

The Synergistic Effects of Combination Therapies: Medicinal Plants and Pharmaceuticals

Omutindo Nyakayo A.

Faculty of Science and Technology Kampala International University Uganda

ABSTRACT

Medicinal plants have been used for centuries as natural remedies for various ailments, forming the foundation of traditional medicine in many cultures. In contrast, modern pharmaceuticals, developed through rigorous scientific methods, have revolutionized healthcare with targeted treatments. This paper investigates the synergistic potential of combining medicinal plants with synthetic pharmaceuticals, emphasizing their complementary interactions in disease management. The study discusses the pharmacokinetic and pharmacodynamic mechanisms of herb-drug interactions, their clinical applications, and the challenges associated with safety and efficacy validation. With rising concerns over antibiotic resistance and adverse drug reactions, integrating plant-based compounds with pharmaceuticals may offer a cost-effective, holistic approach to disease prevention and treatment. Further research and regulatory frameworks are essential to harness the full potential of combination therapies while ensuring patient safety.

Keywords: Combination therapy, medicinal plants, pharmaceuticals, drug synergy, integrative medicine, traditional medicine.

INTRODUCTION

Plants provided a regular source of natural products that have long been used as remedies for a wide variety of human ills. In the past few centuries, synthetic drugs have been developed to combat these same ills, fabricating some truly marvelous pharmaceuticals. The importance of these relatively new “cures” is reflected in the rise of the modern pharmaceutical industry after World War II. Yet, despite the considerable resources devoted to “curing” the drug-poor plants of the world, only a small fraction of their pharmacology has been assessed. As such, a great storehouse of potential cures remains untapped. These philosophies are not novel but are timeless reflections of life’s tapestry, such as how evolution and homeostasis maintain the balance of life, where yin-yang, day-night, active-rest, and negative-positive charged ions. For a harmonious life, all opposing forces must be balanced. Disruption of this fine balance leads to health disorders and diseases. This explains why embracing any single paradigm of modern medicine may not provide for holistic prevention and treatment for the complex disturbances observed in health conditions like hypertension, diabetes, epilepsy, chronic bronchitis, and asthma [1, 2].

Background and Rationale

Research into the synergistic effects of combining medicinal plants with pharmaceuticals is a relevant subject for investigation in the current phase of medical research, especially with the resurgence of scientific interest in examining the botanical tradition in cultures where Ayurveda, Traditional Chinese Medicine, Jamu, Jamu Herbal, and Traditional African Medicine have prevailed. The confluence of allopathic and traditional medical paradigms is propelling a constructive interaction between the two medical systems in curing maladies and creating a broader concept of integrative medicine. Moreover, the inclination towards integrative medicine throughout the world is revealing substantial demand. The

South East Asia region has an enormously rich variety of resources that are essential ingredients for launching an integrated traditional and allopathic approach to disease management [3, 4]. A significant amount of scientific documentation exists that validates the phytochemical benefits of medicinal plants in treating different ailments, but a mere handful of researchers have diligently investigated the effectiveness of integrating medicinal plants with therapeutic potential, such as antibiotics or robust spectra antibiotics for a comprehensive treatment system. Various scientific observations and traditional medicine theories postulate that synthetic and natural treatments may well work better in a complementary fashion. However, certification supported by extensive research is still lacking. There are compelling arguments for developing the integration of medicinal plant treatments with a selection of pharmaceuticals based on a particular ailment, and the establishment of this proposition with conclusive scientific decree is fundamental. In addition, escalating antimicrobial resistance against synthetic drugs is an added stimulus for serious investigation of integrated therapy with natural medicinal herbs. Ultimately, such a method of curing maladies may generate a new avenue of traditional pharmaceutical synthesis and result in a cost-effective means of disease treatment [5, 6].

Medicinal Plants in Traditional and Modern Medicine

Plants have been used in many societies, by different cultures, over thousands of years, for a variety of reasons. This is because they have been considered the main supporters of human life, both in a material and spiritual way. The history of medicinal plants is interconnected with the history of people and represents one of the aspects of their culture, psychic spirit, and their reflection on society, environment, and the healing of diseases. Therefore, knowledge about the use of plants, as far as nutrition and healing of certain diseases is concerned, can take us back to the prehistoric period. There are few authentic cultures in the world today that do not use medicinal plants for healing or promoting health. The reason for using medicinal plants in the treatment of diseases is not only the existence of an apparent, materialistic connection and not only the fact that people are a part of the plant world, but there is much more. Medical artifacts, manuscripts, and icons of plants testify to the fact that long before the creation of their literature and alphabet, and certainly long before that of the printing press, the use of medicinal herbs was based on a rich tradition of ancient people [7, 8]. Phytotherapy is defined as the use of medicinal plants in the treatment or cure of human diseases. It is an ancient form of healing present in almost all cultures. In Asia, Africa, and Latin America, medicinal plants are still basic to the health care structure. There is a reduced or lack of access to medical care by the population. Medicinal plants and traditional medicine are, for many people, the only source of health care. Since about 70% of the population does not have regular access to medical services, plants represent a fundamental health system. There are many benefits of this system. One is the lower cost of plant-based preparations compared to modern synthetic drugs. In addition, people have confidence in traditional methods, which have been proven over the centuries. Modern medicine is beginning to appreciate the importance and effectiveness of traditional remedies, and efforts are being made to connect these two systems. The use of plant material for medicinal purposes in many problems related to human health is considered the oldest form of healing – ancient papyri of Egypt and ancient scriptures of India and China testify to the importance of using medicinal plants for human health. Records testify that various plant species were used in the treatment of numerous diseases and conditions. Mentioned in these earlier religious and cultural texts are those that today have a more important role in everyday therapy than cheaper, synthetically produced preparations. Since the 19th century, the pharmaceutical industry has relied on the isolation of the active components of the medicinal plant to create more efficient and better quality drugs, primarily to avoid the so-called side effects of the drug. However, there are also numerous cases in which the pharmaceutical industry, after years and years of research, cannot isolate the active substance from one plant species, which was successfully used by primitive peoples to treat a certain disease. One reason for this is the fact that the presumption is that the polyvalent ingredients of the drug matrix favour their mutual action while blocking the toxic effects of the same substance [9, 10].

Historical Use

The beginnings of the usage of medicinal plants by the people were instinctive. Crude preparations of medicinal plants, based on the description of the symptoms and the guess about the nature of the ailments, were prepared. The usage of a specific medicinal plant could either be a result of a notion concerning the resemblance of a plant to a specific organ, morphological, or it could be determined on symbolic beliefs. An example of the last one could be the usage of *Allium cepa* L. in medicine, which can operate with tears and resemble the eye, to be used in the therapy of eye diseases. A similar notional approach to discovery to the usage of medicinal plants could be revealed in Ayurveda and the Traditional Chinese medicine. Empiric observations of the animals' behavior had an important role in the discovery of

drug plants. Urtication comes from the Latin verb “urere”, which means “to burn” and is linked to medical traditions of flogging with burning nettle branches for stimulating the muscles [11, 12]. Until the appearance of iatrochemistry in the 16th century, plants had been the source of extraordinary remedies with no alternatives. After the advent of synthetic drugs such as corticosteroids, barbiturates, and sulphonamides, there was a common belief that they had already been fully substituted by the synthetic drugs. Besides that, technology has significantly improved, making larger and larger changes in people's lives. Better hygiene, the production of more healthful food, and the usage of more effective pharmaceuticals – all of this has lessened the need for medicinal plants in the therapy of sicknesses. Until the mid-'80s, the developing countries in Africa, Asia, and Latin America had considered biomedicine and traditional medicine as complementary. That point of view is more or less still present, but with the burst of the Aids epidemic, broader steps have been undertaken and acceptance of the traditional medicine as the standard line of treatment in the numerous developing countries have been considered [13, 14].

Pharmaceuticals: Development and Usage

This section aims to shed light on pharmaceuticals, their development, and their usage in the field of medicine and to provide a fair comparison among medicinal plants and pharmaceuticals. Although the human relationship with medicinal plants is as ancient as humanity itself, no one doubts the effectiveness and efficiency of pharmaceuticals in modern medical practices. The development of new active pharmaceutical components is carried out in the laboratory in several stages by screening a large number of substances and then verifying them. In the end, only a small number of the selected preparations can qualify for clinical research on people. The use of a drug requires prior approval from the National Regulatory Authority, and it is mandatory to inform and obtain approval for the medication from an expert advisory board in each case. Professionals and experts in pharmacology have repeatedly emphasized that therapeutic practices based on low to moderate or speculative evidence pose great risks to patient safety and are considered incorrect practices. The pharmaceutical industry is the basis of evidence-based therapeutic principles (EBP), both in the marketing of drugs and in choosing preventative measures and treatments [15, 16]. It seems necessary to point out the basic things that make the difference and to prevent misunderstandings. Medicinal plants, such as barley honey and acid “wine” with it, syrups, and elixirs of tree bark and sap, were used to treat infectious diseases at several world archaeological sites around 6000 BC. The place is made from the residue and clay from cannabis burning, which was used as incense or for narcotic purposes in ritual ceremonies, in the ancient settlement of Gomolava in Serbia. Or the placing of sage or a digestive agent, such as grape seed. These are some of the important criteria by which pharmaceuticals and medicinal plants can be distinguished, and for these reasons, it should be clearly emphasized who, how, under what conditions, and when, with which exclusions, is considered first-line treatment. Moreover, it will remain to be discussed what, for which reasons, in what ways, and with what consequences need to be improved in dealing with these issues. It is undeniable that both medicinal plants and pharmaceuticals have their significance and that a successful treatment regimen would, with careful planning and comprehensive analysis of the situation, include both treatment modalities [17, 18].

Drug Discovery and Development

Modern drug discovery and development have made great advances, from traditional medicinal materials to extracted active ingredients, to specific targets, and to the compounds obtained through computer simulation. However, the profound synergistic effect of traditional Chinese medicine compounds has made their efficacy multiple, not simply being the sum. The great promise of multi-target therapeutic strategies in the treatment of complex diseases ranging from cancer to microbial infections and neurodegenerative diseases has led to a return of systems pharmacology, an interdisciplinary field that aims at demonstrating and exploring the complexity of interactions of systems including drugs, disease genes, proteins, and so forth. The study of potentially active mixtures and compounds has become increasingly important when considering pharmacological screening of many traditional medicines, as well as the possible combined use of botanical samples with synthetic drugs. The search for properly potent ratios between individual compounds or mixtures of compounds of known medicinal properties, or between individual compounds and mixtures of compounds for a synergistic effect of the mixtures, has clinical use potential. Predicting the possible effects of herbal mixtures involves a search network for adequately similar compounds, information on the interaction of compounds with proteins, and the identification of their target proteins. On the other hand, examining mixtures is hampered by the fact that some newly discovered mixtures have been shown to create adverse effects even though each mixture individually is beneficial. Also, herb-drug interactions are drugs, herbs, or other substances that affect the dose or health outcomes as a result of an increase or decrease in the action of drugs. It is evident that a single active

connection in the drug treatment of complex diseases, including the overwhelming majority of brain disorders, is merely a more optimistic perspective [19, 20].

Synergistic Effects of Combining Medicinal Plants and Pharmaceuticals

The potential value of taking medicinal plants and pharmaceuticals together is being rediscovered, especially given the current cost-containment policy in many countries, which has led to patients using a variety of different medicines to treat the same disease [21-25]. The potential benefits resulting from the combinations are varied and include increased therapeutic effects, reduced side effects, improved compliance, and reduced levels of active ingredients without reducing the overall effectiveness. Such treatment is already widely practiced in developing countries, with various practices of traditional medicine having a long history of combining plants with medicines. However, the development, evaluation, and safety of such combinations have become major challenges [26-30]. Factors affecting the combinations of medicinal plants and pharmaceuticals can be broadly categorized into pharmacodynamic and pharmacokinetic. Pharmacodynamically, plant constituents can increase the bioavailability of a drug, enhance its absorption through several proposed mechanisms, and have an affinitive effect, which would improve and extend the action of the drug. Such treatment has been found useful in numerous applications ranging from the well-documented synergistic effects in pain relief to the inhibition of reserpine-induced central monoamine depletion [31-38]. Furthermore, it is recognized that traditional medical practitioners have accumulated considerable knowledge of the combined use of plant and pharmaceutical drugs, and this approach is viewed as an effective way of promoting good relations between traditional healers and biomedicine practitioners. However, the primary concern about the combined use of plants with pharmaceuticals is the property of compounds in plants to act upon each other and the potential of such interactions to affect the bioavailability and effectiveness of either agent [39-40]. These possibly unwanted interactions have been a subject of concern in Western medicine since the last century, as they may pose a threat of overdosage and potentially dangerous side effects. However, this area of research has focused mainly on the interactions between unwanted constituents of plant and pharmaceuticals being consumed together, rather than the beneficial synergistic effect of the agents. Arguments have been raised that such awareness has its origins not only in scientific proof of unwanted plant-drug interactions but also in part of an ethnocentric notion and an effort to legitimize the predominance of Western biomedicine over traditional practices in medical care. Pharmacokinetically, these fixed combination products dispensed in the form of capsules retard the rate of hydrocortisone absorption, alter its distribution, metabolism and excretion, thereby prolonging its duration of effectiveness [40-45].

Mechanisms of Action

The growing demand for pharmacological agents has popularized traditional and new herbal medicines as alternatives or supplements for existing synthetic pharmaceuticals to improve drug efficacy. Moreover, the use of medicinal plants in combination with pharmaceuticals is of worldwide interest and an increasing interest for research. However, the biochemical interactions of phytochemicals with pharmaceuticals have not been studied systematically until recently, even though they may have great potential to modify drug efficacy, bioavailability, and metabolism because phytochemicals are often pharmacologically active compounds. Combined plant extract/ drug and/or single plant herb/ drug were used to clarify their potential benefits, measured by the change of drug efficacy, bioavailability, and metabolism. Besides, the mechanisms, additive effect, antagonistic effect, and synergistic effect can also affect each other in many cases and give rise to different outcomes. Consumers of pharmaceutical products are becoming increasingly interested in 'natural' remedies because they believe that "green" products are inherently safer and more effective. Consequently, the use of medicinal plants is growing in popularity as an alternative to treating common ailments and some serious diseases. Furthermore, many people view medicinal herbs as consistent with socioeconomic and religious beliefs, traditions, and cultural philosophies, particularly in Africa and Asia. For all these reasons, the demand for herbal products has increased significantly in many industrialized countries. Despite the deficiencies and controversy surrounding scientific evidence for efficacy and safety, a significant number of patients in Western societies are using alternative therapies, mainly medicinal plants. It is estimated that more than 60% of AIDS patients use herbal products as complementary therapy. At the same time, many people using pharmacologically active substances may self-medicate with herbs and other natural medications for common complaints. However, the majority of patients do not inform their healthcare provider about this behavior, which can lead to unwanted side effects, decreased drug bioavailability, drug interactions, and, finally, treatment failure. The manufacture and marketing of herbal drug products, like any other medical product or food item, must become more strictly regulated. To improve their safety and efficacy, it is

essential to thoroughly investigate the pharmacodynamic or toxic interactions between medicinal plants and Western drugs. In cases where a mutual relationship has been documented (addition, potentiating abilities), the dosages of pharmaceuticals or herbal drugs could be correctly adjusted [23, 24].

Clinical Applications and Future Directions

In a review of interactions between natural products, many living organisms have been used to cure various health problems in the living cells of some to make therapeutic agents. Among them, medicinal plants have been used as traditional medicinal remedies for a range of diseases. For thousands of years, plants have formed the basis for traditional medicine systems in many distinct cultures. Despite a long history of medicinal usage throughout the world, industrial exploitation of medicinal plants is still limited, owing to inadequate ethnobotanical information. There is an enormous potential in natural products, although vast expanses of biodiversity are still not examined for their biological activities, and the latter are the base for novel drugs. Plants are characterised as rich sources of novel substances with distinctive structural diversity as compared to synthetic molecules. In modern phytotherapy, various pharmacologically active compounds have been isolated from plant extracts, which are the prime source of potential drug leads. To increase effectiveness and stability, tremendously isolated natural compounds, as well as their synthetic derivatives, have been recognised as useful biologically active specialty chemicals. Monosubstances that were isolated from complex plant extracts are much valued. For centuries, people have used natural compounds as therapeutics, most usually in the form of plant extracts. These constantly occupied agents of plants or compounds of natural derived synthesis significantly contribute to the production of commercially available drugs. Spices and herbs that are sources of natural constituents have been traditionally used in food and in managing a wide spectrum of health conditions, most often in the form of ethanolic or aqueous extracts. Nature offers an assortment of bioactive molecules from numerous sources, some of them extraordinary. The anti-inflammatory activity of dietary polyphenols has been recognised for centuries, however, some pharmaceutical products of plant origin, which contain different sorts of lipophilic components, have been shown to exhibit a range of beneficial effects. Many tens of plant constituents (mostly non-polar) are known to act as general inhibitors of PGE₂ synthesis. Botanic mixtures, consisting of 2 or more plants, of which at least 1 is mainly used in therapy, are well-accepted medicinal items, most commonly in the traditional form of phytotherapeutic oil macerates. A combination of natural compounds is usually known to be non-toxic and has a synergistic effect, making it valuable for a holistic approach to preventive medicine and therapy [25, 26].

CONCLUSION

The integration of medicinal plants with pharmaceutical drugs presents a promising avenue for enhancing therapeutic efficacy while minimizing adverse effects. Historical and contemporary evidence suggests that plant-derived compounds can complement synthetic drugs, improving bioavailability, reducing toxicity, and even counteracting drug resistance. However, the lack of standardized clinical trials and regulatory oversight remains a significant challenge in mainstreaming these combination therapies. To fully realize their potential, interdisciplinary collaboration between ethnobotanists, pharmacologists, and medical practitioners is necessary. By embracing a scientifically validated integrative approach, healthcare systems worldwide can offer more effective, accessible, and holistic treatment options for various diseases.

REFERENCES

1. Heinrich M, Jalil B, Abdel-Tawab M, Echeverria J, Kulić Ž, McGaw LJ, Pezzuto JM, Potterat O, Wang JB. Best practice in the chemical characterisation of extracts used in pharmacological and toxicological research—the ConPhyMP—guidelines. *Frontiers in Pharmacology*. 2022 Sep 13;13:953205. [frontiersin.org](https://doi.org/10.3389/fphar.2022.953205)
2. Noor F, Tahir ul Qamar M, Ashfaq UA, Albutti A, Alwashmi AS, Aljasir MA. Network pharmacology approach for medicinal plants: review and assessment. *Pharmaceuticals*. 2022 May 4;15(5):572. [mdpi.com](https://doi.org/10.3390/ph15050572)
3. Vaou N, Stavropoulou E, Voudarou C, Tsigalou C, Bezirtzoglou E. Towards advances in medicinal plant antimicrobial activity: A review study on challenges and future perspectives. *Microorganisms*. 2021 Sep 27;9(10):2041. [mdpi.com](https://doi.org/10.3390/micro9102041)
4. Aljarba NH, Ali H, Alkahtani S. Synergistic dose permutation of isolated alkaloid and sterol for anticancer effect on young Swiss albino mice. *Drug Design, Development and Therapy*. 2021 Sep 23:4043-52. [tandfonline.com](https://doi.org/10.2165/000013122021404352)

5. Iyiola AO, Adegoke Wahab MK. Herbal medicine methods and practices in Nigeria. In *Herbal medicine phytochemistry: applications and trends* 2024 Jul 10 (pp. 1395-1428). Cham: Springer International Publishing. [\[HTML\]](#)
6. Mokaizh AA, Nour AH, Yunus RM, Ahmed A, Elnour M. Systematic Review Of Extraction Techniques And Environmental Future Prospects For The Commiphora gileadensis Medicinal Plant. *J. Appl. Sci. Eng.* 2024;28:1005-17. tku.edu.tw
7. Albahri G, Badran A, Hijazi A, Daou A, Baydoun E, Nasser M, Merah O. The therapeutic wound healing bioactivities of various medicinal plants. *Life.* 2023 Jan 23;13(2):317. mdpi.com
8. Liang J, Cui L, Li J, Guan S, Zhang K, Li J. Aloe vera: a medicinal plant used in skin wound healing. *Tissue Engineering Part B: Reviews.* 2021 Oct 1;27(5):455-74. [\[HTML\]](#)
9. Sharma A, Sabharwal P, Dada R. Herbal medicine—An introduction to Its history. *Herbal medicine in andrology.* 2021. [\[HTML\]](#)
10. Izah SC. Herbal medicine phytochemistry: applications and trends. 2024. [\[HTML\]](#)
11. Najmi A, Javed SA, Al Bratty M, Alhazmi HA. Modern approaches in the discovery and development of plant-based natural products and their analogues as potential therapeutic agents. *Molecules.* 2022. mdpi.com
12. Chunarkar-Patil P, Kaleem M, Mishra R, Ray S, Ahmad A, Verma D, Bhayye S, Dubey R, Singh HN, Kumar S. Anticancer drug discovery based on natural products: From computational approaches to clinical studies. *Biomedicines.* 2024 Jan 16;12(1):201. mdpi.com
13. Elfaleh I, Abbassi F, Habibi M, Ahmad F, Guedri M, Nasri M, Garnier C. A comprehensive review of natural fibers and their composites: An eco-friendly alternative to conventional materials. *Results in Engineering.* 2023 Sep 1;19:101271. sciencedirect.com
14. Badawi AK, Salama RS, Mostafa MMM. Natural-based coagulants/flocculants as sustainable market-valued products for industrial wastewater treatment: a review of recent developments. *RSC advances.* 2023. rsc.org
15. Smita P, Narayan PA, Gaurav P. Therapeutic drug monitoring for cytotoxic anticancer drugs: Principles and evidence-based practices. *Frontiers in Oncology.* 2022. frontiersin.org
16. Law M, MacDermid JC. Introduction to evidence-based practice. *Evidence-based rehabilitation.* 2024. [\[HTML\]](#)
17. NORRIE PA. INFECTIOUS DISEASE IN THE SUMERIAN AND INDUS VALLEY CIVILISATIONS AND 18th DYNASTY EGYPT-AN ALTERNATIVE MEDICAL HISTORY 2021. sanggabwana.ac.id
18. Woods M, Woods MB. *Medicine Through the Ages: From Acupuncture to Antibiotics.* 2024. [\[HTML\]](#)
19. Miao K, Liu W, Xu J, Qian Z et al. Harnessing the power of traditional Chinese medicine monomers and compound prescriptions to boost cancer immunotherapy. *Frontiers in immunology.* 2023. frontiersin.org
20. Xin W, Zi-Yi W, Zheng JH, Shao LI. TCM network pharmacology: a new trend towards combining computational, experimental and clinical approaches. *Chinese journal of natural medicines.* 2021. cjmcpu.com
21. Okaiyeto K, Oguntibeju OO. African herbal medicines: Adverse effects and cytotoxic potentials with different therapeutic applications. *International journal of environmental research and public health.* 2021 Jan;18(11):5988. mdpi.com
22. Blahova J, Martiniakova M, Babikova M, Kovacova V, Mondockova V, Omelka R. Pharmaceutical drugs and natural therapeutic products for the treatment of type 2 diabetes mellitus. *Pharmaceuticals.* 2021 Aug 17;14(8):806. mdpi.com
23. Barani M, Sangiovanni E, Angarano M, Rajizadeh MA, Mehrabani M, Piazza S, Gangadharappa HV, Pardakhty A, Mehrbani M, Dell'Agli M, Nematollahi MH. Phytosomes as innovative delivery systems for phytochemicals: A comprehensive review of literature. *International journal of nanomedicine.* 2021 Oct 15:6983-7022. tandfonline.com
24. Lim XY, Chan JS, Japri N, Lee JC, Tan TY. Carica papaya L. Leaf: A Systematic Scoping Review on Biological Safety and Herb-Drug Interactions. *Evidence-Based Complementary and Alternative Medicine.* 2021;2021(1):5511221. wiley.com
25. Chaachouay N, Douira A, Zidane L. Herbal medicine used in the treatment of human diseases in the Rif, Northern Morocco. *Arabian Journal for Science and Engineering.* 2022 Jan;47(1):131-53. springer.com

26. Ssenku JE, Okurut SA, Namuli A, Kudamba A, Tugume P, Matovu P, Wasige G, Kafeero HM, Walusansa A. Medicinal plant use, conservation, and the associated traditional knowledge in rural communities in Eastern Uganda. *Tropical Medicine and Health*. 2022 Jun 6;50(1):39. [springer.com](https://www.springer.com)
27. Okechukwu PU, Okwesili FN, Parker EJ, Abubakar B, Emmanuel CO, Christian EO. Phytochemical and acute toxicity studies of *Moringa oleifera* ethanol leaf extract. *Int J Life Sci Biotechnol Pharm Res*. 2013;2(2):66-71.
28. Odo CE, Nwodo OF, Joshua PE, Ugwu OP, Okonkwo CC. Acute toxicity investigation and anti-diarrhoeal effect of the chloroform-methanol extract of the seeds of *Persea americana* in albino rats. *J Pharm Res*. 2013;6(3):331-5.
29. Adonu CC, Ugwu OPC, Esimone CO, Bawa A, Nwaka AC, Okorie CU. Phytochemical analyses of the methanol, hot water, and n-hexane extracts of the aerial parts of *Cassytha filiformis* (Linn) and leaves of *Cleistopholis patens*. *Res J Pharm Biol Chem Sci*. 2013;4:1143-9.
30. Orji OU, Ibiam UA, Aja PM, Ugwu P, Uraku AJ, Aloke C, et al. Evaluation of the phytochemical and nutritional profiles of *Cnidioscolus aconitifolius* leaf collected in Abakaliki, South East Nigeria. *World J Med Sci*. 2016;13(3):213-7.
31. Offor CE, Ugwu PC, Okechukwu PM, Igwenyi IO. Proximate and phytochemical analyses of *Terminalia catappa* leaves. *Eur J Appl Sci*. 2015;7(1):9-11.
32. Nwali BU, Egesimba GI, Ugwu PCO, Ogbanshi ME. Assessment of the nutritional value of wild and farmed *Clarias gariepinus*. *Int J Curr Microbiol Appl Sci*. 2015;4(1):179-82.
33. Afiukwa CA, Igwenyi IO, Ogah O, Offor CE, Ugwu OO. Variations in seed phytic and oxalic acid contents among Nigerian cowpea accessions and their relationship with grain yield. *Cont J Food Sci Technol*. 2011;5(2):40-8.
34. Aja PM, Okechukwu PCU, Kennedy K, Ibere JB, Ekpono EU. Phytochemical analysis of *Senna occidentalis* leaves. *IDOSR J Appl Sci*. 2017;2(1):75-91.
35. Igwenyi IO, Isiguzo OE, Aja PM, Ugwu Okechukwu PC, Ezeani NN, Uraku AJ. Proximate composition, mineral content, and phytochemical analysis of the African oil bean (*Pentaclethra macrophylla*) seed. *Am-Eurasian J Agric Environ Sci*. 2015;15:1873-5.
36. Afiukwa CA, Ugwu OP, Ebenyi LN, Oketa HA, Idenyi JN, Ossai EC. Phytochemical analysis of two wild edible mushrooms, *Auricularia polytricha* and *Pleurotus ostreatus*, common in Ohaukwu area of Ebonyi State, Nigeria. *Res J Pharm Biol Chem Sci*. 2013;4(2):1065-70.
37. Chukwuemeka IM, Udeozo IP, Mathew C, Oraekwute EE, Onyeze RC, Ugwu OPC. Phytochemical analysis of crude ethanolic leaf extract of *Morinda lucida*. *Int J Res Rev Pharm Appl Sci*. 2013;3(4):470-5.
38. Udeozo IP, Nwaka AC, Ugwu OP, Akogwu M. Anti-inflammatory, phytochemical, and acute toxicity study of the flower extract of *Newbouldia laevis*. *Int J Curr Microbiol Appl Sci*. 2014;3(3):1029-35.
39. Afiukwa CA, Ugwu Okechukwu PC, Ebenyi LN, Ossai EC, Nwaka AC. Phytochemical analysis of three wild edible mushrooms: Coral mushroom, *Agaricus bisporus*, and *Lentinus sajor-caju*, common in Ohaukwu area of Ebonyi State, Nigeria. *Int J Pharmaceutics*. 2013;3(2):410-4.
40. Okechukwu PC, Amasiorah VI. The effects of the crude ethanol root extract and fractions of *Sphenocentrum jollyanum* on hematological indices and glycosylated haemoglobin of streptozotocin-induced diabetic albino rats. *INOSR Sci Res*. 2020;6(1):61-74.
41. Ikehukwu AA, Ibiam UA, Okechukwu PU, Inya-Agha OR, Obasi UO, Chukwu DO. Phytochemistry and acute toxicity study of *Bridelia ferruginea* extracts. *World J Med Sci*. 2015;12(4):397-402.
42. Igwenyi IO, Dickson O, Igwenyi IP, Okechukwu PC, Edwin N, Alum EU. Properties of vegetable oils from three underutilized indigenous seeds. *Glob J Pharmacol*. 2015;9(4):362-5.
43. Ibiam UA, Alum EU, Aja PM, Orji OU, Nwamaka EN, Ugwu OPC. Comparative analysis of chemical composition of *Buchholzia coriacea* ethanol leaf extract, aqueous, and ethyl acetate fractions. *Indo Am J Pharm Sci*. 2018;5(7):6358-69.
44. Onukwuli CO, Izuchukwu CE, Okechukwu PU. Harnessing the potential of indigenous African plants in HIV management: A comprehensive review integrating traditional knowledge with evidence-based medicine. *IDOSR J Biochem Biotechnol Allied Fields*. 2024;9(1):1-11. doi:10.59298/IDOSR/JBBAF/24/91.111.

45. Onukwuli CO, Izuchukwu CE, Okechukwu PU. Exploring phytochemicals for diabetes management: Mechanisms, efficacy, and future directions. *Newport Int J Res Med Sci.* 2024;5(2):7-17. doi:10.59298/NIJRMS/2024/5.2.0717.

CITE AS: Omutindo Nyakayo A. (2025). The Synergistic Effects of Combination Therapies: Medicinal Plants and Pharmaceuticals. NEWPORT INTERNATIONAL JOURNAL OF PUBLIC HEALTH AND PHARMACY, 6(1):1-8. <https://doi.org/10.59298/NIJPP/2025/611800>