

Alkaloids, Proximate and Mineral Composition Of *mhb-21*,

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Abstract

The continuous emergence of new strains and variants of disease causing pathogens as well as high cost of standard drugs and nutraceuticals makes the sustained search for alternative medicines and sustainable local sources of essential food nutrients a necessity for man. In the present study, a multi-herbal formula-MHB-21 composed of extracts from various organs of four selected medicinal plants was subjected to phytochemical analysis (to evaluate the constituent alkaloid fractions) as well as proximate and mineral evaluations. The alkaloid fractions of the herbal formula were analyzed by gas chromatography, the percentage composition of the individual components, obtained from electronic integration using flame ionization detector (FID). Proximate composition of the product was evaluated by the methods described by Association of Official Analytical Chemists (AOAC), while atomic absorption spectroscopy and inductively coupled Plasma-optical emission spectroscopy (ICP – OES) were employed for the mineral analysis. Results showed the presence of various alkaloid fractions occurring in appreciable amounts in the product. For instance, 426.3246mg of ephedrine, an important antihypertensive drug occurred per 100g of the product. MHB-21 was observed to have a low moisture content of $7.21 \pm 0.01\%$, with crude protein and crude fibre occurring at appreciable values of $24.56 \pm 0.12\%$ and $13.47 \pm 0.04\%$ respectively. The herbal formula was also observed to be rich in various minerals which are necessary for maintenance of good health. For instance calcium content was $986.33 \pm 4.23\text{mg}/100\text{g}$. Magnesium content was $467.28 \pm 2.20\text{mg}/100\text{g}$ while iron content was $315.33 \pm 2.10\text{mg}/100\text{g}$. It was concluded that, in addition to the already demonstrated ability of MHB-21 to ameliorate cisplatin- induced nephrotoxicity, it can also function as a strong antioxidant (which can be used to curb the invasiveness of free radicals on living cells) as well as contribute significantly to human nutritional needs.

Keywords: Alkaloids, Proximate, mineral, MHB-21, Herbal formula, medicinal plants.

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I. Introduction

The continued existence and optimal performance of man on earth is constantly threatened by a number of factors. Notable among these factors are natural disasters, food shortage and diseases outbreaks. The exploitation of plants by man for the treatment of diseases has been a long time practice in history (Sofowora 2006; Gill, 1992).

Plants possess medicinal properties as a result of different bioactive compounds referred to as phytochemicals inherent in them (Ezeonu&Ejikeme, 2016). These phytochemicals are synthesized a result of metabolic reactions during plant growth (Ezeonu&Ejikeme, 2016). They are thus referred to as secondary plant metabolites (Harbone, 1973; Okwu, 2004).

These bioactive compounds inherent in plants, when consumed, elicit various physiological effects on human cells. Among the physiological actions exhibited by these phytochemicals are antioxidant, hormonal, antibacterial, enzyme activation interference with DNA (Benjamin, 1979).

MHB-21 is a multi-herbal product formulated from selected African medicinal plants. It is constituted of extracts from *Carica papaya* seeds, *Ocimum gratissimum* leaves, *Zingiber officinale* roots and bulbs of *Allium Sativa*. The Antiplasmodial potency of the herbal formula has been demonstrated by Onwusonye *et al.* (2021a). The formula has also been reported to ameliorate cisplatin-induced nephrotoxicity and improve kidney function in rats (Onwusonye *et al.*, 2021b). The present study is therefore aimed at evaluating the alkaloids, proximate and mineral compositions of the product.

II. Materials and Methods

The procedures for collection, identification, preparation and processing of plant samples as well as the formulation of *MHB-21* have been reported elsewhere (Onwusonye *et al.*, 2021). The quantitative evaluation of the alkaloid constituents of the product was done by gas chromatography as described by Obadoni and

Ochuko(2001). For the Proximate Composition, the Procedures for the determination of moisture, crude protein, crude fat, crude fibre and ash content of the product were adapted by Standard AOAC methods reported by Olaniyi, *et al.*, (2018). The carbohydrate content of the sample was determined by difference using the following relationship:

$$\% \text{ Carbohydrate} = 100 - (\% \text{ Moisture} + \% \text{ ash} + \% \text{ fat} + \% \text{ Protein} + \% \text{ crude fibre}).$$

For the determination of Mineral constituents of *MHB -21*, Sodium (Na), Potassium (K), Calcium (Ca), Zinc (Zn), Magnesium, Manganese (Mn) and Copper (Cu) were determined by atomic absorption spectrophotometer (Varian Spectra A. A. 220, USA) while iron (Fe) was determined by ICP – OES 710 – ES series as described by Boubaet *al.*(2012).

III. Statistical Analysis

Data collected were subjected to analysis of variance using the SPSS statistics 17.0 (SPSS Inc., 2008). The means were separated using Duncan Multiple Range Test at the 0.05 level of significance.

IV. Results

4.1 Alkaloids Fraction

The amounts of the various alkaloid fractions found in the multiherbal formula are shown in table 1. The alkaloids observed in high amounts include norephedrine, ephedrine, stanchdrine and wilforine. Retention of the first fraction (Augustamine) was about 7.2 minutes while for the last fraction (Powelline), it was about 20.8 minutes. The total alkaloid content of the product was about 781.379mg/100g.

Table 1: GC Alkaloid Fractions of *MHB-21*

Name of Compound	Retention Time (mins.)	Amount (mg/100g)
Augustifoline	7.243	0.01277
Sparteine	7.698	0.01200
Norephedrine	8.857	56.26801
Nimbol	10.256	0.01017
1,3-Alphahydrorhombifoline	10.671	0.15100
Sugiol	10.876	0.00267
9-octa Decenamamide	12.598	5.05372
Ephedrine	13.382	426.3246
Dihydro-demethoxyhaemnathamine	15.300	1.23146
Augustamine	15.387	3.03100
Stanchdrine	15.735	106.0091
Oxoassoanine	16.620	0.00571
Nimbrin	17.402	2.00121
Crinane-3-alpha-ol	18.472	0.05137
Buphanidrine	19.405	0.07032
Wilforine	19.721	178.02432
Powelline	20.801	3.12003
Total alkaloid constituent		781.3790

4.2 Proximate Composition

The proximate composition of *MHB-21* is shown in table 2. The herbal product has $39.82 \pm 0.16\%$ of carbohydrate. Its crude protein content is high ($24.56 \pm 0.12\%$). Also observed in appreciable amounts in the product is crude fibre ($13.47 \pm 0.04\%$). The value for ash is also relatively appreciable ($11.58 \pm 0.05\%$)

Table 2: Proximate Composition of *MHB-21*

Parameters	Quantity (%)
Moisture	7.21 ± 0.01
Crude fat	3.84 ± 0.02
Crude protein	24.56 ± 0.12
Ash	11.58 ± 0.05
Crude fibre	13.47 ± 0.04
Carbohydrate	39.82 ± 0.16

Data represent Mean \pm SD of triplicate determinations.

4.3 Mineral Composition

The result of somemineral compositions of *MHB-21* is shown in table 3. The herbal product was observed to be rich in calcium, magnesium, iron, sodium and potassium. The mineral copper occurred in lowest amount in the sample

Table 3: Mineral Composition of *MHB-21*

Mineral	Composition (mg/100g)
Na	301.3 ± 4.03
K	248.23 ± 2.20
Ca	986.33 ± 4.23
Mg	467.28 ± 2.20
Zn	10.53 ± 0.31
Mn	31.25 ± 1.76
Cu	5.26 ± 0.03
Fe	315.33 ± 2.10

Data represent Mean \pm SD of triplicate determinations

V. Discussion and conclusion

Plants are gifts from nature which serve as sources of food and drugs for man. Plants perform these roles owing to the presence of phytochemicals and other compounds in their cells. Among these phytochemicals are alkaloids, flavonoids, glycosides, saponins, tannins etc. The medicinal and nutritive values of any plant product will thus depend on its constituent phytochemicals as well as dietary factors like carbohydrates, proteins, lipids, fibre, vitamins and minerals. In this study, the multiherbal formula -*MHB-21*, was observed to be rich in different alkaloids notable among which are ephedrine, norephedrine, wilforine, stanchdrine etc. Many alkaloids have demonstrated important pharmacological activities among which are antispasmodic and bactericidal (Okwu, 2004), antihypertensive, anticancer, antimalarial and antihyperglycemic (Cushie *et al.*, 2014). The drug ephedrine found in abundance in *MHB-21* is used in the treatment of breathing problems, nasal congestion and low blood pressure (during anesthesia). Results of the proximate analysis showed that the product contains carbohydrate, protein and crude fibre in appreciable amounts. Carbohydrates are good sources of energy, proteins encourage growth and repair of worn out body tissues, while fibre makes for proper digestion of foods. The moisture content of the product is $7.21 \pm 0.01\%$. This value falls in line with the value of $7.57 \pm 0.40\%$ and $7.59 \pm 0.08\%$ recorded by Oladayo *et al.* (2019) respectively for leaves and roots of *Rumex crispus L.* This very low moisture content will thus make for good storage quality. *MHB-21* also contains appreciable amounts of Sodium, Potassium, calcium, magnesium and iron. These minerals are necessary for maintenance of good health status in man. The levels of these minerals observed in the herbal formula are also in line with those recorded by Oladayo *et al.* (2019) for leaf and root samples from *Rumex crispus L.* This study has shown that the herbal formula, *MHB-21* is rich in various alkaloid fractions documented to have various medicinal values. For instance, ephedrine occurring in abundance ($426.3246 \text{ mg}/100\text{g}$) in the product suggests that *MHB-21*, in addition to its already demonstrated medicinal values, can also serve as a source of ingredients for a possible medication against hypotension during anesthesia. The significant amounts of alkaloids found in the formula corroborates our earlier observed antiplasmodial potency of the product. Results of the proximate and mineral evaluations also suggest that *MHB-21* can make meaningful nutritional and therapeutic contributions if incorporated in human food products and nutraceuticals.

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