

Chemical profiles of leaf, stem, root and flower of *Ageratum conyzoides*

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ABSTRACT

The leaf, stem, root, and flower of *Ageratum conyzoides* was used to evaluate its chemical profile. The studied samples showed the presence of alkaloids, flavonoids and some constituents of flavonoids, tannins, saponins, glycosides, resins, phenols, asphytochemicals while proteins, carbohydrate and its reducing forms were present as nutrients. Some essential and non-essential amino acids were also present. The leaf of the studied plant is the most concentrated followed by the flower in terms of the chemicals detected in the present study. The chemical compounds detected in the present study could be the source of the medicinal value of *Ageratum conyzoides* as used in folk medicine. The present study has shown the chemical profiles of leaf, stem, root, and flower of *Ageratum conyzoides*.

Keywords: Phytochemicals, macronutrients, amino acids, traditional medicine.

INTRODUCTION

The use of plants and the products for different purposes has been with man from the beginning. Aside food, plants are often used as medicine [9,10,14, 16, 35,41]. Plants used as medicine are known as medicinal plants [14,20, 35,36]. Medicinal plants often exhibit a wide range of biological and pharmacological activities such as anti-inflammatory, anti-bacterial and anti-fungal properties [8, 16, 25,29,35]. Extracts, syrups, infusions and concoctions prepared from different part of these plants are used to remedy different ailments. Such ailments include typhoid, anaemia, malaria, headache, etc [29, 31, 32]. The efficacy of medicinal plants against ill health is possible due to certain numerous biologically active compounds such as nutrients, phytochemicals, etc, which have physiological actions in the body of living organisms [4,20,21,31,34].

Ageratum conyzoides is among such medicinal plants that are effective against diseases and may contain these biologically active compounds, which are effective against ill health. It belongs to the family and tribe of *Asteraceae* and *Eupatorieae* respectively. It is an erect, annual, branched, slender, hairy and aromatic plant, which grows to approximately 1 m in height. It is native to Central America, Southeast Asia, South China, India, West Africa, etc [9, 42]. *Ageratum conyzoides* has been known since ancient times for its curative properties and has been utilized for the treatment of various ailments, such as burns and wounds, headaches pneumonia, analgesic, inflammation, asthma, spasmodic and haemostatic effects, stomach ailments, gynaecological diseases, leprosy and other skin diseases [12]. In Nigeria, different tribes have different names for it. For instance, Igedes of the Middle Belt, Yorubas of the Southwest, and Igbos of the Southeast of the country call it "Ufuopioko", "Imiesu" and "Nriewu" respectively. The plant is widely employed in traditional medicine within the above mentioned geopolitical zones in Nigeria. It is the only plant used in the treatment of HIV/AIDS by Igede people in Nigeria [44].

Sequel to the on-going efforts by researchers to explore the potency of *Ageratum conyzoides*, the present study investigated the chemical profile of *Ageratum conyzoides* using its different parts and as well relating the constituents to their possible pharmacological importance.

MATERIALS AND METHODS

Sample collection and preparation: The *A. Conyzoides* samples used were collected from Imo State University school farm, Owerri, Imo State, Nigeria. The plant parts (leaf, stem, root and flower) were identified and authenticated by Dr. F. N. Mbagwu of Plant Science and Biotechnology Department, Imo State University, Owerri, Imo State, Nigeria. The identified plant materials were separated and fresh ones obtained and air dried for one week. After air drying, the samples were ground to fine powder using Thomas-Wiley milling machine. The ground samples were stored in airtight bottles till required for analysis.

CHEMICAL PROFILE ANALYSIS

Phytochemical analysis: The samples investigated were screened for alkaloids, flavonoids, aurone, chalcone, flavone, flavonol, leucoanthocyanins, glycosides, HCN, saponins, tannins, phenols, steroids, coumarins, chromenes, terpenoids, and cardenolides using the methods of [6, 23].

Macronutrient screening: The macronutrients screening of the investigated parts of *Ageratum conyzoides* were done using the methods of [17].

Amino acid screening: Amino acids were screened using the methods of [2].

RESULT AND DISCUSSION

Table 1: Phytochemical screening of leaf, stem, root and flower of *Ageratum conyzoides*.

Phytochemical	Leaf	Stem	Root	Flower
Alkaloids	+++	+	+	++
Flavonoids	+++	++	+	++
Aurone	++	-	+	+
Chalcone	+	+	+	+
Flavonol	+	-	-	+
Flavone	+	-	-	-
Leucoanthocyanin	+	-	-	-
Tannins	+++	++	+	++
Saponins	++	+	+	+
HCN	+	+	+	+
Glycosides	+	+	+	+
Steroids	+	+	-	+
Coumarins	+	+	-	+
Chromones	+	+	-	+
Terpenoids	+	+	-	+
Resins	+	+	+	-
Cardenolides	+	+	+	+
Phenol	++	+	+	+

Key; +++ = Present in high concentration

++ = Present in moderate concentration

+ = Present in low concentration

- = Absent

HCN= Cyanic acid

Phytochemicals act in numerous ways to assist the body in combating diseases and health problems. They combine with some biomolecules to neutralize activity of scavenging free radicals before they can cause damage within the body [18]. The consumption of phytochemicals enhances reduction in the emergence of degenerating diseases [3]. Phytochemicals (Table 1) screening revealed the presence of alkaloids, flavonoids, tannins, saponins, and cyanic acid (HCN) in the investigated parts of *Ageratum conyzoides*. Pure isolated alkaloids and their synthetic derivatives have been used as analgesic, antispasmodic and bactericidal agent [30]. Flavonoids according to [3] have shown antibacterial, anti-inflammatory, antiallergic, anti-mutagenic, and antiviral, anti-thrombotic and vasodilatory activity. They also have the ability to scavenge hydroxyl radicals, super oxide anions and lipid peroxy radicals [3, 28]. The antimicrobial activity of *Ageratum conyzoides* leaf could be due to the abundant presence of alkaloids and flavonoids. Other flavonoid constituents such as aurone, chalcone, flavonoids, flavone, flavonol and leucoanthocyanin detected in the investigated parts of *Ageratum conyzoides* in the present study may have aided the antibacterial activity of the plant. Tannins have astringent properties, hasten the healing of wounds and inflamed mucous membrane [30]. Studies have shown that saponins although nontoxic, can generate adverse physiological responses in animals that consume them. They exhibit cytotoxic effect and the growth inhibition against a variety of cell making them have anti-inflammatory and anticancer properties. They also show tumour inhibiting activity in animals [10]. The presence of tannins and saponins in the present study could be attributed to the use of *Ageratum conyzoides* in treating wounds, prevention of blood loss, etc [11, 23]. [23] noted that the knowledge of glycosides and

Cyanic acid content of plant is important due to their adverse effect on the respiratory chain but this should not pose a problem since both compounds are low in the investigated samples in this study. Steroidal compounds are important in pharmacy due to their relationship with sex hormones [26]. The presence of phenol in the investigated samples studied indicates that the plant *Ageratum conyzoides* can be used as an anti-microbial agent. This is because phenol and phenolic compounds have been extensively used in disinfection and remain the standard with which other bactericides are compared [26, 27, 28, 32]. Resins are effective against skin abrasion, coumarins play important role as blood anti-coagulants, terpenes fight malaria and cancer [13, 38] where as chromones and cardenolides also found in the investigated parts of *Ageratum conyzoides* are important phytochemicals and may have added to the medicinal value of the plant.

Table 2. Some macronutrient screening of leaf, stem, root and flower of *Ageratum conyzoides*.

Nutrient	Leaf	Stem	Root	Flower
Protein	+	+	+	+
Carbohydrate	+	+	+	+
Fructose	++	++	++	++
Glucose	++	++	++	++
Ribose	++	++	++	++
Galactose	+	+	+	+
Fats and oil	+	+	+	+

+++ = Present in high concentration
 ++ = Present in moderate concentration
 + = Present in low concentration
 - = Absent

Some macronutrient screening (Table 2) of *Ageratum conyzoides* parts investigated shows the presence of protein, carbohydrate and its reducing forms such as fructose, glucose, ribose, and galactose. Fructose, glucose, and ribose are more concentrated in the investigated samples than galactose. [7, 23] noted that protein is for replacement of worn out tissues, carbohydrates and reducing sugars are for energy. Aside the nutritive roles, fats and oils generally house other constituents, which can perform many other functions in the body [5, 27, 40]. Fats and oils were detected in low concentration in the samples.

Table 2. Amino acid screening of leaf, stem, root and flower of *Ageratum conyzoides*.

Amino acid	Leaf	Stem	Root	Flower
Cystine	+++	+	+	++
Leucine	+++	+	+	++
Histidine	+++	+	+	+
Arginine	++	+	+	+
Proline	++	+	+	+
Alanine	+	+	+	+
Lysine	+	+	+	+
Methionine	+	+	+	+
Phenylalanine	+++	+	+	+
Threonine	+	+	+	+
Glycine	++	+	+	+

+++ = Present in high concentration
 ++ = Present in moderate concentration
 + = Present in low concentration

Amino acids are the molecular building blocks of proteins. According to one accepted classification, amino acids are of two groups; the essential and the non-essential amino acids [18, 22, 39, 44,]. Leucine, histidine, valine, phenylalanine, and threonine are the essential amino acids while cysteine, arginine, serine, alanine, tyrosine and glycine are the non-essential amino acids detected in the investigated samples in this study. These amino acids become very important when their functions are considered in the body. For instance, glycine aids in the manufacturing of haemoglobin and cytochromes, proline is a major component in the formation of connective tissue and heart muscle, cystine contributes to tissue antioxidant actions, alanine helps build up immune system, arginine increases secretion of insulin, glucagon, and growth hormone as well as increase sperm count and T-lymphocytes response, threonine acts as amino detoxifiers and prevent fatty build up in the liver, phenylalanine is used in the treatment of some depression, methionine helps to remove toxic wastes from the liver and assists in the regulation of liver and kidney tissue, histidine is one of the major ultraviolet absorber in the skin and is used in the treatment of allergic diseases, rheumatoid arthritis and digestive ulcers, leucine plays a role in reduction of muscle protein breakdown while lysine and vitamin C together form L-carnitine, a biochemical compound that enables muscle tissue to use oxygen more efficiently hence delaying fatigue [22, 29, 40]. The roles these amino acids play in the body

system coupled with those of macronutrients and phytochemicals could be behind the medicinal property of the *Ageratum conyzoides*.

CONCLUSION

The present study has shown the chemical profile of parts of *Ageratum conyzoides* studied contain phytochemicals, macronutrients and amino acids. These compounds could be behind the medicinal property of *Ageratum conyzoides* as explored in traditional medicine.

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