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Research article

Phytochemical Screening of Wild Melon (*Adenopus breviflorus* Benth) Fruit and Physicochemical Properties of the Seed Oil

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Wild melon (Adenopus breviflorus benth) belongs to family: cucurbitacae. It is a tendril climber of shrubs and herbs, the fruit is a green with cream coloured narrow blotch pepo found in the range of tropics and subtropical regions of the world. The present study deals with the phytochemical screening of the parts of the fruits (epicarp, pulp, seed, and whole fruit) and physicochemical properties of the seed oil. Results revealed the highest percentage yield of 10.3 oil in the seed and the least extracts from epicarp and pulp. All the extracts of the parts contained tannins, steroids, flavonoids, carbohydrates, and terpenoids while reducing compounds and anthraquinones were absent. The colour of seed oil was yellowish green with a pH of 8.3 and Density 0.8760gcm^3. The viscosity, refractive index and specific gravity at 25^{0}c were 28.97, 1.45 and 0.8056 respectively. 10.66, 165.50 and 154.84 mg KOH/g were respectively obtained for acid, saponification and ester values while the iodine value was 135.55gI_2/100g. The oil contained 73.84 total unsaturated oils with linoleic dominating. The results thus revealed the potential medicinal value of the fruit and the seed oil when hygienically processed for domestic and industrial purposes.

Key words: Wild melon fruit, phytochemical screening, physicochemical properties, seed oil.

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INTRODUCTION

Wild melon fruit (*Adenopus breviflorus benth)* locally known among 'Yoruba' and 'Igbo' people in Nigeria as tagiri and Ogbenwa respectively belongs to family Cucurbitacaea (Bosa, 2008). The fruits have been claimed in folk traditional literature to be valuable against a wide variety of diseases in man especially in infants and growing children. Nwaoguikpe *et al.,* (2013) had investigated the anti-sickling potentials of some of the family members, watermelon (*Citrullus lonatus*), fluted pumpkin (*Telferia occidentalis*), pumpkin (*Cucurbita maxima*) and cucumber, (*Cucumis sativus*). *Lagenaria siceraria*, a member of this family have been widely used in India as immuno suppressant (Sankari *et al*, 2010), diuretic (Ghule *et al.,* 2007), Cardio-tonic, cardio protective (Fard *et al*, 2008) and nutritive agent (Rahman *et al*, 2008). The use of plants and its products for treatment of disease is immemorial, new plant based products are sources of new natural products in food and

pharmaceutical industry. Scientists are trying to explore the assets of medicinal plants to help the suffering humanity (Bacheti *et al*, 2011). Parts of plants as well as seeds are still widely used as herbal drugs in crude form or as sources of medically active natural products used in traditional medicine. Plant seeds are important source of oil for human and livestock food, industry and pharmaceutical. Attention is generally focusing on unutilized new seeds for possible development and utilization because of the high demand and economic potential of these oil seeds to the chemical industry (Bacheti *et al*, 2002). Similar trend in competition between man and his livestock for scarce conventional plant protein and energy resources as food have agitated animal nutritionists to search for alternative less economically valuable wild sources (Atteh *et al*, 1993). The groundnut and soya bean seeds for example have recently become scarce and market prices of their cakes and meals increase, due to the competition between man and poultry, for these plant protein sources, the resultant effect of these conventionally exploited protein sources in poultry feeds is high cost of poultry production, this among other factors have resulted into an increase in market prices per dozen of eggs and per kilo of chicken meat (Afolayan and Afolayan, 2008). Less competitive and cheaper alternative sources for them have not been intensively or extensively sought. This present study therefore intends to investigate the phytochemicals in the wild melon fruits and physicochemical properties of the seeds to establish whether or not they possess properties that could be exploited for use as sources of antioxidants and plant protein in poultry feed or other livestock.

MATERIALS AND METHODS

Collection of fruits

Matured fruits of *Adenopus breviflorus benth* were harvested from the bush surrounding the villages and towns in Irepodun, Ifelodun, Oke-Ero LGA of Kwara State and Moba LGA in Ekiti State of Nigeria. Some were also purchased from their markets between January and April. The fruits were classified and certified characters of *Adenopus breviflorus benth* at Department of Botany, University of Ilorin.

Processing of the fruits

Fruits were thoroughly washed under tap, before washing with distilled water and were allowed to dry to remove dirt and other contaminants, processing rooms and utensils were also cleaned. Fruits were manually separated into the seed, pulp and epicarp while some were left whole. These were chopped into pieces and airs dried at ambient temperature, each were then separately grounded.

Methods of Extraction

Extraction procedures employed for each of the parts were as reported by Doughari (2012), Habibur *et al* (2013), Prashant *et al* (2011). All the reagents were of analytical grade and were used as such, their solutions were prepared according to standard laboratory methods. Weights of samples and solvents used for extraction were as follows.

a. 1.6kg of seed sample was soaked with 3 litres of n-Hexane
b. 1.3 kg of epicarp was soaked in 4 litres of ethanol
c. 0.8 kg of pulp was soaked in 3 litres of Ethyl acetate
d. 1.6 kg whole fruit was soaked in 4 litres of methanol.

Each of the parts were left in solvents for 72 hours (3 days) after each was decanted, filtered, and concentrated. The percentage yield of each of the sample was determined.

Physicochemical properties of *Adenopus breviflorus benth* seed oil.

The oil sample obtained from the seed was characterized by determining the following physical properties. Viscosity was determined using the method of Foster and Leslie (1972) and Boekenoogen, (1964), while refractive index was determined using the refractometer (available at the Department of Chemistry, University of Ilorin, Nigeria). Density was determined using the method of Boekenoogen (1964), while colour was determined by sensory/ocular, pH, and specific gravity was determined using the methods described by Norris, (1965) and Foster and Leslie (1972). The chemical properties determined were acid value (Foster and Leslie, 1972), saponification value (Litchfield, 1972), ester value (Foster and Leslie, 1972, iodine value (Norris, 1965; Foster and Leslie, 1972 and Litchfield, 1972). The fatty acids composition of the oil sample was established using the GC-MS. QP 2010-PLUS available at National Research Institute for Chemical Technology (NARICT) in Zaria, Kaduna State, Nigeria.

Phytochemical screening of each extracts

Each of the sample obtained was tested for the presence or absence of the following phytochemicals using standard laboratory methods of Harwborne (1993), tannins, steroids, flavonoids, reducing compounds, carbohydrates, terpenoids and anthraquinones.

RESULTS

Table 1: Weight (g) and the percentage yield of crude extract of epicarp, pulp, seed, and whole wild melon fruit.

Solvent used	Fruit part	Weight of crude extract (g)	Percentage yield (%)
Ethanol	Epicarp	26.634	2.05
Ethyl acetate	Pulp	18.334	2.29
n-Hexane	Seed	160.556	10.03
Methanol	Whole fruit	69.431	4.34

Table 2: Physicochemical properties of wild melon seed oil

Properties	Values in sample
Colour	Yellowish-green
pH	8.3
Density (g/cm^3)	0.8760
Viscosity at 25^0c	28.97
Refractive index at 25^0c	1.45
Acid value (mgKOH/g)	10.66
Saponification value (mgKOH/g)	165.50
Iodine value ($_gI_2$/100g)	135.55
Ester value (mgKOH/g)	154.84
Specific gravity at 25^0c	0.8056

Table 3: Percentage composition of fatty acids present in wild melon seed oil

Fatty acid	% composition
Caprylic acid C_{10}:0	0.60
Lauric C_{12}:0	8.74
Myristic C_{14}:0	3.20
Palmitic C_{16}:0	1.71
Linoleic C_{18}:2	69.56
Oleic C_{18}:1	2.22
Staeric C_{18}:0	11.91
Propylengly colmonodeic	2.06

Table 4: Percentage composition of SFA, MUFA, PUFA, TS. and TUS of wild melon seed oil.

Fatty acid	% composition
Saturated fatty acids (SFA)	26.16
Monounsaturated fatty acid (MUFA)	4.28
Polyunsaturated fatty acid (PUFA)	69.56
Total saturates (TS)	26.16
Total unsaturates (TUS)	73.84
Ratio unsaturated/saturated fatty acid	2.82

Table 5: Qualitative phytochemical analysis of the crude extracts of the seed oil, pulp, epicarp and the whole wild melon fruit.

Phytocompounds	Seed oil	Pulp extract	Epicarp extract	Whole fruit extract
Tannins	+	+	+	+
Steroids	+	+	+	+
Flavonoids	+	+	+	+
Carbohydrate	+	+	+	+
Terpenoids	+	+	+	+
Reducing compounds	-	-	-	-
Anthraquinones	-	-	-	-

+ = present **- = absent**

DISCUSSION

The percentage yields of crude extracts obtained for each of the parts are presented in table 1. The least yield was 2.05 for epicarp which is closely followed by the pulp, the oil extract from the seed was highest at 10.03%. The factors that affect the quality and quantity of extracts in plants as itemized by Ncube *et al* (2008) are: the part of the plant used as starting material, type and procedure of extraction, time of extraction, temperature of medium, solvent used for extraction and concentration, polarity of compound. The percentage oil yield of wild melon seed using n-hexane was 10.03% with a yellowish-green colouration, the yield was below the 22.9% reported by Umerie *et al* (2009), the difference could be due to factors earlier highlighted by Ncube *et al, (2008).* However the oil yield of seed were higher than 7.8%, 8.62% and 9.84% when petroleum ether, Ethyl acetate and alcohol were used for extraction of *cucurbita maxima* seeds (Ashok *et al,* 2013) and when Benzene, Chloroform, alcohol and aqueous were used for extraction of *cucumis callosus* seeds where 3.12%, 3.04%, 5.79% and 9.84% were respectively obtained (Tara *et al* 2012), Petroleum ether extract of *cucumis callosus* seeds however yielded 16.08% (Tara *et al,* 2012) which is higher than value obtained in this study for the wild melon seeds with n-hexane. The percentage yields obtained for the pulp, epicarp, and whole fruit in this study could be due to the factors stated by Ncube *et al* (2008).

The determined physicochemical properties of wild melon seed oil as compared with earlier reports by Umerie *et al* (2009) (table6) showed many consistencies in the values.

Table 6: Physico-chemical properties of the seed oil of Adenopus breviflorus benth and their literature value.

Properties	Results obtained	Umerie *et al* (2009)
Colour	Yellowish-green	Yellow
pH	8.3	ND
Density (g/cm^3)	0.8760	ND
Viscosity at 25^0c	28.97	ND
Specific gravity at 25^0c	0.8056	0.947
Refractive index at 25^0c	1.45	ND
Acid value (mgKOH/g)	10.66	2.8
Saponification value (mgKOH/g)	165.50	175.0
Iodine value ($_gI_2$/100g)	135.55	137.2
Ester value (mgKOH/g)	154.84	172.2

ND= not determined

The values obtained for the physical parameters in this work closely agree with the literature except the Acid value. This wide difference could be due to differing regions of collection with differing soil type on which the plant was growing, and season at collection. Physicochemical and physiological properties in plants and seeds have been seen to be affected by the differences in pedoclimatic environment and genotype or their interactive effect (Evrard et al, 1996), cultivars, seasons, nitrogen fertilization, water availability or interactions between these factors (Baldini and Vannozzi, 1996, Pompelli et al 2010).

The refractive index, viscosity, and specific gravity were verified at room temperature 25^0c. Values obtained for refractive index and specific gravity were respectively similar to 1.4778 and 0.8836 obtained for the date seed oil (Mustapha and Mohammed 2009). The high acid value of 10.66 is indicative of its alkalinity. The saponification value of 165.50mgKOH/g obtained for the wild melon was lower than value obtained for rapeseed oil and a higher iodine value of 135.55gI_2/100g than the rape-seed. The higher the iodine value, the more the degree of unsaturated fatty acids bonds present in the fat and oil (Litchfield 1972). The saponification and iodine values of wild melon seed oil compare very well with linseed oil, castor oil, olive oil, cottonseed oil, sesame oil, soybean oil, palm oil, groundnut oil, and palm kernel oil (Choo *et al,* 1988; Akinhanmi *et al,* 2008).

The percentage composition of fatty acids present in wild melon seed oil revealed that wild melon seed oil like most vegetable oils contain small amount of saturated fatty acid while the unsaturated is high, they were 26.16 and 73.84 percent respectively, like many other vegetable oils, linoleic acid is the dominant unsaturated fatty acid.

The qualitative phytochemical screening of the different parts of wild melon and its whole fruit revealed the presence of tannins, Steroids, Flavonoids, Carbohydrates and Terpenoids. These phytochemicals have been investigated and many are observed to enhance good health of man, flavonoids for example protects against allergies, inflammation, free radical, platelet aggregation, microbes, ulcers, hepatoxins, viruses, and tumor (Okwu, 2004 and Nwokonwo 2013), potent water soluble antioxidants and free radical scavengers (Seigler 1998, Balch and Balch 2000, Okwu 2004, Ekan and Ebong 2007). Tannis have antimicrobial and astringent properties and could quicken the healing of wounds and burns (Farquar, 1996 and Onimawo 2002). Terpenoids are anticancer agents, antiflammatory, sedative, insecticidal or cytotoxic, some are antiprotozoal and antihelminitic (Doughari, 2012). Steroids have therapeutically applied as cardiac drugs while some promotes nitrogen retention in osteo porosis and in animals with wanting illness (Maurya *et al,* 2008, Firn 2010 and Madziga *et al* 2010). Kaushik *et al,* (2011) has recommended plants or herbs from cucurbitacae family as a major source of drugs with antiulcer potential. Curcurbitacins in cucurbits have a wide spectrum of biological activities like cytotoxic, hepato protective, antidiabetic, antioxidant, anti-inflammatory, analgesic, antiproliferative and anti ulcer activities (Gill and Bali 2011, Sharma *et al* 2012). Oils obtained from some cucurbit seed (including wild melon) exhibited a significant antioxidant activity which suggest potential for future human food supplements and formulations (Essien *et al,* 2013). These are suggesting that the wild melon fruit or its parts can be useful for treating different ailments by providing useful drugs for human and livestock use.

CONCLUSION

The physicochemical and phytochemical evaluation of seeds of wild melon revealed information about their chemical constituents that could classify them as a rich source of unsaturated fatty acids and a medicinal plant, the compounds present in the parts suggest their possibility in inhibiting the growth of bacterial or being bactericidal. Its high content of unsaturated lipids makes the oil body friendly when hygienically processed. The phytochemical analysis revealed an understanding as to the pharmacological and/ or toxicological properties of the seed oil. This seed oil can therefore be further investigated and exploited for use on commercial scale for both domestic and industrial purposes. The nutrient content of the fruit and the parts should be further investigated to ascertain its desirability in the feeding of livestock.

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