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RESEARCH ARTICLE

Solvent Extraction and Chemical Characterization of Papaya Seeds Oil

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ABSTRACT: Papaya (*Carica papaya* L.) is a plant that grows wild in many parts of the tropics. The seeds of papaya fruits are generally discarded. However, in order to make a more efficient use of papaya, it is worth investigating the use of the seeds as a source of oil. A compound present in crushed papaya seeds is believed to have activity against helminthes intestinal parasites, benzyl isothiocynate has shown to have an effect on vascular contraction using a canine carotid artery in vitro model. The characteristic of seed oil was studied. Percent seed oil was recorded 30.1 and chemical composition of papaya seed was found to be protein (28.1%), Ash (8.2%), Crude fiber (19.1%) and total carbohydrate (25.6%). Papaya seed oil utilized in high amounts could lead to reduced risk of coronary heart disease. In addition, high oleic oil has sufficient stability to be used in demanding applications such as frying, bakery, crackers, cereal dried fruit, and spray oil for snacks. Papaya seed oil can be considered as high oleic and hence viewed as a healthy alternative to many other vegetable oils. Thus, it can be concluded that the seed can be utilized for extraction of oil which has various health benefits with respect to essential fatty acids. Mass production of the Oil will accelerate industrialization while promoting sustainable economic growth hence enhancing improved health and livelihood which is in line with the tenets of vision 2030 and the health-related Sustainable Development Goal.

Keywords: *Carica papaya*, intestinal parasites, seed oil

INTRODUCTION

Papaya (*Carica papaya* L.) is a plant that grows wild in many parts of the tropics. The seeds of papaya fruits are generally discarded. However, in order to make a more efficient use of papaya, it is worth investigating the use of the seeds as a source of oil. A compound present in crushed papaya seed that is believed to have activity against helminthes intestinal parasites, benzyl isothiocynate, has been shown to have an effect on vascular contraction using a canine carotid artery in vitro model (Wilson and Kwan, 2002). Papaya seed oil utilized in high amount such oils could lead to reduced risk of coronary heart disease. In addition, high oleic oil has sufficiently stability be used in demanding application such as frying. Area of spray oil for snacks, crackers, cereal dried fruit, bakery products where the oil is used to maintain product quality and to increase palatability. Papaya seed oil can be considered as high oleic oil and hence viewed as a healthy alternative to many other vegetable oils (Corbett, *et al.*, 2003).

The extraction and use of vegetable oils has for centuries played an important role in the manufacture of a large number of industrial products and food items. Currently, two main processes for the extraction of oil from seeds are of industrial importance: the hydraulic process and further purification and the chemical process using organic solvents (McGlone *et al.*, 1986). This latter process for extracting oil from seeds, although giving high oil extraction recovery, requires expensive capital investment and operational costs and causes undesirable effects on the quality of end products because of the high temperatures used in the process (Christensen, *et al.*, 1991). There is also an older process of aqueous extraction that is advantageous, because it presents no risk of fire or explosion, is nontoxic and the mild processing ensures high quality products (Dominguez *et al.*, 1995). The operation is also more flexible with less initial investment and operational costs. The main disadvantages, as compared to conventional technologies, are lower efficiency of oil extraction and the reduction of product stability, leading to easier microbial contamination. Aqueous extraction, on the other hand, yields not more than 35% of the oil content of the seed (Tano-Debrah and Ohta 1994).

Considering their widespread applications, these processes thus contribute to major losses of fats and oils in the world's food production system. This is an issue worth considering as efforts are intensified to increase fat and oil production to meet the quickly growing global demands (Tano-Debrah and Ohta 1995a). With rising value for oils and with demands for better oil quality, coupled with several years of unfavorable climate conditions in growing regions, there has been a noticeable increase in trials using enzymes for processing a wide variety of oil sources including palm, olive, soybean, rapeseed, sunflower seed, cottonseed, corn germ and groundnut (Godfrey and Reichelt 1983). The use of enzymes shows some improvement in the yield of oil, together with a reduction in the acid development and oxidation of the oil during further processing and storage. Also, there is a reduction in undesirable side products and in waste treatment costs (Dominguez *et al.*, 1994). Much research has been done on enzyme-assisted oil extraction from various seeds such as sunflower kernel (Dominguez *et al.*, 1995), shea tree (Tano-Debrah and Ohta 1994, 1995a), canola, cocoa beans (Tano-Debrah and Ohta 1995b) and coconut (McGlone *et al.*, 1986; Tano-Debrah and Ohta 1997). The enzymes used in the extraction 64 T. The process that were most frequently referred to in the literature are protease, a amylase, cellulose and pectinase. However, there is no literature on the extraction of oil from papaya seeds using the enzymatic process, even though these seeds have proven to be valuable sources of usable oil (Harvey *et al.*, 1978). Thus, the aim of this work is to determine and to compare the physicochemical properties and the quality of oil extracted from papaya seeds using different enzymes with that of oil extracted using solvents.

MATERIALS AND METHODS

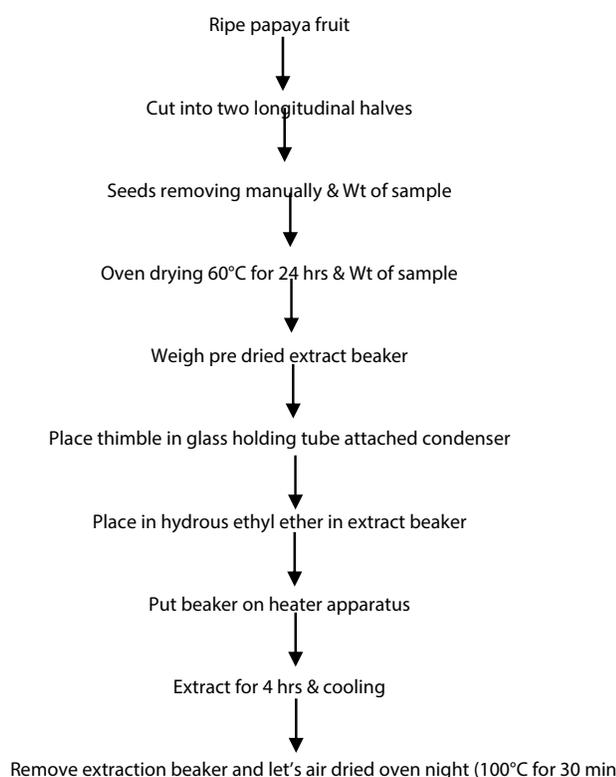
PAPAYA FRUIT

Whole papaya fruits were procured from Jubilee market in Kisumu. Most of the chemicals used in this investigation were of analytical grade. The equipments were obtained from Department of Chemistry and Botany, Maseno University.

PRETREATMENT OF FRUITS

Procured Papaya were washed, wiped and then stored at 100°C in the cold chamber. Preparation of essential oil For solvent extraction, 150 g of ground seeds were placed in a cellulose paper cone and extracted using light Ethanol in a 5-L Soxhlet extractor for 8 h (AOAC 1984). The oil was recovered by evaporating the solvent using a rotary evaporator Model N-1 (Eyela, Tokyo Rikakikai Company, Ltd, Tokyo, Japan) and the residual solvent was removed by drying in an oven at 60°C for 1 h and by flushing with 99.9% nitrogen.

Process Flow Chart of Characteristics of papaya seed oil by (solvent extraction)



DISCUSSION

It is seen from table no 1 that the seed contained moisture (7.3%), oil (30.9%), protein (28.1%), ash (8.2%), carbohydrate (25.6%), and crude fibre (19.1%). The result of the present investigation are more or less similar to that of Marfo *et al.*, (1986) and Pungasari *et al* (2004).

The chemical properties are the most important characteristics of oil, the FFA and iodine value is measure of the degree of unsaturation of the oil.The data pertaining to the Characteristics of papaya seed oil is reported in Table 2. It is observed from the table 5 that papaya seed oil consist of iodine value (65.5), saponification value (155.50), % Unsaponifiable matter (1.37%), and FFA (as % of oleic acid) 0.32. The Characteristics of papaya seed oil are in close agreement with that of Pungasari *et al*, (2004).

The fatty acid composition of papaya seed oil is shown in Table 3. The result showed that the major fatty acid, the relevant extracted oil were oleic (72.5%) followed by Palmitic (13.5%), stearic acid (4.5%) and Linoleic (2.9%). The results of present investigation are well comparable with the result reported by Pungasari *et al*, (2004).

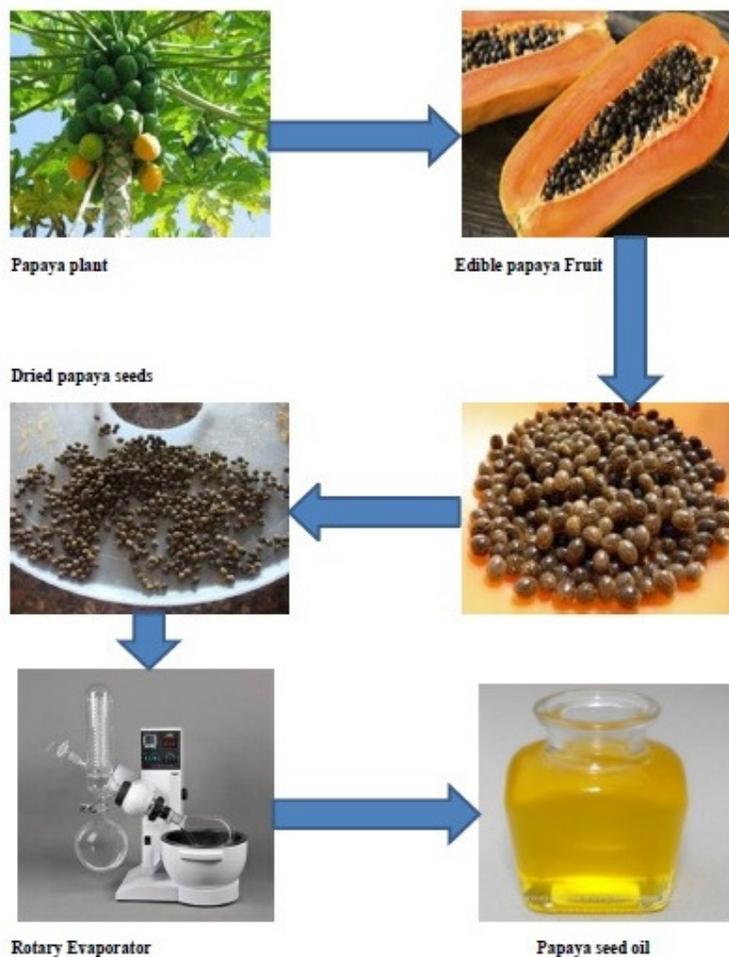


Fig: 1.Flow Chart of Papaya Extraction Method

CONCLUSION

Percent seed oil was recorded 30.1 and chemical composition of papaya seed was found to be protein (28.1%), Ash (8.2%), Crude fiber (19.1%) and total carbohydrate (25.6%).The papaya seed oil consists of iodine value (65.5), saponification value (155.5), unsaponifiable matter (1.37%) and free fatty acid (0.32%).The major fatty acid of papaya seed oil were oleic acid(72.5%) followed by palmitic acid (13.5%) and stearic acid (4.5%).

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Table 1:- Chemical composition of *carica papaya L.* (carica) seeds

S.No.	Chemical properties	Determined values*
1	Iodine value	65.50
2	Saponification value	155.50
3	Unsaponifiable matter (%)	1.370
4	FFA (as percentage oleic acid)	0.32

* mean of triplicate determination.

Table 2:- Relative fatty acid composition (%) of papaya seed oil

S.No.	Chemical properties	Determined values*
1.	Myristic (C14-0)	0.24
2.	Palmitic (C16-0)	13.5
3.	Palmitoleic (C16-1)	0.21
4.	Stearic (C18-0)	4.5
5.	Oleic (C18-1)	72.5
6.	Linoleic (C18-2)	2.90
7.	Linolenic (C18-3)	0.23
8.	Arachidic (C20-0)	0.39
9.	Eicosenoic (C20-1)	0.28

* mean of triplicate determination

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CONFLICTS OF INTEREST

"The authors declare no conflict of interest".

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