International Journal of Food Science and Nutrition
ISSN: 2455-4898
Impact Factor: RJIF 5.14
www.foodsciencejournal.com
Volume 3; Issue 1; January 2018; Page No. 34-36

A study on extraction of oil from *Pumpkin seed* using sun drying and hot air oven drying

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Abstract
Pumpkin seed oil is obtained from the seeds of Cucurbita pepo. It is prepared by pressing roasted hulled pumpkin seeds. Pumpkin seeds are found everywhere today, but are still growing in greatest abundance, not far from the area where they are believed to have originated: Mexico. Other large producers include India, the United States and China. Though largely still in the early stages of exploration, there are claims of health benefits by pumpkin seeds for various conditions. In this work, the oil is extracted from pumpkin seed using two processes known as sun drying and hot air oven drying. The yellow pumpkin seeds are selected the main ingredients. The soxhlet apparatus is used in this work to extract fat from the seeds. The obtained samples and the physiochemical properties of the extracted oil are observed.

Keywords: pumpkin seed, cucurbita pepo, sun drying, hot air oven drying

1. Introduction

Pumpkin is one of the nature's most perfect foods. It is a gourd-like squash of the genus *Cucurbita* and the Family Cucurbitaceae. Pumpkins are usually orange or yellow, some fruits are dark green, pale green, orange-yellow, white, red and gray. Pumpkins generally weigh from 4–8 kg with the largest capable of reaching a weight of over 34 kg (Christy Harp's, 2009). A Pumpkin seeds, also known as Pepita, are small, flat and green in color. Pepita means edible seeds. Pumpkin seeds are covered by a white husk. Pumpkin seeds are subtly sweet and nutty with a malleable, chewy texture. Halloween pumpkin is one of the most nutritious and flavorful seeds around. While pumpkin seeds are available year round, they are the freshest in the fall when pumpkins are in season (jack-o-lanterns, 2007). They are a natural source of beneficial constituents such as carbohydrates, amino acids, unsaturated fatty acids and Vitamins like B, C, D, E, and K. They also contain minerals such as calcium, potassium, and phosphorous. It has many health benefits, it lower cholesterol level in blood. One gram of pumpkin seed protein contains as much tryptophan as a full glass of milk. Pumpkin seeds are a good source of magnesium, manganese, phosphorus, and phytosterols. Pumpkin seeds are a great snack food and make for a very popular ingredient in many countries such as Greece, Turkey, Spain, Italy and Mexico (Jason earls, 1998).

Pumpkin, a type of squash, is native to the Americas. Native Americans relished the seeds for their flavor and properties of healing. It also used to treat prostate and bladder problems. It helps to treat depression and learning disabilities. It was used to treat kidney problems and to eliminate parasites from the intestines (M.Gossell-Williams, 2002). Pumpkin seed contains antioxidants like Beta-carotene. These Antioxidant helps in removing the free radicals from the body, hence it reduces the risk of cancer and other diseases. Beta-carotene converts into vitamin-A which strengthens our immune system. This seed helps preventing kidney stones and also help in combating depression by promoting brain health and function. Pumpkin seed helps to keep young and healthy. Pumpkin seeds also tried to arthritis. Pumpkin seeds do not increase the level of damaged fats (lipid peroxides) in the linings of the joints. The viscous oil is light to very dark green to dark red in colour depending on the thickness of the observed sample. The oil appears green in a thin layer and red in thick layers. When used for cooking or as a salad dressing, pumpkin seed oil is generally mixed with other oils because of its robust flavor. Pumpkin seed oil contains essential fatty acids that help maintain healthy blood vessels, nerves and tissues. It also contains Phytosterols. It is very similar to cholesterol. It reduces cholesterol in blood. It enhances the immune response and decrease risk of certain cancers (Darnell *et al*., 2003). Pumpkin seed oil has been found useful in the treatment of benign prostatic hyperplasia. Pumpkin seed oil is most commonly used to treat irritable bowel syndrome. It has also found to prevent atherosclerosis and regulate cholesterol levels. In German folk medicine, it has been a remedy for parasitic infestations of the intestinal tract such as tapeworm. It is composed of unsaturated fatty acids like myristic, palmitic, Stearic, oleic, Linoleic and s. Linoleic acid.

Pumpkin seed oil is a rich source of antioxidants and polyunsaturated fatty acids. This oil is used for preparation of dessert, ice cream, brittle and soup. It gives a nutty taste to that product (Steve Helmer, 2001). Pumpkin seed oil has moderate amount of saturated fat and good amounts of mono and polyunsaturated fats. This oil has well for prostate enlargement. Pumpkin seed oil is made by pressing roasted, hulled pumpkin seeds and the modern way of processing vegetable oil is by chemical extraction, using solvent extracts, which produces higher yields and is quicker and less expensive. The most common solvent is petroleum-derived hexane. Now- a-days Pumpkin seed oil gains wide acceptance

not only as edible oil, but as a nutraceutical, too. It contains fatty acids that help to maintain healthy blood vessels, nerves and tissues.

Pumpkin is also very well grown in kitchen gardens. It is used to prepare Halwa, jam and so on. But pumpkin seed usage is very low among the people. With the above background, the investigator was motivated to extract oil from pumpkin seed. In section 2, the oil extraction method using sun drying process is explained along with the results.

2. Materials and methods

2.1 Selection of Ingredients

The yellow pumpkin seed was the main ingredients selected for the study. The seed sample was available throughout virudhunagar district. For this study, the sample was collected from Virudhunagar market.

Table 1: Nutritive value of pumpkin seed (per 100gm) (Source: USDA National Nutrient database)

Principle	Nutrient Value
Moisture	5g
Ash	4.9g
Energy	559 Kcal
Total Fat	49.05 g
Protein	30.23 g
Dietary Fiber	6 g
Carotene-ß	9 mcg
Phosphorus	1233 mg
Iron	8.82 mg
Calcium	46 mg

Hot air oven is used for drying and preheating. It is also used for sterilization of dishes, glass wares, utensils and other materials. Muffle furnace is used for ashing, organic and inorganic samples, gravimetric analysis and ignition test. For this study, it was used to produce ash for analysis**.** Hot plate is used for heating the material during analysis. Digital spectrophotometer is used to measure the optical density transmission and absorption rate for the determination of iron, phosphorous and carbohydrate content of the sample. Weighing balance is employed to measure the sample accurately. Weighing balance is an instrument to weigh the certain chemicals needed for the preparation of reagents. It can be weighed by means of grams and milligrams. Soxhlet apparatus is used to extract the oil from seeds and find out the fat content.

Solvent extraction is done in a soxhlet apparatus to extract the oil from its seeds. This soxhlet apparatus contains a glass extractor at the bottom, which is fixed in between a circular bottom flask and a bulb condenser at the top. A bed of seeds is placed in thimble the glass thimble. The round-bottom distillation flask has an extracting solvent and it is heated with the help of an electrothermal heating mantle at a 450°C maximum temperature, 1 liter max capacity and power 300W. As the solvent vapor reaches the condenser, it condenses and stores inside the extractor. Now, the solvent reaches the seeds and oil is leached out of the seeds. When the condensate goes down through the bed of seeds, mass transfer of oil from the seeds to solvent happens. However, a large amount of mass transfer happens when the stored solvent goes up purely due to the hydrostatic pressure head. The seed-solvent contact time is the two major factor for the yield of the oil production. The chemicals used in this process are analytical reagent (AR) or laboratory reagent (LR) grade chemicals. Distilled water and double distilled water were used for analysis.

2.2 Methods

Pumpkin seed oil was extracted from pumpkin seed using the following steps which are given below.

2.2.1 Drying

Seeds which are dry will retain their viability for longer periods of storage in gene banks. It is recommended that, in general, seeds should be dried to between 3-7% moisture content for long-term storage, except in certain cases where it has been shown that low moisture content causes problems e.g. pumpkin seed should be dried to about 8% moisture content. Drying has an independent effect of temperature on viability during storage and adequate drying could prolong viability for reasonably long periods without cold storage.

i) Sun drying

In the absence of forced air drying facilities, the moisture content of seeds has to be reduced in the field before harvest, and later by sun drying on the threshing floor. The system involves harvesting of crops when they are fully dried in the field, leaving the harvested produce in the field for a couple of days to sun dry and later spreading the threshed and winnowed produce in thin layers on threshing floors to sun dry. The main advantage of sun drying is that it requires no additional expenditure, or special requirement. The disadvantages are delayed harvest, risks of weather damage and increased likelihood of mechanical admixtures.

If sun drying is to be done, the following precautions should be taken to ensure seed quality:

1. Do not spread the produce on wet, dirty and Kacha threshing floors.
2. Only one crop variety, and produce from one plot, should be handled on a threshing floor, in order to maintain lot identity and to avoid mechanical admixtures

ii) Hot air oven drying

In this system air (natural or heated) is forced into seeds. The air passing through damp seeds picks up water. The evaporation cools the air and the seed. The heat necessary for evaporating the water comes from the temperature drop of the air. This is the most fundamental principle of forced air seed drying.

2.2.2 Extraction

Solvent extraction as employed in the United States is the most efficient means of deriving oil from the seeds. Generally, 9 – 12% more oil with fewer impurities can be extracted from the seeds by solvent extraction than by mechanical pressing. Further, a minimum of heat is involved in solvent extraction, so the oil produced is of better quality. This process is energy conserving as compared with mechanical extraction (Reichman, M.E, *et al*. 1993). Hexane is the most widely used solvent. The oil fraction of the seeds is soluble in hexane during extraction and hexane is distilled off and reused.

Because of its high volatility little or no hexane residue remains in the finished oil after processing (Harry Lawson, 1997). The yield of oil extraction is given as a percentage of the ratio of weight of oil extracted to the weight of pumpkin seeds used.

$$\text{Yield of oil extraction} = \frac{(\text{Weight of oil extracted})}{(\text{Weight of pumpkin seeds used})} \times 100\% \quad (1)$$

3. Results

In the first step, seeds were cleaned, to remove the dirt and stones In the second step seeds were dried under the sun and hot air oven. In the third step pumpkin seeds were powdered. The theory of diffusion has been applied to extract oil. Hexane is the solvent used to extract oil. Crude fat is estimated using Soxhlet apparatus. The fat is extracted with petroleum ether from the dried sample. The solvent is removed by evaporation and residue of fat is weighed. A 5g of sample is taken in an extraction thimble. The round bottom flask is washed and dried in oven. Then it is cooled in a dessicator and then the flask is weighted. About 100ml of petroleum ether is added to the flask and it is connected with reflex condenser through extractor. The heater is turned on for 5-6hrs to extract the sample under reflex. After takig out the round bottom flask, petroleum ether is evaporated. Then 2ml of acetone is added and air is blown to remove the last traces of solvent. Then the flask with fat residue is again dried in an air oven at 100^0 C for 5 minutes and it is reweighted after cooling the flask in a dessicator. Table 2 shows the physiochemical properties of the pumpkin seed oil obtained from two different processes and the obtained oil samples are depicted in figure 1.

Table 2: Physiochemical properties of pumpkin seed oil

Properties	Sample A*	Sample B*
Colour	Reddish green	Reddish green
Texture	Liquid	Liquid
Specific gravity at 20˚c	0.9261	0.9270
Refractive index	1.4672	1.4691
Lipid content	49.5	43.7
Saponification value	155.5	147.6
Acid value	2.25	2.40

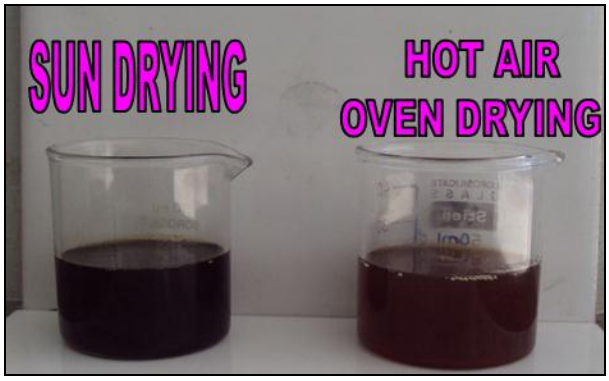

Fig 1: Samples of pumpkin seed oil obtained from the sun drying and hot air drying

4. Conclusion

The oil extracted from pumpkin seeds has physical and chemical properties as other vegetable oils have.In this paper, using sun drying and hot air oven drying process, the pumpkin seeds are dried for extracting oil from them. Then the properties of the oil extracted using these two methods are observed. In the future works, the nutritional compound analysis and food preparation using pumpkin seed oil for adding flavor and taste will be described. Moreover this oil can treat many diseases and hence it can be used in preparing medicines.

5. References

1. Bruneton J. Pharmacognosy: Phytochemistry, Medicinal Plants Intercept/Lavoisier, Paris, 2000.
2. Choo YM, Goh SH, Ong ASH, Khor HT. Transesterification of fats and oils, British Patent Application No, 1986, 8602645.
3. Cocks LV, Van Rede C. Laboratory Handbook for Oil and Fat Analyst, Academic Press, London, 1966.
4. Egbekun MK, Nda-Suleiman EO, Akinyeye O. Utilization of fluted pumpkin fruit Telfairia occidentalis in marmalade manufacturing. Plant Foods Hum. Nutr. Processing Effects on some Antinutritional Factors, 1998; 52:171-6.
5. Giami SY, Barber LI. Utilization of protein concentrates from ungerminated and germinated fluted pumpkin Telfairia occidentalis Hook seeds, 2004.
6. Jaber R. Respiratory and allergic diseases: from upper respiratory tract infections to asthma. Prim Care. Leung A, Foster S. Encyclopedia of natural ingredients used in foods 2nd ed. New York: Wiley.1996-2002; 29(2):231-261.
7. Morrison WH, Hamilton RJ, Kalu C. Sunflowerseed Oil. In Developments in Oils and Fats, R.J. Hamilton, ed Blackie Academic and Professional, Glasgow, 1995, 132-152.