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Full Length Research Paper

Analysis of *Moringa oleifera* (leaves and flowers) to determine some phytochemicals and functional groups

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ABSTRACT: The infra-red (IR) spectra analysis of *moringa oleifera* indicated the presence of the following functional groups and their frequency ranges which includes; O-H stretching vibrations (3790-3390), C-H stretching (2953-2752), N-H stretch (1643-1514),C=N symmetric stretching (2723-2351) bending, N=O symmetric stretching (1460-1305), C-N stretch (1265-1033),C=O stretching (1651-1566) and C=C bending (1033-721). The phytochemical analysis of moringa leaves using standard procedures shows it contains (%) saponin 5.0%, flavonoid 5.42%, alkaloid 5.36% and cyanogenic glycoside 3.3% while the saponin, flavoniod, alkaloid and cyanogenic glycoside in flower are 3.20%, 7.12%, 1.55% and 2.6% respectively. This result shows that the presence of saponin, alkaloid and cyanogenic glycoside are higher in moringa leaves than its flowers while flavonoid is higher in concentration in *moringa oleifera* flower than its leaves. It has been shown from the analysis that the percentages of the phytochemicals are not lethal especially the cyanogenic glycoside in the sample which indicates less toxicity and a minor quantity of hydrogen cyanide which can easily be detoxified for better health benefits.

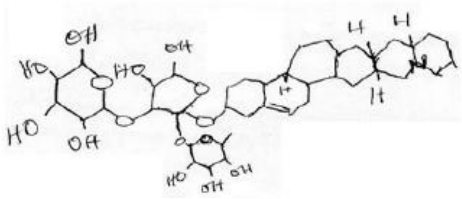
Keywords: Moringa oleifera, saponin, alkaloid, infra-red spectrophotometer

INTRODUCTION

The importance of *moringaoleifera* cannot be overemphasized. It is a plant species that is very crucial medically, traditionally, industrially,economically and ornamentally. Hence, this research was intended to analyze some phytochemicals in *moringaoleifera* and their usefulness (Patrick and Moyo,2011). The phytochemicals analyzed were found to be some of the parameters in *moringaoleifera* plant which has made it very useful to man and his environment (Forster and Hartonut, 2006). Some of the phytochemicals determined were saponin, flavonoid, cyanogenic glycoside and Alkaloid using the leaves and flowers. This has also shown that some parts of *moringa oleifera* are very edible and can be properly digested, also its usefulness for good health (Frank and Vertkaik, 2006). *Moringa* plant, (*moringa oleifera)* is a highly valued plant that is mostly cultivated in the tropics and sub-tropics, it is a multi-purpose tree which originated from India, Philippines, Sri-lanka, Thailand, Malaysia, Pakistan, Nigeria, Malaysia, etc. It is a perennial softwood tree with timber of low quality, but for centuries has been advocated for traditional, medicinal and industrial uses with various edible parts (Fugile and Olson, 2010). *M. oleifera* belongs to the morinagaceae family which has various species of deciduous trees classified in a single genus (Fahey and Jed, 2005). *M.oleifera* is the most widely known and distributed species. All parts of *moringa oleifera* are very useful. They are majorly used for food, medicinal and

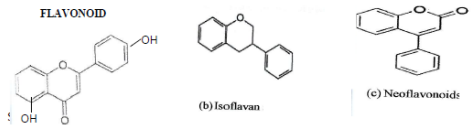
industrial purposes. It is cultivated to use as a vegetable (leaves, green pods, flower seeds), for spice (mainly roots) for cooking and cosmetic oil (seeds) and as a medicinal plant (all plant organs). Medicinally, *moringa* parts are used for treatment of anaemia, anxiety, asthma, fever, semen deficiency (Frank and Vertkaik, 2006). Traditionally, it is used for skin infections and sores in Malaysia and India. Its utility as a non-food product has also been extensively described. Nutritionally, *moringa* trees have been used to combat malnutrition, especially among infants and nursing mothers. Morin*ga* leaves (Andreas, 2009) contains more vitamin A than carrots, more calcium than milk, more iron than spinach, more vitamin c than milk, more potassium than bananas and that the protein quality of *moringa* leaves rival that of milk and eggs (Ted and Elevitch, 2010). It has high anti-oxidant properties making it a valuable source of vitamins A, C and E. it is one of the highest naturally occurring sources of anti-oxidants (Hossein, 2008). The phytochemicals studied such as saponins, cyanogenic glycosides, flavonoids, and alkaloids are natural products which exist in plants and are very significant in the nutritional, medicinal and health benefits of moringa plants (Lindhorst, 2007).

Saponins



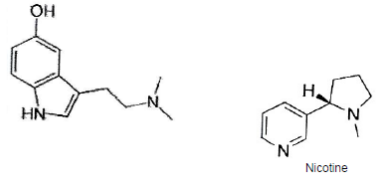
Structure of Saponin

Flavonoid



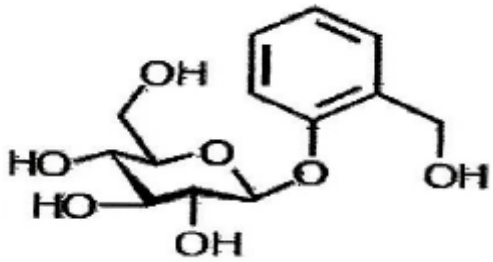
Structures of some Flavonoids

Alkaloids



Bufoteinin Structures of Alkaloids.

Cyanogenicglycoside ft



Structure of Glycoside

MATERIALS AND METHOD

Phytochemical screening

Crude extracts were subjected to phytochemical tests for presence of saponin, alkaloid, flavonoid and cyanogenic glycosides using standard procedures.

Determination of alkaloid

To 5g of the sample in a 500ml beaker was added. 200ml of 10% Acetic acid in ethanol was added and covered. It was allowed to stand for 2h, this was filtered and the extract was concentrated on a water bath to one-quarter of the original volume 50mls concentrated ammonium hydroxide was added drop wise to the extract until precipitate was formed. The solution was allowed to settle, the precipitate was collected and washed with ammonium hydroxide and filtered. The residue was dried and weighed.

Determination of flavonoid

10g of the sample was repeatedly extracted with 100ml of 80% aqueous methanol at room temperature. The solution was filtered. The filtrate was later transferred to a crucible and evaporated to dryness over a water bath and weighed to a constant weight (Bohm and Kocipal-Abyazam, 1999)..

Determination of saponins

10g of sample was first defatted using acetone solvent by soxhlet continuous extraction method. The residue in the thimble was extracted with methanol solvent into a pre-weighed distillation flask by soxhlet continuous extraction. The extract was distilled to dryness and further placed in an air oven to eliminate all traces of methanol solvent. The flask was then reweighed to obtain the weight of the Saponin in the sample.

Table 1: Phytochemicals and functional groups identified.

SAMPLE IDENTIFIED	SAPONIN	FLAVONOID	ALKALOID	CYANOGENIC GLYCOSIDE
Percentages	**%**	**%**	**%**	**mg/10g**
Moringa leaves	5.00	5.42	5.36	0.20
Moringa flowers	3.20	7.12	1.56	0.16

Table 2: Infra-red (IR) spectrum of *moringa* leaves and flowers

BOND TYPE	FREQUENCES RANGES (CM^{-1})
O-H	3790-3390
C-H	2953-2752
N-H	1643-1514
C=N	2723-2351
N=O	1460-1305
C-N	1265-1033
C=C	1033-721
C=O	1651-1566

Determination of cyanogenic glycoside

10g of sieved sample (sieve No. 20) in 800ml Kjeldahl flask was added 200ml water and allowed to stand for 3h. Steam distillation was employed and 155ml was distillated into sodium hydroxide solution (0.5g in 20ml H_2O) and diluted to 250ml. 10ml of the distillate was titrated against 0.02N silver nitrate using micro-burette. End-point was determined at permanent mixture turbidity.

INFRA RED (FTIR) SPECTRUM

FTIR 8400S Fourier Transform Infrared spectrophotometer was used to identify the functional groups.

RESULTS AND DISCUSSION

Results of some phytochemical analysis of *moringaoleifera* leaves and flowers (dry) are presented in the (Table 1). From our analysis, it shows that phytochemicals; saponin, alkaloid and cyanogenic glycoside are higher in *moringa oleifera* leaves than in its flower while flavonoid concentration or percentage is higher in *moringaoleifera* flower than its leaves. Flavonoid has the highest percentage in the flower. The high percentage of flavonoid in the *moringa* flower is responsible of its naturally bright colouration and fragrance, it is also interesting to note that flavonoid has the highest concentration or percentage in the leaf sample.The different parameters determined were variously distributed in the sample, this could be seen in the following percentages for the *moringa* leaves, saponin 5%, flavonoid 5.42% alkaloid 5.36% and cyanogenic glycoside 3.3% while in *moringa* flowers, the percentages of the parameters are saponin 3.20%, flavonoid 7.12%, Alkaloid 1.56% and cyanogenic 2.6%. This confirms that *moringa oleifera* leaves and flowers are good sources of saponin and flavonoid which contain high amount of lipids. The caloric value was high due to high content of lipids. Saponin helps in protecting the plant against microbes and fungi and may also enhance nutrient absorption and aid in animal digestion. The presence of saponins have many health benefits which includes; reduction of blood cholesterol level, cancer and improvement of the immune system (Bate-smith,1962) and (Hartmut, 2009).The results revealed that the phytochemical parameters analyzed in the sample of *moringa oleifera* leaves and flowers are of good health benefits and therefore, *moringa oleifera* is a good source of food. The phytochemical components in *moringa oleifera* flowers and leaves are useful in treating medical ailments like hypertension, cancer, asthma, atherioscheriosis etc. Also act as anti-cancer, anti-allergic, antioxidants, anti-viral and anti-inflammatory effects (Hartmut, 2009). The percentage of cyanogenic glycoside in the sample shows that, it is less toxic and will produce a minor quantity of hydrogen cyanide which can easily be detoxified. Infra-red (IR) spectral bands scan of the *moringa oleifera* leaves and flowers samples are presented in (Table 2 and Figure 1) their frequencies are related to the functional group similar to that reported by(Williams and Flemings 1964). The broad O-H stretching vibration of alcohol group of the entire sample was in the region (3790-3390cm^{-1}) and the C–O stretch of alcohol was in the region (1265-1030cm^{-}). Other functional groups observed were: C-H stretching vibrations of alkane (2953-2752cm^{-1}), N=O symmetric stretching (1643-1514cm^{-1}), C-N stretch (1454-1377cm^{-1}),C=O stretch(1651-1566) and C=C bending(1033-721).The bands of the crude extract of *moringa oleifera* leaves and flowers sample indicate mainly the presence of carboxylic fatty acid and O-H of fatty alcohol, while the absorption band of C-N and N-H shows the presence of

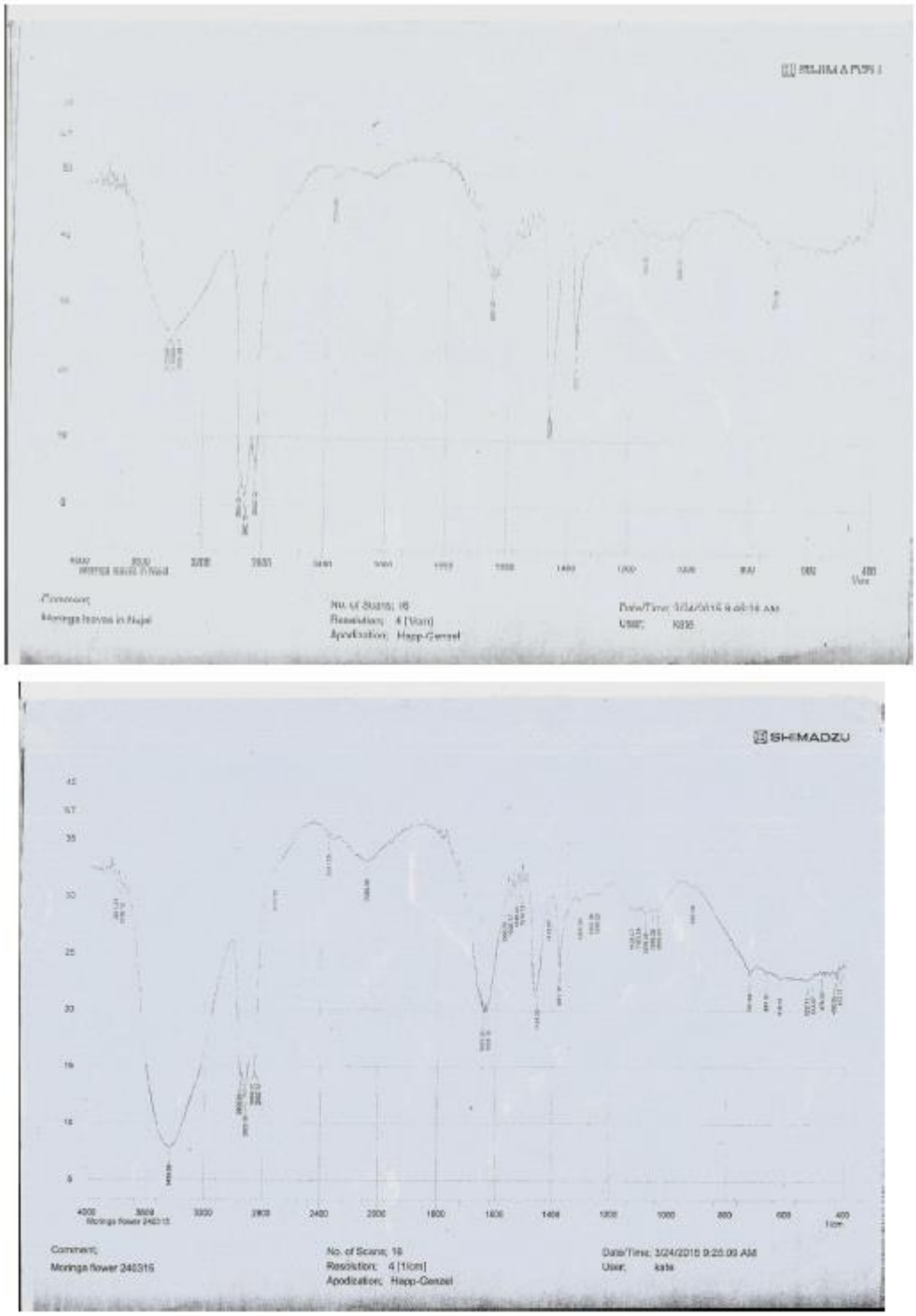


Figure 1: Analysis of *moringa oleifera* leaves and flowers.

some protein material.

Conclusion

Phytochemical analysis of *moringa oleifera* leaves and flowers reveal the presence of saponins, alkaloid, cyanogenic glycoside and flavonoid which have so much health benefits especially for treatment of some ailments. Industrially, the phytochemicals are also very useful in making food, beverages, drinks, shampoos and some facial cleansers. The IR bands also indicated the presence of some functional groups like O-H, carboxylic, fatty acid and O-H fatty alcohol, while the absorption

band of C-N and N-H shows the presence of some protein and cyanide materials.

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