toasted seed samples.

**Preparation of Boiled *Helianthus* Seed Samples**

*Helianthus* seeds were washed, put in a cooking pot and boiled for three different time periods namely 15, 25 and 35 minutes. The seed were then dried, milled and sieved to give smooth boiled samples.

**Determination of Proximate Composition:** The crude protein, fat, crude fibre, ash were determined using the procedure outlined by AOAC (1990) and carbohydrate by difference.

**Determination of Antinutrients:** Tannin content was determined according to Schanderl(1970). The level of phytate content of *Helianthus* seeds samples was determined using the method of Wheeler and Ferrel(1971). The saponin content of the samples was determined by double solvent extraction gravimetric method Harborne(1973).

**Statistics Analysis:** All data were subjected to analysis of variance (Steel and Torrie, 1960). Significant Differences between the treatment means were determined at 5% confidence level using the Least Significant Difference (LSD) test.

**RESULTS AND DISCUSSIONS**

Figure 1 shows the proximate composition of raw and processed *Helianthus annus* seed. The protein content was estimated to be in the range of 20.08-24.4 percent. There was observed a significant increase (p<0.05) in protein content with the processing treatments and these were in accordance with the results reported for other legumes (Elegbede, 1998). The total lipid content in raw and processed was 31.2- 55.0 g/100g. The processing treatments resulted in significant reduction (p<0.05) in lipid content. This could be as a result of leaching during processing. Processing techniques such as
boiling has been reported to bring about denaturation of lipid fraction in processed samples (Elgbede, 1998). Olumu (1995) reported crude fat of 26.01% for whole sunflower seeds which was slightly lower than the range reported in the present study, the difference in values may be due to the type of processing methods used before the ether extraction. However, total lipid and crude protein contents was found to be higher in *Helianthus annus* seed, which is an indication that it contains more Nitrogenous substances than the other variety and also it is the better source of lipid when compared.

The high level of oils in the investigated seeds quality them as good sources of oil for both industrial and culinary applications (Gupta and Shrivastava, 2004). There was significant increase (p<0.05) in crude fibre content of Sb3 as compared to raw samples. These results are in good agreement with other varieties of oilseeds (Salunke et al., 1992; Cancalon, 1971; Nagraj, 2001; Lah and Chaeryn, 1980; Atasie et al., 2009). The total Carbohydrate content of raw seeds was found to be lower as compared to processed samples. The level of some antinutrients in the raw and processed *Helianthus annus* seed samples are shown in Fig. 2. There were significant differences (p<0.05) in antinutrient composition between raw and processed seeds, a reduction trend was observed in the level of antinutrients in various samples with processing time.

The tannin content of raw sunflower seeds was 6.1% which was significantly higher (p<0.05) than the processed samples. The amount of tannin investigated in boiled (25 minutes) sample was significantly lower when compared with other treated samples. This suggests that cooking could reduce the level of tannin in the *Helianthus annus* seed sample. Tannins have the capability of decreasing the digestibility and palatability of proteins because they form insoluble complexes with them (Osagie et al., 1996). A significant reduction (p<0.05) was observed in phytic acid composition with processing time when compared with raw samples (2.1%). The lowest amount of phytic acid was found in boiled samples (1.0%). Studies by Martinez (1977) revealed that oilseeds, which contain little or no endosperm the phytate are distributed through the kernel and are found within subcellular inclusions, aleurone grains or protein bodies.

Saponins are heterogeneous group of naturally occurring foam producing triterpenes or steroidal glycosides that occur in a wide range of plants, including pulses and oilseeds such as kidney beans, chickpea, soybean, groundnut and sunflower (Leiner, 1980; Price et al, 1980; Jenkins and Atwal, 1994). A significant reduction trend was observed in the level of saponins in the samples with processing treatments. Toasting for 10 minutes significantly reduces (p<0.05) the amount of saponins as compared to raw sample. This may be due to heat hydrolysis.

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**Figure 1:** The Percentage Composition of Raw and Processed *Helianthus annus* Seed Samples. Determination Was Done on Dry Matter Basis. Values Are Means of 3 Replicates Pertreatment (±SD). Raw-Raw *Helianthus annus* Seed Sample, St1- Sunflower Toasted (5minutes), St2-Sunflower Toasted (10minutes), St3-Sunflower Toasted (15 minutes), Sb1-Sunflower Boiled (15minutes), Sb2-Sunflower Boiled (25minutes), Sb3-Sunflower Boiled (35 minutes)
Figure 2: Levels of Some Antinutritional Factors in Raw and Processed *Helianthus annuus* Seed Samples. Values are Means of 3 Replicates per Treatment (±SD). Raw- Raw *Helianthus annuus* Seed Sample, St1- Sunflower Toasted (5 minutes), St2-Sunflower Toasted (10 minutes), St3-Sunflower Toasted (15 minutes), Sb1-Sunflower Boiled (15 minutes), Sb2-Sunflower Boiled (25 minutes), Sb3-Sunflower Boiled (35 minutes)

CONCLUSIONS

The various processing treatments undertaken during the present investigation impacted some chemical changes in the nutritional composition of the selected seed and resulted in a decrease in antinutrients. The results of the present nutritional study suggest that these seeds could be more widely utilized as dietary protein sources. Their potential for nutritional exploitation is further enhanced by the fact that these seeds would not require prolonged and expensive heat treatment prior to use. The data presented in the study also suggests that the seeds have low levels of antinutritional factors. However, more research is required in processing to improve removal of oxalic acid.

REFERENCES

