Extraction of Oil from Watermelon Seeds

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Abstract

Oil content in the seeds is between 35-40% and the unsaturated fatty acid content in oil is 78-86% The rate of extraction of oil from date seed depends on and type of solvent, partial size of watermelon seed, and time of extraction temperature. Soxhlet extraction is the most common technique for oil seed extraction. Watermelon seed oil is obtained from date seed through the Soxhlet extraction technique. % Yield and recovery of Oil using solvent extraction with different feed-to-solvent ratios. For solvent petroleum ether shows 1:2, 1:4, 1:6 seed powder to petroleum ether ratio the % yield 18%, 28% and 32% resp. For solvent petroleum ether shows 1:2, 1:4, and 1:6 seed powder to petroleum ether ratio the % recovery 45%, 70%, 80% resp. As per observation petroleum ether is the best suitable for extraction of oil from the watermelon seed. petroleum ether can easily separate after extraction and has a higher yield than others with low cost. The ratio of feed to solvent is also an important factor to be considered for the extraction process which affects the yield of oil. The optimum value for feed to solvent is 1:4 which maximum yield for watermelon seed oil extraction. As the feed-to-solvent ratio increases more than 1:4 there is an appreciable change in the yield but the cost of solvent increases. The 1:4 feed-to-solvent ratios is to be the optimum value for watermelon seed oil extraction. The time of extraction increased the yield of oil also increase and up to the maximum level. Crushed seed in powdered form gives a large surface area for solid-liquid contact. Due to small size particles increased rate as well as yield of extraction of oil from watermelon seed. Extraction carried out at boiling temperature of solvent should be better for rate and yield of extraction. Temperature for extraction with petroleum ether up to 35-40 C.

Keywords: - Recovery, Extraction of Oil.

Introduction

As watermelon seed oil is rich in vitamin E and having the good moisturizing properties so it can be used inflammatory agent for skin care product. The oil can be use for modifying properties for skin care product and used for modification oil. The chemical composition of the oil extract gives qualitative identification of oil which reveals guide in commercialization and utility . watermelon seed also known as kalhari oil or otenga oil mostly suitable for cosmetic application .high amounts of unsaturated fatty acid linoleic acid and oleic acid are present in used watermelon fruit .watermelon seed contain considerable amount of PUFAS Which are very receptive in the oxidation and other side reaction that cause deterioration of oil . the present study that carried to investigate the suitable solvent6 for extraction omega 6 fatty acid which rich oil from watermelon seeds of Indian origin and its chemical and physical characterized protein extraction from defatted seed cake .watermelon seeds.Dried Melon seeds of the family cucubitacae were investigated for the nutritional quality and oil seed quality and oil seed characteristics. These melon seed , on dry weight basis consisted of 52.3% of test and 47.7% kernel. The oil content of seeds very high ranging from 22.1-53.3%due to presence of hulls 22%from the seeds an the 53% of the kernel .and also the crude protein 21.8% of seeds. Seeds of many edible fruit are often thrown out as waste despite. They are important source of edible oils and potential source of high quality. The by-products emanating from the processing could be useful in firing boilers for plants or as animal feed if properly processed. Watermelon seeds are nowadays used for oil extraction. The seeds are dried and oil is extracted by pressing them. West Africa watermelon seed oil is popularly known as Otenga oil or Kalahari oil. Oil is used as frying oil in various African nations. Watermelon seed has a great potential to use as an excellent source of edible protein. Amino Acid profile of watermelon seed proteins shows various amino acids, mainly Histidine and Glycine. The oil can be used for modifying the properties of skin care products and used as modification oil. The DOC (De Oiled Cake) remained after extraction can be further utilized for protein extraction as it contains a significant amount of protein which can be utilized by surfactant industries as well as nutraceutical and pharmaceutical industries. The DOC is also used to feed the cattle. The chemical composition of the oil extract gives a qualitative identification of oils which reveals guide in its commercialization and utility i.e. iodine value gives an index of the drying and polymerizing properties of oil while flash points indicates a substantial removal of solvent from a solvent extracted oil. The characterization based on different fatty acids group gives an insight into the distribution of acids in the unsaturated fraction among oleic, linoleic and linolenic acids

LITERATURE REVIEW

The yield of the seed oil was found to be 40 %. The pH value of 3 - 4 suggests that the oil is acidic which is indicative of the presence of free fatty acids in the extracted oil. The oil was found to be miscible with ether which shows that the oil contains unsaturated free fatty acids that confers on its industrial utility. The oil was found to have a congealing temperature of -15 OC to 20 OC. The refractive index of the oil was 146 OC at 25 OC while the Rf values was determined to be 1.7cm which falls within values reported for similar seed oils 1.48 for Teleferic occidental seed oil and 1.47 for corn oil. The specific gravity obtained was found to be 0.9 g/ml at 15 OC. These values are very close to the values 0.89–092 g/ml reported for edible oil. The fruit seeds prepared for use by decorating, sun drying and grinding. Soxhlet extractor was used for the extraction of oil from the seed at a temperature of 40 OC with petroleum ether solvent. Extraction was done continuously for 18 hours after which the solvent was covered by simple distillation and the residual oil was oven-dried at 60 OC for one hour. The oil was allowed to cool in a desiccator before being weighed. The extracted oil was well sealed in dark brown coloured glass bottle and kept for analysis of various properties. The acid value of the oil was found to be 85 percent while the oil had the saponification value of 116. The unsaponifiable matter content of the oil was found to be 0.9. The iodine value and peroxide value of the water melon seed oil were determined to be 60.43 g/100g and 19.00 respectively.

Applications of Water Melon Seed Oil :-

1. Watermelon seed oil has excellent humectant and moisturizing properties

2. It is to be observed that it has positive effect over the both oily and dry skin.

3. It is easily absorbed by the skin and helps in restoring the elasticity of the skin.

4. Watermelon oil can be utilized by cosmetic industries.

5. Preparation of moisturizer which shows properties similar to market grade moisturizer.

6. Antioxidants property of oil beneficial role in skincare in combating free-radicals resulting from sun damage and pollutants.

7. Seed oil formulated into skincare products in the form of emulsions and Nano emulsioN

Water Melon Seed Composition

Dried melon seeds (Citrullus colocynths L.) of the family Cucurbitaceous were investigated for nutritional quality and the oil seed characteristics. These melon seeds, on a dry weight basis, consisted of 52.3% of Testa and 47.7% of kernel. The moisture content in melon seeds was 54.5% and the mineral constituents. The oil content of seeds very high ranging from 22.1-53.5% due to the presence of the hulls 22% from the seeds and 53% of the kernel and also the crude protein content so high as the 21.8% of the seeds. The approximate composition of 100 g of watermelon seeds reveals an energy value of 619 Kcal while pulp presents higher nutritional value and lower energy value. Watermelon seed is one of the unexplored seed in the world which is often discarded after eating the fruit. Researches show that these seeds contain nutrients like protein, essential fatty acids, vitamins and minerals. Oil content in the seeds is between 35-40% and the unsaturated fatty acid content in oil is 78-86% predominantly linoleic acid (45-73%).

Experimental Process Solvent Extraction

Extraction with Petroleum Ether for Feed to Solvent Ratio 1:2

Take 50 gm water melon seed dried in oven (at 105 OC) or sunlight to remove moisture. Crush the watermelon seed to form powder. Take 1: 3 ratios of watermelon seed powder (50 gm) to petroleum ether (100 ml). Take cotton cloth or filter paper and watermelon seed powder in cloth or filter paper. Put cloth or filter paper in thimble of Soxhlet Extraction apparatus contains seed powder. Take 300 ml of the petroleum ether as solvent in round bottom flask of Soxhlet. The mixture was then heated at 35 OC- 40 OC (B.P. solvent) for 1.5-2 hrs. After extraction removal of round bottom flask from Soxhlet apparatus. Date seed oil to be separated from the solvent using simple distillation. Separation by simple distillation carried out at temperature 35-40 OC. In distillation petroleum ether recover as top product and oil as a bottom product.

MATERIAL BALANCE

Material balance provide the total quantity of material flow input and output, accumulation. Material balance can take with help of unit operation carried out in the process. It can calculate by law of mass conservation. According to the law Total material input is sum of the material output and the accumulation. We can select the both solvents acetone and petroleum ether. Both solvents have low B.P. which can easily separate from the oil after extraction process. In the observation we carried out the experiment by using the

seed powder to solvent ratios 1:3, 1: 4 and 1:5. Calculated the extraction yield after separation of solvent from oil by simple distillation process.

RESULT

Extraction and Distillation Balance for Feed to Solvent Ratio 1:2

Extraction Balance

Watermelon Seed Powder + Petroleum Ether = (Solvent + Oil) + Powder Residue
50 gm + 100 ml = 59 ml + 60 gm + 31 ml of solvent Flash during Extraction

Distillation Balance

Watermelon Seed Oil + Petroleum Ether = Distillate (P.E.) + Residue (Oil)
59 ml = 40 ml Petroleum Ether + **9 ml Watermelon Seed Oil** + 10 ml of solvent Flash

% Yield and %Recovery of Oil

Feed to Solvent Ratio	% Yield With Oil	% Recovery Oil
1:2	18	45 %

FUTURE SCOPE AND DEVELOPMENTS

Watermelon seed oil has lots of usage and applications as commercial and industrial use. It has excellent humectant and moisturizing properties. Oil can be utilized by cosmetic industries. Preparation of moisturizer which shows properties similar to market grade moisturizer. Antioxidants property of oil beneficial role in skincare in combating free-radicals resulting from sun damage and pollutants. Seed oil formulated into skincare products in form of emulsions and Nano emulsions. Seed oil should be more effective than peel wax as an additive in cosmetics products to reduce and prevent cellular damage.

CONCLUSION

Solvent extraction is one of the traditional techniques of extracting vegetable oil. Oil seeds is one of the cheapest sources, applied to produce oil from seeds. Rate of extraction of oil from date seed depends on type of solvent, partial size of watermelon seed, time of extraction and temperature. Soxhlet extraction is the most common technique for oil seed extraction. Watermelon seed oil is obtained from watermelon seed through Soxhlet extraction technique. Oil content in the seeds is between 35-40% and the unsaturated fatty acid content in oil is 78-86% predominantly linoleic acid (45-73%). % Yield and recovery of Oil using solvent extraction with different feed to solvent ratio. For solvent petroleum ether shows 1:2, 1:4 and 1:6 seed powder to petroleum ether ratio the % yield 18%, 28% and 32% resp. For solvent petroleum ether shows 1:2, 1:4 and 1:6 seed powder to petroleum ether ratio the % recovery 45%, 70% and 80% resp. As per observation petroleum ether is the best suitable for extraction of oil from the watermelon seed. petroleum ether can easily separate after extraction and has higher yield than other with low cost

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