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PHYTOCHEMICAL ANALYSIS OF MORINGA OLEIFERA (LEAVES AND FLOWERS) AND THE FUNCTIONAL GROUP.

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Keyword: moringa, research, analysis, functional group

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 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.

INTRODUCTION

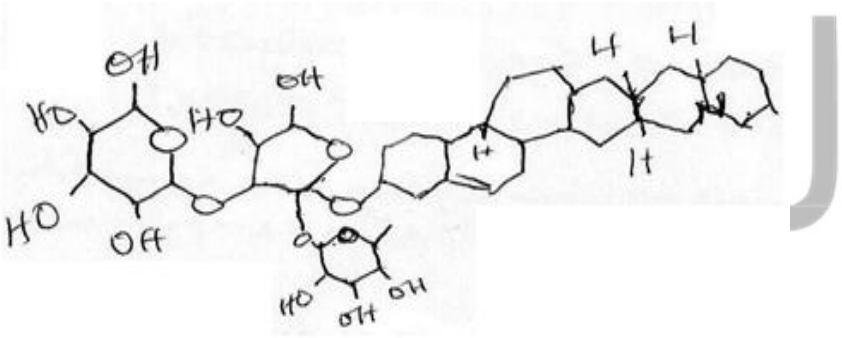
The importance of *moringa oleifera* cannot be over-emphasized. It is a plant species that is very crucial medically, traditionally, industrially economically and ornamentally. Hence, this research was intended to ascertain or analyze some phytochemicals in *moringa oleifera* and their usefulness(Fugile,2010). The phytochemicals analyzed were found to be some of the parameters in *moringa oleifera* plant which has made it very useful to man and his environment. Some of the phytochemicals determined were saponin, flavoniod, cyanogenic

glycoside and Alkaloid using the leaves and flowers. It has been discovered from the analysis that the percentages of the phytochemicals are not lethal and so may not cause harm or death. 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,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, 2010). There are varieties of *Moringa* species which *are M.. Peregrine, M. Arborea, M. Stenpetalla, M. Longituba, M. Borziana, M. Concanensin, M. Drouhardii, M. Pygmaea, M. Rivac, M. Ovalifolia, M. Hildebranti,* (Tsaknis *et al,* 1998). *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. *Moringa* plant, because of its unique nature has several names which are "Never dies" that is, can grow both in poor and minimally affected by difficult climate conditions such as draught. "Horse-raddish tree" arising from the use of the root by European in India as a substitute for horse raddish, "Drum stick tree" arising from the shape of the pods, resembling the slender and curved stick used for beating the drum. (Olson, 2010). The Nigerian names of *moringa oleifera* are*:-* Gawara, Gaware, Konamarade, Rini maka, habiwal for the Fulanis, Bagaruwar maka, Bagaruwar masar, for the Hausas, Odudu oyibo, okwe olu, Uhe-ghara-ite, Okochi egbu for the Ibos and for the Yorubas, Adagba malero, Ewele, Eweile, Ewe igbale, Idagbo monoye. (Patrick and Moyo, 2011). 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, 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. (Olson, 2010). Non-governmental organization, churches and educational concerns for hunger organization have advocated *moringa* as "natural nutrition for the tropics," leaves can be eaten fresh, cooked, or stored as dried powder for many months without refrigeration and reportedly without loss of nutritional value. (Harold, 2004). *Moringa* leaves contain 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). The nutritional properties of *moringa* are now well known that there seems to be little doubt of the substantial health benefit to be realized by consumption. It has been found that the seeds are sometimes eaten without any heat treatment like c. armoracia, the roots of *moringa* are pungent and are commonly used as a condiment or garnisher. Such a practice would not be recommended as the root has been shown to contain small quantities of alkaloids, especially moringinine, bacteriocide and spirochine of which can prove fatal following ingestion. (Ted and Elevitch, 2010). *Morringa oleifera* oil is very stable and has an extremely long shelf life (6 years or more). This stability makes it natural as it carries oil volatile fragrances, it is used in highly quality perfumes in Egypt and Europe. Skin allergies, inflations, wounds and blemishes are all healed by *moringa oleifera* oil. 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). *Moringa oleifera* oil contains four times the collagen of carrot oil, this helps to rebuild skin's collagen fibres which minimizes wrinkling. (Hossein,2008).*Moringa oleifera* being very light with pleasant tasting is similar to olive oil in containing unsaturated fats, it is good for healthier eating,

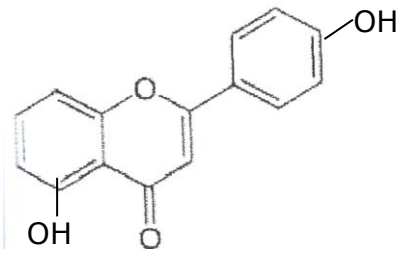
spreads easily on the skin and also very useful in massaging the body. The oil itself is known as Behan oil, a good rub for pregnant woman's belly, has moisturizing, nourishing and emollient properties. (Rajangam and Tsakn,2001). It has an excellent cleaning ability in soaps, shampoo etc. modern use of *moringa* oil are majorly as lubrication oil for fine machinery, skin care and fuel for lamps which gives a clear smokeless light. (Rajangam and Tsakn,2001).

SAPONINS



Structure of Saponin

FLAVONOID



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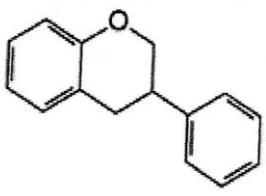
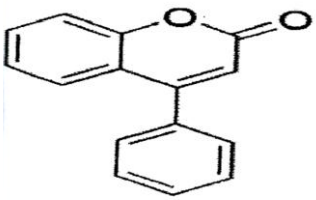
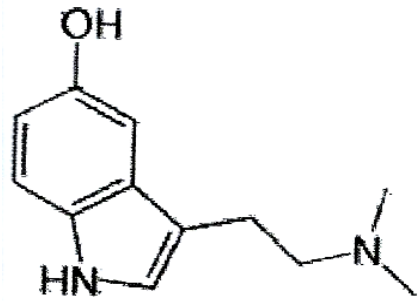


(b) Isoflavan

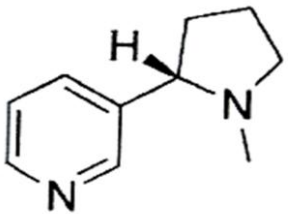


(c) Neoflavonoids

ALKALOIDS



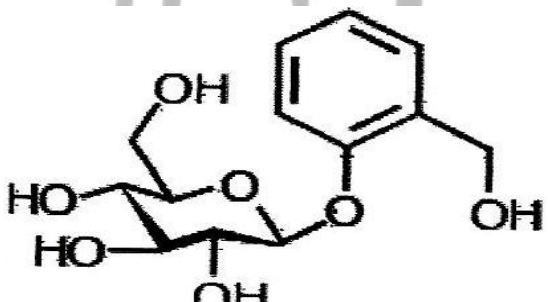
Bufoteinin



Nicotine

Structures of Alkaloids.

CYANOGENIC GLYCOSIDE



Structure of Glycoside

MATERIALS AND METHOD

Sample Collection and treatment.

Moringa oleifera leaves and flowers were collected from the premises of Seventh-Day Adventist Church, Mile 3, Port Harcourt, Rivers State and was transported immediately to the laboratory under suitable temperature. The leaves and flowers were air-dried and later pulverized into powder and then stored in in plaster container for the various analyse.

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 2hrs, 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: (.Bohm and Kocipal-Abyazam, 1999).

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.

Determination of Saponins: .(Forster and Hartonut,2006)

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.

Determination of Cyanogenic Glycoside(Lindhorst T. K. 2007).

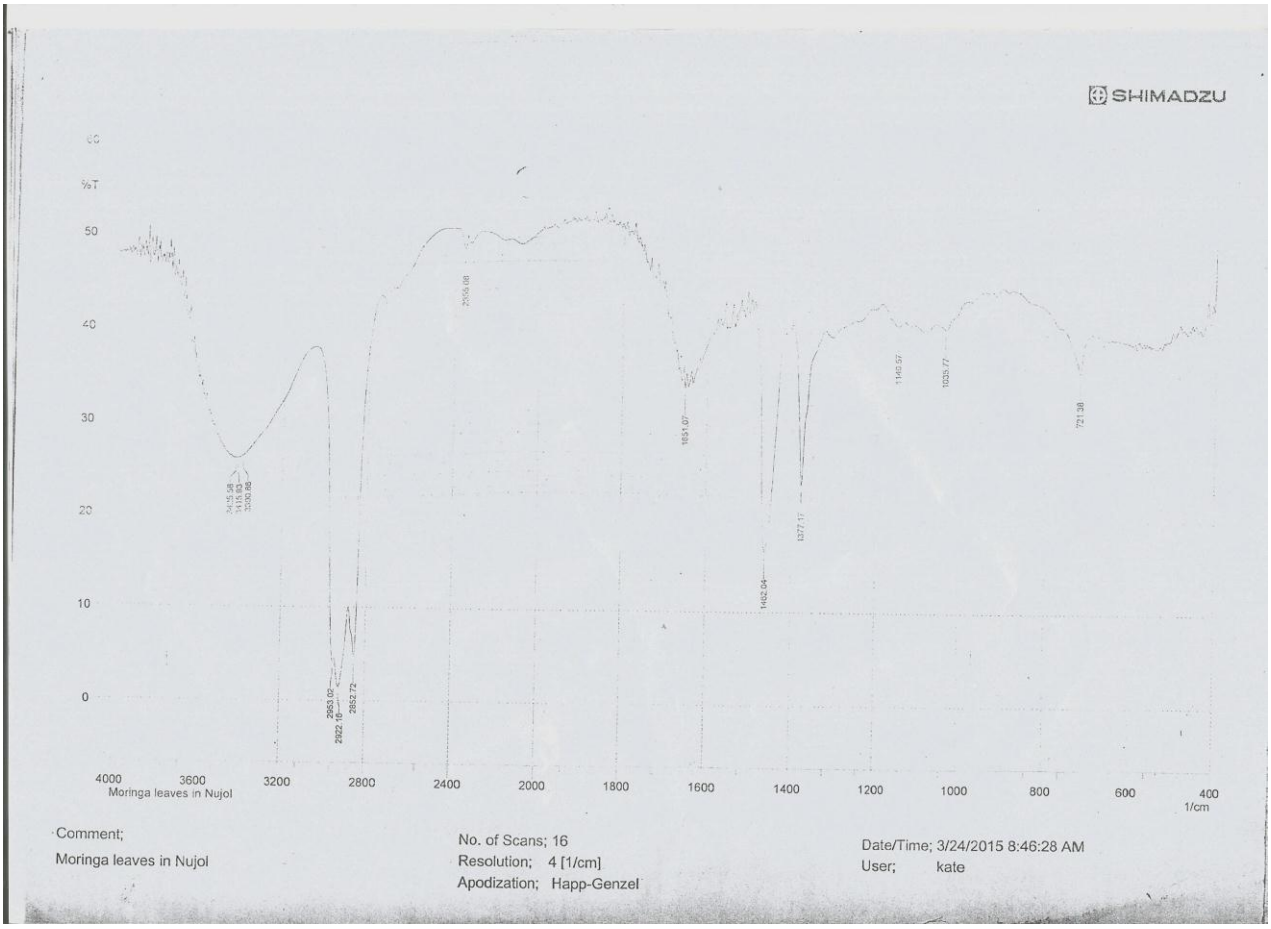
10g of sieved sample (sieve No. 20) in 800ml Kjeldahl flask was added 200ml water and allowed to stand for 3hrs. Steam distillation was employed and 155ml was distillated into

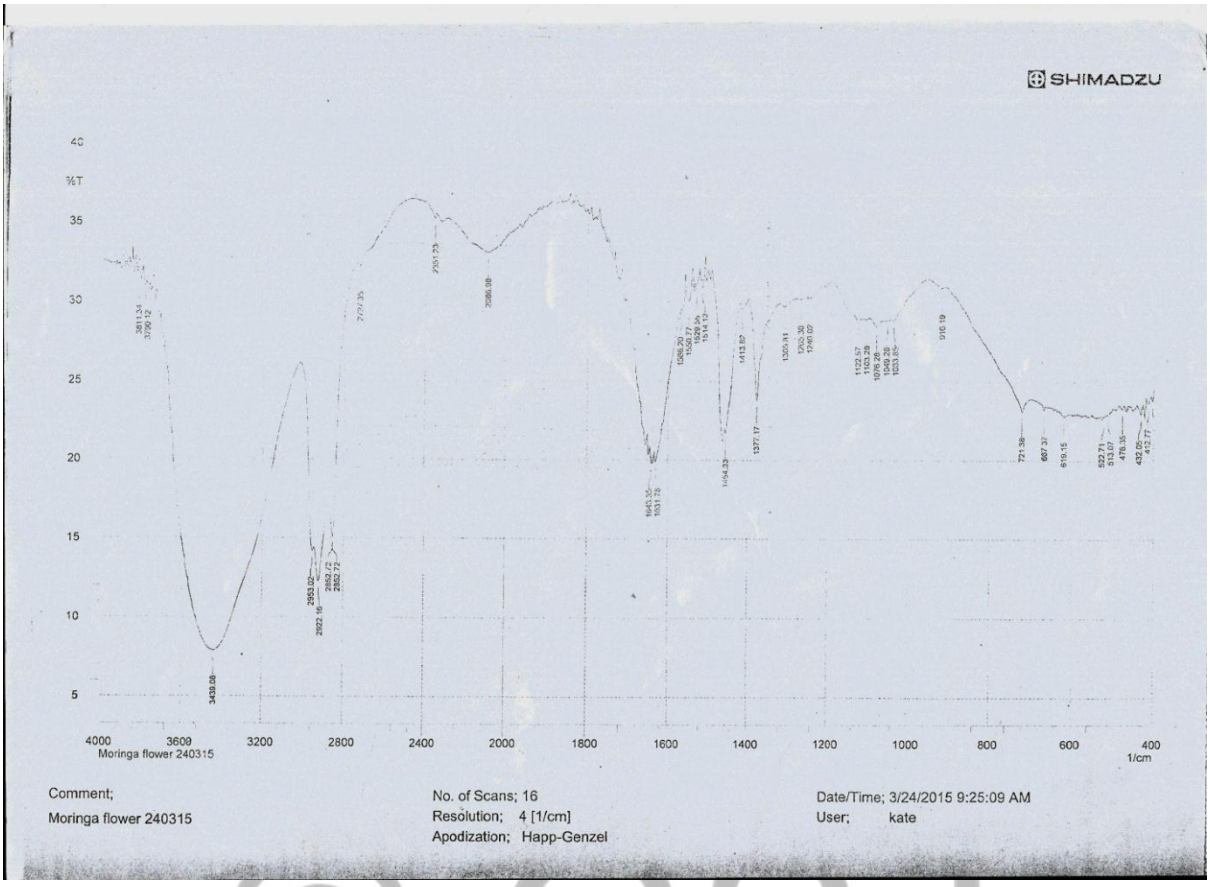
sodiumhydoxide solution (0.5g in 20ml H_2O) and diluted to 250ml. 10ml of the distillate was titrated against 0.02N silvernitrate using micro-burette. End-point was determined at permanent mixture turbidity.

INFRA RED (FTIR) (Williams and Fleming,1964)

Functional Group Analysis:

A little amount of sample was placed between two polished flat potassium discs (cells) which were squeezed together. The disc with sample was mounted on the sample compartment of the FTIR spectrometer and a scan for transmittance within 4000cm^{-1} to 400cm^{-1} was performed. The individual peaks were labeled with their corresponding wavelengths and the spectrum was printed out.





RESULT AND DISCUSSION

Analyses of some Phytochemicals in *Moringa oleifera* (leaves and flowers)

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

Results of some phytochemical analysis of *moringa oleifera* leaves and flowers (dry) are presented in Table above. 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 *moringa oleifera* 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 colour and the odour, 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 flavanoid 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) 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 C=O	1033-721 1651-1566

Infra-red (IR) spectral bands scan of the *moringa oleifera* leaves and flowers samples are presented in table 4.2 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 were 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 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 protein and some cyanide materials.

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