

Extraction Of Oil from Watermelon Seed and Utilization of Its Oil and Flour in Bakery Products

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ABSTRACT: A large number of herb materials contain essential oil with extensive bioactivities. Also many of fruits and vegetables are also contained oils which are very beneficial for human health, and into the fruits the seeds which are also beneficial for health but we can not consumed it directly.

Acknowledging the importance of fruit seed and its medicinal value, Extraction of oil from fruit seed had been done using Solvent Extraction Method. And its utilization in bakery products. In this research Solvent Extraction used to extract oil from different fruit seed like watermelon seed, Papaya seed, Tamarind seed, etc. There are a variety of methods for obtaining oils from seeds. Solvent Extraction Method was found to be one of the promising techniques for the Extraction of oils from fruits seeds, by which we will preserve the original qualities of the fruit seed. The Solvent Extraction was conducted in Soxhlet Apparatus Analysis of fruit seeds oil was done using Gas Chromatography- Mass Spectrometer Apparatus, which gives evaluates fruit seed oil qualitatively and quantitatively. As we know we cannot eat the any fruit seed directly for Human Consumption because of this we are also using the watermelon seed flour in bakery products. Watermelon seed flour is using near about 90% with reducing amount of all purpose flour.

KEYWORDS: Solvent extraction, essential oil, watermelon seed, Soxhlet Apparatus

INTRODUCTION:

Watermelon (*Citrullis Vulgaris*) refer to both fruit and plant of a vine like (Climber and Trailer) herb originally from Southern Africa and one of the most common type s of melon are a member of the Cucurbit family which also includes Rock-melon, Honeydew melon, cucumbers, pumpkins, squash, zucchini and other gourds .Common in fruit platters or as are freshing dessert at a Picnic, watermelons are available in wide range of size and shapes. The watermelon fruit, loosely consider a type of melon (although not in a genus curcumins), has a smooth exterior rind (Green, Yellow, and sometimes White) and a juicy, sweet, usually Red but sometimes Orange, Yellow or pink interior Flesh .Dark Red Fleshed (Champagne) melons and small mini melons also find a ready market .Watermelon is a flowering plant that is vine-like and whose fruits are not fruits nor vegetables but berries (so-called "pepos") which are also called watermelons. Berries have an interior which is sweet, juicy and full of water (hence the name) and exterior in a form of smooth hard rind which is green with dark green stripes or yellow spots. Interior can be of different colors (red, pink, orange, yellow, or white) and it contains many seeds (although there are seedless variants). Watermelon is grown annually and can be up to 3 meters long. The first watermelons appeared in South Africa some 5,000 years ago, and we still can find many wild variants there, from sweet, too bland and bitter. They spread from there and by the 2000th year BC they were cultivated and became an everyday food in ancient Egypt. One of the earliest proofs of that are the hieroglyphs on the buildings from that time that tell stories about the harvesting of watermelons. Remains of watermelons were also found in tombs of the kings where they were left as food for the deceased in the afterlife. Its popularity in the hot, desert regions can be attributed to the high amount of water that watermelon contains.

Even Bible mentions watermelon as the food of ancient Israelites who were a slave in Egypt at that time. From Africa, watermelon crossed to Europe (Moors brought it in the 10th century) where it grew successfully in the warmer parts of Mediterranean. By the 7th century, it reached India and from there China which saw its first watermelons in the 10th century. Today, China is the world's largest producer of watermelons. Rest of Europe didn't state growing watermelons until the 17th century when they were widely accepted as a minor garden crop. Watermelons were brought to Americas by European colonists and by slave trade from Africa. The first ones were grown in Florida in the 16th century. Later, in the 17th century, they were grown in Massachusetts, Peru, Brazil, Panama and many British and Dutch colonies. Captain James Cook and other explorers introduced watermelons to Hawaii and other Pacific islands. Everyone seems to love juicy watermelon in the summertime. Native to Africa, melons need warm temperatures (up to 80°F during the day) and a long growing season. Gardeners in colder climates can still have success in growing watermelon Vines by starting seeds indoors and choosing short-season varieties. Days to maturity range from 70 to 90, depending on the variety.

HEALTH BENEFITS OF WATERMELON SEEDS

When you think of the health benefits of watermelon, the seeds probably don't come to mind. You probably think about the sweet, juicy pulp, with the seeds an afterthought and may be good only for spitting contests. The fact is, watermelon seeds make a great snack when they have been dried and roasted, the United States Department of Agriculture, lists several important nutritional components of watermelon seeds.

PROTEIN:

Watermelon seeds are very high in protein, with 1 cup of dried seeds containing 30.6g, which is 61 percent of the daily recommended value. The protein in watermelon seeds consists of several amino acids, one of which is arginine. While the body produces some Arginine, Medline Plus states that some health conditions may benefit from additional arginine. Some of the health

benefits of arginine include regulating blood pressure and treating coronary heart disease. Several other amino acids make up the protein in watermelon seeds, including tryptophan, glutamic acid, and lysine.

B-VITAMINS:

Watermelon seeds are also loaded with several of the B vitamins. The American Cancer Society reports that B vitamins are necessary for converting food into energy and other important bodily functions. The most prevalent B vitamin in watermelon seeds is niacin, with 1 cup of dried watermelon seeds containing 3.8mg, which is 19 percent of the daily value. Niacin is important for maintaining the nervous system, digestive system and skin health. Other B vitamins in watermelon seeds include folate, thiamin, riboflavin, vitamin B6 and pantothenic acid.

MINERALS:

Minerals abound in watermelon seeds. Magnesium is the most abundant mineral, weighing in with 55 mg, or 139 percent of the recommended daily value, in 1 cup of dried seeds. According to the National Institutes of Health, magnesium helps regulate blood pressure and the metabolism of carbohydrates, which has a beneficial effect on blood sugar as well. Other important minerals in watermelon seeds are phosphorous, iron, potassium, sodium, copper, manganese and zinc.

FATS:

The most surprising thing about watermelon seeds is the amount of fat they contain. In 1 cup of dried seeds, there are 51g of fat, with 11 of those being saturated fat. The other fats are monounsaturated fats, polyunsaturated fats, and omega-6 fatty acids. The American Heart Association reports that mono and polyunsaturated fats reduce blood cholesterol, and omega-6 fatty acids can help reduce high blood pressure. The down side of consuming a cup of watermelon seeds is the calorie count you'll take in just over 600 calories if you eat the whole Cup.

WATERMELON SEED OIL GENERAL USES

Watermelon Seed Oil is processed from Watermelon Seeds. It has a slightly nutty aroma. It is still traditionally used as a cooking oil in Africa. It is a rich source of Linoleic and Oleic Acids. It tones up the skin and does not clog pores. It cures the problem of both Dry and Oily Skin. It restores the elasticity of the skin and dissolves the sebum build-up on the skin. It can be used as a facial moisturizer, cleanser, sunscreen and also aids Skin Ailments. It helps to fight against free radical damage thus slows down Premature Aging. It is a light oil with good absorption. It is a good remedy for Hair. A massage on the scalp treats greasy hair and reduces Frizz in hair. Use it as a hot oil therapy. A massage with this warm oil on the body take away the dirt deposited on the skin. It helps to expel toxins. Thus, acts as a Detoxifying agent. It tones up the Urinary system. It increases the Urine output.

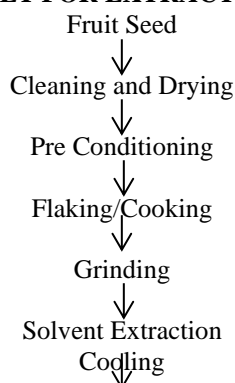
MATERIALS AND METHODS:

1. Watermelon seed and flour
2. Watermelon oil
3. All purpose flour
4. Sugar
5. Baking powder
6. Salt

EXTRACTION OF OIL FROM THE FRUIT SEED

Extraction is the first step in the refining process. Oils and fats are extracted from their original source (the seeds, fruits or other oil-bearing raw materials) using a variety of different methods. In some cases, for example virgin olive oil, the oil is extracted directly from the fruit by means of a simple mechanical press and used without the need for any further processing. This process is known as cold pressing. For most oils however, the process is more complex. Modern oil mills extract oil using a combination of pressing, cooking and solvent extraction. This process is often carried out in the country of origin. The seed/bean is cleaned and dried and foreign material is removed. Crushing used to be done between mill stones that later became steel rolls. Seeds with a high oil content like rapeseed and sunflower seed are usually mechanically pressed in expellers after a preheating step in indirectly heated conditioners. The oil bearing material is fed into one end of a cylinder where a power-driven worm conveyor forces the material to the other end of the cylinder and out against resistance. The pressure exerted in the process squeezes out the oil. Solvent extraction is used to separate oil from seeds/beans. The pre-processed seeds/beans are treated in a multistage counter current process with solvent until the remaining oil content is reduced to the lowest possible level. The mixture of oil and solvent is separated by distillation and the solvent is recycled into the extraction process and the crude oil is stored ready for refining. Analysis of Essential Oil is done by using Gas Chromatography with Mass Spectrometer. The qualitative and quantitative analysis is done to know the constituents in the oil and the percentage of components present in the oil respectively, by doing so we can know the purity of that particular oil.

FLOW SHEET FOR EXTRACTION OF OIL



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Fruit Seed Oil

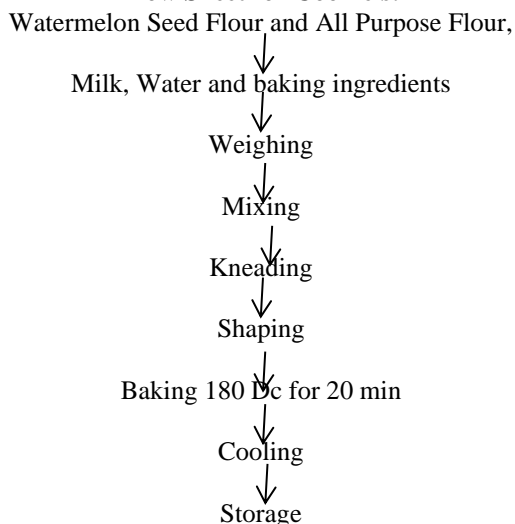
APPLICATION OF SOLVENT EXTRACTION

The manner in which solvent extraction is applied to the processing of oilseeds differs in various parts of the world. Until rather recently, Germany was the recognized leader in the technology of extraction, and the methods employed in that country are therefore worthy of study. German operators process soybeans almost entirely by solvent extraction, either in multiple-contact batch or in continuous extractors, but in the United States only about 30 percent of the soybeans processed are extracted. Nearly all of the remainder are pressed in expellers and screw presses. In German mills, peanuts, rapeseed, and other seeds containing high percentages of oil are fore pressed and then extracted. This practice is also followed in the United States both on castor beans, which are processed first in cage presses and then in rotary batch extractors, and on wet-milled corn germs which, in some cases, are fore pressed in expellers and then extracted in either batch or continuous equipment. In Germany, however, the fore pressing is often performed two or three times before extraction, instead of once as in this country. Copra and palm kernels are ordinarily fore pressed in expellers, both in the United States and in Europe. It is customary to "finish" these materials in cage presses, but some European mills have utilized solvent extraction successfully.

PROCEDURE FOR COOKIES MAKING

Cookies is a bakery product which is generally made from all purpose flour and creaming of fat with powder sugar .along with milk solid/ egg, baking powder , flavor , etc. All this ingredient are mix properly and make a dough .give some shape to dough and place it for Some minutes .pre-heat the oven at 370 degree Fahrenheit .bake the molded cookies in oven. Sometimes cookies are made by using fat and we are using oil instead of fat. A cookies that is a baked o cooked good that is small flat and sweet .It usually contains Flour , sugar and some type of oil or fat .it may include other ingredient such as Resins ,Oats , chocolate chips , nuts , etc. alternative name of cookies is Biscuit and it is use as Snacks or Dessert .place of origin of cookies is Persia in 7th century . Cookies generally stored at room temperature . Although they may be serve when still warm from the oven.

Flow Sheet for Cookie's:



1. RAW MATERIAL

Select the materials which are Blend of Fruit Seed Flour (Powder), All Purpose Flour Milk Solid, Fat and Sugar, Flavor, Baking Soda and Salt

2. WEIGHING

Then after that weight properly all this ingredients (Raw Material) at Weighing Balance as it required .And to yield Specific amount of required material

3. MIXING

Mixing is done for proper mixing of raw material. Fat and Sugar are then whisk together add some flavor and pinch of salt into it .Again mix it to first mixture dissolve the Baking Soda. After it mix the All Purpose Flour and Watermelon Seed Flour (Powder) properly an prepare a dough for cookies Place it for 20 minutes to set the dough in refrigerator.

4. KNEADING

Remove the dough from the refrigerator and make a ball and press it to give it's some shape.

5. SHAPING

.After Kneading Shaping is done. In this step the dough which is well set by kneading this dough is used for making cookies by using of mould to give shape to dough for proper shaping of Cookies

6. BAKING

Preheat the oven to 370°F. Drop oil by the teaspoonful on to lightly greased baking sheet. We can use oil for making a dough roll the dough out on to parchment paper and place in freezer for 30 minutes After 30 minutes remove the dough from refrigerator and make a ball and press it well to give proper shape to it or also can use the moulds. Bake it at 370°F (180°C) for 20 minutes.

7 COOLING

After Baking the Cookies are ready. Open the Oven and remove the tray safely and carefully. Remove Cookies from the tray and leave it for some minutes for proper handling.

8. STORAGE

Then after packed and store at ambient temperature for long storage of Cookies And to preserve for long time

ANALYSIS OF PRODUCT

DETERMINATION OF ASH CONTENT:

Ash is the inorganic residue remaining after the water and or organic matter have been removed By heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a food. Analytical techniques for providing information about the total mineral content are based on the fact that the minerals (the analyte) can be distinguished from all the other components (the matrix) within a food in some measurable way. The most widely used methods are based on the fact that minerals are not destroyed by heating, and that they have a low volatility compared to other food components. The three main types of analytical procedure used to determine the ash content of foods are based on this principle Dry Ashing, Wet Ashing and Low Temperature Plasma Dry Ashing. The method chosen for a particular analysis depends on the reason for carrying out the analysis, the type of food analysed and the equipment available. Ashing may also be used as the first step in preparing samples for analysis of specific minerals, by atomic spectroscopy or the various traditional methods described below. Ash contents of fresh foods rarely exceed 5%, although some processed foods can have ash contents as high as 12%, e.g., dried beef.

PROCEDURE:

Weigh the empty crucible and record its weight. Weigh 5g of the sample into a crucible. Place crucibles in cool muffle furnace. Use tongs, gloves and protective eyewear if the muffle furnace is warm. Place 10-12 hours (or overnight) at about 550°C until the sample become white or grey. Turn off muffle furnace and weight to open it until the temperature has drop to at least 250C, open door carefully to avoid losing ash that may be fluffy. Using safety tongs, quickly transfer crucibles to a desiccators. Cover crucibles, close desiccators and allow to cool prior to weighing.

DETERMINATION OF PROTEIN CONTENT

Proteins differ from each other according to the type, number and sequence of amino acids that make up the polypeptide backbone. Hence, they have different molecular structures, nutritional attributes and physiochemical properties. There are three major protein analysis techniques, protein separation, western blotting and protein identification.

PROTEIN SEPARATION

This method separates proteins mainly on the basis of molecular weight as opposed to charge or folding. It is a technique that is widely used in biochemistry, forensics, genetics and molecular biology.

Isoelectric Focussing: In this method, different molecules are separated by their electric charge differences. This technique is a type of zone electrophoresis that is usually performed in a gel and takes advantage of the fact that a molecule's charge changes with the pH of its Surroundings.

Chromatic Methods: There are two chromatic methods frequently used for protein separation high-performance liquid chromatography and thin-layer chromatography. Both these methods are particularly useful adjuncts to gel-based approaches. Although chromatography is a Common technique in biochemistry laboratories used for purification, identification and quantification of protein mixtures, laser diffraction is traditionally used for pre-column size and polydispersity management.

Two-dimensional Gel Electrophoresis: This is a powerful gel-based method commonly used to analyse complex samples in the interest of characterizing the full range of proteins in the sample, not just a few specific proteins.

DETERMINATION OF CARBOHYDRATE CONTENT

Carbohydrates are one of the most important components in any foods. Carbohydrates may be present as isolated molecules or they may be physically associated chemically bound to other molecules. Carbohydrates are digestible by humans and therefore provide an important source of energy. The Lane Eynon method is an example of a titration method of determining the concentration of reducing sugar in a sample. The burette is used to add the carbohydrate solutions being analyse to a flask containing a known amount of boiling copper sulphate solution and methylene blue indicator. Copper sulphate solution is also known as Fehling solution or reagent. The reducing sugar in the carbohydrate solution react with copper sulphate in the flask. Once all the copper sulphate in solution has reacted, any further addition of reducing sugar causes the indicator to change from blue to white (indicating endpoint is reached). The volume of sugar solution required to reach the end point is recorded. The reaction is not stoichiometric, that means it is necessary to prepare a calibration curve by carrying out the experiment with a series of standard solution of known carbohydrate concentration.

PROCEDURE:

10ml of mix felhing reagent is placed in a 250ml flask. The sugar solution is transferred into a burette and suspended over the flask. 15ml of sugar solution is added to the flask and to boiling. The solution is boil for 15 sec and portions of the sugar solution is added rapidly until only the faintest perceptible blue color remains. 2 to 5 drops of 1% of aqueous solution of methylene blue is added and heating is continue. The sugar solution is added drop wise until the titration is complete which is shown by the reduction of the dye.

DETERMINATION OF MOISTURE CONTENT AND TOTAL SOLIDS

About 10 gm of juice sample is weighed into a Petridish and place it hot air oven for drying at temperature 110°C and time for drying 2 h. the dried sample is placed in to the desiccators for cooling. After that then take the weight of moisture box in weighing balance and calculate the moisture and total solid using formula (A.O.A.C. 1995).

Moisture % = [(W1 - w2) x 100] + W

Total solid = (100 - Moisture content)%

Where,

W=Weight of sample

W1= weight of sample + weight of Petri dish

W2- Weight of dried sample + weight of Petri dish

**RESULT AND OBSRVATION:
DIFFERENT FORMULATION OF WATERMELON SEED FLOUR**

Sr. No	Raw material	Trail 1 st	Trail 2 nd	Trail 3 rd
1	Watermelon Seed Flour	50g	70g	90g
2	All Purpose Flour	50g	30g	10g
3	Sugar Powder	50.060g	50.61g	65.214g
4	Baking Powder	3.547g	4.282g	5.172g
5	Fat	22.66g	26.214g	26.186g
6	Milk Solid	20.97g	20.97g	24.567g
7	Salt	0.806g	0.801g	0.756g

NUTRITIONAL INFORMATION -Trail 1st

Sr. No	NUTRIENTS	As per 100g
1	Calories	714.86
2	Carbohydrates	111.477
3	Protein	20.26
4	Fat	24.842
5	Iron	25
6	Calcium	3

NUTRITIONAL INFORMATION -Trail 2nd

Sr. No	NUTRIENTS	As per 100g
1	Calories	693
2	Carbohydrates	84.55
3	Protein	24.0
4	Fat	33.29
5	Iron	27
6	Calcium	4

NUTRITIONAL INFORMATION -Trail 3rd

Sr. No	NUTRIENTS	As per 100g
1	Calories	121.37
2	Carbohydrates	12.79
3	Protein	4.2674
4	Fat	6.9872
5	Iron	28
6	Calcium	6

SENSORY EVOLUTION FOR WATERMELON SEED COOKIE PREPARED FROM DIFFERENT FORMULATION

Hedonic rating scale is used to measure the consumer acceptability. Three trials were carried out with varying formulations. Sensory evaluation was done by trained panelists. Out of three samples, preference was given to trial II (Watermelon Seed Flour 70g, All Purpose Flour 30g, Sugar Powder 50.61g, Baking Powder 4.282g, Fat 26.214g, Milk Solid 20.97g and Salt 0.801g). Below in Table sensory evaluation score for all the three samples along with control is mentioned. Then selected watermelon seed flour is taken for the further processing.

Sensory evaluation prepared different formulation

Attributes	Trial I	Trial II	Trial III
Colour	6.66±0.57	7.66±0.57	7.33±0.57
Mouthfeel	8.33±0.57	7.66±1.15	7.33±0.57
Sweetness	7.66±0.50	8.33±1.15	7.66±1.15
Aroma	8.33±0.57	7.33±1.15	8.66±0.57
Sourness	6.66±0.57	7.66±1.15	7.00±0.00
Overall acceptance	7.66±0.57	8.00±1.00	6.66±0.57

CONCLUSIONS:

The present investigation entitled "Cookies by using Watermelon Seed Flour and Watermelon Seed Oil was carried out in the department of Food Technology, Ballarpur Institute of Technology, Ballarpur. The experiment was conducted to develop Cookies by incorporation of Watermelon Fruit Seed Flour and by using Watermelon Fruit Seed Oil with different Composition. Out of three samples, preference was given to trial II (Watermelon Seed Flour 70g, All Purpose Flour 30g, Sugar Powder 50.61g, Baking Powder 4.282g, Fat 26.214g, Milk Solid 20.97g and Salt 0.801g). Solvent Extraction Method was found to be one of the promising techniques for the extraction of Essential Oil from Fruit Seed as this process will preserve the original qualities of the Fruit Seed. It can be concluded that Watermelon Seed Flour and Watermelon Fruit Seed Oil can be incorporated in a suitable amount in the Cookies which has many Health Benefits. The texture and taste of Cookies is improved by increasing Sugar and Moisture.

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