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Review Article

GENUS *LEPIDAGATHIS* (ACANTHACEAE): REVIEW OF ITS ETHANOBOTANY, PHYTOCHEMISTRY AND PHARMACOLOGICAL POTENTIAL

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ABSTRACT

Almost all societies have employed medicinal plants as a source of medicine. Due to their natural origin, low cost, and lack of side effects, traditional medicinal plants have become increasingly popular over the past few decades. The Vedas and the Bible both mention the common usage of herbal medicines and healthcare products. People have used medicinal plants for thousands of years to flavour and preserve food, cure health problems, and prevent disease. Acanthaceae plant species are valued for their cultural and economic significance in horticulture and traditional medicine worldwide due to their wide range of medicinal characteristics. It was discovered that 87% of therapeutic drugs were made from naturally occurring substances taken from plants. In addition to being utilized as food, medicine, or ornamentals, plant species in this family also contain a variety of vital secondary metabolites, such as alkaloids, terpenoids, tannins, quinones, and flavonoids. The ethnopharmacological drugs of this class are utilised in many South and East Asian countries. According to some studies, Acanthaceae may possess antiviral, antifungal, cytotoxic, anti-inflammatory, antipyretic, hepatoprotective, immunomodulatory, and antiplatelet aggregation properties. The current review identifies some salient traits of a few significant genera in this family and explores how they are used in both traditional and creative ways in modern society. By keeping these factors in mind, the current study will be helpful for future research and clinical trials in the study of some new significant plant species that belong to this significant family.

Keywords: Acanthaceae, Pharmacology, Phytochemistry

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INTRODUCTION

Due to the increasing interest in using traditional medicine, it is essential to address some of the troubling issues, such as the general lack of research, the lack of evidence for the safety, effectiveness, and high quality of natural remedies, the lack of patent rights for traditional medicines, and the requirement to maximize and integrate the use of natural products as potential sources of remedies in primary healthcare [1]. Plants have been a significant source of sustenance and medicine since the dawn of human civilization. Around 80% of the world's population still relies on medicinal plants to fill the gap in health, and folk medicine practitioners have strong roots in society [2].

Gurib-Fakim remarked in 2006 that modern methods of using medicinal plants to make usable pharmaceuticals have significantly improved the conventional medical system. Studying ethnobotanical materials opened doors for the investigation of novel groups of chemicals [3]. Kamboj A reported in 2012 that due to their natural origins and lack of negative side effects, traditional herbal remedies have been used extensively for thousands of years [4]. According to Inoue and Crawford's 2014 report, medicinal plants serve as sources for the medications used to treat ailments; hence their demand is rising daily. Trade sparked the globalization of herbal remedies, revealing the mystery of underlying metabolic mechanisms, new concepts, diseases, and settlements, as well as native hostility [5]. According to Barnes *et al.* (2008) and Oh *et al.* (2014), the domestic cultivation of medicinal plants is a subject of growing public interest. Due to improved methods and widespread knowledge of effective medicinal plant harvesting among growers, income levels have risen. Similar to this, natural substance research is thriving to make plants widely accessible for treating a variety of disorders [6, 7].

According to Singh V *et al.* (2017), India contains an estimated 4.5 million plant species, but only between 250,000 and 500,000 of these have been studied for their phytochemical content's potential to have biological or pharmacological effects [8]. Neelam Bamola *et al.* reported in 2018 that pharmaceutical companies may use bioactive components or plant extracts to create new formulations for the development of novel medications for the treatment of various disorders. The secondary metabolites shield the cells from the harm that unstable molecules named free radicals [9].

In 2017, Refaz Ahmad Dar *et al.* reviewed how understanding plant toxicity and defending people and animals against natural poisons were two benefits of studying medicinal plants. The synthesis of secondary metabolites by plants gives them their therapeutic properties. With this in mind, research in natural product chemistry has seen an increase in attention. Therapeutic needs, the remarkable diversity of chemical structure and biological activities of naturally occurring secondary metabolites, the use of novel bioactive natural compounds as biochemical probes, the development of novel and sensitive methods to detect biologically active natural products, improved methods to isolate, purify, and structurally characterize these active constituents, and advanced techniques to characterize these active constituents are some of the reasons for this interest [10].

Cancer is an abnormal kind of tissue growth in which cells divide uncontrolled and largely on their own, leading to a gradual increase in the number of dividing cells. It is a significant global public health concern and the second-leading cause of death worldwide. There are more than a hundred different types of cancer [58]. Cancer may develop in any portion of the body at any time and at any age; it is both uncontrollable and incurable. It results from the interaction of numerous poorly understood genetic and environmental variables [11]. The Cancer-related fatalities are expected to rise from 7.1 million in 2002 to 11.5 million in 2030 on a global scale [12]. The care of cancer patients has unquestionably improved with the development of contemporary drug-targeted therapies. Advanced cancer with metastases, however, is still incurable. Therefore, it is evident that ongoing research into safer and more efficient chemoprevention and therapy is required to increase efficiency and reduce treatment costs for cancer care [13]. Depending on the stage, different kinds of options are available, such as surgery, organ transplantation, radiation therapy, chemotherapy, biological

therapy, hormone therapy, etc. These techniques could result in unwanted side effects [14]. For instance, with chemotherapy, a large proportion of healthy cells will be eliminated along with malignant cells due to the drugs' non-selectivity. Novel medications are therefore needed to solve this issue. Nowadays, herbal, marine and microbial sources provide more than 60% of the anticancer substances that are helpful to cancer patients. A range of nutraceuticals, functional foods, and naturally occurring chemicals are recognized to have medical qualities and therapeutic efficacy, according to recent and sophisticated investigations and scientific trials. Numerous studies on plants' beneficial effects in cancer treatment have shown encouraging findings. The tumorigenicity effects of carcinogens are aided by phytochemicals or bioactive compounds, which block their suppression of cell proliferation and mutagenicity, as shown in *in vitro* experiments. Dietary bioactive chemicals significantly impact how gene expression is regulated, even in very small amounts [12, 15]. The growing popularity of herbal remedies is a reflection of both their perceived efficacy in the treatment and prevention of disease as well as the belief that because they are "natural," they are harmless. Different scientific approaches have been used by researchers to assess the efficacy of herbs for treating liver disorders, and in many cases, the mechanisms and modes of action of these herbs, as well as their therapeutic efficacy, have been established.

Serisha Gangaram *et al.* reported in 2022 that Acanthaceae plant species are valued for their cultural and economic significance in horticulture and traditional medicine due to their wide range of therapeutic characteristics. Because they are utilized as food, medicine, or ornamentals and because they contain a variety of vital secondary metabolites, including alkaloids, terpenoids, tannins, quinones, and flavonoids, plant species in this family play a significant role for both humans and other animals [16]. This family of plants contains several notable plants that are useful in treating and controlling numerous fatal pathogenic, metabolic, genetic, and other disorders. These plants with therapeutic qualities could serve as the basic raw materials for complex pharmaceutical formulations [17].

In this regard, we chose to evaluate a few genera of the Acanthaceae family of plants, such as *Justicia, Ruellia, Barleria, and Lepidagathis*. Ibrahim Khan *et al.* (2017) identify a few crucial characteristics of a few significant genera within this significant plant family. Acanthaceae mostly consists of annual and perennial herbs, shrubs, undershrubs, perennial climbers, and very infrequently tiny trees that are upright, recumbent, or climbing. However, there are also some sizable trees there. The simple, opposite decussate, sinuate, estipulate, and typically entire-margined leaves of Acanthaceae plants have round to quadrangular stems and single or racemose inflorescences. Large, beautiful volucral bracts surround the flowers, which occur in racemes, spikes, or cymes. The fruit is frequently explosively dehiscent and has a loculicidal capsule shape. Seeds are typically carried on hook-like retinacula, but occasionally there are no retinacula and the surface is smooth or roughened without trichomes or pubescence [17, 18].

Genus *Justicia L*: In 1991, Jain SK *et al.* discovered that plants from this genus are found throughout Southeast Asia, including India, Pakistan, Indonesia, and Malaysia [19]. According to a Hussain M *et al.* study in 2008, the *Justicia* genus of plants is used as sedatives, hallucinogens, somniferous agents, depressants, and therapies for epileptic seizures and other mental problems due to their effects on the central nervous system [20]. This genus has been used as an antispasmodic, anti-inflammatory, anti-diabetic, anti-jaundice, fever reducer, anti-bleeding, disinfectant, and bronchodilator, according to Maurya S *et al.* in 2010 [21]. According to the review by Ayyanar M *et al.* in 2008, the leaves, petals, and roots of *Justicia cadhatoda* are used in herbal medicines to treat cancer and helminths [17, 22]. *Justicia hyssopifolia* was found to have a cytotoxic effect against human cancer cell lines, according to Navarro E *et al.* in 2001. In 2002, Day *et al.* reported that an ethanol extract of *Justicia neesii Ramamoorthy* (Acanthaceae) was found to have anticancer properties against P388 lymphocytic leukaemia in mice. *In vitro* cytotoxicity in the 9-KB cell line and *in vivo* growth inhibition of P-388 lymphocytic leukaemia was both significantly inhibited by *Justicia procumbens L.* (human nasopharyngeal carcinoma) in the treatment of diabetes, cancer, inflammation, and giardiasis. Cytotoxic action was demonstrated by *Justicia hyssopifolia L*. Human hepatocellular carcinoma, human cervical carcinoma, human colorectal adenocarcinoma, human colorectal carcinoma, and human breast cancer were among the cancer cell types that *J. ciliata* significantly affected [23].

According to Khurram Afzal *et al.* (2015), a genus of blooming plants called *Ruellia* is also referred to as "wild petunias" or "Ruellias." Rosanna Freyre*et al.* and Amanda Soares Miranda *et al.* observations in 2014and 2016 the largest genus in the family Acanthaceae is *Ruellia*, which has over 350 species of perennial herbs, subshrubs, and shrubs that are primarily found in tropical and subtropical climates [24-26]. According to observations made by Ibrahim Khan *et al.* (2017) and Christine O. Wangia *et al.* (2018), several species in the genus include significant components including glycosides, flavonoids, alkaloids and triterpenoids, saponins, and sterols. These plants are employed in the production of many different medicines as a result of this feature. Plant extracts from the genus *Ruellia* have been shown to have anti-hypertensive, antinociceptive, analgesic, antispasmolytic, antioxidant, antiulcer, antidiabetic, antipyretic, and anti-inflammatory properties. They are also effective against gonorrhea, bladder stones, bronchitis, skin diseases, anthelmintics, asthma, flu, fever, uterine inflammation, whooping cough, and stomach ache [17, 27].

R. squarrosa (root) exhibited anticancer efficacy against the human prostate cancer (PC3) cell line, according to a 2015 paper by Muhammad Khurram Afzal *et al.* [28]. *Ruellia tuberosa L* apoptogenic activity on the HepG2 cell line was reported by Sayanthan Dev *et al.* in 2013 [29]. According to Khurram Afzal *et al.* (2015), stomach cancer is treated by *Ruellia tuberose* [24]. In 2022, Jagtap T. D. *et al.* updated *R. tuberosa,* showing *in vitro* cytotoxicity against the KB cell line and significant cytotoxic activity against human lung cancer cell lines [30]. *R. brittoniana* used as anti-cervical cancer agent and *Ruellia tuberosa* used as a chemo-preventive agent against breast cancer reported by Bo EngCheonga *et al.* in 2013 and Anna Safitri *et al.* 2019 [31, 32].

More than 300 species in the vast genus *Barleria* of the Acanthaceae family, with a wide range of taxonomy, were reported by Shankar M. Shendage *et al.* in 2010 [33]. *Barleria prionitis* was discovered to have the best anti-cancer activity against the majority of tested cancer cell lines, including the lung metastatic cell line (A549), breast metastatic cell line (MDMAMB-468), breast cell line (MCF-7), colon metastatic cell line (DLD-1), and lung metastatic cell line. This was reported by Priyanka Kumari Panchal *et al.* in 2018 [34]. Using *Barleria prionitis* leaf extract, Shalaka S. Rokade and colleagues (2017) synthesized platinum and palladium nanoparticles that showed strong anticancer activity against human breast adenocarcinoma (MCF-7) cell lines [35]. In 2019, Baskaran *et al.* reported that *Barleria longiflora* decreases cervical cancer cell line viability [36].

Based on the above information, we have concluded the Acanthaceae family has good anticancer activity. This review focuses primarily on the phytochemical and pharmacological activities of the *Lepidagathis* species.

Acanthaceae plants of the genus *Lepidagathis* have not been extensively studied for their biological activities. The genus has 110 species, most of which are found in tropical and subtropical regions, including 33 species in India [37]. Regarding bioactivity, there is less scholarly research accessible. Plants from the *Lepidagathis* class have traditionally been used to treat polyuria, fever, mouth ulcers, diarrhea, uterine problems, and polyuria. They also have anti-oxidant, antiviral, hepatoprotective, anti-cancer, and anti-platelet aggregation activities. *Lepidagathis* sp. is also used to treat skin infections, headaches, jungle fever, cardiovascular diseases, and stomach problems (table 1). All of these factors were taken into consideration when planning the current review, which assessed *Lepidagathis* sp. for its ethnomedicinal applications, phytochemical components, and pharmacological properties. The chemical and pharmacological data in the current work could lead to novel *Lepidagathis* species' biomedical uses [38, 39].

Fig. 1: *Lepidagathis cristata* [53]

It is a perennial herb with multiple branches growing from a greatly shortened primary stem; sessile, linear-lanceolate, pubescent leaves with sharp tips and an entire to serrated border; Flowers are grouped in globose heads at the base of the stem, and the bracts are elliptic, spine-tipped, and bracteolate. Oblong fruit capsule with seeds (fig. 1) From January to March is the flowering season. The chemical constituents are-Cristatin A-an alkaloid generated from tryptophan, 6-hydroxyluteolin, 6-hydroxy luteolin-7-apposite, oleic acid, 3-(octadecyloxy) propyl ester from the inflorescence, Heptadecane, 9-hexyl, Ethyl iso-allocate, and Heptadecane, 9-hexyl, 3-ethyl-5-octa (2-ethylbutyl). This herb has historically been used to treat various conditions, including fever, eczema, psoriasis, epilepsy, skin abscess, burns, mouth ulcers, snake bites, skin itching, and skin diseases. It also has anti-inflammatory, analgesic, and antiemetic properties, as well as hypoglycemic, immunosuppressive, and wound-healing properties [39-41].

Fig. 2: *Lepidagathis hyaline* [42]

It is a prostrate herb with thin stems. The opposite, somewhat hairy, varied, elliptic leaves have a petiole between 2 and 4 mm and six pairs of nerves. Flowers are borne on terminal and axillary soft-haired spikes (fig. 2). The plant stands 40 cm tall [42]. Carbohydrates, quinones, alkaloids, reducing sugars, polyphenols, flavonoids, triterpenoids, coumarins, and cardiac glycosides are present. This plant claimed that a bioactive substance known as triterpenoid saponin (3-β-O-[α-L-rhamnopyranosyl (1→4) O-β-D-glucopyranosyl]16-α-hydroxy-olean12-en(13)-28-oicacid).
Triterpenoid saponin isolated from *L. hyaline* leaves It is used as an immunosuppressant, antioxidant, anti-inflammatory, anti-arthritic, thrombolytic, cytotoxic, anti-anthelmintic, cardiovascular, antimicrobial, anxiolytic, antidepressant, neuroprotective, and hepatoprotective [43, 44].

Fig. 3: *Lepidagathis keralensis* [53]

A perennial, prostrate, heavily branched, and attached to hard, lateritic soil. The stem is always glabrous, quadrangular, and somewhat winged. The opposing, narrowly oblong-lanceolate, purple-margined, stiff, plicate, glabrous, and prominently nerved leaves are dark green in colour. Terminal, procumbent, 1-3, 2 cm long spikes. Each of the sessile, oblong-lanceolate, thickly pubescent flowers has a persistent mucronate spine that is rigid and pointed. Ovary compressed ovoid, two cells with one ovule in each, hairy at the lower ventral area with glands; style slender, capitate, slightly bifid (fig. 3). Fruit is a compressed capsule with smooth skin; seeds are two and have a white aril. Alkaloids, sugars, amino acids, tannins, glycosides, terpenes, saponins, phlobatannins, resins, sterols, flavonoids, protein, phytosterols, and phenols are among the components of plants. The methanol extract of the leaf included 13 photo components, according to GC-MS analysis of the extracts. The main substances found in the extract included cyclopentaneundecanoic acid methyl ester (27.4%), benzene, (ethenyloxy)-(17.3%), n-Hexadecanoic acid (palmitic acid) (13.93%), and 10-Undecynoic acid, methyl ester (11.67%). Cyclopentaneundecanoic acid (29.6%), 1, 6-Octadiene, 3,7-dimethyl-(17.17%), 10-Undecyn-1-ol (9.54%), and 3-Hydroxy-4-methoxy benzoic acid (6.79%) were the predominant components among the 25 components found in the acetone extract of the stem. This plant has anti-inflammatory, anticancer, antibacterial, antifungal, and diuretic properties. It can also treat kidney stones, chest pain, and asthma and work as a blood purifier [37, 46].

Fig. 4: *Lepidagathis cuspidate* [53]

It is an erect undershrub with pubescent or glabrous stems that taper near the top. Large, lanceolate, acute or acuminate at the apex, cuneate and decurrent into the long petiole to practically its base, muticous leaves are found on the main stem. The leaves on the

branches are much smaller, almost linear, mucronate, softly pubescent, and spinous-pointed (fig. 4). Flowers have bracteate, ovate, cuspidate, three-nerved, glandular-pubescent, and strongly spinous-pointed bracts and bracteoles. Glabrous ovary with pubescent styles. Fruits are tall, sharp, glabrous capsules with 2 valves and no subsolid tip. Hygroscopically hairy, especially on the edges, crushed seeds Time for flowering and fruiting: October through March [47]. Steroids, tannins, phenolics, saponins, alkaloids, flavonoids, carbohydrates, and amino acids are the phytoconstituents of this plant. From this extract, the following substances were identified: Compound 1 was determined to be 16, 28-dihydroxy22-acetyl-21-tigloylolean-12-ene-3-O.-d-glucopyranosyl -(12)-d-glucopyranosyl-(13)-[-d-glucopyranosyl-(12)] Cuspidate A is also known as d-glucopyranosiduronic acid. Clémontanoside-C was recognised as compound 2. This plant is used as a fever reducer, antioxidant, antifungal, and anti-inflammatory agent, anti-oral ulcer treatment, and wound healer [48, 49].

Fig. 5: ***Lepidagathis pungens*** **[42]**

It is a herb that has prostrate, simple, opposing, ovate, light green leaves with three to four sharp, spiny-mutonate teeth on either side that can reach a length of five centimeters. The leaf tip is acute and pointy (fig. 5). Root: deep, robust, thick at the base, and more or less fibrous in appearance. A dense collection of branches forms on the ground. Flowers are many, axillary clustered, white lined brown inside, two-lipped, and have stamens with four longer and two shorter stamens (didynamous). Fruits: A compressed, oblong capsule that splits in half when moist. Two flattened, hairy-smooth seeds are included in each capsule. *L. pungens* contains phytoconstituents like flavonoids, alkaloids, tannins, saponins, phenolic compounds, and steroids. This plant has antioxidant and anticancer properties against numerous cancer cell types [38, 50, 51].

Fig. 6: ***Lepidagathis prostrate*** **[42]**

It is a woody-stocking, inflexible, prostrate undershrub that typically grows in the cracks of exposed laterite rocks. One of the herb species in the Pashanbhed family is *Lepidagathis prostrata*. It's woody perennial stems from a mat and adhere to the rocky ground. Flowers are uniquely decorated (fig. 6). After the plateau dries out in the early summer, the plant blooms. Alkaloids, terpenoids, phenols, tannins, flavonoids, glycosides, sterols, saponins, fixed oils, and fat are the secondary metabolites of this plant. Rutin, lupeol, and beta-sitosterol were isolated from this. This plant exhibited antioxidant, antibacterial, and antiurolithiatic properties [52].

Fig. 7: ***Lepidagathis fasciculate*** **[42]**

Herbs with a hirsute stem that grows to a height of 50 cm, opposite, elliptic, sharp, serrated, pubescent leaves, axillary or terminal condensed spike inflorescences. Outside, flowers have velvety hair (fig. 7). White, bilipped corolla; 4 stamens; a globular ovary; and 2 ovules per locule. Oblong, 4-seed capsule with hairy tip Seeds are round. November through May are the months for flowering and fruiting [42,53]. Alpha-cubebene (2.8%), beta-calacorene (3.6%), ar-curcumene (3.3%), trans-4,10-epoxy-amorphane (3.2%), gamma-curcumene (9.8%), sandaracopimarinal (6.6%), germacrene D-4-ol (6.1%), cembrene (5.0%), beta-calacorene (3.6%), ar-curcumene (3.3%) This plant's oil, which contains 44.8% sesquiterpene hydrocarbons, was isolated. This plant is used as a cytotoxin, antiviral, and antioxidant [54].

Fig. 8*: Lepidagathis trinervis* **[42]**

Complex, alternate, sessile, muticose, acute, entire, lanceolate leaves: near the edges, the margins are scabrid; elsewhere, the leaf is more or less glabrous. The midrib beneath is prominent, with a slender nerve running parallel to it. Blossoms-bisexual. The bracteoles are linear-lanceolate and softly membranous. Bracts are bracteate, ovate, spinous-cuspidate-glabrous, and frequently minutely pubescent at the apex and border (fig. 8). Fruit-ovoid-lanceolate, 2

seeded capsules with long, mucilaginous hygroscopic hairs that are brownish-black, smooth, and rounded at the tip. Blossoming September through February [55]. Alkaloids, flavonoids, and polyphenols are all present. An alkaloid produced from tryptophan has been isolated from this plant. It is used as a bitter tonic for rheumatic diseases, blotches, and swellings. It exhibits anticancer activity in leukemia and eczema and has a hypotensive effect [42, 56].

CONCLUSION

Numerous bioactive substances isolated from various genus of this family's include iridoids, phenolics, terpenoids, phytosterols, and phenylethanoid glycosides, flavonoids, Cristatin A, triterpenoid saponin, cyclopentaneundecanoic acid methyl ester, rutin, lupeol, and beta-sitosterol, among others. Additionally, all of the phytoconstituents in this genus exhibited a variety of biological properties, such as sedatives, hallucinogens, somniferous agents, depressants, and treatments for epileptic seizures. They also exhibited antinociceptive, analgesic, antispasmolytic, antioxidant, antibacterial, antifungal, anti-inflammatory, anticancer, antidiabetic, antiulcer, and hepatoprotective properties. We only look at a handful of the readily available facts about the *Lepidagathis* species.

Rural and underprivileged populations, especially in developing countries, are strongly advised to use economical herbal medicine to effectively cure various disorders. This family contains several notable plants that are useful in treating and controlling numerous fatal pathogenic, metabolic, genetic, and other disorders. Therefore, in the future, we have made the decision to research the cytotoxic and free radical scavenging abilities of new species of this *Lepidagathis*.

Table 1: Phytoconstituents and pharmacological activities of various species of *Lepidagathis*

S. No.	Plant name	Phytoconstituents and compound isolated	Activity analyzed	References
1	*Lepidagathis cristata*	Cristatin A-an alkaloid,6-hydroxyluteolin,6-hydroxyluteolin-7-apioside, oleic acid, 3-(octadecyloxy) propyl ester from inflorescence, Heptadecane, 9-hexyl, Ethyl iso-allocholate, Heptadecane, 9-hexyl, 3-ethyl-5-octa (2-ethylbutyl)	Used to treat fever, eczema, psoriasis, epilepsy, skin abscess, burns, mouth ulcers, snake bites, skin itching, skin diseases, anti-inflammatory, analgesic, antiemetic, hypoglycaemic, immunosuppressive, and wound-healing properties.	[39-41]
2	*Lepidagathis hyaline*	Carbohydrates, quinones, alkaloids, reducing sugar, polyphenols, flavonoids, triterpenoids, coumarins, and cardiac glycosides are present. Bioactive substance known as triterpenoidsaponin (3-β-O-[α-L-rhamnopyranosyl(1→4)O-β-D-glucopyranosyl]16-α-hydroxy-olean12-en(13)-28-oic acid).	Used as an immunosuppressive, antioxidant, anti-inflammatory, anti-arthritic, thrombolytic, cytotoxic, anti-anthelmintic, cardiovascular, antimicrobial, anxiolytic, antidepressant, neuroprotective, and hepatoprotective.	[43, 44]
3	*Lepidagathis keralensis*	Alkaloids, sugars, amino acids, tannins, glycosides, terpenes, saponins, phlobatannins, resins, sterols, flavanoids, protein, phytosterols, and phenols. Bioactive substances cyclopentaneundecanoic acid methyl ester (27.4%), benzene, (ethenyloxy)-(17.3%), n-Hexadecanoic acid (palmitic acid) (13.93%), and 10-Undecynoic acid, methyl ester (11.67%). Cyclopentaneundecanoic acid (29.6%), 1, 6-Octadiene, 3,7-dimethyl-(17.17%), 10-Undecyn-1-ol(9.54%), and 3-Hydroxy-4-methoxybenzoic acid(6.79%) were isolated	anti-inflammatory, anticancer, antibacterial, antifungal, and diuretic properties. It can also treat kidney stones, chest pain, asthma, and work as a blood purifier	[37, 46]
	Lepidagathis cuspidata	Steroids, tannins, phenolics, saponins, alkaloids, flavonoids, carbohydrates, and amino acids. Bioactive compound 1 was determined to be 16, 28-dihydroxy22-acetyl-21-tigloylolean-12-ene-3-O.-d-glucopyranosyl-(12)-d-glucopyranosyl-(13)-[-d-glucopyranosyl-(12)] Cuspidate A is also known as-d-glucopyranosiduronic acid. Clémontanoside-C was recognised as compound	Fever reducer, anti-oxidant, antifungal, and anti-inflammatory agent, anti-oral ulcer, and wound healer	[48, 49]
	Lepidagathis pungens	Flavonoids, alkaloids, tannins, saponins, phenolic compounds, and steroids	This plant has antioxidant and anticancer properties	[38, 50, 51]
	Lepidagathis prostrate	Alkaloids, terpenoids, phenols, tannins, flavonoids, glycosides, sterols, saponins, fixed oils, and fat are the secondary metabolites of this plant. Rutin, lupeol, and beta-sitosterol were isolated	This plant exhibited antioxidant, antibacterial, and antiurolithiatic properties	[52]
	Lepidagathis fasciculate	Alpha-cubebene (2.8%), beta-calacorene (3.6%), ar-curcumene (3.3%), trans-4, 10-epoxy-amorphane (3.2%), gamma-curcumene (9.8%), sandaracopimarinal (6.6%), germacrene D-4-ol (6.1%), cembrene (5.0%), beta-calacorene (3.6%), ar-curcumene (3.3%) This plant's oil, which contains 44.8% of sesquiterpene were isolated	This plant is used as a cytotoxic, antiviral, and antioxidant.	[54]
	Lepidagathis trinervis	Alkaloids, flavonoids, and polyphenols are all present. Alkaloid produced from tryptophan has been isolated from this plant.	Bitter tonic for rheumatic diseases, blotches, swellings and exhibits anticancer activity in leukemia, eczema, and has hypotensive effect.	[42, 56]

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

No potential conflict of interest exists, according to the authors.

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