

ETHNOBOTANY OF SOME MEMBERS OF THE GENUS *CASSIA* (*SENNA*)

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Abstract: The Genus *Cassia*, also known as *Senna*, is a large group of leguminous plants belonging to the family of Fabacea. They have a wide range of ethnobotanical uses, including medicinal, ornamental, and industrial applications. In traditional medicine, the Genus has been used in the treatment of various diseases all over the world. Various phytochemicals with diverse bioactivities have been isolated from the *Cassia* species. However, this has not been done exhaustively in all the species. This review relates the ethnobotanical uses of various *Cassia* species and emphasizes the importance of doing scientific research on these secondary metabolites for the benefit of the general public.

Keywords: ailments, allopathic medicine, *Cassia*, ethnopharmacology, folklore, *Senna*.

1. INTRODUCTION

Medicinal plants are critical to developing novel medications [1-3] 70-90% of the population in Asia, Africa, Latin America, and the Middle East rely on traditional medicine for primary healthcare. Most pharmaceutical has and continues to revolve around this point [2]. The global acceptability of popular and efficient traditional species from Europe, North America, Africa, and Asia is expanding due to increased demand for medicinal plants in many countries [3]. The percentage of individuals using herbal plants has increased: to 40–50% in Germany, 42% in the USA, 48% in Australia, and 49% in France [3, 5]

The Tropics and Sub Tropics, which run from South America to Australia, have a rich floral diversity, and this richness corresponds to the diversified folklore management of the flora. Ethnobotany has played and will continue to play a significant role in drug discovery [6, 7]. In addition, traditional medical practices involving plant or plant parts are embedded in virtually all community cultures [7]. So folklore information on certain plant species from these areas have harnessed and wholly employed to develop drugs that have become the major lines of disease management [9, 10]. Such species include: *Cartharanthus roseus* in the management of leukemia [10] and *Cinchona* [11] have been incorporated into allopathic medicine with fewer modifications or alternative substantive substitutes.

During the literature review of *Chamaecrista nigricans* syn. *Cassia nigricans*, it became clear that there was significant documentation; however, there was still room to add more knowledge to this already exciting Genus *Senna* (*Cassia*). *Cassia* genus belongs to the family Fabaceae and comprises about 600 species of herbs, shrubs, and trees distributed in tropical and subtropical countries, mainly Africa, Asia, and South America [13, 14]. The species have been used, anciently *in vogue*, to treat various ailments that include: skin diseases (such as scabies, eczema, and ringworm), helminthiasis, impetigo, ulcers, pesticide, laxatives, rheumatic diseases, headache, and fever. This article attempts to give an overview of the

ethnopharmacology and bioactivity of the phytochemical compounds isolated from various species of the Genus *Cassia*. It is expected to emphasize the importance and traditional utilization of the Genus for novel drug discovery. This effort will incentivize more research to isolate bioactive constituents and develop drugs from the already bioactive compounds from the Genus. Virtually all the members of this Genus are of economic importance as fodder for foraging bees and nitrogen fixers, thus increasing soil fertility in essential nutrients [14].

The relevant information on the botanical description and ethnopharmacological have been generated from various search engines, including Google Scholar, Google, Springer, Elsevier, PubMed, Science Direct, and Research Gate. *Cassia* or *Senna* and its associated plant names were employed as keywords to find the pertinent information.

***Cassia auriculata* Linn**

Synonyms: *Senna auriculata* and *C densistipulata* (L.) Roxb. It is a fast-growing shrub to a small tree used in green manuring, ornamental, soil reclamation, and tannin. The plant possesses some cardiac glycosides [15]. It is commonly found in Asia [16].

The whole plant treats liver ailments [17]. The leaves have been used for ulcers, skin diseases, anthelmintics, and leprosy [18]. The bark is an astringent [19], while the roots have been used to treat skin conditions such as leprosy, tumours, urethroea, and asthma [20]. The roots are also used in managing ailments in the urogenital system, fever, constipation, and diabetes [22, 23]. The flowers cure nocturnal emissions, urinary discharges, throat irritation, and diabetes [23]. Flowers are also used as a body coolant, treating yellow fever and in blood and liver purification [24]. The seeds are used in chylous urine, diabetes, ophthalmic, and aphrodisiac complaints [25]. The leaves have also been used as hair cleaner and to cure common cold, whereas roots also cure diarrhea, abdominal pains, and vomiting [26]. The plant is also used generally for intestinal problems, female infertility, worms, leprosy, conjunctivitis, rheumatism, and diarrhea [27]. Its seed, hydro-alcoholic extracts, is used in Ayurvedic and has been reported to possess antidiabetic activity [28].

***Cassia glauca* (Lam)**

Synonym *Senna sulfurea* (Collad.) H.S. Irwin & Barneby. A shrub usually with yellow flowers and is used as an ornamental. It is found in Tropical Asia, India, Australia, South America, Malaysia, Pakistan, and China [30, 31]. The leaves have been used to manage blennorrhagia [32, 33]. The seeds treat skin diseases and leukoderma, whereas the bark and leaves treat gonorrhoea and diabetes [29]. The plant has been used for common cold as an antimalarial, central depressant, purgative, and diuretic [33].

***Cassia angustifolia* Vahl**

Synonyms are *Senna alexandrina* Mill, *C.acutifolia* Delile, *C.lanceolata* Forssk., *C.senna* L., *Senna acutifolia* (Delile Batka) and *Sangustifolia* (Saheed SA & Illoh HC). The plant is also referred to as Indian *Senna*. It is found in India, Saudi Arabia, Pakistan, Egypt, Somalia, Arabia, and Yemen [35, 36]. The leaves have been used to manage hepatomegaly, anaemia, constipation, malaria, loss of appetite, indigestion, jaundice, ringworm, splenomegaly, and to increase peristaltic movement of the colon [13, 35]. The leaves and pods are used for splenic enlargements, cholera, antipyretic in typhoid, anthelmintic, and laxative [35]. Dry tubers have been used as an aphrodisiac, general debility tonic, and rheumatism [36].

***Cassia fistula* L**

Synonyms are: *C Bactrylobium fistula* (L.) Willd; *C.bonplandiana* D.C; *C. excels* Kunth; *C.fistuloides* Collad; *C.Rhombifolia* Roxb; *Cathartocarpus excelsus* G. Don; *Cathartocarpus fistula* (L.) Pers; *Cathartocarpus fistuloides* (Collad) G. Don; and *Cathartocarpus hombifolius* (Roxb) G. Don. The medicinal use of the species date from ancient times and has been the main factor in its spread. It is called "**Aragvadh**," **a word that can be translated as "elimination of diseases" in Sanskrit**. The plant must have originated from the Indian Subcontinent. It is widespread in East Africa and several of the Indian Ocean Islands [37]. The roots, bark, leaves, flowers, and seeds are all used for therapeutic purposes; the leaves have been used as a purgative against ringworms [38]. The whole plant treats anorexia, skin diseases, rheumatism, jaundice, and inflammatory diseases [39]. The roots also cure heart diseases, dysentery, joint pain, retained excretions, chest pain, fever, and migraine [40]. Ayurvedic medicines recognize the use of the plant for skin diseases, tubercular glands, adenopathy, burning sensations, syphilis, and leprosy [41]. The fruit, seeds, flowers, and pulps are all used for skin diseases; the pulp is also used to treat gout and rheumatism, while the leaves have been used as a laxative [42]. In addition, flowers,

leaves, bark, root, and pulp have been used in wound healing, liver protection, and as an antimycotic [43]. The whole plant also treats ulcers, purgative, impetigo, and helminthiasis, although the leaves and the seeds act as a liver tonic, cardiotoxic, laxative, ophthalmic, antiperiodic expectorant as well as in treating constipation and bronchitis [44]. The species' seeds have been used in treating swollen throats, oral sores, jaundice, and biliousness [45]. The plant is also used as a hair cleanser and in the treatment of venereal diseases, diarrhea, toothache, muscle pain, cold, inflammation, reduces body heat, vomiting as well as diabetes [27, 38].

***Cassia alata* L**

Synonyms: *Senna alata* L and *Herpetica alata*. It is distributed in Africa, South and North America, and India [47, 48]. The plant leaves treat ulcers, scabies, ringworm, and skin diseases such as eczema, itching, and pruritis [46]. The leaves and stem bark are used to treat burns, diarrhea, jaundice, gastroenteritis, and hepatitis, whereas the immature leaves are effective against food poisoning and constipation [48]. This plant is good against insect bites, worms, goitre, fever, blemishes, sexually transmitted diseases, and fungal skin infections [50, 51, 52]. The leaves also cure asthma and bronchitis [51]. The roots are used for uterus disorder [53, 54].

***Cassia tora* L**

Synonyms: *Senna obtusifolia* (L.) H.S.Irwin & Barneby, *Cassia numilis* Collad, *C. obtusifolia* (L.), *C. toroides* Raf., *Diallobus uniflorus* Raf, *Senna toroides* Roxb. It is found in Africa, Fiji, Southeast Asia, Northern Australia, and Latin America [55, 56]. The species has been used in Folklore medicine in that the leaves of the plant are used for the treatment of jaundice, eczema, ringworm, intestinal impetigo, helminthiasis; and the decoction of leaves and flowers against asthma and bronchitis; and the seeds are used to treat leprosy, psoriasis, earache, itching, eye diseases, liver problems while pods are used against dysentery and in eye diseases [56]. Its fermented leaves have purgative properties [57]. Traditionally, the plant has been widely employed in managing hemorrhoids, vitiated tridosha, hepatitis, skin diseases, dandruff, cough constipation, and fever [55]. The leaves and seeds possess cardiotoxic, ophthalmic, antimicrobial, and liver tonic properties [58].

***Cassia abbreviata* Oliv**

Synonyms: *Cassia afrodistula* Brenan, *Cassia beareana* Holmes and *Cassia kassneri* Bak. It is a medium-sized tree widely distributed in the tropics of Asia and other tropical Worlds [59] and used as medicine. The roots treat malaria, fever, impotence, abdominal pain, wounds, dysentery, syphilis, snake bite, body weakness, and hernia [61, 62, 63]. The plant is used to treat cancer [63]. Its root bark manages vaginal candidiasis [64]. The leaves, roots, and bark have been used to treat cough, epilepsy, diarrhea, fever, convulsion, vomiting, abortion, infertility, earache bilharzia, syphilis, hemorrhoids, gonorrhea, jaundice hernia, and stomach ache [65]. The bark and the roots cure dysentery, bloody vomiting, and menstrual cycle problems [66]. Fruits are used against eye infections and malaria [59]. The bark is also used in treating toothache and sexually transmitted diseases [67]. The roots are also used as an aphrodisiac [68].

***Cassia nigricans* Vahl**

Synonym: *Chamaecrista nigricans* Vahl .The roots and leaves are vermifuge and antiperiodic [69]. The leaves also treat rheumatoid pains, gastrointestinal disorders, and family planning [71, 72]. The leaves also manage fever and sore throat [72]. The plant treats skin diseases, ulcers, diarrhea, and gastrointestinal disorders [74, 75].

***Cassia sieberiana*: D.C.**

This species is a medium-sized tree widely distributed in Sub-Saharan Africa, from Senegal to East Africa [75]. The root bark and rootlets treat toothache, abdominal pains, skin diseases, hemorrhoids, helminths, and leprosy [76]. The roots also treat hemorrhoids and skin irritation and manage indigestion, stomach pains, and gastric ulcer [77, 78]. The seeds have been used in weight reduction, clearing of acne, detoxification, and driving out internal heat [79].

***Cassia absus* L.**

Synonym: *Chamaecrista absus* H.S.Irwin & Barneby. It is a small hairy herb, a native of Africa; however a common monsoon weed in South East Asia [80]. In folklore medicine, the seeds have been used to treat syphilitic ulcers, skin infections, leukoderma, ophthalmia, and as a cathartic [81]. The leaves are used for nasal diseases, cough, and as an astringent to the bowel [82]. The leaves are used in curing tumours, while the roots are used against constipation [83].

***Senna septemtrionalis* H.S.Irwin & Barneby.**

Synonyms: *Cassia aurata* Roxb., *C. elegans* Kunth, *C. Floribunda* Kunth *C. laevigata* Willd var., *floribunda sensu* Ghesq., *C. quadrangularis*, *C. septemtrionalis* Viv and *C. vernicosa* Clos. A shrub to a sub-shrub native to America now spreads in the tropic and subtropics up to India and South Africa [84]. The roots treat malaria, gonorrhoea, syphilis, intestinal worms, and blood cleansing [67, 84]. The leaves are used as a vermifuge [85, 86]. It is also used in treating stomach aches, wounds, fever, gastroenteritis, snakebites, burns, epilepsy, hemorrhoids, anxiety, and as a laxative, fungicide agent, and expectorant as antidiuretic [87]. This plant has also been used as a medication for rabies, cold, alopecia, earache, bile diseases, pain, inflammation, and cholera [88, 89].

***Senna petersiana* (Bolle) Lock**

Synonym: *Cassia petersiana* (Bolle) Lock. This small tree is generally found in Tropical and sub-Tropical Africa and can grow to 12 m [90]. The root extracts treat infertility, malaria, and deworming and are used as inhalers [91] [92, 93]. The leaves cure skin diseases, backaches, stomach aches, and febrifuge [90, 93]. The plant is used to treat arthritis and management of diabetes [94]. The roots also treat a loss of appetite [95]. The plant also cures cholera, cold, and fever [96]. The plant's roots, leaves, and stems have been used for convulsion and healing pain in the bones [97]. Various parts of the plant have been used in traditional medicine in different parts of the world [98]. The leaves and bark have been used to treat skin cancer [99]. The stem, bark, leaves, and roots treat sprain, stomach pain, and tooth infection [100]. The leaves cure hepatitis, vomiting, and loss of appetite, and the stem bark prevents stillbirth [101]. The roots treat epilepsy and agitation [102]. The flowers are used as an anti-inflammatory, anti-ulcer, and antispasmodic agent and in treating respiratory tract infections, malaria, and typhoid [103]. The root bark is also used for abdominal pain, bilharziosis, mental disorder, women's infertility, constipation, convulsion, painful uterus, swollen breast, fever, menstruation, gonorrhoea, anti-emetic, hernia, and in managing snakebites [104, 105].

***Senna didymobotrya* (Fresen.) H.S.Irwin and Barneby**

Synonyms: *Cassia didymobotrya* Fresen, *C. nairobiensis* H. Bailey, *C. verdickii* De Wild and *Chamaesenna didymobotrya* Sunarno. It is an invasive shrub that forms a dense growth that hinders the development of other plant species in a given area [106]. It is distributed in North, West, East, Southern Africa, and Madagascar [107]. This plant's leaves, stem, and roots have been used in treating sickle cell anaemia, backache, fibroids, inflammation of fallopian tubes, and hemorrhoids [108]. The bark is an antihemorrhagic [109]. The plant has been used in treating skin disease, jaundice, purgative, malaria, sexually transmitted diseases, intestinal worms, and as an appetizer and antibiotic [107, 110, 111]. The leaves are used in curing dysentery, diarrhea and as an emetic and diuretic, while the root is used to treat ringworm, malaria, intestinal worm, fever, and jaundice [110].

***Senna bicapsularis* (L) Roxb**

Synonyms: *Cassia bicapsularis* L., *C. emarginata* L, *C. berterii* Colla, *Adipera bicapsularis* (L.), *Adipera spiciflora* Pittier, *Cathartocarpus bicapsularis* (L.) Ham *Isandrina emarginata* (L.) Britt. & Rose ex Britt. & Wilson, *Chamaefistula inflata* G.Don and *Isandrina arborescens* Raf. It is distributed in South America and tropical countries [112]. The species is cultivated in many parts of the world; however, it has escaped being naturalized and has an unpleasant odour [113]. Roots and leaves are used for stomach aches [114]. The leaves have been used in treating skin ailments [115]. The flowers have been used as an abortifacient and contraception agent for both males and females [116]. The plant has been used to treat pain as well as a muscle relaxant and purgative [117].

***Cassia spectabilis* (D.C.) H.S. Irwin & Barneby**

Synonyms: *Cathartocarpus humboldtianus* Loudon; *Cathartocarpus speciosus* (DC.) G.Don; *Cathartocarpus trinitatis* (D.C.) G.Don; *Cassia trinitatis* Rehb.exDC. *Cassia carnaval* Speg, *Pseudocassia spectabilis* (DC.) Britton & Rose, *Senna speciosa* Roxb. *Senna surattensis* (Burm. f.) Irwin & Barneby. *Cassia amazonica* Ducke and *Senna spectabilis* (D.C.) Irwin & Barneby. The species is a native of South America, Brazil, and coastal Ecuador and has migrated throughout Central America, the West Indies, the tropics, and sub-tropic parts of the world [118, 119, 120]. The leaves are used for throat inflammation and diarrhea [118]. The plant is used to cure headaches, malaria, and dysentery, while the leaves treat anxiety, epilepsy, insomnia, constipation, and anxiety [121]. The species has also been used in treating ringworm, skin disease, flu, cold, whooping cough, menstrual cramps, and diabetes [119, 122, 123].

***Cassia siamea* Lam**

Synonyms: *Senna siamea* Lam.; *Senna sumatrana* Roxb, *Cassia florida* Vahl, *Cassia arayatensis* Naves, *Cassia sumatrana* Roxb, *Cassia arborea* Macfad, *Cassia gigantea* DC., and *Sciaccassia siamea* Lam. It is widely spread in South Africa, East Africa, Brazil, Mexico, China, West Indies, and Asia [124]. The fruits prevent convulsion and expel intestinal worms [125, 126]. The plant treats asthma and microbial infections [124]. Leaves treat stomach pains, malaria, constipation, sleeplessness, liver disorder, hypertension, cough, and toothache; the roots are used for diabetes mellitus, malaria, and snake bite; flowers and seeds are used to cure convulsion, typhoid fever, snake and scorpion bites while the stem is used against herpes, scabies, rhinitis, urogenital diseases, diabetes and as a laxative [127] [128]. The plant is also used to reduce blood sugar levels and to treat abdominal pain, fever, typhoid, menstrual pain, and jaundice [129].

Cassia mimosoides

Synonymns: *Chamaecrista mimosoides* L., *Chamaecrista nictitans* (L.) Moench, *Cassia aeschynomene* D.C, *Cassia aspera* Muhl. ex Ell., *Cassia multipinnata* Pollard, *Cassia procumbens* Stickman, *Cassia Chamaecrista fauricomma* Kuntze, and *Cassia nictitans* Sickmann. It is native to China but has spread to different countries [130]. The leaves cure swelling of the legs during pregnancy; [131], facilitate urination, and act as an anti-inflammatory agent [130]. Roots treat colic pain, stomach spasms, and diarrhea [132]. The plant also cures chronic hepatitis and other liver diseases, including liver cirrhosis and liver fibrosis [133].

***Cassia occidentalis* L**

Synonymns: *Senna occidentalis* (L.) Roxb, *Cassia caroliniana* Walter, *C. obliquifolia* Schrank, *C ciliata* Raf, *Cassia planisiliqua* L, *C. falcate* L *Cassia macradenia*, *Cassia torosa* Cav, and *Ditrimexa occidentalis* (L.) Britt & Rose. It is distributed in Asia, South America, Australia, and Africa [134]. The plant treats diarrhea and dysentery [135]. The leaves are used for throat infections, itching, and bone fractures. It also manages fever, anaemia, leprosy, tuberculosis, menstrual, and liver problems [136]. Moreover, the leaves and seeds are used for skin disorders such as eczemas and mycoses [137]. Additionally, the plant is used to treat cancer, eye inflammation, and venereal diseases [138]. The roots cure diabetes, elephantiasis, epilepsy, and convulsion [139, 140].

***Cassia Italica* Mill.**

Synonyms *Senna italica* Mill *Cassia obovata* Collad, *Cassia aschrek* Fors., Its origin is in the equatorial region and surrounding areas [141]. The plant treats venereal diseases [142]. The roots are used for dysmenorrhoea, nausea, and liver problems, whereas the pods and the leaves are used for burns, skin diseases, and ulcers [143]. Leaves are used as hair conditioners, while roots are used to cure diarrhea [144]. The whole plant is used as a urinary tract purifier and laxative, while its leaves, seeds, and pods treat elephantiasis and eye diseases and as a purgative [145].

***Cassia afrofistula* Brenna**

Synonyms: *Cassia beareana* Holmes and *Cassia kassneri* Bak. F. It is distributed in Madagascar, Mozambique, Tanzania, and Kenya [146]. The roots treat hernia and body weaknesses, while the stem is used for kidney diseases and liver pains [60]. The bark is used as an aphrodisiac and laxative. The bark also cures pneumonia, fever, stomachaches, backache, and blood pressure [147]. It is also used to manage uterine complaints, fever, malaria, syphilis, gonorrhoea, pneumonia, and snakebites [147]. Bioactive compounds have not been isolated from this plant.

***Cassia falcinella* Oliv**

Synonym: *Chamaecrista falcinella* Oliv. It is found in Kenya, Tanzania, Uganda, Rwanda, Namibia, Zambia, Zimbabwe, Mozambique, Botswana, and DR Congo [146]. The roots are used as an aphrodisiac and in treating gonorrhoea [148]. Its leaves are used to cure broken bones and rheumatism, while the roots are also used to treat diarrhea [146]. Bioactive compounds have not been isolated from this plant.

***Cassia kirkii* Oliv**

Synonym: *Chamaecrista kirkii* Oliv. It is widely spread in tropical and subtropical Africa [149]. Leaves are used for upsetting pains [150]. The plant is used for skin diseases and fertility [151]. Bioactive compounds have not been isolated from this species.

***Cassia leptocarpa* Benth**

Synonyms: *Senna hirsuta* L., *Cassia caracasana* Jacq, *Cassia hirsuta* L., *Cassia tomentosa* L., *Cassia longisiliqua* Blanco, *Cassia. venenifer* Rodsch. Ex G.Mey, *Cassia neglect* Vogel var. *acuminata* Benth, *Cassia pubescens* Jacq and *Cassia gooddingii* A. Nelson. It is distributed in North, Central, South America, and tropical regions [152] [153]. It is used to treat liver diseases, malaria, high blood pressure, diarrhea, typhoid fever, and skin rashes and to reduce cholesterol levels [154].

2. CONCLUSION

The Genus *Cassia* has been widely used in Chinese, Ayurveda, African, and South American folklore medicine systems to manage various ailments. Various studies have been done on their crude extracts and phytochemicals from different plant parts of the individual species of this Genus. It has been established that several species have a wide range of bioactivities: antimalarial, larvicidal, antimicrobial, wound healing, laxative, antiasthmatic, hepatoprotective, antidiabetic, antiparasitic, antioxidant, analgesic, anti-inflammatory and anticancer.

Regularization, documentation, and the development of the pharmacopeias based on the folklore are still not well articulated in some of these systems, such as in Africa and, largely, the Amazonia and the farthest East Asia. These shortfalls have been the loopholes that the allopathic drug developers have exploited to the disadvantage of the indigenous drug regions. Several products, like *Cinchona officinalis* L., *Artemisia annua* L. and, lately, *Adansonia digitata* L., are currently plundered by the Wet pharmaceutical without any meaningful returns to the raw material producers. This Genus is being subjected to the same fate.

Overall, the ethnobotany of *Cassia* species is quite diverse, and these plants continue to play an important role in traditional practices and customs worldwide. However, it is important to note that all species of *Cassia* have not been thoroughly researched, and in some cases, the safety and efficacy of traditional uses have not been scientifically proven.

REFERENCES

- [1] K. Busia, "Medical provision in Africa - Past and present", *Phyther. Res.*, vol 19, no 11, bll 919–923, 2005, doi: 10.1002/ptr.1775.
- [2] A. M. Barata, F. Rocha, V. Lopes, en A. M. Carvalho, "Conservation and sustainable uses of medicinal and aromatic plants genetic resources on the worldwide for human welfare", *Ind. Crops Prod.*, vol 88, bll 8–11, 2016, doi: 10.1016/j.indcrop.2016.02.035.
- [3] S. A. Noorhosseini, E. Fallahi, C. A. Damalas, en M. S. Allahyari, "Factors affecting the demand for medicinal plants: Implications for rural development in Rasht, Iran", *Land use policy*, vol 68, no July, bll 316–325, 2017, doi: 10.1016/j.landusepol.2017.07.058.
- [4] Alamgeer *et al.*, "Indigenous medicinal plants of Pakistan used to treat skin diseases: A review", *Chinese Med. (United Kingdom)*, vol 13, no 1, bll 1–26, 2018, doi: 10.1186/s13020-018-0210-0.
- [5] U. P. Albuquerque *et al.*, "Are ethnopharmacological surveys useful for the discovery and development of drugs from medicinal plants?", *Brazilian J. Pharmacogn.*, vol 24, no 2, bll 110–115, 2014, doi: 10.1016/j.bjp.2014.04.003.
- [6] A. K. Pandey, "Ethnobotany and its relevance in contemporary research", *J. Med. Plants*, vol 5, no 3, bll 123–129, 2017.
- [7] W. K. Chebii, J. K. Muthee, en K. Kiemo, "The governance of traditional medicine and herbal remedies in the selected local markets of Western Kenya", *J. Ethnobiol. Ethnomed.*, vol 16, no 1, bll 1–24, 2020, doi: 10.1186/s13002-020-00389-x.
- [8] P. Tugume en C. Nyakoojo, "Ethno-pharmacological survey of herbal remedies used in the treatment of paediatric diseases in Buhunga parish, Rukungiri District, Uganda", *BMC Complement. Altern. Med.*, vol 19, no 1, bll 1–10, 2019, doi: 10.1186/s12906-019-2763-6.
- [9] A. G. Atanasov *et al.*, "Natural products in drug discovery: advances and opportunities", *Nat. Rev. Drug Discov.*, vol 20, no 3, bll 200–216, 2021, doi: 10.1038/s41573-020-00114-z.
- [10] T. Maher *et al.*, "Medicinal plants with anti-leukemic effects: A review", *Molecules*, vol 26, no 9, 2021, doi: 10.3390/molecules26092741.

- [11] H. Hariyanti, "A Review: Pharmacological Activities of Quinoline Alkaloid of Cinchona sp.", *Biointerface Res. Appl. Chem.*, vol 13, no 4, bl 319, 2022, doi: 10.33263/briac134.319.
- [12] H. Dave en L. Ledwani, "A review on anthraquinones isolated from Cassia species and their applications", *Indian J. Nat. Prod. Resour.*, vol 3, no 3, bl 291–319, 2012.
- [13] M. F. Y. Fonkou, J. P. Kamdem, L. A. Fono, en R. J. Priso, "Identification keys of seven Cassia species from the (Caesalpinioideae: Fabaceae)", *Int. J. Plant, Anim. Enviromental Sci.*, vol 8, no 4, bl 5–18, 2018, doi: 10.21276/Ijpaes.
- [14] J. . Nduwayezu, L. L. . Lulandala, en S. A. O. Chamshama, "Managing Decomposition and Minaralization of Senna singueana (Del.) IOCK. Manure to improve N use Efficiency and Maize Yield in Morogoro, Tanzania", *J. Agron.*, vol 4, no 4, bl 349–359, 2005.
- [15] M. Kanthimathi en R. Soranam, "Phytochemical screening and Invitro antibacterial Potential of Cassia auriculata Linn . Flowers Against Pathogenic Bacteria", *Int. Res. J. Pharm. Biosci.*, vol 1, no 1, bl 45–56, 2014.
- [16] R. Gowri, K. Durgadevi, S. T. Mini, en V. Ramamurthy, "Phytochemical Profiling of Ethanolic Leaves Extract of Cassia auriculata", *Int. J. Pharm. Biol. Sci.*, vol 8, no 4, bl 1177–1183, 2018.
- [17] M. Ayyanar en S. Ignacimuthu, "Pharmacological Actions of Cassia auriculata L. and Cissus quadrangularis Wall.", *J. Pharmacol. Toxicol.*, vol 3, no 3, bl 213–221, 2008, doi: 10.3923/jpt.2008.213.221.
- [18] A. V. Jaydeokar, D. D. Bandawane, K. H. Bibave, en T. V. Patil, "Hepatoprotective potential of Cassia auriculata roots on ethanol and antitubercular drug-induced hepatotoxicity in experimental models", *Pharm. Biol.*, vol 52, no 3, bl 344–355, 2014, doi: 10.3109/13880209.2013.837075.
- [19] P. Yoganandam, "'Aavarai Kudineer'- A Potent Polyherbal Siddha Formulation for Management of Diabetes Mellitus", *Int. J. Pharm. Dev. Technol.*, vol 2, no 1, bl 45–61, 2014.
- [20] G. Nille en K. R. C. Reddy, "A Phytopharmacological Review of Plant – Cassia auriculata", *Int. J. Pharm. Biol. Arch.*, vol 6, no 6, bl 1–9, 2015.
- [21] P. Saritha, "Medicinal Properties of Telangana State Flower Tangedu (Cassia Auriculata Linn)", *World J. Pharm. Res.*, vol 6, no 8, bl 1597–1605, 2017, doi: 10.20959/wjpr20178-9036.
- [22] G. C. Nille, S. K. Mishra, A. K. Chaudhary, en K. R. C. Reddy, "Ethnopharmacological, Phytochemical, Pharmacological, and Toxicological Review on Senna auriculata (L.) Roxb.: A Special Insight to Antidiabetic Property", *Front. Pharmacol.*, vol 12, no August, bl 1–23, 2021, doi: 10.3389/fphar.2021.647887.
- [23] M. M. Aye, H. T. Aung, M. M. Sein, en C. Armijos, "A review on the phytochemistry, medicinal properties and pharmacological activities of 15 selected myanmar medicinal plants", *Molecules*, vol 24, no 2, 2019, doi: 10.3390/molecules24020293.
- [24] V. Jayaseelan, "Herbal Treatment for Alcohol Use Disorder - An Experiment in Tamilnadu , South India", *Int. J. Heal. Sci. Res.*, vol 9, no June, bl 164–170, 2019.
- [25] V. M. Haripriya, K. Dhamocharan, S. K. Shukla, V. Suvakbala, L. Ragupathy, en A. Kumaran, "Aphrodisiac properties of hydro-alcoholic extract of Cassia auriculata flower in male rats", *Andrologia*, vol 51, no 2, 2019, doi: 10.1111/and.13180.
- [26] B. Salma, S. P. Muthukumar, S. Avinasha, en S. N. Manjula, "Review on ethnobotany, phytochemistry, and pharmacological properties of Cassia auriculata", *Pharm. Pharmacol. Int. J.*, vol 8, no 2, bl 106–111, 2020, doi: 10.15406/ppij.2020.08.00286.
- [27] A. Karim, "Constituents of Sudanese Cassia auriculata Linn .(Caesalpinaceae) Oil", *Pharm. Chem. J.*, vol 7, no 2, bl 28–33, 2020.
- [28] A. S. Puranik *et al.*, "Cassia auriculata: Aspects of safety pharmacology and drug interaction", *Evidence-based Complement. Altern. Med.*, vol 2011, no Figure 2, 2011, doi: 10.1093/ecam/nep237.

- [29] R. B. Singh, "Nature of seed polysaccharide isolated from *Cassia glauca* Lam . plant", *Int. J. Multidiscip. Sci.*, vol 01, no 01, bll 1–3, 2018.
- [30] S. M. Osman *et al.*, "Aldose reductase inhibitor form *Cassia glauca*: A comparative study of cytotoxic activity with Ag nanoparticles (NPs) and molecular docking evaluation", *PLoS One*, vol 15, no 10 October, 2020, doi: 10.1371/journal.pone.0240856.
- [31] M. Salahuddin en S. S. Jalalpure, "Evaluation of antidiabetic activity of *Cassia glauca* lam. Leaf in streptozotocin induced diabetic rats", *Iran. J. Pharmacol. Ther.*, vol 9, no 1, bll 29–33, 2010.
- [32] B. S. Kittur, Y. Srinivas, en S. R. Deshpande, "Evaluation of Leaf and Stem Extracts From *Cassia Glauca* L. for Antimicrobial Activity", *Int. J. Pure Appl. Zool. ISSN*, vol 3, no 1, bll 98–102, 2015, [Online]. Available at: <http://www.ijpaz.com>.
- [33] K. Rashed, "Phytochemical propertiead and biological activities from *Cassia nigricans*: A Review", *Int. J. Innov. Pharm. Sci. Res.*, vol 09, no 01, bll 8–13, 2021, doi: 10.21276/IJIPSR.2021.09.01.851.
- [34] Y. C. Tripathi, "*Cassia angustifolia*, a versatile medicinal crop", *For. Trees Livelihoods*, vol 10, no 2, bll 121–129, 1999, doi: 10.1080/01435698.1999.9752999.
- [35] S. I. Ahmed *et al.*, "Pharmacologically active flavonoids from the anticancer, antioxidant and antimicrobial extracts of *Cassia angustifolia* Vahl", *BMC Complement. Altern. Med.*, vol 16, no 1, bll 1–9, 2016, doi: 10.1186/s12906-016-1443-z.
- [36] S. Patra en P. Samal, "Medicinal Plants - Therapeutic Potential in Today's Context", *Int. J. Curr. Microbiol. Appl. Sci.*, vol 7, no 08, bll 3841–3848, 2018, doi: 10.20546/ijcmas.2018.708.393.
- [37] A. Sharma, A. Kumar, en V. Jaitak, "Pharmacological and chemical potential of *Cassia fistula* L- a critical review", *J. Herb. Med.*, vol 26, bl 100407, 2021, doi: 10.1016/j.hermed.2020.100407.
- [38] T. Bhakta, P. K. Mukherjee, K. Mukherjee, M. Pal, en B. P. Saha, "Studies on in vivo wound healing activity of *Cassia fistula* linn. Leaves (Leguminosae) in rats", *Natural Product Sciences*, vol 4, no 2. bll 84–87, 1998.
- [39] I. Raju, M. Malika, en S. Venkataraman, "Anti-inflammatory and antioxidant activities of *Cassia fistula* linn bark", *Afr. J. Trad.*, vol 2, no 1, bll 70–85, 2005, doi: 10.4314/ajtcam.v2i1.31105.
- [40] M. Danish, P. Singh, G. Mishra, S. Srivastava, K. K. Jha, en R. L. Khosa, "*Cassia fistula* Linn. (*Amulthus*)- An Important Medicinal Plant: A Review of Its Traditional Uses, Phytochemistry and Pharmacological Properties", *J. Nat. Prod. Planet Resour.*, vol 1, no 1, bll 101` – 118, 2011.
- [41] P. Raji, J. Sreenidhi, M. Sugithra, K. Renugadevi, en A. V. Samrot, "Phytochemical screening and bioactivity study of *Cassia fistula* leaves", *Biosci. Biotechnol. Res. Asia*, vol 6, no 12, bll 5096–5100, 2014, doi: 10.13005/bbra/2202.
- [42] P. Limtrakul, S. Yodkeeree, P. Thippraphan, W. Punfa, en J. Srisomboon, "Anti-aging and tyrosinase inhibition effects of *Cassia fistula* flower butanolic extract", *BMC Complement. Altern. Med.*, vol 16, no 1, bll 1–9, 2016, doi: 10.1186/s12906-016-1484-3.
- [43] C. Biji, "Plant Drug Analysis - A Comparative Analysis of *Cassia Fistula*", *Int. J. Appl. Res. Technol.*, vol 2, no 1, bll 60–72, 2017.
- [44] A. V Pawar, S. J. Patil, en S. G. Killedar, "Uses of *Cassia Fistula* Linn as a Medicinal Plant", *Int. J. Adv. Res. Dev.*, vol 2, no 3, bll 85–91, 2017, [Online]. Available at: www.ijarnd.com.
- [45] A. Maqsood, M. Ayesha, en S. Sammia, "A Phytopharmacological Evaluation of *Cassia fistula* . A Comprehensive Review", *Int. J. Pharm. Sci. Rev. Res.*, vol 62, no 09, bll 45–53, 2020.
- [46] M. N. Abubacker, R. Ramanathan, en T. S. Kumar, "*In vitro* antifungal activity of *Cassia alata* linn. flower extract", *Nat. Prod. Radiance*, vol 7, no 1, bll 6–9, 2008.
- [47] S. Halim-Lim, N. . Ramli, F. A. Fadzil, en M. H. A. Abd Rahim, "The antimicrobial and antioxidant properties of *Cassia alata* extraction under different temperature profiles", *Food Res.*, bll 1–6, 2020.

- [48] J. Okpuzor, H. Ogbunugafor, G. K. Kareem, en M. N. Igwo-Ezikpe, "In vitro investigation of antioxidant phenolic compounds in extracts of *Senna alata*", *Res. J. Phytochem.*, vol 3, no 4, bll 68–76, 2009, doi: 10.3923/rjphyto.2009.68.76.
- [49] M. Sugumar en D. Victor Arokia Doss, "Biochemical Properties and Bioactive Compounds With Multiple Therapeutic Values of *Senna Alata* (L.), an Ornamental Shrub From the Botanical Family of Fabaceae (Leguminosae)", *Int. J. Curr. Res.*, 2015.
- [50] R. R. Priya, N. Bhadusha, V. Manivannan, en T. Gunasekaran, "Extraction and Isolation of Bioactive Compounds from a Therapeutic Medicinal Plant-*Wrightia tinctoria* (Roxb.) R. Br.", *J. Pharmacogn. Phytochem. Res.*, vol 11, no 3, bll 199–204, 2019, [Online]. Available at: www.ijppr.com.
- [51] R. P. Lahare, Y. K. Bisen, H. S. Yadav, en A. K. r Dashahre, "TLC Based Phytochemical Analysis and Antioxidant Activity of *Senna Alata*", *Int. J. Adv. Res.*, vol 8, no 11, bll 1099–1107, 2020, doi: 10.21474/ijar01/12106.
- [52] D. E. Okwu en F. U. Nnamdi, "Cannabinoid Dronabinol alkaloid with antimicrobial activity from *Cassia alata* Linn.", *Der Chem. Sin.*, vol 2, no 2, bll 247–254, 2011.
- [53] S. J. N. Tatsimo *et al.*, "Antibacterial-guided isolation of constituents from *Senna alata* leaves with a particular reference against Multi-Drug-Resistant *Vibrio cholerae* and *Shigella flexneri*", *Int. J. Biol. Chem. Sci.*, vol 11, no 1, bl 46, 2017, doi: 10.4314/ijbcs.v11i1.4.
- [54] A. Prabhu, M. K. M. Krishnamoorthy, D. J. Prasad, en P. Naik, "Anticancer Activity of Friedelin Isolated from Ethanolic Leaf Extract of *Cassia tora* on HeLa and HSC-1 Cell Lines", *Indian J. Appl. Res.*, vol 3, no 10, bll 1–4, 2011, doi: 10.15373/2249555x/oct2013/121.
- [55] S. A. Bhalerao *et al.*, "Bioactive Constituents , Ethnobotany and Pharmacological Prospectives of *Cassia Tora*", *Int. J. Bioassays*, bll 1421–1427, 2013.
- [56] M. Choudhary, Y. Gulia, en Nitesh, "Cassia tora: Its chemistry, medicinal uses and pharmacology .", *Pharmacologyonline*, vol 3, bll 78–96, 2011.
- [57] S. Sirappuselvi en M. Chitra, "In vitro Antioxidant Activity of *Cassia tora* Lin", *Int. Res. J. Biol. Sci. I. Res. J. Biol. Sci.*, vol 1, no 6, bll 57–61, 2012.
- [58] V. Sreelakshmi en A. Abraham, "Protective effects of *Cassia tora* leaves in experimental cataract by modulating intracellular communication, membrane co-transporters, energy metabolism and the ubiquitin-proteasome pathway", *Pharm. Biol.*, vol 55, no 1, bll 1274–1282, 2017, doi: 10.1080/13880209.2017.1299769.
- [59] N. I. Mongalo, B. Mafoko, en N. I., "Cassia abbreviata Oliv. A review of its ethnomedicinal uses, toxicology, phytochemistry, possible propagation techniques and Pharmacology", *African J. Pharm. Pharmacol.*, vol 7, no 45, bll 2901–2906, 2013, doi: 10.5897/ajpp12.1017.
- [60] I. Hedberg, O. Hedberg, P. J. Madati, K. E. Mshigeni, E. N. Mshiu, en G. Samuelsson, "Inventory of plants used in traditional medicine in Tanzania. I. Plants of the families acanthaceae-cucurbitaceae", *J. Ethnopharmacol.*, vol 6, no 1, bll 29–60, 1982, doi: 10.1016/0378-8741(82)90070-8.
- [61] S. C. Chhabra, B. L. A. Mahunnah, en E. N. Mshiu, "Plants used in traditional medicine in eastern Tanzania. I. Pteridophytes and angiosperms (acanthaceae to canellaceae)", *J. Ethnopharmacol.*, vol 21, no 3, bll 253–277, 1987, doi: 10.1016/0378-8741(87)90103-6.
- [62] M. C. Gessler, M. H. H. Nkunya, L. B. Mwasumbi, M. Heinrich, en M. Tanner, "Screening Tanzanian medicinal plants for antimalarial activity", *Acta Trop.*, vol 56, no 1, bll 65–77, 1994, doi: 10.1016/0001-706X(94)90041-8.
- [63] M. Moshi, A. Kamuhabwa, Z. Mbwambo, en P. De Witte, "Cytotoxic Screening of Some Tanzania Medicinal Plants", *East Cent. African J. Pharm. Sci.*, vol 6, no 3, bll 52–56, 2005, doi: 10.4314/ecajps.v6i3.9700.
- [64] D. K. B. Runyoro, O. D. Ngassapa, M. I. N. Matee, C. C. Joseph, en M. J. Moshi, "Medicinal plants used by Tanzanian traditional healers in the management of *Candida* infections", *J. Ethnopharmacol.*, vol 106, bll 158–165, 2006, doi: 10.1016/j.jep.2005.12.010.

- [65] S. Augustino, J. B. Hall, F. B. S. Makonda, en R. C. Ishengoma, "Medicinal resources of the Miombo woodlands of Urumwa, Tanzania: Plants and its uses", *J. Med. Plant Res.*, vol 5, no 27, bll 6352–6372, 2011, doi: 10.5897/JMPR10.517.
- [66] P. Bruschi, M. Morganti, M. Mancini, en M. A. Signorini, "Traditional healers and laypeople: A qualitative and quantitative approach to local knowledge on medicinal plants in Muda (Mozambique)", *J. Ethnopharmacol.*, vol 138, no 2, bll 543–563, 2011, doi: 10.1016/j.jep.2011.09.055.
- [67] T. Ngarivhume, C. I. E. A. Van'T Klooster, J. T. V. M. De Jong, en J. H. Van Der Westhuizen, "Medicinal plants used by traditional healers for the treatment of malaria in the Chipinge district in Zimbabwe", *J. Ethnopharmacol.*, vol 159, bll 224–237, 2015, doi: 10.1016/j.jep.2014.11.011.
- [68] H. Aparicio, I. Hedberg, S. Bandeira, en A. Ghorbani, "South African Journal of Botany Ethnobotanical study of medicinal and edible plants used in Nhamacoo area, Manica province À Mozambique", *South African J. Bot.*, vol 139, bll 318–328, 2021, doi: 10.1016/j.sajb.2021.02.029.
- [69] P. A. Akah, O. E. Orisakwe, K. S. Gamaniel, en A. Shittu, "Evaluation of Nigerian traditional medicines: II. Effects of some Nigerian folk remedies on peptic ulcer", *J. Ethnopharmacol.*, vol 62, no 2, bll 123–127, 1998, doi: 10.1016/S0378-8741(98)00060-9.
- [70] P. A. Nwafor en F. K. Okwuasaba, "Contraceptive and estrogenic effect of a methanol extract of *Cassia nigricans* leaves in experimental animals", *Pharm. Biol.*, vol 39, no 6, bll 424–428, 2001, doi: 10.1076/phbi.39.6.424.5886.
- [71] P. A. Nwafor en F. K. Okwuasaba, "Effect of methanolic extract of *Cassia nigricans* leaves on rat gastrointestinal tract", *Fitoterapia*, vol 72, no 3, bll 206–214, 2001, doi: 10.1016/S0367-326X(00)00303-8.
- [72] M. Khurm *et al.*, "The genus *Cassia* L.: Ethnopharmacological and phytochemical overview", *Phyther. Res.*, vol 35, no 5, bll 2336–2385, 2021, doi: 10.1002/ptr.6954.
- [73] R. G. Ayo, J. O. Amupitan, I. G. Ndukwe, en O. T. Audu, "Some chemical constituents of the leaves of *Cassia nigricans* Vahl.", *African J. Pure Appl. Chem.*, vol 3, no 11, bll 208–211, 2009.
- [74] R. G. Ayo, "Phytochemical constituents and bioactivities of the extracts of *Cassia nigricans* Vahl: A review", *J. Med. Plants Res.*, vol 4, no 14, bll 1339–1348, 2010, doi: 10.5897/JMPR10.010.
- [75] I. Toma, Y. Karumi, en M. A. Geidam, "Phytochemical screening and toxicity studies of the aqueous extract of the pods pulp of *Cassia sieberiana* DC. (*Cassia Kotchiana* Oliv.)", *African J. Pure Appl. Chem.*, vol 3, no 2, bll 26–30, 2009, [Online]. Available at: <http://www.academicjournals.org/AJPAC>.
- [76] G. H. Sam, M. L. K. Mensah, en N. Nyakoa-Ofori, "Pharmacognostic studies and standardization of *Cassia Sieberiana* roots", *Pharmacogn. J.*, vol 3, no 21, bll 12–17, 2011, doi: 10.5530/pj.2011.21.2.
- [77] E. T. Nartey, M. Ofosuhene, W. Kudzi, en C. M. Agbale, "Antioxidant and gastric cytoprotective prostaglandins properties of *Cassia sieberiana* roots bark extract as an anti-ulcerogenic agent", *BMC Complement. Altern. Med.*, vol 12, 2012, doi: 10.1186/1472-6882-12-65.
- [78] J. Briggs, L. Liu, A. Lu, J. van der Greef, en A. Xu, *The Art and Science of Traditional Medicine*, vol 346 (6216). 2014.
- [79] A. A. Olapade, O. A. Ajayi, en I. A. Ajayi, "Physical and chemical properties of *Cassia sieberiana* seeds", *Int. Food Res. J.*, vol 21, no 2, bll 767–772, 2014.
- [80] S. Adhma, A. Hassan, W. M. Abbasi, en T. Rehman, "Phytochemistry and pharmacological potential of *Cassia absus* – a review", *J. Pharm. Pharmacol.*, vol 70, no 1, bll 27–41, 2018, doi: 10.1111/jphp.12816.
- [81] K. M. Hosamani, "A Rich Source of Novel 9-Ketooctadec-cis-15-enoic Acid from *Cassia absus* Seed Oil and Its Possible Industrial Utilization", *Ind. Eng. Chem. Res.*, vol 33, bll 1058–1061, 1994.
- [82] P. Nancy en V. Ashlesha, "Pharmacognostic and phytochemical studies of *cassia absus* seed extracts", *Int. J. Pharm. Pharm. Sci.*, vol 8, no 1, bll 325–332, 2016.

International Journal of Novel Research in Life Sciences

 Vol. 10, Issue 5, pp: (1-14), Month: September - October 2023, Available at: www.noveltyjournals.com

- [83] D. S. Reddy en A. V. Reddy, "Pollen morphology of medicinally valuable *Cassia* L. spp. (sensu lato) belong to Nalgonda District, Telangana State", *Int. J. Pharm. LIFE Sci.*, vol 7, no 12, bll 5360–5368, 2016, [Online]. Available at: www.iseeadyar.org.
- [84] L. N. Kamau, P. M. Mbaabu, J. M. Mbaria, P. K. Gathumbi, en S. G. Kiama, "Ethnobotanical survey and threats to medicinal plants traditionally used for the management of human diseases in Nyeri County, Kenya", *Tang [Humanitas Med.]*, vol 6, no 3, bll 21.1-21.15, 2016, doi: 10.5667/tang.2016.0007.
- [85] R. Irakiza, M. Vedaste, B. Elias, B. Nyirambangutse, N. J. Serge, en N. Marc, "Assessment of traditional ecological knowledge and beliefs in the utilisation of important plant species: The case of Buhanga sacred forest, Rwanda", *Koedoe*, vol 58, no 1, bll 1–11, 2016, doi: 10.4102/koedoe.v58i1.1348.
- [86] A. Rakotondrafara, R. Rakotondrajaona, M. Rakotoarisoa, M. Ratsimbason, V. E. Rasamison, en S. R. Rakotonandrasana, "Ethnobotany of medicinal plants used by the Zafimaniry clan in Madagascar", *J. Phytopharm.*, vol 7, no 6, bll 483–494, 2018, doi: 10.31254/phyto.2018.7606.
- [87] A. J. Alonso-Castro *et al.*, "Diuretic activity and neuropharmacological effects of an ethanol extract from *Senna septemtrionalis* (Viv.)H.S. Irwin & Barneby (Fabaceae)", *J. Ethnopharmacol.*, vol 239, no April, bl 111923, 2019, doi: 10.1016/j.jep.2019.111923.
- [88] L. Jones, B. Bartholomew, Z. Latif, en S. D. Sarker, "Constituents of *Cassia laevigata*", *Fitoterapia*, vol 71, no 2000, bll 580–583, 2000.
- [89] V. E. Arana-Argáez *et al.*, "Anti-inflammatory and antinociceptive effects of an ethanol extract from *Senna septemtrionalis*", *Inflammopharmacology*, vol 28, no 2, bll 541–549, 2020, doi: 10.1007/s10787-019-00657-7.
- [90] P. C. Djemgou *et al.*, "Antitumor and immunostimulatory activity of two chromones and other constituents from *Cassia petersiana*", *Nat. Prod. Commun.*, vol 1, no 11, bll 961–968, 2006, doi: 10.1177/1934578x0600101109.
- [91] J. C. Lovett, C. K. Ruffo, R. E. Gereau, P. Høst, K. Mikkelsen, en H. Ndangalasi, "Field Guide to the Moist Forest Trees of Tanzania", bll 1–193, 1994.
- [92] L. Loffler en P. Loffler, *Swaziland Tree Atlas -including selected shrubs and climbers*. Pretoria: Southern African Botanical Diversity Network (SABONET) c/o South African National Biodiversity Institute, Private Bag X101, 0001, Pretoria. Printed, 2005.
- [93] E. Amri en D. P. Kisangau, "Ethnomedicinal study of plants used in villages around Kimboza forest reserve in Morogoro, Tanzania.", *J. Ethnobiol. Ethnomed.*, vol 8, no 1, bl 1, 2012, [Online]. Available at: <http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L364818597%5Cnhttp://dx.doi.org/10.1186/1746-4269-8-1%5Cnhttp://sfx.library.uu.nl/utrecht?sid=EMBASE&issn=17464269&id=doi:10.1186%2F1746-4269-8-1&title=Ethnomedicinal+study+of+plant>.
- [94] P. . Tshidzumba, "An inventory and pharmacological evaluation of medicinal plants used as anti-diabetes and anti-arthritis in Vhembe District Municipality , Limpopo Province , RSA By Tshidzumba P . W Student Number : 11595304 Submitted in fulfilment of the requirements of", 2015.
- [95] S. S. Semanya en A. Maroyi, "Ethnobotanical survey of plants used by Bapedi traditional healers to treat tuberculosis and its opportunistic infections in the Limpopo Province, South Africa", *South African J. Bot.*, vol 122, bll 401–421, 2019, doi: 10.1016/j.sajb.2018.10.010.
- [96] E. Nicosia *et al.*, "ABS Provides Opportunities for Indigenous and Local Communities in the Limpopo National Park. An ethnobotanical survey of plants used by the Changana community, Limpopo National Park, Mozambique", *Res. Sq.*, bll 1–19, 2020, [Online]. Available at: <https://doi.org/10.21203/rs.3.rs-51722/v1>.
- [97] L. Manuel, A. Bechel, E. V. Noormahomed, D. F. Hlashwayo, en M. do C. Madureira, "Ethnobotanical study of plants used by the traditional healers to treat malaria in Mogovolas district, northern Mozambique", *Heliyon*, vol 6, no 12, 2020, doi: 10.1016/j.heliyon.2020.e05746.
- [98] M. G. Hiben, G. G. Sibhat, B. S. Fanta, H. D. Gebrezgi, en S. B. Tesema, "Evaluation of *Senna singueana* leaf extract as an alternative or adjuvant therapy for malaria", *J. Tradit. Complement. Med.*, vol 6, no 1, bll 112–117, 2016, doi: 10.1016/j.jtcme.2014.11.014.

- [99] M. Gebrelibanos, “In vitro Erythrocyte Haemolysis Inhibition Properties of Senna singueana Extracts”, *Momona Ethiop. J. Sci.*, vol 4, no 2, bl 16, 2012, doi: 10.4314/mejs.v4i2.80113.
- [100] G. Zenebe, M. Zerihun, en Z. Solomon, “An ethnobotanical study of medicinal plants in Asgede Tsimbila District, Northwestern Tigray, Northern Ethiopia”, *Ethnobot. Res. Appl.*, vol 10, bll 305–320, 2012, doi: 10.17348/era.10.0.305-320.
- [101] B. Yemane, Y. Berhane, en D. K. Surender Reddy, “Ethnobotanical Study of Medicinal Plants in Sub region Logo Anseba, Region Gash Barka, Eritrea”, *IOSR J. Pharm. Biol. Sci.*, vol 11, no 04, bll 63–73, 2016, doi: 10.9790/3008-1104046373.
- [102] Mairaira *et al.*, “Anxiolytic Effects of Senna singueana in Mice after Exposure to Chronic Restraint-Stress”, *Int. J. Brain Cogn. Sci.*, vol 7, no 2, bll 36–41, 2018, doi: 10.5923/j.ijbcs.20180702.02.
- [103] B. Adedoyin *et al.*, “Chemical Composition and Bioactivity of the Essential Oil of Cassia singueana Flowers Growing in Nigeria”, *Pharm. Biomed. Res.*, vol 5, no 3, bll 1–7, 2019, doi: 10.18502/pbr.v5i3.2110.
- [104] S. K. Mokuu, J. M. Mbaria, T. E. Maitho, en G. A. Moriasi, “Ethnobotanical Documentation, Phytochemical Screening, and Cytotoxicity Evaluation of Medicinal Plants Used to Manage Snakebite Envenomation in Mwingi West Subcounty, Kenya”, *Evidence-Based Complement. Altern. Med.*, vol 2021, bll 1–12, 2021, doi: 10.1155/2021/4167296.
- [105] H. Momoh, A. A. Olaleye, S. M. Ibrahim, en J. State, “Evaluation of Phytochemicals and Antimicrobial Activities of Cassia singueana Root Extracts”, *Dutse J. Pure Appl. Sci. (DUJOPAS)*, vol 7, no 2, bll 16–21, 2021.
- [106] N. Mukungu, K. Abuga, F. Okalebo, R. Ingwela, en J. Mwangi, “Medicinal plants used for management of malaria among the Luhya community of Kakamega East sub-County, Kenya”, *J. Ethnopharmacol.*, vol 194, bll 98–107, 2016, doi: 10.1016/j.jep.2016.08.050.
- [107] A. Israel, T. Sisay, M. Fikre, K. Belayhun, en E. Milkyas, “Phytochemical analysis of the roots of Senna didymobotrya”, *J. Med. Plants Res.*, vol 9, no 34, bll 900–907, 2015, doi: 10.5897/jmpr2015.5832.
- [108] O. J. K. Anthony Swamy Thangiah, Mutuku Chrispus Ngule, “Phytopharmacological Analysis of Methanolic-Aqua Extract (Fractions) of Senna Didymobotrya Roots”, *Int. J. Bioassays*, vol 02, no 11, bll 1473–1479, 2013.
- [109] W. Kipkore, B. Wanjohi, H. Rono, en G. Kigen, “A study of the medicinal plants used by the Marakwet Community in Kenya”, *J. Ethnobiol. Ethnomed.*, vol 10, no 1, bll 1–22, 2014, doi: 10.1186/1746-4269-10-24.
- [110] L. B. Nyamwamu, M. Ngeiywa, M. Mulaa, A. E. Lelo, J. Ingonga, en A. Kimutai, “Phytochemical constituents of Senna didymobotrya fresen irwin roots used as a traditional medicinal planta in Kenya”, *Int. J. Educ. Res.*, vol 3, no 6, bll 1–12, 2015, [Online]. Available at: www.ajcnet.com.
- [111] T. Omara, “Antimalarial Plants Used across Kenyan Communities”, *Evidence-based Complement. Altern. Med.*, vol 2020, 2020, doi: 10.1155/2020/4538602.
- [112] Y. W. Mak, L. O. Chuah, R. Ahmad, en R. Bhat, “Antioxidant and antibacterial activities of hibiscus (*Hibiscus rosa-sinensis* L.) and Cassia (*Senna bicapsularis* L.) flower extracts”, *J. King Saud Univ. - Sci.*, vol 25, no 4, bll 275–282, 2013, doi: 10.1016/j.jksus.2012.12.003.
- [113] T. Jaca, “*Senna didymobotrya* (Fabaceae : Caesalpinioideae): Northwestern , east and southern Africa, and Madagascar”, *Flower. Plants Africa*, no January, 2017.
- [114] C. K. Ruffo, A. Birnie, en B. Tenganäs, *Edible Wild Plants of Tanzania*, no 27. 2002.
- [115] I. Boulogne, L. Germosén-Robineau, H. Ozier-Lafontaine, M. Fleury, en G. Loranger-Merciris, “TRAMIL ethnopharmacological survey in les Saintes (Guadeloupe, French West Indies): A comparative study”, *J. Ethnopharmacol.*, vol 133, no 3, bll 1039–1050, 2011, doi: 10.1016/j.jep.2010.11.034.
- [116] A. Missoum, “An update review on *Hibiscus rosa sinensis* phytochemistry and medicinal uses”, *J. Ayurvedic Herb. Med.*, vol 4, no 3, bll 135–146, 2018, [Online]. Available at: www.ayurvedjournal.com.
- [117] F. A. Alhumaydhi, “ In vivo analgesic, muscle relaxant, sedative and toxicological studies of *Senna bicapsularis* (L.) Roxb ”, *J. Taibah Univ. Sci.*, vol 15, no 1, bll 340–346, 2021, doi: 10.1080/16583655.2021.1978806.

- [118] C. Viegas *et al.*, “Lipoperoxidation and cyclooxygenase enzyme inhibitory piperidine alkaloids from *Cassia spectabilis* green fruits”, *J. Nat. Prod.*, vol 70, no 12, bll 2026–2028, 2007, doi: 10.1021/np070312g.
- [119] S. L. Jothy *et al.*, “*Cassia spectabilis* (DC) Irwin et Barn: A Promising Traditional Herb in Health Improvement”, *Molecules*, vol 17, no 9, bll 10292–10305, 2012, doi: 10.3390/molecules170910292.
- [120] D. M. Selegato *et al.*, “Update: Biological and chemical aspects of *Senna spectabilis*”, *J. Braz. Chem. Soc.*, vol 28, no 3, bll 415–426, 2017, doi: 10.21577/0103-5053.20160322.
- [121] E. N. Bum *et al.*, “Anticonvulsant and Sedative Activity of Leaves of *Senna spectabilis* in Mice”, *Int. J. Pharmacol.*, vol 6, no 2, bll 123–128, 2010, doi: 10.3923/ijp.2010.123.128.
- [122] G. M. Karau, E. Nyagah, M. Njagi, A. King 'ori Machocho, L. N. Wangai, en P. Ng 'aru Kamau, “Phytonutrients, Minerals and in vitro Antioxidant Capacity of Leaf and Stem Bark Powders of *Senna spectabilis*”, *IC J. J. Pharmacogn. Phytochem.*, vol 8192, no 2, bll 2668735–5, 2013, [Online]. Available at: www.phytojournal.com.
- [123] A. Torey *et al.*, “Exploration of the anticandidal mechanism of *Cassia spectabilis* in debilitating candidiasis”, *J. Tradit. Complement. Med.*, vol 6, no 1, bll 97–104, 2016, doi: 10.1016/j.jtcme.2014.11.017.
- [124] C. Ogbiko, “Phytochemical, GC-MS Analysis and Antimicrobial Activity of the Methanol Stem Bark Extract of *Cassia siamea* (Fabaceae)”, *Asian J. Biotechnol.*, vol 12, no 1, bll 9–15, 2019, doi: 10.3923/ajbkr.2020.9.15.
- [125] Y. R. Smith, ., “Determination of Chemical Composition of *Senna-siamea* (Cassia Leaves)”, *Pakistan J. Nutr.*, vol 8, no 2, bll 119–121, 2009.
- [126] R. K. Brar, U. Jyoti, R. K. Patil, en H. C. Patil, “Fluoroquinolone antibiotics: An overview”, *Adesh Univ. J. Med. Sci. Res.*, vol 2, no 1, bll 26–30, 2020, doi: 10.25259/aujmsr_12_2020.
- [127] M. Kamagaté en C. Koffi, “Ethnobotany, phytochemistry, pharmacology and toxicology profiles of *Cassia siamea* Lam”, *J. Phytopharm.*, vol 3, no 1, bll 57–76, 2014, [Online]. Available at: http://www.phytopharmajournal.com/vol3_issue1_09.pdf.
- [128] S. K. R. Venkateshwar Chinna, “Quantitative Analysis of Phytochemicals in the Bark Extracts of Medicinally Important Plant *Cassia fistula*, Linn.”, *Int. J. Curr. Microbiol. Appl. Sci.*, vol 6, no 4, bll 1073–1079, 2017, doi: 10.20546/ijemas.2017.604.133.
- [129] F. . Nas, T. I. Oyeyi, en M. Ali, “Antibacterial efficacy and phytochemical screening of *Senna siamea* leaves extracts on some pathogenic bacteria”, *J. Microbiol. Exp.*, vol 6, no 3, bll 159–163, 2018, doi: 10.15406/jmen.2018.06.00208.
- [130] M. A. Alayo, M. N. Femi-Oyewo, L. G. Bakre, en A. O. Fashina, “Larvicidal Potential and Mosquito Repellent Activity of *Cassia Mimosoides* Extracts”, *Southeast Asian J. Trop. Med. Public Health*, vol 46, no 4, bll 596–601, 2015.
- [131] F. N. Ekwueme, O. A. . Oje, O. F. C. . Nwodo, en N. F. Ozoemena, “Anti-inflammatory capacity of the aqueous leaf extract of *Senna mimosoides* on inhibition of rat oedema, platelet aggregatory activity and prostaglandin synthase activity”, *J. Med. Plants Res.*, vol 5, no 14, bll 3028–3036, 2011, doi: 10.13140/2.1.2487.3607.
- [132] G. Fichadiya en C. R. Harisha, “Detailed Pharmacognostical Evaluation of Root of *Cassia Mimosoides* L. Along With the Whole Plant Powder Microscopy”, *World J. Pharm. Res.*, no May, bll 756–765, 2017, doi: 10.20959/wjpr.20175-8329.
- [133] Y. Yang *et al.*, “Induction of callus in *Cassia mimosoides*”, *E3S Web Conf.*, vol 189, bll 2–6, 2020, doi: 10.1051/e3sconf/202018902017.
- [134] V. Chhapola, S. K. Kanwal, A. G. Sharma, en V. Kumar, “Hepatomyoencephalopathy secondary to *Cassia occidentalis* poisoning: Report of three cases from North India”, *Indian J. Crit. Care Med.*, vol 22, no 6, bll 454–456, 2018, doi: 10.4103/ijccm.IJCCM_85_18.
- [135] A. N. Saidu, E. O. Aina, A. Mann, en U. I. Leje, “The effect of aqueous extract of *Senna occidentalis* leaves on rats infected with *Salmonella typhi*.”, *Aust. J. Basic Appl. Sci.*, vol 5, no 12, bll 1863–1867, 2011.
- [136] R. Malviya en R. Sharma, “*Kasamarda* (*Senna Occidentalis* Linn): Ayurvedic Approach”, *J. Pharm. Sci. Innov.*, vol 2, no 2, bll 25–27, 2013, doi: 10.7897/2277-4572.02214.

- [137] M. Lombardo, S. Kiyota, E. T. M. Kato, M. B. Mathor, T. de Jesus Andreoli Pinto, en T. M. Kaneko, "Evaluation of in vitro biological properties of senna occidentalis (L.) link", *Acta Sci. - Biol. Sci.*, vol 37, no 1, bll 9–13, 2015, doi: 10.4025/actascibiolsci.v37i1.22525.
- [138] S. Manikandaselvi, V. Vadivel, en P. Brindha, "Review on nutraceutical potential of cassia occidentalis L. – An indian traditional medicinal and food plant", *Int. J. Pharm. Sci. Rev. Res.*, vol 37, no 2, bll 141–146, 2016.
- [139] V. V. Singh, J. Jain, en A. K. Mishra, "Determination of antipyretic and antioxidant activity of Cassia occidentalis linn methanolic seed extract", *Pharmacogn. J.*, vol 9, no 6, bll 913–916, 2014, doi: 10.5530/pj.2017.6.143.
- [140] T. O. Issa, A. I. Mohamed Ahmed, Y. S. Mohamed, S. Yagi, A. M. Makhawi, en T. O. Khider, "Physiochemical, Insecticidal, and Antidiabetic Activities of Senna occidentalis Linn Root", *Biochem. Res. Int.*, vol 2020, 2020, doi: 10.1155/2020/8810744.
- [141] O. E. Mohammed, A. Rahman, en A. E. L. Mahdi, "Autecology and biology of Senna (cassia italica mill) desert plants", *Assiut J. Agric. Sci.*, vol 39, no 1, bl (11-24), 2008.
- [142] P. Masoko, S. S. Gololo, M. P. Mokgotho, J. N. Eloff, R. L. Howard, en L. J. Mampuru, "Evaluation of the antioxidant, antibacterial, and antiproliferative activities of the acetone extract of the roots of Senna italica (fabaceae)", *Afr. J. Tradit. Complement. Altern. Med.*, vol 7, no 2, bll 138–148, 2010.
- [143] R. Shunmuga Jothi, V. Bharathy, en F. Uthayakumari, "Antioxidant potential of aerial part of senna italica sub species micrantha mill", *J. Pharm. Sci. Res.*, vol 7, no 9, bll 621–625, 2015.
- [144] A. Mahmuda, M. Sani, T. Adamu, A. Sanda, en L. G. Gobir, "In vivo Anthelmintic Activity of Ethanolic Leaf Extract of Senna italica on Rats with Hymenolepis diminuta Infection", *Adv. Res.*, vol 21, no 8, bll 18–27, 2020, doi: 10.9734/air/2020/v21i830223.
- [145] S. H. Qari, A. F. Alrefaei, W. Filfilan, en A. Qumsani, "Exploration of the medicinal flora of the aljumum region in Saudi Arabia", *Appl. Sci.*, vol 11, no 16, 2021, doi: 10.3390/app11167620.
- [146] G. H. Schmelzer en A. Gurib-Fakim, *Plant Resources of Tropical Africa*, vol 11, no 1. 2008.
- [147] L. S. Chagonda en A. H. Mericli, "Screening of traditional medicinal plants from Zimbabwe for phytochemistry, antioxidant, antimicrobial, antiviral and toxicological activities", 2009.
- [148] W. L. Makhatsa, "Evaluation of Antimicrobial Activity of Some Plants Used By Traditional Healers for Treatment of Microbial Infections in Kakamega District", 2007.
- [149] M. de la Estrella, F. J. Cabezas, C. Aedo, en M. Velayos, "The Papilionoideae (Leguminosae) of Equatorial Guinea (Annobón, Bioko and Río Muni)", *Folia Geobot.*, vol 45, no 1, bll 1–57, 2010, doi: 10.1007/s12224-010-9057-6.
- [150] S. . C. . Chhabra en R. . L. . A. . Mahunnah, "Plants Used in Traditional Medicine by Hayas of the Kagera Region , Tanzania", *Econ. Bot.*, vol 48, no 2, bll 121–129, 1994.
- [151] S. F. Sikolia, "Medicinal Plants of Kakamega Forests and Their Consistency Applications : Opportunities and Challenges To-Date .", *IOSR J. Pharm. Biol. Sci. (IOSR-JPBS)*, vol 13, no 1, bll 48–54, 2018, doi: 10.9790/3008-1301064854.
- [152] Queensland Department of Agriculture and Fisheries, "Invasive plant risk assessment: Hairy sicklepod Senna hirsuta", 2016.
- [153] E. Hidayati *et al.*, "Research Journal of Pharmaceutical , Biological and Chemical Sciences Antimicrobial Assay and GC-MS Analysis of Leaves Extracts Medicinal Plant Senna hirsuta (L .).", *Res. J. Pharm. Biol. Chem. Sci.*, vol 11, no 215, bll 215–219, 2020.
- [154] K. N. Agbafor, A. C. Nwaka, K. Dasofunjo, Asuk, en M. N. Ugwu, "Glucose-6-Phosphate Dehydrogenase Activity in Albino Rats Treated With Aqueous Extract of Fresh Leaves of Morinda Lucida", *©IDOSR Publ. Int. Digit. Organ. Sci. Res.*, vol 2, no 2, bll 10–17, 2017, [Online]. Available at: www.idosr.orgwww.idosr.org.

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