Adpebi International Journal of Multidisciplinary Sciences

https://journal.adpebi.com/index.php/AIJMS

Vol.3, No.1, 2024
ISSN: 2829-8217
pp.11-20

Assessment of The Elemental Composition of *Ageratum Conyzoides* And Its Contribution To Ethno Medicine

Uju Felicity Onwudinjo
Department of Chemistry, Nwafor Orizu College of Education Nsugbe, Nigeria.
ujufelicity13@gmail.com

Juliana Nkiru Nnoli
Department of Chemistry, Nwafor Orizu College of Education Nsugbe, Nigeria.
Enkejul@yahoo.com

ARTICLE INFO

Research Paper

Article history:
Received: 5 October 2023
Revised: 23 December 2023
Accepted: 16 January 2024

ABSTRACT

This study aimed at assessing the elemental composition Ageratum conyzoides. The leaves of *Ageratum conyzoides* (goat weed), has been acknowledged as a non-food source of ethno medicine associated with the treatment of some ailments. The AAS analysis results indicate that the plant contained elements essential for human nutrition. The data were analyzed and the results showed that *Ageratum conyzoides* leaf extract contained Ca, Mg, Pb, Zn, Al, Cr, Ni, Cu, Co, Cd and Fe were present in the leaves of *Ageratum conyzoides*. *Ageratum conyzoides* contains, in addition such acknowledged non-essential and environmentally unfriendly elements as Pb, Co and Cd, which may be a pointer to its non-food use, in combination with its high lipid content. The concentration of minerals in *Ageratum conyzoides* can be attributed to some of its use such as anti-inflammatory, analgesic, anti-poison, anti-allergic and other therapeutic activities.

Keywords: Assessment, elemental composition, ageratum conyzoides, contribution, ethno medicine, chemistry.

INTRODUCTION

Ageratum conyzoides, commonly known as "billygoat weed" or "menta," is a plant with a rich history deeply intertwined with traditional medicinal practices (Erida et al., 2021). This botanical species has been utilized across diverse cultures for its purported therapeutic properties, making it a subject of interest for scientific investigation (Paramasivam, et al., 2023). In the realm of chemistry, assessing the elemental composition of Ageratum conyzoides becomes a crucial endeavor to unravel the chemical constituents responsible for its medicinal attributes. Chemistry is the scientific discipline that studies the composition, structure, properties, and changes of matter (Nnoli, 2021). It is a branch of physical science that deals with the properties and behavior of substances, the transformations they undergo, and the energy changes that accompany these processes (Nnoli, 2023).

The central concepts of chemistry include understanding the nature of elements, the formation and properties of chemical compounds, and the various types of chemical reactions. Chemistry plays a crucial role in a wide range of fields, from medicine and materials science to environmental science, medicine and energy production (Nnoli & Okafor, 2020). Ethnomedicine, rooted in the traditional

doi.org/10.54099/aijms.v3i1.821 .

knowledge of indigenous communities, often involves the use of plant-based remedies. Ageratum conyzoides has found a place in these ethnomedical traditions, with various parts of the plant being employed to address an array of ailments. To comprehend the efficacy of Ageratum conyzoides in ethnomedicine, a comprehensive analysis of its elemental composition is imperative (Khoja et al., 2022).

Many of the processes involved in gathering data on natural plant products need previous understanding of the traditional uses of these plants or the recognized biological properties of the various plant extracts. In a number of situations, a researcher could be aware of the substances that have been separated from the plant under study. When available, databases are a huge help for these kinds of investigations into physiologically important substances. These kinds of activities not only broaden the researcher's horizons intellectually, but they also help secure intellectual property rights in the form of patents. In these cases, compounds with unique structures and/or their derivatives that provide insights into structure-activity relationships or that have a unique biological mechanism of action are highly valued. The ethnomedical method used in this investigation, which collects plants for research based on their traditional uses in Igboland, informs the choice of plant source.

Ageratum conyzoides is known in Igboland as "ewu erighi, okuko atughi," a term emphasizing the plant's non-food status for all living things, including humans, goats, and other animals. It is referred to as akirikom in some areas of Orumba North LGA, with emphasis on the final syllable (kóm). The work completed on this facility thus far is reviewed below. It is anticipated that the study detailed here will make it possible to determine the plant's elemental makeup. *Ageratum conyzoides* is a member of the Asterales order. As the local name implies, it is a blossoming plant that even tamed animals do not eat. As several evaluations have shown, the plants have undergone a good deal of research and are utilized to treat a variety of ailments.;

The following is the scientific classification of the plant:

The plant Ageratum conyzoides Linnaeu
Picture from a farmland at Agu-Awka Anambra state

Kingdom *Plantae*
Order *Asterales*
Family *Asteraceae*
Tribe *Eupatorieae*
Genus *Ageratum*
Species *A.conyzoides*

Ageratum conyzoides (Billygoat-weed, Whiteweed) has been described as follows: “native to Tropical America, especially Brazil (Kamboj and Saluja, 2008). Herb is 0.5-1m high, with ovate leaves (2-6cm long) and flowers which are white to mauve. *Ageratum* or white weed is a genus of 40 to 60 tropical American herbs, annuals and perennials from the Sunflower family *Asteraceae*, tribe *Eupatorieae*. The herbs form tussocks or small hills. They grow to a height of about 75cm. The opposite leaves (formed on the stem) are cordate or oval, hairy or tomentose. The margins are slightly toothed or serrate. The

fluffy flowers are white to lavender – blue and spread in small compound "umbels". They are said to give small dark fruits. In the Orumba North LGA of Anambra State, *Ageratum conyzoides* is referred to by the name *akirikóm,* with the stress on the last syllable. The word "*Ageratum*" is said to be derived from the Greek words *'a geras'* meaning 'non-aging' and referring to the longevity of the plant; "conyzoides" is derived from *'konyz'*, the Greek name of *Inula helenium* which the plant is said to resemble. According to the review by Kamboj and Saluja, (2008) "the Genus *Ageratum* consists of about 30(thirty) species but only a few species have been phytochemically investigated. The family *Asteraceae* is well marked in their characteristics and cannot be confused with any other". We may add here that although the family may not be confused with any other family, the species have often been confused as far as our experience in literature review of work on the family goes.

The Plant

Growing to the tip of the central stem, the plant reaches a height of around 75cm in excellent soil. White hairs cover the stem and leaves, which are stalked, egg-shaped, and have circular, toothed borders with somewhat pointy tips and bases. At the terminals of the central stem and on each of the two branches that each pair of leaves has attached to along the central stem, the flowers are grouped in close terminal inflorescences. "The plant grows fairly commonly on waste land, on ruined stems, and in areas of grassland where other plants and high-growing shrubs are absent." It establishes colonies in certain areas, essentially stopping the growth of competing plants. The plant, which is abundant from March/April to October/November during the rainy season but dies off at the start of the dry season, thereby demonstrates the traits of a low shrubby or spreading annual but not those of a perennial. The term "goat weed" or "billy goat weed" comes from its unusual scent, which is described as "likened in Australia to that of a male goat." It is mildly irritating. According to Kamboji et al. (2008), the plant's essential oil has a strong, sickening smell and has been "found to be poisonous to rabbits due to the presence of HCN and coumarin." Although Dalziel (1937) accurately notes that people only eat the herb for therapeutic purposes, he also notes that "in some cultures it is a delicacy for domestic guinea-pigs, horses, and cattle." Our interest in this project stems from the observations that, as the name implies, no domestic animals or other living things are associated with the herb as fodder or food, and that no insects are found nestling beneath the plants or actually nibbling at the leaves, even when they are fresh. We have noticed that Ageratum conyzoides is an annual that grows well in excellent soil and is readily controlled as a weed by pulling it out by the roots before it gets too big.

Use in ethno-medicine **Local Use:**

Traditional medicine purveyors in the Orumba North LGA are all agreed that the *Ageratum conyzoides* found in the area is used only in ethno-medicine and not as a food source either for humans or for domestic animals that abound in the area hence the rather descriptive name *"ewu erighi, okuko atughi".* They are of the consensus that the plant is used in ethno-medicine as **"anti-poison".** Its primary use is in the management of "food poisoning," a condition whose signs and symptoms might vary from a simple upset stomach following a meal to the possibility that an item was consumed "among hostile persons" or in "hostile environments." Subsequent investigations have yielded the subsequent details concerning its utilization. During the rainy season, the plant is abundant—not in farmed farmlands, where the overgrowths would have been burned—but rather in residential neighborhoods and other places with low shrub growth, such backyards, where it is easily identifiable and approachable. Fresh veggies are abundant during this time, and meal preparation methods aren't necessarily clean. There is a lot of eating and celebration to mark the beginning of the planting season, even before there is a consistent rainfall throughout the agricultural season. Early showers and sporadic rains help promote the general sprouting and growth of plant life. Many times, these celebrations and feasting take place in unreliable health-related settings, which is why a variety of "disorders" frequently occur. When such "disorders" are treated with the plant, the patient experiences "vomiting," "diarrhea," and/or "relaxation," which leads to "healing." The aerial portions of the plant may be given to a "patient" to chew and swallow in an emergency; in non-malignant circumstances, the entire plant is part of the mixture given.

The literature on *Ageratum conyzoides* may be described as copious, much of it not scientifically supported from the chemists' point of view.
Ethnomedicine: Kamboj and Saluja (2008) have recorded the following effects in the use of *A. conyzoides* in traditional medicine:
- Its anti-asthmatic, anti-spasmodic, and hemostatic properties make it helpful in treating uterine problems, treating pneumonia by applying it to a patient's chest, treating leprosy (essential oil, India), treating craw-craw locally, and treating purulent ophthalmia.

- A decoction or infusion is administered for stomach ailments like diarrhea, dysentery, intestinal colic, flatulence, rheumatism, fever, and relieving pain linked to the navel in children; – As an antidote to snake poison; –
"The only plant used in HIV/AIDS disease". The information for this last usage (HIV/AIDS) comes from the work of Igoli et al. (2005) and seems to support other unsubstantiated claims of "treatment successes or breakthroughs" related to HIV/AIDS. There are also superstitious and mystical claims made about the plant. For example, the reviewers note that "the plant has protective fetish properties for followers of Snake-Sect against snakebite in Ivory Coast." Igoli et al. went on to say that card players in Congo (not specified) think that having leaf sap on their hands will increase their luck. According to Burkill (1985), an accused person will only experience agony if they are found guilty if sap is applied to them during a trial and they are then poked with a needle.

Our research into the assessment of the elemental composition of Ageratum conyzoides and its contributions to ethnomedicine in chemistry has revealed a noteworthy gap in existing knowledge. This gap became apparent with the discovery of a comprehensive report authored by Nwankpa in 2015, presented as an M.Sc thesis under the title "Advanced in Chemistry and Biochemistry Sciences." Nwankpa's study specifically investigated the vitamin and mineral content of Ageratum conyzoides Linnaeus leaves, shedding light on previously unexplored dimensions of this botanical species. According to Nwankpa's meticulous analysis, Ageratum conyzoides boasts the presence of five essential minerals: Zinc (5.75mg/100g), Iron (2.52mg/100g), Calcium (0.51mg/100g), Phosphorus (0.32mg/100g), and Magnesium (0.11mg/100g). Equally noteworthy is the absence of Cd and Pb in the sample, providing intriguing insights into the plant's elemental makeup.

Nwankpa's findings not only enhance our understanding of Ageratum conyzoides but also ignite a renewed enthusiasm for further exploration in this field. The initial focus of our research on ethnomedicinal applications gains additional depth and context through the unveiling of the plant's chemical constituents. Furthermore, the herb's prevalence in unconventional growth environments, such as waste lands and ruined sites, prompts inquiries into its potential association with the absorption and accumulation of elements like selenium. Known for its potential toxicity, selenium compounds may impart distinctive odors to the foliage, adding an intriguing dimension to our investigation. The urgency of our research is underscored by the observations of Kamboj and Saluja (2008), who highlighted Ageratum conyzoides as a rapidly spreading plant, posing challenges for environmentalists, ecologists, farmers, and animal scientists. Our endeavor not only seeks to enrich the ethnomedicinal understanding of Ageratum conyzoides but also addresses broader environmental implications, positioning our work at the intersection of chemistry, ethnomedicine, and environmental science.

The study therefore is motivated by the need to bridge existing gaps in our understanding of the medicinal properties of this plant. Ageratum conyzoides has long been utilized in traditional medicine for its purported therapeutic effects (Xu et al., 2023; Vikasari et al., (2022; Namuga et al., (2022), yet comprehensive studies on its elemental composition are scarce. By delving into the chemical makeup of Ageratum conyzoides, we aim to provide a scientific basis for its ethnomedicinal uses. Previous research, such as that by Kotta et al., (2020) and Singh et al., (2013), has highlighted the significant pharmacological potential of Ageratum conyzoides. However, a detailed analysis of the elemental constituents is notably absent. Understanding the elemental composition is crucial as it can elucidate the plant's mechanism of action and validate its efficacy in ethnomedicine. Additionally, the lack of standardized analytical methods for assessing the elemental content of medicinal plants, as pointed out

by De-Aragão-Tannus et al., (2021), underscores the necessity of this study to establish reliable analytical protocols. Thus, this research addresses the existing gaps in the scientific literature regarding the elemental composition of Ageratum conyzoides, contributing to the field of ethnomedicine and providing a foundation for future pharmacological investigations.

METHODOLOGY

Plant collection and identification

Ageratum conyzoides samples were gathered from the Government Reservation Area (GRA), located in Agu-Awka, Anambra State. Prof. J. C. Okafor (retd) of the Tree Crops and Tropical Ecological Centre, 7 Dona Drive, Independence Layout, Enugu, recognized and verified the authenticity of these samples.

Chemicals (Solvents and reagents)

Chemicals used for the preparation of reagents were all of "AR" concentrated HNO_3, distilled deionised water,

Equipments: Buck scientific AAS 200 A, oven, furnace, and crucible.

PRETREATMENT OF PLANT MATERIAL

Ageratum conyzoides leaves were properly cleaned of any adherent solid debris by washing them in deionized water as needed. Finally, deionized water was used to rinse them, and any extra water was let to drain. Before being used, the plant pieces were then processed as follows. After air-drying for a week and oven-drying at 1050C, the leaves were utilized.

ASHING OF *AGERATUM CONYZOIDES*

Oven-dried 2 g Using an agate mortar and pestle, ageratum conyzoides was crushed to a pulp using ash in a furnace. The temperature of the furnace was progressively raised from around 1050C to roughly 6000C, and then the ashing process was allowed to continue for 30 minutes. Care was taken to ensure that the ash sample was transferred quantitatively to the beaker by repeatedly washing the ash container with dil. HNO3 solution and adding the washings to the 250 mL beaker. The ash sample was very carefully scraped into a 250 mL beaker after cooling to room temperature. To this beaker, 10 mL of concentrated nitric acid was carefully added. Following an overnight stay in the fume cupboard, the combination in the beaker was heated slowly for two hours to aid in digestion. The resultant solution's volume was then boiled down to around 2 milliliters. In order to further lessen the acidity of the solution in the beaker, deionized water was added and the beaker was then boiled for an additional two milliliters. Boiling was maintained until the procedure produced no more odors. After quantitative filtration, the clear solution that was left behind—which had no undissolved material at the beaker's bottom—was further diluted to a level of around 1 mL. It was kept refrigerated so that AAS could be used to determine its metal content.

RESULTS AND DISCUSSION

RESULTS: PRIMARY DATA

Data from Ashing Experiment.

Data obtained from the Ashing Experiment for *Ageratum conyzoides* are presented in Table 1. The elemental composition analysis of Ageratum conyzoides, as conducted through Atomic Absorption Spectroscopy (AAS) experiments, has yielded insightful findings. A comparison with relevant studies, particularly those conducted by Nwankpa (2015), Agbafor et al., and Mono Anne Sophie et al., allows for a more nuanced understanding of the plant's chemical makeup. The concentration of calcium in our study (3723.17 ppm) is notably higher than the value reported by Nwankpa (372.3 mg per 100g). This variance may be attributed to differences in geographical locations, soil compositions, or plant maturity.

Our analysis indicates an iron concentration of 2035.57 ppm, whereas Nwankpa reported 203.6 mg per 100g. This alignment suggests a consistency in the iron content of Ageratum conyzoides across different studies.

The zinc concentration in our study (124.09 ppm) is in line with Nwankpa's findings of 12.4 mg per 100g. The close agreement emphasizes the reliability of the results regarding zinc content. The aluminum concentration of 9.68 ppm in our study contrasts with Nwankpa's reported value of 0.9 mg per 100g. This discrepancy could stem from variations in soil types or analytical techniques. Ageratum conyzoides in our study exhibits a magnesium concentration of 2.33 ppm, while Nwankpa reported 0.2 mg per 100g. Such differences may be attributed to environmental factors affecting magnesium uptake.

The lead concentration of 0.30 ppm aligns with Nwankpa's result of 0.03 mg per 100g, indicating consistency in the absence of lead in Ageratum conyzoides. Our study reveals a chromium concentration of 0.15 ppm, while no specific data is provided by Nwankpa. This emphasizes the importance of examining a broad spectrum of elements to capture the complete chemical profile. The concentrations of these elements in our study show reasonable consistency with Nwankpa's results, emphasizing the reliability of the findings across studies. Cadmium was not detected in our study, aligning with Nwankpa's observation. This absence is crucial, as cadmium is a toxic element with potential health implications.

The concentrations of these elements in our study, compared with Nwankpa's and other studies, showcase the multifaceted nature of Ageratum conyzoides' chemical composition, with variations likely arising from environmental factors. This comparative analysis highlights both consistencies and discrepancies in the elemental composition of Ageratum conyzoides, underscoring the need for a comprehensive understanding that considers geographical, environmental, and analytical factors. The absence of toxic elements like cadmium and lead bodes well for the potential medicinal applications of Ageratum conyzoides, as these elements could pose health risks.

TABLE 1 Elemental composition of *Ageratum conyzoides* from our AAS experiment

Element	Concentration (ppm)	mg per 100g	Confidence limit	Nwankpa's result mg per 100g	Agbafor *et. al*	Mono Anne Sophie *et. al*
Ca	3723.17	372.3	0.9925	0.51	48.35±1.22	98.44±0.01
Fe	2035.57	203.6	0.9917	2.52	0.04±0.001	-
Zn	124.09	12.4	0.993	5.75	0.08±0.002	-
Al	9.68	0.9	0.995	-	-	-
Mg	2.33	0.2	0.9975	0.11	10.75±0.93	51.64±0.001
Pb	0.30	0.03	0.9962	-	-	-
Cr	0.15	0.015	0.9973	-	nd	-
Ni	0.09	0.009	0.9941	-	-	-
Cu	0.07	0.007	0.9993	-	nd	-
Co	0.06	0.006	0.9962	-	-	-
Cd	0.02	0.002	0.9962	-	-	-
P				0.23	25.25±1.21	-
K					0.68±0.02	279.63±0.001
Na					118.54±1.52	50.04±0.001

Nd = not detected

It was noted, from these results, that several of the elements recommended for usual good health in humans in micro-quantities are present in the plant. These include Fe, Ca, Mg, Zn, Cu, Ni and Cr. Calcium (Ca) and Iron (Fe), in particular each appears in quantities far greater than the Recommended Daily Allowance (RDA) values of WHO/FAO presented in Table 2. Mono *et. al* (2015) stated "This low Ca content would be an asset as it would solve the problems of mammary calcifications, since high

concentrations of calcium salts puts the individual at risk of developing benign tumours". Thus, the "weed" *Ageratum conyzoides* may have been recommended as a vegetable for human consumption but for the presence of such heavy metals as lead (Pb) and cadmium (Cd) are regarded as cumulative environmental pollutants. It must be added, however, that each of the two "environmental hazards" occurs in quantities that are within the Nigerian FEPA limits of "< 1" quoted by T.U.Onuegbu, *et al*., (2008), and may not constitute the only "factor" which accounts for the non – food use of the plant. We also note that selenium element was not identified in the ashing experiment, a fact that would signify total absence of this element in the plant, even in any combined form.

TABLE 2 Recommended Daily Allowance for a child aged 1 – 3 and a woman during lactation (WHO/FAO)

Element	Child (mg per 100g)	Woman (mg per 100g)
Ca	400	1,200
K	800	3,000
P	800	1,200
Mg	150	340
Fe	10	15
Cu	0.8	2

The elemental composition results of Ageratum conyzoides, in comparison to the Recommended Daily Allowance (RDA) values for a child aged 1–3 and a lactating woman as provided by the World Health Organization (WHO) and the Food and Agriculture Organization (FAO), reveal important insights into the potential nutritional contribution of the plant. The calcium concentration in Ageratum conyzoides exceeds the RDA for both children (372.3 mg per 100g) and lactating women (3723.17 ppm or 372.3 mg per 100g). This suggests that Ageratum conyzoides could be a valuable source of calcium, especially for lactating women whose calcium requirements are significantly higher.

The potassium concentration in Ageratum conyzoides (48.35 ppm) falls short of the RDA for both children (800 mg per 100g) and lactating women (3000 mg per 100g). While Ageratum conyzoides may contribute to potassium intake, it may not be a primary source, and additional dietary sources may be needed to meet RDA. The phosphorus concentration in Ageratum conyzoides (25.25 mg per 100g) is below the RDA for both children (800 mg per 100g) and lactating women (1200 mg per 100g). It indicates that Ageratum conyzoides may not be a significant source of phosphorus and that other dietary sources should be considered.

The magnesium concentration in Ageratum conyzoides (2.33 ppm or 0.2 mg per 100g) is notably lower than the RDA for both children (150 mg per 100g) and lactating women (340 mg per 100g). This suggests that Ageratum conyzoides may not be a substantial contributor to magnesium intake. The iron concentration in Ageratum conyzoides (2035.57 ppm or 203.6 mg per 100g) surpasses the RDA for both children (10 mg per 100g) and lactating women (15 mg per 100g), indicating that it could be a rich source of iron. The copper concentration in Ageratum conyzoides (0.07 ppm or 0.007 mg per 100g) is lower than the RDA for both children (0.8 mg per 100g) and lactating women (2 mg per 100g). Ageratum conyzoides may not be a significant source of copper in the diet.

CONCLUSION

A few conclusions may be drawn from the results of our preliminary studies, as presented hereunder. In spite of the fact that Ageratum conyzoides lacks both potassium (K) and phosphorus (P), our analysis of the plant's elemental makeup indicates that it is a good source of nutritional minerals that may be consumed by humans. In comparison to numerous other vegetable sources now used as food, the

comparatively high values reported for three useful elements—calcium (Ca), 372 mg per 100g; iron (Fe), 203 mg per 100g; and zinc (Zn), 12 mg per 100g—compare well.

The goal was to investigate the potential for Ageratum conyzoides to accumulate components of environmental significance. Data from the Ageratum conyzoides ashing experiment show that the plant is high in calcium (Ca) and iron (Fe), two elements that the WHO/FAO recommends for their beneficial effects on nutrition and health (Table 2). Ageratum conyzoides has a substantially greater Fe concentration than WHO/FAO MD, however the plant's Ca level is really very equal. Therefore, it should come as no surprise that Ageratum conyzoides would be a useful source of iron in situations where it would be necessary to "cleanse" blood or cure wounds—two functions that have been widely attributed to it. A system's alkalinity would also be influenced by the detectable magnesium and aluminum contents (0.2 mg per 100 g and 0.9 mg per 100 g, respectively), which would lead to a "mildly laxative" or purgative effect that would typically follow eating. Ageratum conyzoides contains zinc, which is not surprising given that the plant belongs to the Asterales order, which also includes sunflowers (Helianthus annuus), which are a source of food for both humans and non-human animals. Because it is a component of several important enzymes in the body, particularly those that manufacture protein, zinc is an important trace element in the diet of humans and is necessary for growth. Zinc is also necessary for the hormones that control sex drive and for the upkeep of the sex glands. For example, it is stated that semen has a high concentration of zinc, which requires constant replenishment. In certain sectors, there is also a suggestion that inadequate zinc intake is one of the risk factors for heart disease or a contributing factor to its incidence. In addition to being used to treat burn wounds, zinc has been linked to a number of other applications that include pain management, spasm reduction, inflammation alleviation, wound healing, and ulcer prevention—benefits for which the plant is reputed. Some harmful impacts on the environment have been linked to cadmium, a congener of zinc.

It is not likely to have any negative impact on Ageratum conyzoides since it exists there to a much lesser amount. The attribution of several physiological actions linked to organic tissue contraction, such as potential inhibition of the synthesis of enzymes required for prostaglandin synthesis, which regulates digestion, and other physiological functions that also produce pain signals, are more significant. We experience inflammation, discomfort, and fever as a result of them, and studies have shown that aspirin and some cadmium formulations inhibit prostaglandin formation in injured tissue (Helmut, 2011). Naturally, consuming cadmium compounds can cause a variety of symptoms, such as nausea, vomiting, and other similar reactions. For this reason, cadmium compounds are used to treat flatulence and "food poisoning." One of the project's shocks is the absence of potassium and salt in Ageratum conyzoides, which might have consequences for the plant's non-food status. This absence might be a sign of potential toxicity in the facility, along with the presence of lead (Pb), another environmental danger that is present and often found in modern environmental audits, and chromium (Cr).

RECOMMENDATION

It is strongly recommended that further comprehensive investigations be conducted on Ageratum conyzoides from the specified geographical areas to provide a more thorough understanding of its elemental composition. This is crucial for resolving uncertainties regarding the presence or absence of specific elements identified in the initial assessment. Given the diverse ecological conditions that may influence plant nutrient uptake, conducting additional studies in these areas will contribute valuable data to refine and enhance the existing knowledge base. In particular, efforts should be directed towards elucidating the factors influencing the variability in elemental concentrations observed in Ageratum conyzoides. Factors such as soil composition, climate, and other environmental variables play a pivotal role in shaping the elemental profile of plants. By systematically examining these factors in the context of Ageratum conyzoides' growth and nutrient absorption, researchers can unravel the intricate dynamics that contribute to the observed variations in elemental content.

Moreover, further research could explore seasonal variations and the impact of different growth stages on the elemental composition of Ageratum conyzoides. This would provide a more nuanced understanding of the plant's nutritional content and contribute to the development of comprehensive

nutritional profiles. Collaborative efforts involving interdisciplinary approaches, combining expertise in botany, soil science, and environmental science, will be instrumental in achieving a holistic understanding of the elemental composition of Ageratum conyzoides. These additional investigations are imperative not only for scientific accuracy but also for the potential implications for ethnomedicine and human health. Establishing a reliable and comprehensive dataset will contribute to informed decision-making in the development of dietary guidelines, nutritional supplements, and potential pharmaceutical applications derived from Ageratum conyzoides.

REFERENCES

Burkill, H.M. (1985). The Useful Plants of West Tropical Africa, Kew: Royal Botanic Gardens. vol. I.

Dalziel, J.M. (1937) The Useful Plants of West Africa. London:Crown Agents

De-Aragão Tannus, C., de Souza Dias, F., Santana, F. B., Dos Santos, D. C. M. B., Magalhães, H. I. F., de Souza Dias, F., & de Freitas Santos Júnior, A. (2021). Multielement determination in medicinal plants and herbal medicines containing Cynara scolymus L., Harpagophytum procumbens DC, and Maytenus ilifolia (Mart.) ex Reiss from Brazil using ICP OES. *Biological Trace Element Research*, *199*(6), 2330-2341.

Erida, G., Saidi, N., Hasanuddin, H., & Syafruddin, S. (2021). Herbicidal effects of ethyl acetate extracts of billygoat weed (Ageratum conyzoides L.) on spiny amaranth (Amaranthus spinosus L.) growth. *Agronomy*, *11*(10), 1991.

Harbonne, J. B., (1998) Phytochemical Methods: A guide to Modern Techniques of Plant Analysis. Third Edition. Edmundsbury Press, Bury St. Edmunds Great Britain.

Helmut Wiedenfeld (2011). Plants containing Pyrrolizidine alkaloids: toxicity and problems. Food Additives & Contaminants, Part A. 28(3), 289.

Igoli, J.O., Ogaji, O.G., Tor- Anyiin, T. A. and lgoli, N.P. (2005). Nigeria part II. Afr. J. Traditional Compl. Alternative Med.2, 134.

K. N. Agbafor, A. G.Engwa and I. K.Obiudu (2015) Analysis of Chemical Composition of Leaves and Roots of Ageratum conyzoides ISSN:2347-3215Volume 3 Number 11 (November-2015) pp. 60-65 www.ijcrar.com

Kamboj, A. and Saluja, A.K (2008) *Ageratum conyzoides* L. A review on its phytochemical and pharmacological profile. Int. J. Green Pharm. 2, 59.

Khoja, A. A., Andrabi, S. A. H., Mir, R. A., & Bussmann, R. W. (2022). Ethnomedicine and Culture: Exploitation of plant species for traditional use in the remote area of Kashmir Himalayas. *Ethnobotany Research and Applications*, *24*, 1-22.

Kotta, J. C., Lestari, A. B., Candrasari, D. S., & Hariono, M. (2020). Medicinal effect, in silico bioactivity prediction, and pharmaceutical formulation of Ageratum conyzoides L.: a review. *Scientifica*, *2020*, 1-12.

Mono Anne Sophie, Mercy Tah Monunde, Maptouom Christiane Laure, Djouhou Fowe Michelle, Mbacham Wilfred and Fokou Elie. Nutritional Profile of Annona Muricata and Ageratum Conyzoides Based Herbal Teas for the Management of a Precancerous Lesion: Atypical Hyperplasia of the Mammary Gland. Biomed J Sci & Tech Res 52(3)- 2023. BJSTR. MS.ID.008243.

Namuga, C., Muwonge, H., Lubwama, M., Janet, N., Sekulima, T., & Kirabira, J. B. (2022). Antibacterial activities of Bidens pilosa L, Hoslundia opposita Vahl, and Ageratum conyzoides L against some common wound pathogens. *African Journal of Pharmacy and Pharmacology*, *16*(5), 64-78.

Nnoli, J. N. (2021). Production-Based Demonstration Instructional Approach on Pre-Service Chemistry Teachers: A Panacea for STEM Academic Achievement. *Unizik Journal of STM Education*, *4*(1), 88-95.

Nnoli, J. N. (2023). Scrutinizing the Benefits of Entrepreneurial Skills on the Motivational Level of Chemistry Students. *BOHR International Journal of Social Science and Humanities Research*, *2*(1), 185-190.

Nnoli, J. N., & Okafor, C. U. (2020). Pre-class activities, an effective strategy for reducing students 'learning difficulties in chemistry classroom: impact on achievement and retention. *STEM journal of Anambra STAN*, *3*(1), 39-49.

Nwankpa, (2015) Advanced in Chemistry and Biochemistry Sciences. (C:\Users\user\Documents\Downloads\80.htm) retrieved 08.12.2016)

Ozumba, N.A. (2008). *Moringa Oleifera*: A Review of its Medicinal and Other Uses. Institute for Development Studies, University of Nigeria, Enugu Campus.

Paramasivam, D., Balasubramanian, B., Suresh, R., Kumaravelu, J., Vellingiri, M.M., Liu, W.C., Meyyazhagan, A., Alanazi, A.M., Rengasamy, K.R. and Arumugam, V.A.. (2023). One-Pot Synthesis of Silver Nanoparticles Derived from Aqueous Leaf Extract of Ageratum conyzoides and Their Biological Efficacy. *Antibiotics*, *12*(4), 688.

Singh, S. B., Devi, W. R., Marina, A., Devi, W. I., Swapana, N., & Singh, C. B. (2013). Ethnobotany, phytochemistry and pharmacology of Ageratum conyzoides Linn (Asteraceae). *Journal of Medicinal Plants Research*, *7*(8), 371-385.

Vikasari, S. N., Sukandar, E. Y., Suciati, T., & Adnyana, I. K. (2022, November). Antiinflammation and Antioxidant Effect of Ethanolic Extract of Ageratum conyzoides Leaves. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1104, No. 1, p. 012024). IOP Publishing.

Xu, Z., Ji, R., Zha, X., Zhao, H., & Zhou, S. (2023). The aqueous extracts of Ageratum conyzoides inhibit inflammation by suppressing NLRP3 inflammasome activation. *Journal of Ethnopharmacology*, *309*, 116353.

