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VOLATILE COMPONENTS OF BANANA PEELS TEA; A NEW PHARMACEUTICAL PRODUCT

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ABSTRACT

Objective: Banana (*Musa sp.*) is an important edible medicinal plant. This plant is a rich source of many important biologically active secondary metabolites. This work is performed to evaluate volatile compounds of both petroleum ether and ether extracts of banana peels tea.

Methods: GC analysis of both petroleum ether and ether extracts of banana peels tea was carried out in this work.

Results: Results of GC analysis of ether extract revealed that, it contained 13 volatile compounds. The most dominant compound of this extract is 17-(1,5-Dimethyl-3-phenylthiohex-4-enyl) -4,4,10,13,14-pentamethyl-2,3,4,5,6,7,10,11,12,13,14,15,16,17- tetradecahydro- 1H cyclopent(a) phenanthren-3-ol; Area % is 30.84, this compound is followed by Butylated Hydroxytoluene; Area % is 7.77. Benzene, (1-Propyloctyl)- was found to be the least available compound in this extract; Area % is 1.51. Petroleum ether extract was found to contain 20 volatile compounds. The most dominant compound in this extract is Benzene, (1-butylheptyl)- ; Area % is 9.45, this compound is followed by Benzene, (1-pentylheptyl)- ; Area % is 8.65. Benzene, (1-ethyloctyl)- was found to be the least available compound in this extract; Area % is 2.28.

Conclusion: Petroleum ether and ether extracts of banana peels tea can be considered as rich sources of many valuable volatile compounds.

Key words: Banana peels, Ether extract, Petroleum ether extract, Volatile compounds.

INTRODUCTION

Banana is the common name for the fruit of the herbaceous plant of the family *Musaceae* and genus *Musa*. They are native to the tropical region of Southeast Asia. Bananas are mostly cultivated for the fruit and also for fiber and ornamental use. About 170 countries produce bananas in the world. In the developing world banana are considered as staple food [1].

According to the Food and Agriculture Organization of the United Nations (FAO), banana is the main fruit in international trade and one of the most popular fruits in the world. This fruit industry is an important source of income, employment and export earnings for developing countries in Latin America, Asia and Africa, and is responsible for creating many jobs, both in agricultural and urban areas [2]. It provides instant energy, rich source of fiber, minerals and vitamins [1]. Banana is a rich fruit in nutrients with good flavor, it is widely consumed throughout the world [3].

It has about 200 volatile components which include phyto-nutrients, sterols and fatty acids. Traditionally it is considered good for any gastric irritations, ulcers, constipation. Its starch provides a protective layer in the stomach while its non-digestible fiber is good for cholesterol lowering and constipation. Native Africans use inner part of banana peel for insect bites and skin problems. In Ayurveda, they suggest eating of banana peel for diabetics as it is good source of potassium, but it does not contain sugars which are more in the edible portion. Ancient uses and recent studies have shown that bananas have good antioxidant properties and correcting electrolyte imbalance [1].

The presented work is a part of submitted Patent no.: 377/2014 (Banana peels tea, an important product, as a tool of agricultural waste recycling). Presented to the Academy of Scientific Research and Technology, Egypt in 11/3/2014. This patent is aimed at production of a cheap new pharmaceutical product, this product is valuable against many diseases such as kidney diseases like stones etc.,. The advantage of using such products is recycling some waste products to produce some valuable materials.

MATERIALS AND METHODS

Plant materials

Banana peels tea was obtained from banana fruits (purchased from the Egyptian market), these peels were washed carefully with distilled water and surface sterilized by 70 % ethanol for 20-30 seconds, then they cut into small pieces, then dried at room temperature ($25^{o}C$) till complete dryness, then grinding to give a tea like material.

Chemical analysis

Ether and petroleum ether extracts of Banana peels tea were obtained by soaking this tea separately in both HPLC-Grade ether and petroleum ether (1/10 W/V) for 1 week, shaking well of samples during the extraction period was done. Volatile components of these extract were analyzed using GC (Gas Chromatography) instrument (Date of analysis: 08/17/14 06:21:51 PM, Scans: 18532,Libraries used in analysis are: Wiley9, mainlib and replib, Operator: ISQ120602, High Mass (m/z): 649.99335, Low mass (m/z): 40.00000, ISTD Amount: 0.000, Dilution Factor: 1.00, Run Time: 63.02 minutes, Sample Weight: 0.00) of the Central lab of National Research Centre, Giza, Egypt.

RESULTS

GC analysis of ether extract (Tables: 1-2) revealed that, it contained 13 volatile compounds. The most dominant compound of this extract is 17-(1,5- Dimethyl-3-phenylthiohex-4-enyl) -4,4,10,13,14-pentamethyl- 2,3,4,5,6,7,10,11,12,13,14,15,16,17-tetradecahydro-1-H-cyclopent phenanthren-3-ol; Area % is 30.84. This compound is followed by Butylated Hydroxytoluene; Area % is 7.77. Benzene, (1- Propyloctyl)- was found to be the least available compound in this extract; Area % is 1.51. Petroleum ether extract was found to contain 20 volatile compounds.

The most dominant compound in this extract is Benzene, (1-butylheptyl)-; Area % is 9.45, this compound is followed by Benzene, (1-pentylheptyl)-; Area % is 8.65. Benzene, (1- ethyloctyl)- was found to be the least available compound in this extract; Area % is 2.28. Benzene, (1-butylheptyl)-, Benzene, (1-propyloctyl)-, Benzene, (1- pentylheptyl)-, Benzene, (1-butyloctyl)-, Benzene, (1-propylnonyl)- and Benzene, (1-Pentyloctyl)- are found in both ether and petroleum ether extracts, area % of these six compounds are higher in case of petroleum ether extract than those in case of ether extract.

DISCUSSION

These results are in parallel to some previous results specially those highlighted that, aroma and flavor of fruits are determinant factors in their consumption. Chemically, the aroma and flavor are given by the presence of volatile compounds that impress the olfactory receptors. With regard to banana, its pleasant and peculiar flavor has been the subject of several studies over the past 40 years. More than 150 volatile compounds from several chemical classes have been identified, including esters, ketones, terpenes and aldehydes.

Mainly isoamyl and isobutyl esters together with 2-pentanone are the compounds commonly found in larger quantities in banana samples [4-5].

Table 1: Volatile components of ether extract of Banana peels tea:

RT	Molecular Weight	Molecular Formula	Compound Name	Area (%)
28.91	220	$C_{15}H_{24}O$	Butylated Hydroxytoluene	7.77
32.38	232	$C_{17}H_{28}$	Benzene, (1-butylheptyl)-	2.24
32.65	232	$C_{17}H_{28}$	Benzene, (1-Propyloctyl)-	1.51
34.94	246	$C_{18}H_{30}$	Benzene, (1-pentylheptyl)-	2.41
35.06	246	$C_{18}H_{30}$	Benzene, (1-butyloctyl)-	2.29
35.38	246	$C_{18}H_{30}$	Benzene, (1-propylnonyl)-	1.58
37.49	260	$C_{19}H_{32}$	Benzene, (1-Pentyloctyl)-	1.79
40.04	374	$C_{25}H_{42}O_2$	Cyclopropanebutanoic acid, 2-[[2-[[2-[(2-pentylcyclopropyl)methyl]cyclopropyl] methyl]cyclopropyl]methyl]-, methyl ester	1.66
40.96	290	$C_{20}H_{34}O$	2,4,7,14-Tetramethy-l4-vinyl-tricyclo[5.4.3.0 (1,8)]tetradecan-6-ol	2.30
48.20	450	$C_{32}H_{66}$	Dotriacontane (CAS)	2.22
52.15	380	$C_{27}H_{56}$	Heptacosane	3.98
59.25	460	$C_{27}H_{56}O_5$	Dimethoxyglycerol Docosyl Ether	2.17
67.69	534	$C_{36}H_{54}OS$	17-(1,5-Dimethyl-3-phenylthiohex-4-enyl) -4,4,10,13,14-pentamethyl-2,3,4,5,6,7,10,11,12,13,14,15,16,17-tetrade Cahydro-1-Hcyclopent (a)phenanthren-3-ol	30.84

Table 2: Volatile components of petroleum ether extract of Banana peels tea:

RT	Molecular Weight	Molecular Formula	Compound Name	Area (%)
15.18	156	$C_{11}H_{24}$	Undecane (CAS)	3.16
18.77	170	$C_{12}H_{26}$	Dodecane	2.89
29.60	218	$C_{16}H_{26}$	Benzene, (1-butylhexyl)-	3.66
29.85	218	$C_{16}H_{26}$	Benzene, (1-propylheptyl)-	2.80
30.37	218	$C_{16}H_{26}$	Benzene, (1-ethyloctyl)-	2.28
32.32	232	$C_{17}H_{28}$	Benzene, (1-pentylhexyl)-	5.11
32.44	232	$C_{17}H_{28}$	Benzene, (1-butylheptyl)-	9.45
32.71	232	$C_{17}H_{28}$	Benzene, (1-propyloctyl)-	7.27
33.26	232	$C_{17}H_{28}$	Benzene, (1-ethylnonyl)-	6.35
34.27	232	$C_{17}H_{28}$	Benzene, (1-methyldecyl)-	6.06
35.00	246	$C_{18}H_{30}$	Benzene, (1-pentylheptyl)-	8.65
35.13	246	$C_{18}H_{30}$	Benzene, (1-butyloctyl)-	8.05
35.43	246	$C_{18}H_{30}$	Benzene, (1-propylnonyl)-	6.09
35.97	246	$C_{18}H_{30}$	Benzene, (1-ethyldecyl)-	5.21
36.97	246	$C_{18}H_{30}$	Benzene, (1-methylundecyl)-	4.80
37.54	260	$C_{19}H_{32}$	Benzene, (1-pentyloctyl)-	6.39
37.70	260	$C_{19}H_{32}$	Benzene, (1-butylnonyl)-	3.91
38.00	260	$C_{19}H_{32}$	Benzene, (1-propyldecyl)-	2.99
38.57	260	$C_{19}H_{32}$	Benzene, (1-ethylundecyl)-	2.57
39.55	260	$C_{19}H_{32}$	Benzene, (1-methyldodecyl)-	2.31

CONFLICT OF INTERESTS

Declared None

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