ISSN : 0974 - 7508 Volume 9 Issue 2

Trade Science Inc.

Natural Products

An Indian Journal

Full Paper

NPAIJ, 9(2), 2013 [65-69]

Physico-chemical study of fixed oils of *Pterospermum acerifolium* plant

M.Amin*, S.S.Sawhney, Shanni Kumar

Uttaranchal College of Science and Technology, Dehradun- 248001, (INDIA)

E-mail: mohdaminmir@gmail.com; mohdaminmir77@yahoo.in

ABSTRACT

The present communication attempts to evaluate the physicochemical studies on the oil of *Pterospermum acerifolium*. The oil was extracted from freshly collected leaves and roots of *Pterospermum acerifolium* with petroleum ether using Soxhlet apparatus. *Pterospermum acerifolium* leaves showed 20.0% and roots showed 25.7% yield of absolute oil. Some Physico-chemical properties of the extracted oil like colour, (Flower - Yellow greenish Roots - Pale yellow) Relative density (Leaf - 0.420 Roots - 0.76), Reichter Meissel value, (0.22 ± 0.01 for leaf oil and 0.28 ± 0.22 for root oil) Saponification value, (39.27 ± 0.05 for leaf oil and 30.08 ± 0.12for root oil) Iodine value, (1.21 ± 0.11for leaf oil and 5.50 ± 0.11for root oil) Acid value, (23.5 ± 0.03 for leaf oil and 27.70 ± 0.06 for root oil) Ester value, (15.70 ± 0.08 for leaf oil and 12.08 ± 0.07 for root oil), Peroxide value (7.5 ± 0.09 for leaf oil and 10.70 ± 0.011 for root oil) were determined.

KEYWORDS

Physico-chemical;
Pterospermum acerifolium;
Fixed oils;
Chemical characteristics.

INTRODUCTION

Plants are one of most important sources of medicines. Today large number of drugs in use is derived from plants, like morphine from papaver somniferous, Ashwagandha from Wathena somniferous, etc. The medicinal plants are rich in secondary metabolites and essential oil of therapeutic importance. The important advantages claimed for therapeutic uses of medicinal plants in various ailments are their safety besides economical, effective and their easy availability. Because of these advantages the medicinal plants have been widely used by traditional medicinal practitioners in their day to day practice.

The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds. Many of the indigenous medicinal plants are used as spices and food plants.

The term oil is applied to large number of liquids which are insoluble in water and highly viscous. Their greasy feel is the result of these properties. So this study was carried out for the physicochemical property determination of the Pterospermum acerifolium plant. Okabe S, Takata Y, Takeuchi K, Naganuma T, Takagi K,[1] in 1976, studied the Effects of carbenoxolone Na (Pterospermum acerifolium) on acute and chronic gastric lesion reduced by NSAIDs drugs in mice. The bark extract of Pterospermum acerifolium is Anti inflammatory and Analgesic in nature as Manna A. K. 2009[2]. The antiulcer property of Pterospermum acerifolium bark extracts was studied by Manna A. K. 2009[3].

Full Paper

Murshed S, et.al studied the chronic effects of Pterospermum acerifolium bark on glycemic and lipedemic status of type 2 diabetic model rats Diabetes 2000[4]. The Anthelminthic potential of crude extracts and its various fractions of different parts of Pterospermum acerifolium Linn Sambit Parida 2010[5], Shweta Saboo et.al in 2007[6] evaluated the Antimitotic and Anticancer activity of the crude extracts of wild leaves of Pterospermum acerifolium.

MATERIALS AND METHODS

Pterospermum Acerifolium plant was collected from the Dehradun region of Uttarakhand in paper boxes. The *Pterospermum Acerifolium* was shade dried and powdered in mixture. The plant samples were air dried and grounded into uniform powder with a grinder.

EXPERIMENTAL

Chemicals and reagent

All the chemicals used in this investigation were of analytical reagent (AR) grade and were purchased from Sigma Merck. De-ionized water was used for the complete study. All the glassware and equipment used for handling were stabilized properly prior to use.

Collection and preparation of samples

Pterospermum Acerifolium plant was collected from the Dehradun region of Uttarakhand in paper boxes. Plant was weighed before and after the removal of unwanted material kept under shade at room temperature for the removal of extra moisture and were then subjected to oil extraction.

Extraction of oil

For the extraction of essential oil from *Pterospermum Acerifolium*, solvent extraction was performed and concrete & absolute oils were obtained. 95 mg of the plant material was used for the extraction of oil. The extraction process was carried out using petroleum ether as organic solvent. When the entire aroma was taken out by solvent, then the process of distillation was carried out. The apparatus to be used in each process was thoroughly washed and dried.

Concrete oil recovery

Dissolved organic residue in the petroleum ether was collected in a flask and dried over by adding anhydrous $NaSO_4$. The last traces of petroleum ether were removed by bubbling nitrogen gas through the oil. Concrete oil was taken in pre weighed 100ml flask and the weight of concrete oil was determined by again weighing the flask. Percentage yield of concrete oil was calculated on the basis of whole plant weight.

Absolute oil recovery

Concrete oil was dissolved in minimum volume of absolute alcohol to remove the natural waxes present in the essential oil and was then filtered through a Whatmann filter paper # 43. Alcohol was removed by distillation and by passing nitrogen gas through the oil. Percent yield of absolute oil was also calculated on the basis of whole plant weight.

Physico-chemical analysis

Physical and chemical properties such as density, acid value, saponification value, iodine value, R.M. value, ester value, peroxide value were observed. Colour of absolute oil was noted from physical appearance. The relative density of the oil was determined by using the relative density bottle.

Determination of specific gravity

$20cm^3$ of the oil was measured in a pre-weighed measuring cylinder. The weight of the cylinder and oil were measured, the weight of the oil was then obtained by subtracting the weight of the cylinder from the weight of the oil and cylinder. The specific gravity of oil was obtained.

Physico-chemical parameter determination

For the determination of acid number, 1.5 gm of absolute oil was weighed accurately into a 100 c.c. saponification flask. 15 c.c of neutral 95% alcohol and 3 drops of 1% phenolphthalein solution were added. Titration of the free acid with a slandered 0.1 normal aqueous solution of NaOH was done by adding the alkali drop wise at a uniform rate. The contents of the flask were continuously agitated. The first appearance of red colour was considered as an end point. Process was repeated 3 times to get mean value and the acid number was calculated.

Full Paper

Another sample of 1.5 gram of absolute oil was taken and same procedure was followed and 10 c.c of 0.5N alcoholic solution of NaOH was added. A glass air cooled condenser was attached to the flask and contents were refluxed for one hour on a water bath. The apparatus was removed and allowed to cool at room temperature for 15 minutes. Excess alkali was titrated against standardized 0.5N aqueous HCl and the ester contents were calculated.

Ethanolic hydroxide (0.5 N) was pipetted into conical flask containing 1 g of sample. The content of each flask was reflux for 45 minutes un-till clear solution was obtained with occasional shaking, then cooled to room temperature, after it was titrated with sulphuric acid (0.5 N) using phenolphthalein as indicator. A blank was subjected to the same treatment. Results were expressed as mg KOH g^{-1} for the saponification value determination of oil.

Oil sample (0.5 g) was added into a boiling tube containing 1 g powered potassium iodide for the Peroxide value determination of an oil sample. Glacial acetic acid / chloroform mixture (20ml, 2:1) was added, the boiling tube was placed in boiling water 1 minute after which its content was poured into conical flask containing potassium iodide solution (20ml; 5%). The boiling tube was rinsed twice with distilled water (25ml) and content added into the conical flask. The whole content was titrated with sodium thiosulphate (0.2N) solution to colourless end point using starch as indicator. Results are expressed as mMol/g.

An accurately weighted amount of the oil was dissolved in 10ml alcoholic solution. Reflux the content for 15 minutes on a water bath, removed the reflux condenser and boil off the alcohol on the water bath. Diluted the reaction mixture with 100ml of distilled water, heat to obtain a clear solution, acidify with 40ml of H_2SO_4 and distillate, filter and titrated 100ml of it against N/10 NaOH.

The sample (2%) was prepared in chloroform, titrated with Wij's solution (5ml) mixed thoroughly and allowed to stand in the dark for 1 hr. Potassium iodide solution (5ml;7.5%) was added and titrated to a light straw colour using 0.1N sodium thiosulphate solution. Starch indicator was thereafter added and titration continued to a colourless end point. Results are expressed as I_2 $100g^{-1}$. From this the Iodine value of the sample was calculated.

Also the ester value of an oil sample was carried out, which is the saponification value minus times the acid value of oil.

All the experiments were carried out in triplicate and the data is reported as mean ± standard deviation (SD) as per Steel *et al.*[7].

RESULTS AND DISCUSSION

The results of the physicochemical analyses conducted on the *Pterospermum Acerifolium* extracted oil are presented in TABLES 1 and 2.

TABLE 1 : Physical properties of the *Pterospermum Acerifolium* oil.

Parameters	Results	
	Leaves	Roots
Colour of oil	Yellow greenish	Pale yellow,
Relative density	0.420	0.76
Smell	Irritating Smell	Pungent odour
Oil yield	20.0%	25.7%

TABLE 2 : Chemical properties of *Pterospermum Acerifolium* oil.

Parameters	Results	
	Leaves	Roots
Reichter Meissel value	0.22 ± 0.01	0.28 ± 0.22
Saponification value (mg KOH/g)	39.27 ± 0.05	30.08 ± 0.12
Peroxide value (mg/100g)	1.21 ± 0.11	5.50 ± 0.11
Acid value (mg KOH/g)	23.5 ± 0.03	27.70 ± 0.06
Ester value	15.70 ± 0.08	12.08 ± 0.07
Iodine value (gI_2/100)	7.5 ± 0.09	10.70 ± 0.011

Physical properties

The percentage yield of the leaf and root oil was found to be 20.0%, 25.7% respectively which is low when compared to Bottle Gourd *Lageneria siceraria* seed oil 39.22%[8] and specific gravity of the leaf and root oil was found to be 0.420 g/cm^3 and 0.76 g/cm^3. However the oil is liquid at room temperature which may be due to the presence of unsaturated fatty acids[9].

Chemical properties

(a) Peroxide value

This measures the deterioration of oil from oxidation[10]. Therefore, the low peroxide value of 1.21 ± 0.11 and 5.50 ± 0.11 obtained from leaf and root oil

Full Paper

when compared to palm kernel oil 3.58%, indicates that the oil can be kept for a very long period of time[11]. Initial peroxide values for the edible oils and fat ranged between 0.9 and 15.9 meq/kg-oil. The peroxide value of the plant is within the FAO/WHO and TBS standards for edible vegetable oils. Peroxide values increased during storage. The rate of peroxidation differed from oil to oil as related to different treatment to which the oils were subjected. Peroxide value is a measure of the concentration of peroxides and hydro peroxides formed in the initial stages of lipid oxidation. Milliequivalents of peroxide per kg of fat are measured by titration with iodide ion. Peroxide values are not static and care must be taken in handling and testing samples. It is difficult to provide a specific guideline relating peroxide value to rancidity. High peroxide values are a definite indication of a rancid fat, but moderate values may be the result of depletion of peroxides after reaching high concentrations.

(b) Acid value

The acid value of 23.5 ± 0.03 and 27.70 ± 0.06 mg KOH/g obtained from the leaf and root oil is high when compared to Sheanut butter oil 10.3mgKOH/g[12]. Thus the higher the acid value of oil, the lower its storage quality and vice-versa[13], this shows that the concerned plant oil have less storage quality when compared to that of Sheanut butter oil.

(c) Saponification value

The saponification value of the plant leaf and root oil was found to be 39.27 ± 0.05 and 30.08 ± 0.12 mgKOH/g which is low when compared to 183.1mgKOH/g of sheanut butter oil[14] and 123.3 ± 3.428 mgKOH/g, *jatropha* oil respectively, which they have potential for soap production[15]. This indicates that the oil could be used in soap making since its saponification value is high.

(d) Iodine value

This is a measure of the proportion of unsaturated acid or fat and oil present, but the test measures the amount of iodine absorbed per gram of sample. The determination of iodine value measures the reaction of the double bonds with halogen. The iodine value of 7.5 ± 0.09 and 10.70 ± 0.011 g/100g which was obtained from the oil is low when compared to 16.0g/100g Tiger nut oil. The oil shows quite degree of unsaturated fatty acid which indicates that the oil is suitable for consumption and can also be used as a non drying oil, which is useful in the manufacture of soap[16].

(e) Reichert meissel value (R.M value)

The Reichert-Meissel is a value determined when examining fat. The Reichert value is an indicator of how much volatile fatty acid can be extracted from fat through saponification. It is equal to the number of mililiters of 0.1 normal hydroxide solution necessary for the neutralization of the water-soluble volatile fatty acids distilled and filtered from 5 grams of a given saponified fat. The R.M value gives the natural composition of the fat and is used for detection of fat adulteration. Butter that has high percentage of short-chain fatty acids has highest Reichert-Meissel number compared to margarine. The Reichter Meissel value of the concerned leaf and root oil was found to be equal to 0.22 ± 0.01 and 0.28 ± 0.22 respectively.

CONCLUSION

The results in this analysis indicated good quality for the *Pterospermum Acerifolium* oil. Chemical analyses presented saponification value, peroxide value, acid value, free fatty acid and Iodine values that fell within the range of those acceptable as having good potential for soap production although with low storage property. Before storage, the imported edible vegetable oils physicochemical characteristics largely conform to both local standards set by TBS and international standard of the FAO/WHO. The physicochemical properties changed significantly depending on storage time and also with the mode of storage. With storage the quality of oils deteriorated. The peroxide value of the oils and fat exposed to atmospheric oxygen and light being the highest changing property. Oils kept in tightly sealed containers and stored in the dark exhibited very minor changes in their physicochemical properties.

REFERENCES

[1] S.Okabe, Y.Takata, K.Takeuchi, T.Naganuma, K.Takagi; Effects of carbenoxolone Na on acute and chronic gastric lesion reduced by NSAIDs drugs in mice sgents pterospermum acerifolium action, **21**, 316-19 **(1976)**.

[2] S.Leyek, M,.J.Parnham; Acute anti-inflammatory and gastric effects of the seleno–organic compound Pterospermum acerifolium. Agents Actions, **30**, 427-31 **(1990)**.

[3] O.H.Lowry, N.L.Rosebrough, A.L.Farr, R.J.Randall; Protein measurement with folin phenol reagent. J.Biol.Chem., **193**, 265- 75 **(1951)**.

[4] K.Lange, B.A.Peskar, B.M.Peskar; Pterospermum acerifolium stimulation of rat gastric mucosal leukotriene formation by ethanol. Naunyn Schmiedberg's Arch Pharmacol Suppl., **330**, R27 **(1985)**.

[5] J.L.Wallace; Lipid mediators of inflammation in gastric ulcer, Am.J.Physiol Pterospermum Acerifolium, **258**, GI-11 **(1990)**.

[6] K.Rapala; The effect of tumor necrosis-alpha on wound healing, an experimental study Pterospermum acerifolium. Ann.Chir,Gynacol Suppl., **211**, 1 **(1996)**.

[7] R.G.D.Steel, J.H.Torrie, D.A.Dickey; Principals and procedure of statistics. Mc Graw Hill Book Co.Inc., New York, **(1997)**.

[8] L.G.Hassan, N.A.Sani; Comparative studies on the physico-chemical properties of bottle gourd lageneria siceraria seeds oils extracted by two methods. Nigeria Journal of Basic and Applied Sciences, **15**, 50-51 **(2007)**.

[9] M.I.Mohammed, Z.U.Hamza; Physicochemical properties of oil extracts from sesamum indicum L. Seeds Grown in Jigawa State-Nigeria. Journal Applied Environment Management. **12(2)**, 99-100 **(2008)**.

[10] L.G.Hassan, N.A.Sani, Comparative studies on the physico-chemical properties of bottle gourd lageneria siceraria seeds oils extracted by two methods. Nigeria Journal of Basic and Applied Sciences, **15(1&2)**, 50-51 **(2007)**.

[11] S.L.Chopra, J.S.Kanwar, Analytical agricultural chemistry, 4th Edition, New Delhi, Kalyami publishers. 12-15 **(1991)**.

[12] M.N.Ogbuagu, Inhibitory effect of onion and garlic extracts on the rancidity of palm and palmKernel Oils. Journal Chemistry Society of Nigeria, **33(1)**, 43-44 **(2008)**.

[13] S.Nielsen; Food analysis, Laboratory manual 3th Edition, Kluwer academic premium Publishers, London, 88-89 **(2003)**.

[14] A.A.Warra, S.Y.Gunu, A.Jega, J.A.Aisha, Soap production from shea nut butter. International Journal of Applied Sciences, **5(4)**, 410-412 **(2011)**.

[15] A.A.Warra, I.G.Wawata, L.G.Hassan; Extraction and physicochemical analysis of some selected Northern Nigerian industrial oils. Scholars research library: Archives of Applied Science Research, **3**, 536-541 **(2011)**.

[16] C.I.O.Kamalu, P.Oghome, Extration and characterization of tiger nut oil. Journal of Chemistry Society of Nigeria, **33**, 79-87 **(2008)**.