A Review of *Mitracarpus scaber* and *Ageratum conyzoides* in the Traditional Management of Eczema in Nigeria

ABSTRACT

Various medicinal plants are used globally in the treatment of different skin diseases such as eczema, skin rashes, ringworm, vitiligo, measles, boils, chicken pox, and small pox. Herbal medicine is as old as civilization. Usage of herbal medicine is common among the low income-groups in villages across West Africa countries where medicinal services are less accessible. Herbal treatments are generally perceived as effective with few side effects. Eczema is a condition that causes dry and itchy patches of the skin. The condition weakens the skin’s barrier function, which is responsible for helping the skin to retain moisture and protecting the body from outside elements. Management of the condition is complicated. *Mitracarpus scaber* and *Ageratum conyzoides* have been reported in the treatment of various skin diseases prominent among which is eczema. The use of these plants for treating the disease has gained so much attention to the extent that, they are now being formulated into antifungal cream. This review explores the bioactive compounds of these plants and their potentials in managing the condition.

**Keywords:** *Mitracarpus scaber*, *Ageratum conyzoides*, eczema, skin diseases, medicinal plants

**Introduction**

The use of herbal medicines for the treatment of various health challenges continues to expand rapidly across the world. As the inventory list WHO showed, greater than 20,000 species of medicinal plants have been compiled so far.1 Medicinal plant products remain the most accessible and easily affordable medicines for primary health care in developing countries.2 People, especially the low-income group in the society, use available indigenous plants for treating and preventing common illnesses, which include both infectious and non-infectious. It is a common practice in Africa and other parts of the world to use plants in the form of crude extracts, decoction, infusion, or tincture to treat common infections and chronic conditions.3 Prominent among the conditions treated with medicinal plants are skin diseases such as eczema, ringworm, skin rashes, vitiligo, measles, boils, chicken pox, and small pox.

Nigeria is richly blessed with many varieties of these medicinal plants whose leaves, roots, fruits, seeds, and barks are useful in traditional medicine. Ethnomedicinal surveys have shown that *Mitracarpus* species have been used as antioxidants,4 insecticides,5 sedatives,6 antifungals,7 antidiabetics,8 anti-inflammatories,9 antibacterials,10 and anti-diarrheals.11 Leaf extracts of *Mitracarpus scaber* have also shown antitrypanosomal and hepatoprotective effects.12

*Ageratum conyzoides* contains a variety of phytochemicals such as alkaloids, flavonoids, tannins, saponins, glycosides, resins, and phenols, as well as proteins, carbohydrates, and essential and non-essential amino acids.13 The plant’s phytochemicals have antimicrobial and antioxidant properties, making it useful for treating burns, skin disorders, diarrhoea, giardiasis, headaches, colic, dysentery, rheumatism, leprosy, snakebites, and pain relief during childbirth.14 The presence of free radicals in the environment can cause oxidative stress, which harms human health. Antioxidants are molecules that prevent the oxidation caused by free radicals as they interact and stabilise them.15 Antioxidants are typically lowered to achieve this. They are primarily reducing agents, including thiols, ascorbic acid, and polyphenols.

The human skin is the body’s largest organ and is made up of water, protein, fats, and minerals. It forms the first guard line. It comprises of three main layers: the epidermis, which is the outer layer of the skin defined as a stratified squamous epithelium primarily comprising keratinocytes in progressive stages of differiation.16 The dermis forms the inner layer of the skin made of collagen with some elastin. It cushions the deeper structures from mechanical injury and provides nourishment to the epidermis. The hypodermis is the subcutaneous layer lying below the dermis.

 Cutaneous inflammation is intensified by pathogenic micro-organisms, harmful mechanical and chemical agents, and immune/autoimmune responses. It is a complex procedure in which the body undergoes to repair tissue damage and protect itself from hazardous stimuli. Inflammation is defined by symptoms like redness, swelling, itching, heat, and discomfort.17 Inflammatory factors cause the release of intracellular biochemical. Monocytes and macrophages generate cytokines. They activate inflammatory cells (neutrophils, macrophages, and mast cells), facilitate communication, stimulate prostaglandin protein formation and, influence Creactive protein synthesis. Cytokines can be classified as pro-inflammatory (IL-1, IL-6, IL-8, IL-17, IL-18, α and β interferons, and TNF) or anti-inflammatory (IL-4, IL-10, IL-13). The first type causes a systematic inflammatory reaction, while anti-inflmmatory cytokines cause an anti-inflammatory response.18 Chronic inflammatory disorders are caused by excessive production of pro-inflammatory mediators such as IL-1β, IL-6, and TNF-α, which initiate an inflammatory cascade. Skin inflammatory diseases can disrupt eicosanoids biosynthesis in the epidermis and disrupt the neuroimmunological system, leading to increased production of neuroinflammatory mediators such as P substance, which stimulates nitrogen oxide synthesis.19

 Atopic dermatitis (atopic eczema) is a chronic inflammation-based skin condition that affects individuals with a genetic predisposition to respond to environmental causes. The condition often coexists with impetigo, common warts, vitiligo, and alopecia areata. It is a common dermatological disorder in young ones, presenting symptoms such as redness, skin irritation, severe itching, dry patches, and rashes. The causes of atopic eczema are unclear, but it is often linked to type 2 inflammation. Stress can also trigger it by increasing the release of cortisol, a hormone that ramps up inflammation. T lymphocyte activation is linked to the pathogenesis of atopic dermatitis and other inflammatory skin conditions. This is caused by complex interactions between various cells, including keratinocytes, endothelium cells, eosinophils, Langerhans cells, and T lymphocytes, as well as cytokines and mediators. In atopic skin illnesses, skin cells produce interleukins that cause inflammation.20 Patients exhibit high IgE production against minor dietary and inhalant allergens, leading to inflammation.The release of leukotrienes, prostaglandins, and proteases causes inflammatory symptoms in various organs and systems. Atopic dermatitis is characterised by extreme skin dryness due to a shift in the activity of ∆6-desaturase, an extreme enzyme that converts linolenic acid to γ-linolenic.

 Patients with this condition have low levels of essential fatty acids (EFA) and abnormal lipid synthesis in the epidermis. These factors are crucial for the establishment and maintenance of dermal abnormalities. Atopic dermatitis patients have higher levels of trans epidermal water loss (TEWL) in dry skin areas without inflammation compared to clinically healthy skin. This may be due to a lower concentration of lipids in the skin, particularly ceramides, and the loss of ingredients of a natural moisturising factor (NMF).21

 This review aims to examine the use of *Mitracarpus scaber* and *Ageratum conyzoides* in the traditional management of eczema in Nigeria, with an emphasis on their bioactive compounds. It will provide a thorough understanding of the mechanisms by which *Mitracarpus scaber* and *Ageratum conyzoides* exert their curative effects. Finally, it aims to add to the body of information on *Mitracarpus scaber* and *Ageratum conyzoides*, supporting their integration into clinical practice for improved health outcomes.

**Materials and Methods**

 This review examined the use of *Mitracarpus scaber* and *Ageratum conyzoides* in the traditional management of eczema in Nigeria using a comprehensive examination of existing literature. The search was developed to enable a thorough and systematic review of a diverse range of relevant studies in English, Spanish, French, and Portuguese. Key databases used included Science Direct, Web of Science, Medline, BVS Regional Portal, Embase, and Google Scholar. The primary keywords used in the search were “*Mitracarpus scaber*,” “*Ageratum conyzoides*,” “eczema,” “skin diseases,” and “Medicinal plants.” To ensure scientific rigour, only peer-reviewed research was considered. The review method included a comprehensive study of titles and abstracts, followed by a thorough examination of chosen full-text papers. Key data were rigorously retrieved and classified according to research type, bioactive substances, extraction procedures, and documented therapeutic effects. The emphasis was on the antifungal activity of *Mitracarpus scaber* and *Ageratum conyzoides*.

**Results and Discussion**

*Botanical description*

 The Asteraceae family consists of 1500 genera and 2500 different species. *Ageratum* is one of the genera included in the Asteraceae family and consists of 30 species.The family is widely distributed throughout the world in a variety of ecological habitats, except Antarctica. They are found in forest habitats, high altitude grasslands and even urban green spaces, but they are much less common in tropical areas. The morphology of the Asteraceaeplants is also diverse. Some species are trees reaching more than 30m. The form of the leaves varies widely: while most are large, others are small and spiny, and some are non-existent, with their function being taken over by a green stem. Most of their leaves are covered with an indumentum and hairs of all lengths and colours.

 *Mitracarpus scaber* belongs to the familyRubiaceae. The family is one of the largest Magnoliopsida classes, with 1317 genera and 33,971 species worldwide. Plants in the family can be trees, shrubs, lianas, or herbs. Common name is botton grasses. It is known as “Harwachi” among the “Hausa” speaking people of northern Nigeria. The plant is characterised by a rich phytochemical profile, notably containing alkaloids, tannins, cardiac glycosides and saponins.**oot1. Habit3. Stand fallowed l**

*Extraction techniques and phytochemical profile*

 *Mitracarpus scaber* and *Ageratum conyzoides* have been extracted using several procedures targeting different plant components, such as leaves, roots, stems, and flowers, to maximise their therapeutic potentials. These procedures use selective solvents and standardised methods to produce complicated mixes in liquids, semisolids, and dry powders. Extraction efficiency depends on plant characteristics, solvent selection, temperature, pressure, and duration.15

 Traditional extraction methods, including Soxhlet extraction, maceration, decoction, and infusion, are successful in isolating a diverse range of chemicals. Modern technologies, including supercritical fluid extraction, have been developed. Bioactive compounds from *Mitracarpus scaber* and *Ageratum conyzoides* are extracted using maceration, hydrodistillation, distillation, and supercritical fluid extraction methods.23 Maceration, which soaks plant materials in a solvent at room temperature, promotes the diffusion of compounds into the solvents. Hydrodistillation and distillation, which use heat, are effective methods for extracting essential oils and other volatile substances.

 Modern techniques, such as supercritical fluid extraction (SFE) and solid phase microextraction (SPME), provide more advanced and efficient methods. Supercritical fluid extraction (SFE) employs CO2 as a solvent to extract bioactive chemicals at precise temperatures and pressures. This approach has the advantage of selectively extracting chemicals without using organic solvents, making it environmentally benign. SPME uses a coated fibre to absorb volatile and semi-volatile chemicals from the sample matrix and then desorbed for analysis. This approach is popular for its speed and low solvent requirement. The essential oil of *Mitracarpus scaber* and *Ageratum conyzoides* contain volatile and non-volatile compounds which include monoterpenes, sesquiterpenes, precocene I, ageratochromene, sabinene, β-pinene, 1,8-cineole, limonene, α-terpinen-4-ol, and α-terpineol.

The phytochemical profiles of extracts of *Mitracarpus scaber* and *geratum conyzoides* are rich and diverse. Principal compounds include saponins, tannins, flavonoids, glycosides, alkaloids, terpenoids, chromenes, coumarin, phenols, and resins, as shown in Tables 1 and 2, respectively. Phenolic compounds, renowned for their antioxidant properties, are instrumental to their antioxidant defence mechanisms. Glycosides, which are a group of secondary plant metabolites found in the leaves, constitute a significant proportion of the plant’s phytochemistry. Glycosides are compounds that contain a carbohydrate molecule that can be broken down into a sugar and non-sugar component.

*Mitracarpus scaber and Ageratum conyzoides in treating eczema*

Fungal infection of the skin is one of the common dermatological problems, making the skin look scaly with rashes.24 Eczema is considered a group of medical conditions that cause the skin to become inflamed or irritated.25 Eczema stands as the prevalent chronic inflammatory skin ailment, impacting approximately 230 million individuals globally. In developed nations, its prevalence varies, with rates ranging from 10% to 25% in children and 7% to 10% in adults.26 Clinically, atopic dermatitis is distinguished by intense itching, dry skin, and eczematous lesions, which typically affect flexures of the head, neck, and hands.26 Furthermore, disturbances in focus and poor sleep quality, most likely caused by itching, might occur, affecting both academic and professional performance.27

Eczema is believed to be caused by an overactive immune system in response to an irritant; however, the exact aetiology is unknown. It has been found that both internal and external variables might trigger an increase in the inflammatory response. While there is no cure, medical therapy, avoidance of allergens, and periodic skin moisturising can help control the disease. Eczema treatment aims to alleviate irritation and reduce the risk of infection. Ointments and creams are prescribed to moisturise the dry and itchy skin caused by the condition. Over-the-counter hydrocortisone 1% cream and prescription topical steroids, combined with oral antihistamines, are commonly used to relieve inflammation.

If the affected area gets infected, topical or oral antibiotics may be recommended to eliminate the infection-causing microorganisms. Additionally, creams with calcineurin inhibitors may be used.28 Previous therapies for itching include tar treatment, phototherapy, and cyclosporine or oral steroids for those who do not respond to previous options. Corticosteroids are effective treatment, but their long-term and excessive use can have serious adverse effects that patients are concerned about. To reduce adverse effects, consider adding topical herbs to the therapy plan. According to 29, traditional Chinese medicine can reduce the need for corticosteroids, making it a viable integrative therapy option.

Medicinal and aromatic plants have been used in ancient times to formulate natural remedies to treat skin ailments and a wide variety of dermatological disorders, such as acne, spots, wound healing, or dermatoses like eczema, psoriasis, and pruritus.30 Aqueous extracts of *Mitracarpus scaber and Ageratum conyzoides* are used to treat these dermatological diseases. Table 3 shows the traditional use of *Mitracarpus scaber and Ageratum conyzoides* in treating skin diseases. Plant extracts and phytochemicals have been shown to have antieczema efficacy in vitro, but there is inadequate evidence for human use. Clinical trials and noteworthy findings are few. Many phytochemicals have not been studied for cytotoxicity, acute toxicity, or long-term toxicity in normal cells and animals, limiting in vivo studies. More research is needed to fully understand the effects of medicinal plants on eczema, despite recent advances.

**Conclusion**

The review suggests that *Mitracarpus scaber and Ageratum conyzoides* have significant potencies and clinical benefits. However, further research is needed to determine the specific toxicity and adverse side effects of these herbal extracts in clinical studies. Additionally, there has been little progress in the formulation of these herbs using advanced technology, which could increase their economic value. Therefore, this could be a good invention for developing dosage form formulations with *Mitracarpus scaber and Ageratum conyzoides*.

**Conflict of Interest**

The authors declare no conflict of interest.

**References**

1. Vaou N, Stavropoulou E, Voidarou C, Tsigalou C, Bezirtzoglou, E. Towards advances in medicinal plant antimicrobial activity: A review study on challenges and future perspectives. Microorganisms 2021; 9: 2041.
2. Gumisiriza H, Birungi G, Olet EA, Sesaazi CD. Medicinal Plant Species Used by Local Communities around Queen Elizabeth National Park, Maramagambo Central Forest Reserve and Ihimbo Central Forest Reserve, South Western Uganda. J. of Ethnopharmacol.2019; 239: 1-22.
3. Suleiman MHA. An ethnobotanical survey of medicinal plants used by communities of Northern Kordofan region, Sudan. J. of Ethnopharmacol. 2015; 176: 232-242.
4. Ouadja B, Anani K, Djeri B, Ameyapoh YO, Karou DS. Evaluation of the phytochemical composition, anti-microbial and anti-radical activities of *Mitracarpus scaber* (Rubiaceae). J. of Med. Plants Res. 2018; 12(28): 493-499.
5. Adesina JM, Ofuya TI, Ileke KD, Rajashekar Y, Mobolade-Adesina TE. Biochemical and toxicological studies of *Bridelia micrantha* (Berth)and *Mitracarpus villosus* (Swartz) DC extracts used as biofumigant against stored produce insects pests on Albino rats. Iran. J. of Toxicol. 2019; 13(4): 5-10.
6. Abubakar AR, Haque M. Medicinal plants with reported anxiolytic and sedative activities in Nigeria: a systematic review. Istanbul J. Pharm. 2019;49(2): 92-104.
7. Kudu AA, Odda J, Aliero AA, Oloro J. Evaluation of antifungal activity of ethanolic crude extract of *M.hirtus* plant against drematophytes. Galore Int. J. of Health Sci. Res. 2018;3(1): 18-23.
8. Abubakar MK, Wasagu RSU, Usman JN, Galadima LG. Effects of methanol and aqueous leaf extract of *Mitracarpus scabrum* in alloxan induced diabetic rats. J. Pharmacogn. Phytochem. 2016; 5(1): 4-7.
9. Obiora OF, Bege J, Agat IJ, Barnabas NJ. Crude extracts of *Mitracarpus scaber* roots significantly ameliorate paracetamol (PCM) induced liver damage in rats. Am. J. Biomed. Life Sci.2019; 7(6): 148-154.
10. Sani I, Abdulhamad A, Bello F, Fakai IM, Sa’idu A. Anti-bacterial efficacy of *Mitracarpus villosus* extract on some selected multi-drug resistant clinical isolates. J. Appl. Sci.2015; 19(5): 400-405.
11. John-Africa LB. Antidiarrhoeal effects of the methanol extract of the aerial parts of *Mitracarpus villosus*. Pak. J. of pharm. Sci. 2018;31(4): 1293-1299.
12. Jonathan B, Victor M, Samuel KM, Sani J. Some hepatic function indices in trypanosome brucei-infected rats treated with aqueous extract of *Mitracarpus scaber.* Int. J. of Chem. Biol. Sci. 2015; 1:5.
13. Amadi BA, Duru MKC, Agomou EN. Chemical profile of leaf, stem,root and flower of *Agerratum conydoides*. Pelagia Research Library 2012; 2(4): 428-432.
14. Okunade AL. *Agerratum conydoides* L. (Asteraceae). Fitoterapia. 2002; 73: 1-16.
15. Saheli B. Berberi plants: Drifting from farm to food applications, phytotherapy, and phytopharmacology. Foods. 2019; 8(10): 522. Doi: 10.3390/FOODS8100522.
16. Amirlak B, Shahabi, L. Skin Anatomy. 2017.
17. Ikeda Y, Murakami A, Ohigashi H. Ursolic acid: an anti-and pro-inflammatory triterpenoid. Mol. Nutr. Food Res. 2008; 52:26-42.
18. Karpel E. Systematic inflammatory response mediators-the importance in clinical practice and intensive care. Anest. Inten. Ter. 2001; 3:181-190.
19. European Medicines Agency (EMEA). *Avena sativa* L., Herba and *Avena sativa* L., Fructus; London. 2008.
20. Aries MF, Vaissiere C, Fabre B, Charveron M, Gall Y. Avena rhealba inhibits arachidonic acid cascade, CPLA2 and COX expression in human keratinocytes. Interest in cutaneous inflammatory disorders. J. Invest. Dermatol. 2003; 121(1): 1-4.
21. Pytkowska K. Effect of lipids on epidermal barrier function. Wiadomosci PTK 2003; 2: 7-10.
22. Agrahari S, Kesharwani V, Kushwaha N. A review on modern extraction techniques of herbal plants. Int. J. Pharmacogn. 2021; 8(5): 177-188.
23. Patel MR, Dave KR, Patel PR. A review on different extraction methods of plants: Innovation from ancient to modern technology. Int. J. Biol. Pharm. Allied Sci. 2021: 10(12): 511-527. <https://doi.org/10.31032/IJBPAS/2021/10.12.1044>
24. Genatrika E, Sundhani E, Oktaviana MI. Development and Evaluation of a Tropical Herbal Gel for the Treatment of Tinea Pedis. Trop J Nat Prod Res. 2022; 6(12):1914-1918. <http://www.doi.org/10.26538/tjnpr/2021/v6i12.2>
25. Shadi TZ, Talal AZ. A review of four common medicinal plants used to treat eczema. J. Med. Plants Res. 2015; 9(24): 702-711. Doi: 10.5897/JMPR2015.5831
26. Weidinger S, Beck LA, Bieber T, Kabashima K, Irvine AD. Atopic dermatitis. Nat Rev Dis Primers. 2018; 4:1. Doi: 10.1038/s41572-018-0001-z.
27. Birdi G, Cooke R, Knibb RC. Impact of atopic dermatitis on quality of life in adults: a systematic review and meta-analysis. Int J Dermatol. 2020; 59:75-91. Doi: 10.1111/ijd.14763.
28. Carr WW. Topical calcineurin inhibitors for atopic dermatitis: review and treatment recommendations. Paediatr. Drugs. 2013; 15(4): 303-310.
29. Chen HY, Lin YH, Huang JW, Chen YC. Chinese herbal medicine network and core treatments for allergic skin diseases: Implication from a nationwide database. J. Ethnopharmacol. 168: 260-267.
30. Nadia S, Hamza EF, Asma H, Abdelhamid Z, Lhoussaine ER. Traditional Knowledge of Medicinal Plants Used for Cosmetic Purposes in the Fez-Meknes Region. Trop J Nat Prod Res. 2023; 7(11): 5135-5154. <http://www.doi.org/10.26538/tjnpr/v7i11.17>

 **Figure 1:** *Ageratum conyzoides*



**Figure 2:** *Mitracarpus scaber*

 **Table** **1**: Phytochemical profile of *Mitracarpus scaber*

 Phytochemicals *Mitracarpus scaber*

Saponins +

Tannins ++

Flavonoids +

Essential oils ++

Glycosides +++

Note: + = Trace of the compound, ++ = Moderate constituent, +++ = Large constituent.

 **Table** **2**: Phytochemical profile of methanolic extract of *Ageratum conyzoides*

 Phytochemicals *Ageratum conyzoides*

Tannins +

Proteins +

 Glycosides +

Note: + = presence of compound

**Table** **3**: *Ageratum conyzoides* and *Mitracarpus scaber* and their traditional uses for treating skin diseases

 Herb scientific name Family Habit Parts used Selected traditional uses

 *Ageratum conyzoides* Asteraceae Annual herb Leaves, roots, Skin diseases including

 and flower buds eczema, irritation, burns,

 inflammation, wounds,

 itching, psoriasis, allergic

 conditions.

 *Mitracarpus scaber* Rubiaceae Annual herb Leaves Skin diseases including

 eczema, ringworm,

 scabies, rashes, boils,

 acne, inflammation,

 wounds.