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Phytomedicinal And Nutritional Values of *Mentha Piperita*

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ABSTRACT

Pepper mint (*Mentha Piperita*) is a hybrid mint. It is indigenous to Europe and the Middle East. It is predominantly grown in the Jos area of Nigeria. Pepper mint is used as a spice, herbal tea and infusions for numerous medicinal applications. This study was done to evaluate, the nutritional content and phytomedicinal importance of *mentha piperita*. Proximate analysis was done using AOAC (2000), Vitamin and Phytochemical analyses were carried out, using standard techniques while elemental analysis was conducted using Agilent FS240AA Atomic Absorption Spectrophometer according to the method of APHA 1995. The results showed that *Mentha piperita* contains carbohydrates (34.13%), protein (9.80%), fat (15.99%), fibre (11.27%), and moisture (17.95%). It has ash content of (10.86%). Vitamin analysis showed that *mentha piperita* has high amount of vitamin C (69.4mg/kg), vitamin E (14.6mg/kg) and some amount of vitamin A (5.9mg/kg), vitamin D (3.8mg/kg) and vitamin B12 (3.8mg/kg). It also contains some essential minerals notably, Potassium (5.7ppm), Magnesium (4.7ppm), Sodium (4.3ppm), Calcium (3.9ppm) and other minerals found in trace amounts. The major Phytochemicals present include Anthocyanin (14.42 %), Flavonoid (11.80%), Tannin (8.89%), Alkaloid (8.42%), Steroid (7.11%) and Saponin (4.83%). The result infers that *mentha piperita* contains various nutrients, antioxidants and phytochemicals for the maintenance of good health, prevention and management of various ailments.

Keywords: *mentha piperita*, antioxidants, phytochemicals, health, minerals, nutrients and vitamins.

INTRODUCTION

Mint or *mentha* belongs to the Lamiaceae family, which contains around 15 to 20 plant species, including peppermint and spearmint. Peppermint (*Mentha Piperita* L) also known as mentha balsamea wild (Keifer *et al*., 2007) is a hybrid mint, a cross between water mint and spear mint (Rita and Animesh, 2011). Indigenous to Europe and the Middle East (Rita and Animesh, 2011). The plant is now widely spread and cultivated in many regions of the world (Loolaie *et al.*, 2017). It is occasionally found in the wild with its parent species. (Salehi *et al*.,2018).

Peppermint has high menthol content. The essential oil also contains menthone and carboxyl esters, particularly methyl acetate (De Groot and Schmidt, 2016). Peppermint oil has a high concentration of natural pesticides, mainly pulegone. It is known to repel some pest insects, including mosquitoes, and has uses in organic gardening. It is also widely used to repel rodents (Dolzhenko *et al.*, 2010).

Peppermint leaves have a characteristic, sweetish, strong odor and an aromatic, warn, pungent taste with a cooling after taste. It is probably the most important commercial aromatic herb in the world today, from the standpoint of the size of the area cultivated for oil distillation (Dolzhenko *et al.*, 2010). Peppermint extract is commonly used as a dietary supplement, as a herbal or alternative medicine. Its active ingredient menthol, activates the TRPM8 receptor in sensory neurons, resulting in a cold sensation when peppermint extract is consumed or used topically (Liu *et al.*,2013**).** It is used as an antiseptic, anti-viral and stimulant (Tanu and Harpreet, 2016). Moderate levels can be safely mixed into food items or applied topically, sprayed on surfaces as a household cleaner, or inhaled as an aromatherapy. In alternative medicine, peppermint extract is used to treat symptoms of common cold and flu and to relieve bloating and flatulence. It is also used to treat symptoms of arthritis and rheumatism, to relieve menstrual cramps and as a remedy for toothache (Heshmati *et al.*, 2016). The leaves are often used alone in peppermint tea or with other herbs in herbal tea either fresh or dried. It is used for flavouring ice cream, candy, fruit preserves, alcoholic beverages, chewing gum, tooth paste, some soaps, shampoos and skin care products. Candy canes are one of the most common peppermint- flavoured candies. (Salehi *et al.*, 2018).

In Nigeria, mint leaves on visual inspection look so much like scent leaves (Nchanwu in Igbo dialect), while in Northern part of Nigeria, mint leaves is locally called “Naa na a”. The Yoruba call it Ewe mint (Victor-Aduloju *et al*., 2020). Because of its strong aromatic flavor, peppermint is not widely used in Nigerian dishes, rather, it’s close relative, spearmint which is milder may be added to sauces, dressings and cakes. Manufacturers of toothpaste, chewing gum, candy, biscuit and beauty products often use mint leaf or oil (Bajaj *et al.*, 2016).

MATERIALS AND METHODS

Reagents/ chemicals

All reagents/chemicals, distilled and deionised water used, were of analytical standard.

Sample Collection and Preparation

Peppermint leaves *(Mentha piperita)* were sourced from Jos, Plateau state. They were properly identified by a taxonomist in the Botany Department of Nnamdi Azikiwe University, Awka. It was assigned the herbarium number NAUH-220 B. Thereafter, the leaves were washed under running tap water, shade dried at room temperature and ground into fine powder.

Quantitative Proximate Analysis

The proximate analysis of *mentha piperita* leaves was done using the AOAC (2000) standard. Proximate analysis, also known as Weende analysis is a chemical method of assessing and expressing the nutritional value of a feed, which reports the moisture, ash (minerals), crude fibre, crude fat and crude protein (total nitrogen) present in a fuel as a percentage of dry fuel weight.

Vitamin Analysis

Vitamin analysis was carried out according to standard procedures and techniques, some methods are described below.

Estimation of Vitamin A

Vitamin A was estimated by the method of Bayfield and Cole (1980).

Estimation of Vitamin E

Vitamin E was estimated in the samples by the Emmerie-Engel reaction as reported by Rosenberg (1992).

Determination of Vitamin C

Vitamin C was analyzed by the spectrophotometric method described by Roe and Keuther (1943).

Determination of Vitamin D

Vitamin D was assayed according to the method of Brockmann *et al.* (1974).

Elemental/Mineral Analysis

Heavy metal analysis was conducted using Agilent FS240AA Atomic Absorption Spectrophometer according to the method of APHA 1995 (American Public Health Association)

Quantitative Phytochemical Screening

Quantitative analyses of the crude powder of *Mentha piperita* leaves for determination of phytochemicals was carried out according to standard procedures and techniques, some methods are described below.

Determination of Alkaloids was done using Harborne (1998) method.

Determination of Tannin by Van-Burden & Robinson (1981) method

Determination of Saponins: The method described by Obadoni and Ochuko (2001) was used.

Determination of Flavonoids by the method of Bohm and Kocipai- Abyazan (1994).

Determination of Cardiac Glycosides: This was determined according to Osagie (1998):

$$\% \text{ cardiac glycoside} = \frac{(\text{weight of filter paper + residue}) - \text{weight of filter paper}}{\text{weight of sample analyzed}} \times 100$$

Determination of Phytate: Phytate content was determined using the method of Young and Greaves (1940) as adopted by Lucas and Markakes (1975).

Determination of Haemagglutinin

Haemagglutinin level of the samples were determined by the method of Jaffe (1979).

Determination of Oxalate: This was determined according to Osagie (1998).

Determination of Anthocynanin in the water of life using the gravimetric method of Harborne, 1973.

Determination of steroid content

The powdered sample of 1.0g was weighed and mixed in 100ml of distilled water in a conical flask. The mixture was filtered and the filtrate eluted with 0.1N ammonium hydroxide solution. 2ml of the eluent was put in a test tube and mixed with 2ml of chloroform. 3ml of ice cold acetic anhydride was added to the mixture in the flask. 2 drops of (200mg/dl) standard sterol solution was prepared and treated as described for test as blank. The absorbance of standard and test was measured, zeroing the spectrophotometer with blank at 420nm.

Calculation (mg/100ml) $\frac{\text{Absorbance of test}}{\text{Absorbance of std.}} \times \text{Conc of std}$

RESULT

Proximate Analysis

The proximate analysis result of pepper mint leaves is shown in table one. The result shows that dried pepper mint leaves has high moisture content of 17.95%. It contains substantial amount of carbohydrates (34.13%), some amount of fibre (11.27%), appreciable amount of fat (15.99%), protein (9.80%) and an ash content of 10.86%.

Table 1: Showing the results of the proximate analysis of *mentha piperita* (Pepper mint leaves).

PARAMETERS	PEPPERMINT LEAVES (%)
Moisture content	17.95
Ash content	10.86
Fat content	15.99
Fibre content	11.27
Protein content	9.80
Carbohydrate content	34.13

Vitamin Analysis

The vitamin analysis carried on pepper mint leaves is shown in table two. The result showed that pepper mint leaves has high amount of vitamin C(69.46mg/kg), it also contains appreciable quantity of vitamin E (14.62mg/kg), reasonable amounts of vitamins A (5.96mg/kg), vitamin D (3.82mg/kg), vitamin B12 (3.80mg/kg). Other B-vitamins were found in very trace quantities.

Table 2: Vitamin analysis of *mentha piperita* (mint leaves) in mg/kg.

VITAMINS	PEPPERMINT LEAVES (mg/kg)
Vitamin A	5.968872
Vitamin E	14.62745
Vitamin C	69.46667
Vitamin D	3.820896
Vitamin B1	0.03072
Vitamin B2	0.01356
Vitamin B3	0.5246
Vitamin B6	0.252888
Vitamin B12	3.807128

Elemental/Mineral Analysis

The elemental analysis is shown in table three. The result showed that pepper mint leaves contain potassium (5.78ppm), magnesium (4.78ppm), sodium (4.34ppm) and calcium (3.97ppm). Other minerals such as iron, zinc, manganese, chromium, copper, selenium, molybdenum and cobalt were found in minute quantities.

Table 3: Elemental analysis of *mentha piperita* (pepper mint leaves) in ppm.

PARAMETER	PEPPER MINT LEAVES (ppm)
Iron	0.987
Potassium	5.787
Zinc	0.863
Calcium	3.978
Chromium	0.156
Copper	0.455
Magnesium	4.787
Manganese	0.456
Molybdenum	0.034
Sodium	4.344
Selenium	0.105
Colbat	0.022

Phytochemical analysis

The phytochemical screening shows that pepper mint contains high amount of anthocyanin (14.42%) and flavonoid (11.80%). It also contains reasonable amounts of tannin (8.89%), Alkaloid (8.42%) and steroid (7.11%). Other Phytochemicals present in lower concentrations, include saponin (4.83%), phenol (3.12%), cardiac glycoside (2.12%), cyanogenic glycoside (1.57%) and phytate (1.16%). Haemagglutinin and oxalate were found in trace quantities.

Table four: Phytochemical analysis of *mentha piperita* (pepper mint leaves).

PARAMETERS	PEPPERMINT LEAVES (%)
Saponin	4.83
Cardiac glycoside	2.12
Tanin	8.89
Alkaloid	8.42
Flavonoid	11.80
Phytate	1.16
Cyanogenic glycoside	1.57
Oxalate	0.37
Anthocyanin	14.42
Steriod	7.11
Phenol	3.12
Haemagglutinin	0.77

DISCUSSIONS

The proximate analysis for pepper mint leaves (table 1) shows that pepper mint leaves (*mentha piperita*) contain some amount of moisture (17.949%). It also contains moderate amount of carbohydrates (34.132%), some amount of protein (9.8%), fibre (11.270%), fat (15.992%) and minerals (10.857%).The result differs from the result obtained by Ali *et al*., 2017, in which the moisture, Ash, Fat, Fibre, Protein and Nitrogen contents were found to be lower in two species of *mentha piperita* compared to the results obtained in this current study. The wide difference in geographical, topographical, climatic, species, and soil factors might account for the discrepancies in these studies, as the former work was carried out in Pakistan, south Asia, while the letter was carried out in Nigeria, Africa. However, the results from this present study, was found to be a bit closer to what was obtained by Mainasara *et al*., 2018, which studied the nutritional composition of both fresh and dried pepper mint leaves in Sokoto state, Nigeria. The study done by Mainasara *et al*., 2018, reported higher ash and carbohydrate contents in dried *mentha piperita*, when compared to the result gotten in this study. The similarities of the

results from this present study and that of Mainasara *et al*., 2018, might be because of the fact that both studies were carried out in Nigeria, while the differences in both studies might be because of changes in topography, species used and soil nutritional conditions.

The percentage moisture content of pepper mint leaves (17.949%) found in this study implies that mint leaves contains some amount of water and may perish easily because of some microbial activities. It may need some time to be properly dried for preservation and storage. It would also grow mold and decay easily, if not well dried before preservation and storage, techniques like air drying, shade drying might be employed to preserve it nutritive values.

The Ash content is a reflection of the amount of mineral present in a sample. The ash content of pepper mint leaves in this study was found to be 10.57%. This shows that pepper mint leaves contains some amount of minerals that would be needed in the body.

The fat content of pepper mint leaves in this study was found to be 15.992%. This result, tallies with previous works done by Erawati *et al*., 2022 which showed that pepper mint leaves contain some amount of oil (pepper mint oil), used as an enhancer in nanostructured lipid carriers (NLC), which affects the characteristics and stability of NLC. Pepper mint oil is widely known and used in the pharmaceutical and skin care industries because of its medicinal and pharmacological properties for the preparation of topical gels, lotions and creams, cough medicines etc. The study carried out by Mainsara *et al*., 2018 also shows that pepper mint leaves contain high amount of volatile oil. The proximate analysis also showed that pepper mint leaves contains significant amount of fibre (11.270%). Fibre is needed in the body, because it aids digestion of food and bowel movement and equally helps in weight management. Pepper mint leaves will be a good source of fibre in the body. The protein content of pepper mint leaves in this study was found to be 9.80%. This implies that this plant contains some amount of amino acids needed in the body for growth, development and repair of worn out tissues.

The carbohydrate content of pepper mint leaves in this study was found to be 34.132%. The addition of this leaves to food will not only serve as a spice or herbal remedy, but will also supply the body with carbohydrates for the generation of energy to carry out various activities.

The vitamin analysis, (table 2), showed that pepper mint leaves contain high amount of vitamin C, moderate amount of vitamin E and some amount of vitamins A, D and B12. Other B-vitamins such as B1, B2 and B6 were found to be of minute concentrations. Vitamin C is an essential vitamin, which helps to strengthen the immune system. It's a powerful antioxidant and also helps to improve iron absorption. Pepper mint leaves is a good source of vitamin C in the body, its regular intake may help strengthen the body, preventing and treating diseases and infections. It may also help in reducing the effects of free radicals in the body. The vitamin E content of pepper mint leaves would also contribute to the antioxidant effect of the plant, it may help in wound healing and treatment of inflammations and in maintaining healthy skin and eyes. The vitamin A content would help support cell growth, immune function and vision. Vitamin A is best known for its role in vision and eye health. It is also an antioxidant, helping to the body to fight free radicals. The vitamin D in pepper mint leaves may help in the absorption of calcium and phosphorus, regulating inflammation and supporting good immune function. Vitamin B12 is crucial for nerve tissue health, brain function and production of red blood cells. The intake of pepper mint leaves will therefore be a good source of many essential vitamins except for some of the water soluble B-vitamins.

The mineral analysis for pepper mint leaves (table 3), shows that it contains considerable amount of potassium, magnesium, sodium and calcium. Other minerals analyzed were found to be very low in concentrations (table 3).

The studies done by Mainasara *et al*., 2018 and Ali *et al*., 2018, both reported the presence of potassium and sodium in pepper mint leaves. Some other minerals were found to be in different concentrations. Variations in minerals present and their concentrations might be due to soil nutritional state, geographical and topographical differences. The presence of potassium in pepper mint leaves would help in regulating blood pressure, water balance, muscle contractions, nerve impulses, digestion, pH balance and heart rhythm. Infusions of pepper mint leaves would help in times of dehydration to replace lost electrolytes such as potassium and sodium. Sodium helps to balance the amount and distribution of water in the body, playing a key role in controlling blood pressure. Magnesium is essential in the body, as it helps to regulate calcium and vitamin D levels and in metabolism of insulin and glucose control. It may also help to lower anxiety levels, maintaining healthy muscles, including the heart. Calcium is important for healthy bones and teeth and plays important role in blood clotting, blood circulation and regulating muscle contractions. Iron, though very low in concentration as found in this study, would help in blood heamoglobin formation amongst other functions. Some other minerals in pepper mint leaves were found to be very low in concentration such as zinc, copper, manganese etc (table 3), but may still contribute to the nutritive value of pepper mint.

The phytochemical analysis of pepper mint leaves (table 4), shows that it contains high amount of anthocyanins and flavonoids, moderate amount of tannins, steroid, alkaloid, saponin and trace quantities of phenol, cardiac glycosides, phytate, cyanogenic glycoside, heamaglutin and oxalate. This is in accordance with the study done by Mainsara *et al*., 2018 which also reported high amount of flavonnoids, alkaloid, steroid and moderate amount of tannin and saponin in pepper mint leaves.

The study done by Ajuru *et al*., 2018 also reported the presence of alkaloid, tannin, flavonoid, saponin and phenol in ethanolic extract of pepper mint leaves.The presence of these phytochemicals in pepper mint leaves implies that this plant may possess some medicinal properties as these phytochemicals have been linked to various health benefits in both prevention and management of various diseases.

The presence of high amount of anthocyanin (table 4) in pepper mint leaves might be attributed to its bright green colour. Anthocyanins are known to impart different colours in plants, depending on their PH. They belong to a parent class of molecules called flavonoids and have antioxidant properties in vitro. The high amount of anthocyanin in pepper mint leaves implies that the plant possesses some antioxidant properties and might be effective in the prevention and management of age-related diseases such as diabetes. The leaves also contain moderate amount of flavonoids. Flavonoids are mainly found in fruits, vegetables, tea and wine. They are known to possess antioxidant activity, free radical scavenging capacity, anti inflammatory and anticancer activities. The functional hydroxyl groups in flavonoids mediate their antioxidant effects by scavenging free radicals and/or chelating ions (Kumar *et al*., 2013). The chelation of metals could be crucial in the prevention of radical generation, which target biomolecules.Some flavonoids are

also potent inhibitors of the production of prostanglandins, a group of powerful proinflammatory signaling molecules (Agati *et al*., 2012). These anti inflammatory effects of flavonoids might account for the use of pepper mint in topical gels, lotion and creams, for the treatment of swellings and inflammations such as boils, arthritis, rheumatism etc. Flavonoids also possess antibacterial and antiviral properties. Their mode of anti microbial action may be related to their ability to inactivate microbial adhesins, enzymes, cell envelops, transport proteins etc. Lipophilic flavonoids may also disrupt microbial membranes (Mishra *et al*., 2009; Zandi *et al*., 2011). Pepper mint leaves and its oil extract may therefore be effective as an anti microbial agent, because of the amount of flavonoids it contains. It may find application in creams and gels for the treatment of some skin infections and also may be used for the prevention and treatment of minor infections of the GIT amongst others.

Table 4, also shows that pepper mint leaves possesses moderate amount of tannin. Tanins are polyphenolic biomolecules that bind to precipitate proteins and various organic compounds (Berbehenn and Constabel, 2011). Like many other flavonoids and phenolics, tannins have strong antioxidant capacity invitro. The presence of catecholic B-ring is typical of most tannins and the key factor determining their antioxidant capacity (Quideau *et al*., 2011). They act as antioxidant through H-atom transfer or single-electron transfer mechanisms (Quideau *et al*., 2011). Tanins have also been demonstrated to possesss anti-inflammatory effect through its ability to decrease MPO enzyme activity (Soyocok *et al*., 2019). The presence of tannic acid in pepper mint leaves thus implies that this plant may serve as an antioxidant and anti-inflammatory agents. It may be useful for the prevention and management of diseases such as cancer, diabetes, respiratory disorders such as common cold, influenza, cough etc. Pepper mint has already been reported in several journals to be used in the treatment of cough, catarrh, common cold etc. this might be attributed to its anti inflammatory, antioxidant , anti bacterial and anti viral properties of its tannin content. Tannins have the ability to pass through bacterial cell wall, up to the internal membrane and interfere with the metabolism of the cell, resulting in the bacterial destruction (Thiesen *et al*., 2014). They also inhibit the uptake of sugar and amino acid in viral and bacterial cells, limiting their growth and consequently causing their death (Belhaouses *et al*., 2020; Pandey and Negi, 2018).

However, the downside to pepper mint consumption especially in excess, might be the inhibition of iron absorption caused by the presence of tannin. Tannins are known to inhibit iron absorption in the GIT. This might be a problem for people who are lacking iron, especially the sick. It may not be a problem for people with healthy iron levels. (Delimont, 2017). Putting this into consideration, it would be advised that taking pepper mint tea, smoothie, juice and infusions should be done some hours after taking iron rich foods and supplements. Also, pepper mint drinks should not be taken on an empty stomach as high levels of tannins are known to cause nausea (Matthews, 2010), especially for people with very sensitive digestive systems. The food taken may bind with some tannin in pepper mint drink, reducing its effect on the GIT.

Pepper mint leaves contain moderate amount of alkaloids as shown in table 4. Alkaloids have a wide range of pharmaceutical activities including analgesic, antimalarial, vasodilatory, anticancer, and antibacterial effects amongst others (Shoaib *et al*., 2016; Uzor, 2020, Cassia *et al*., 2022; Gupta, 2015; Gurrapu and Mamidala, 2017). The Alkaloid content of pepper mint might be responsible for the analgesic effect of pepper mint leaves and its extracts used in the treatment of painful swellings and inflammations. The analgesic effects of alkaloids may be through its ability to inhibit peripheral as well as central nervous system mechanisms (Shoaib *et al*.,2016). Pepper mint leaves have lots of pharmaceutical potentials as an antibacterial, antioxidant, anticancer and vasodilatory agent on account of its alkaloid content, as well as other phytochemicals present in this plant in various concentrations. The leaves also contain considerable amount of steroid. Plant steroids have anti inflammatory effects by acting as a non-redox inhibitor of 5-lipoxygenase, thereby inhibiting leukotriene in a dose dependent manner (Shah *et al*., 2009). They also possess cholesterol lowering effects (Othman and Moghadasian, 2011), Pepper mint, may serve as a natural remedy to reduce high cholesterol, thus help in the prevention and management of arteriosclerosis, stroke and other cardiac related diseases.

Saponin was also found to be present in pepper mint leaves, though not at a high concentration, but still of significant importance (table four). Saponins have various pharmaceutical attributes including having anti cancer, anti microbial, anti obesity and anti hyperlipidemic properties. They also have cytotoxic activity and are effective against different cancer cells (Natal *et al*., 2014). They help in restoration of insulin response, increase plasma insulin levels and induce the release of insulin from the pancreas, thus acting as a hypoglycemic agent (Elekofehinti, 2015). They also inhibit Adipogenesis, thus preventing weight gain (Torres-Fuentes *et al*., 2015).Pepper mint leaves may therefore help in the prevention and management of hyperglycemia, cancer and obesity. The presence of saponin in pepper mint leaves may explain its weight reduction property when used in infusion and tea. Saponins have the ability to reduce appetite, food intake and leptin levels (Kim *et al*., 2009). Phenol was also found in trace amount in pepper mint leaves (table four). Its presence in pepper mint may contribute to the antioxidant and anticancer property of the plant, in synergy with other phytochemicals present. Phenols are known to act as antioxidant, helping to prevent various oxidative stress related diseases (Rasmussen *et al*., 2005). This effect is mediated by their ability to scavenge radical species such as ROS/RNS and suppress ROS/RNS production via inhibition of some enzymes or chelation of metals involved in free radical production (Rasmussen *et al*., 2005). Phenols may also inhibit growth of tumors by induction of apoptosis and cell cycle arrest (Rasmos, 2008).

Pepper mint leaves also contain trace quantity of cardiac glycosides. The amount of cardiac glycoside found in pepper mint leaves in this study was quite low (table four), but may still be very effective, as this class of phytochemicals are known to have powerful effects on cardiac muscles even at low concentrations. A very small amount of cardiac glycoside can exert beneficial simulation on diseased heart. They increase the force of heart contraction without a concomitant increase in oxygen consumption; consequently, the myocardium becomes more efficient pump and is able to meet the demands of the circulatory system. Cardiac glycosides inhibit the pumping activity of the Na-K-ATpase pump, raising intracellular Na+, which in turn inhibit the function of Na+/Ca2+ exchanger, reducing the exchange of extracellular sodium with intracellular calcium, causing an increase in intracellular calcium (Li and Xie, 2009). Pepper mint leaves may therefore benefit patients suffering from congestive heart failure, as the presence of cardiac glycoside might help to stimulate and boost the heart pumping activity. However, it should not be taken concomitantly with heart failure drugs as they may contain synthetic forms of cardiac glycosides or other heart failure medications leading to an over dose of the drugs in the system. Pepper mint leaves may also

exert some negative effects on hypertensive patients as it may increase heart contractions because of its cardiac glycoside content, there by worsening the situation. Caution is therefore advised when taking pepper mint tea and infusions especially in people with cardiac problems.Cardiac glycosides in pepper mint leaves may also contribute to the anti inflammatory property of the plant as this phytochemical has been reported to possess anti-inflammatory activities (Furst *et al*., 2017).

Cyanogenic glycoside, a natural plant toxin was also found in pepper mint leaves, thoughof little concentration (table four). This phytochemical is known to cause growth retardation, neurological symptoms, intoxication, resulting from tissue damage in CNS as a result of the cyanide content (Bolarina *et al*., 2016). Processing methods like boiling and cooking pepper mint leaves before consumption may help detoxify cyanogenic glycoside and reduce the risk of cyanide poisoning.

Phytate was found also to be of little concentration. They may also impair absorption of minerals such as Iron, Zinc, Calcium etc as they are known food anti nutrients (Silva *et al*., 2016). Cooking and boiling will help minimize its effect in the body. Phytates may also contribute to the antioxidant effect of peppermint as they can help to scavenge free radicals.

Phytochemicals like oxalate and heamagluttin were found to be very minute in concentration (table four). They may therefore not have significant contribution to the pharmacological activities of pepper mint leaves.

From the results, it is pertinent; to state that pepper mint leaves in tea, infusions and herbal remedies etc used for weight reduction, prevention and management of obesity and other health benefits should be taken in moderation. It should be taken with caution and with a doctor's permission in the sick, elderly, pregnant women and children. Large concentrations of pepper mint for whatever purpose should be avoided. A well balanced diet should also be taken along side, to fore stall any nutrient/mineral deficiency that may occur as a result of the biochemical activities of the phytochemical constituents of pepper mint. Body changes and reactions should also be monitored as well.

CONCLUSION

Mentha piperita (pepper mint), is a highly nutritious and pharmacologically useful plant, owing to its rich mineral, vitamin and Phytochemical contents. This plant can be harnessed for its medicinal properties especially, for the prevention and management of certain diseases. The plant is already being used for the production of pepper mint oil, menthol etc for the treatment of various ailments. Further studies are recommended on how this plant can be safely used as a herbal remedy.

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