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Plants discovered in Costa Rica between 2010 and 2020 and their possible pharmacological use

Plantas descubiertas en Costa Rica entre 2010 y 2020 y su posible utilidad farmacológica

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Abstract

Costa Rica is known for having 6% of the world's biodiversity, approximately 12% of the plant species that exist in the country are endemic and because in Costa Rica the use of plants for medicinal purposes has been a tradition, it is important to know the potential pharmacological activities of the species that have recently been discovered. A bibliographic search was carried out under the criteria: Costa Rican species, endemic, recently discovered (2010-2020), that have few studies, that present ethnobotanical uses or that the family to which they belong, report this type of medicinal use. One or more criteria had to be met and, therefore, information on plants from 18 families is reported. Finally, it is very important to carry out more research on the large number of plant species that have been discovered in Costa Rica since it could be useful to know the molecular and phytochemical profile of these species both to know if they have pharmacological potential, as well as to know better its taxonomic and evolutionary classification.

Keywords: Costa Rica, endemic, ethnobotanical, medicinal uses, new species.

Resumen

Costa Rica es conocida por tener el 6% de la biodiversidad mundial, aproximadamente el 12% de las especies vegetales que existen en el país son endémicas y debido a que en Costa Rica el uso de plantas con fines medicinales ha sido una tradición, es importante conocer las potenciales actividades farmacológicas de las especies que se han descubierto recientemente. Se realizó una búsqueda bibliográfica bajo los criterios: especies costarricenses, endémicas, descubiertas recientemente (2010-2020), que tengan pocos estudios, que presenten usos etnobotánicos o que la familia a la que pertenecen, reporte este tipo de uso medicinal. Se debía cumplir uno o más criterios y, por lo tanto, se reporta información sobre plantas de 18 familias. Por último, es muy importante realizar más investigaciones sobre la gran cantidad de especies vegetales que se han descubierto en Costa Rica ya que podría ser útil conocer el perfil molecular y fitoquímico de estas especies tanto para saber si tienen potencial farmacológico, así como para conocer mejor su clasificación taxonómica y evolutiva.

Palabras clave: Costa Rica, endémica, etnobotánica, usos medicinales, nueva especie.

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Introduction

Costa Rica is recognized for being one of the 20 countries with the greatest diversity of species in the world and possibly the country with the highest density. It is estimated that around 500 000 species can be found in Costa Rica, representing 6% of the world's biodiversity, of which, until 2018, more than 121 000 are known, for an estimated 2.3 species per Km (Aguilar Sandí, 2018; Ministerio de Ambiente y Energía (MINAE) et al., 2018).

The number of plant species in the country is estimated at more than 11 500 (Aguilar Sandí, 2018).

Approximately 12% of these are endemic (Ministerio de Ambiente y Energía (MINAE), 2018). Therefore, they are known only in Costa Rica and it is not possible to find them naturally in any other country (Acebey Dávalos et al., 2012). About 500 species of medicinal plants are included from these (Ulloa Leitón, 2017).

Since ancient times, plants have been used for medicinal purposes, in Costa Rica this tradition has had the contribution of knowledge of the indigenous, Spanish, and Afro-Caribbean people (Museo de Cultura Popular, 2024). The usefulness of these plants has been transmitted from generation to generation orally or in a written manner (García-González & Morales, 2005). Nevertheless, popular knowledge about the use of medicinal plants has recently been lost substantially (Contreras Arias & Campregher, 2010).

In some cases, the effects of plants in the treatment of certain diseases have resulted in the overestimation of the possible effects of certain plants, attributing properties that they do not possess. Currently, interest in medicinal plants is increasing globally, and Costa Rica is not the exception, either because of the need to reduce drug use and the side effects they generate or because people do not have the economic resources to access health services or treatments (García-González & Morales, 2005).

This carries into an increase in global consumption and trade in medicinal plants and herbal products; furthermore, it represents a fantastic opportunity for the country. The state has encouraged sustainable and cost-effective production of such plants, both for export and for domestic consumption. This growth in demand could bring improvements in regulations, production practices, quality, safety and efficiency of plants and their preparations (Ulloa Leitón, 2017).

Medicinal plants are particularly important in the pharmacological research and development of new medicines, they can be used as therapeutic agents or for obtaining useful pipelines in the synthesis of medicines. Although very few species have been studied in terms of their possible applications in medicine, there is very little information on the efficacy and safety of these plants, their active components, extracts, and preparations containing them, so the World Health Organization has urged member countries to regulate trade of these products (World Health Organization, 2000).

Considering the above and the growing number of plants discovered in the country, it becomes imperative to collect the most recent discoveries reported in the literature and identify possible medicinal uses of these new species.

Methodology

The present study was carried out as a bibliographic review aimed at collecting information on plant species recently discovered in Costa Rica between 2010 and 2020 (Fig 1). The objective was to identify endemic species with possible pharmacological use, considering specific inclusion criteria based on ethnobotanical and medicinal background.

For the selection of the species, the following inclusion criteria were established: (1) be Costa Rican and endemic species, (2) have been discovered between 2010 and 2020, (3) have few previous studies, (4) present documented ethnobotanical uses, and (5) belong to families with a history of reported medicinal uses. A species had to meet at least one of these criteria to be included in the analysis.

The bibliographic search was carried out in scientific databases such as PubMed, Scopus, Medline, Google Scholar and Elsevier, as well as in articles, books and resources available in the library system of the University of Costa Rica. Keywords used in the search included combinations of terms such as: “Costa Rican species,” “endemic,” “recently discovered (2010-2020),” “ethnobotanical uses,” “medicinal uses,”

and "new species." These keywords were used in both English and Spanish to expand the coverage of relevant information.

The procedure consisted of performing initial searches with the keywords mentioned, followed by filtering the results to exclude duplicates and irrelevant references. The selected documents were analyzed to identify information on taxonomy, geographic distribution, and possible medicinal applications of the species. The data collected were organized by botanical family and distribution region.

The information extracted was validated by peer review, which guaranteed the quality and accuracy of the data used. The findings were presented in tables and figures to illustrate relevant patterns, such as the temporal and geographic distribution of the discovered species.

Results and Discussion

In this study, a total of 46 species were analyzed and identified (Table I), distributed across different parts of the country (Fig. 2), all meeting one or more of the inclusion criteria established for the research. The findings highlight the limited research conducted on these species, emphasizing the need for further study, particularly at the molecular level. Notably, these species belong to major families with documented medicinal applications, as detailed below:

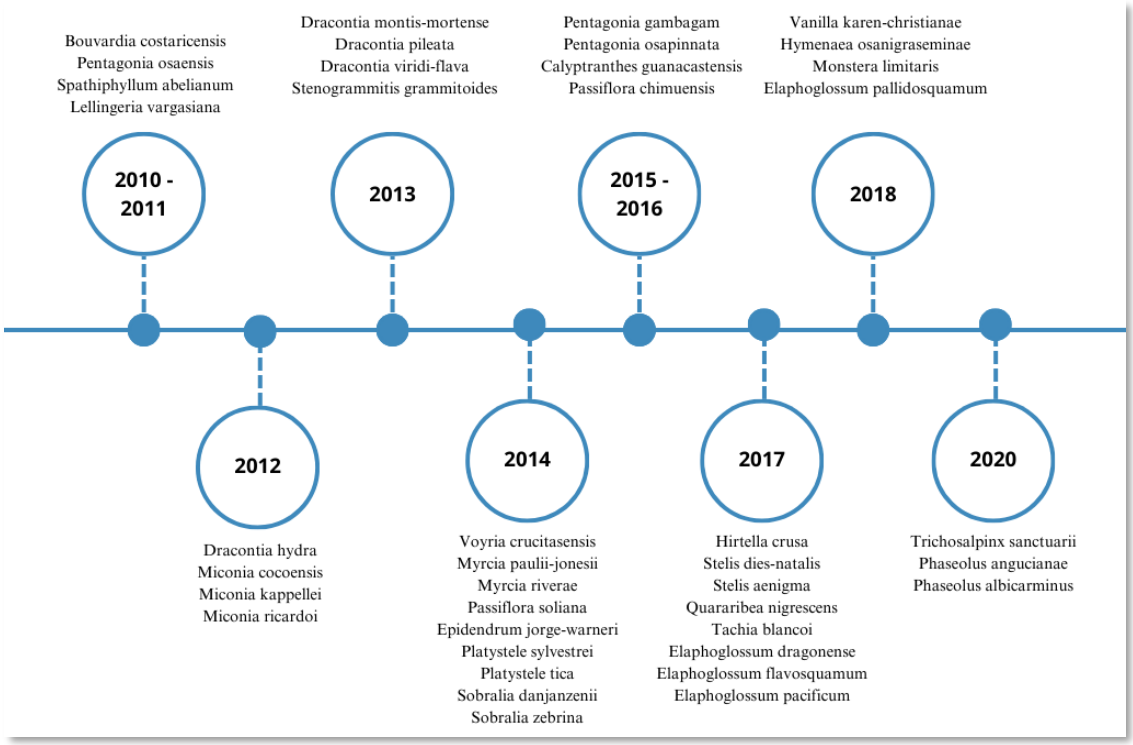

Fig. 1. Temporal distribution of the different newly discovered species (2010-2020), after an exhaustive review of original articles, both in English and Spanish, focused on endemic Costa Rican species.

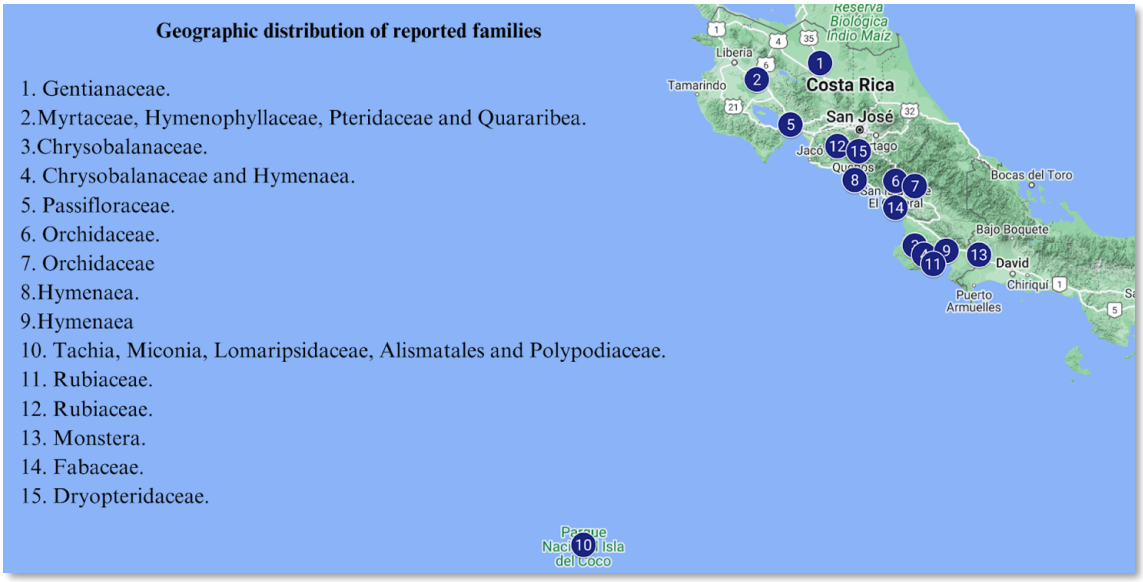

Fig 2. Distribution of the different families after an exhaustive review of original articles, both in English and Spanish, focused on Costa Rican endemic species.

Table I.

Comprehensive review of original articles, both in English and Spanish, focused on endemic species of Costa Rica, recently discovered (2010-2020), with limited studies, with ethnobotanical uses of the families with reported medicinal uses.

Plant Family	Plant Species	Taxonomic classification	Distribution	Study report Family
Gentianaceae:	***Voyria crucitasensis*** Y. Guillén & G. Vargas, sp.nov.	Plantae, Spermatophyta, Magnoliopsida, Gentianales, Gentianaceae, Voyria (Guillén Rodríguez & Vargas Rojas, 2014).	Species endemic to Costa Rica, collected in the very humid tropical forest of the Caribbean slope, Crucitas de Cutris, lajuela (Guillén Rodríguez & Vargas Rojas, 2014).	It has been reported that species from this family, such as *Eustoma* Salisb. and *Exacum* L., have ornamental value. Other species, such as *Gentiana* L. and *Swertia* L., are used in traditional Mexican medicine or as sources of pharmacologically and cosmetically relevant compounds (Rostro del Muro et al., 2024). In Mexico, the Otomí people use *Gentiana spathacea* Kunth and *Gyrandra tenuifolia* to treat gastrointestinal disorders (Rostro del Muro et al., 2024). *Gentianella* (*G. nitida* Griseb., *G. alborosea* (Gilg) Fabris), commercially known as "hercampure" or "hercampuri" in traditional medicine, contain bitter compounds and are recommended for the treatment of flu, diabetes, high cholesterol, obesity, liver disorders, blood detoxification, stomach pain, gastritis, skin conditions (such as acne), postpartum pain, arthritis, and rheumatism, as well as for appetite stimulation (Seminario et al., 2021). It has been identified that the vast majority of these species contain polyphenols, xanthones, pectins, saponins, triterpenes, sesquiterpenoids, sterols, and other bioactive compounds (Seminario et al., 2021).
Myrtaceae	***Calyptranthes quanacastensis*** N. Zamora, S. Kim, & R. Espinoza, sp.nov	Plantae, Spermatophyta, Magnoliopsida, Myrtales, Myrtaceae, Calyptranthes (Zamora et al., 2016).	Endemic species of the northwest region of Cordillera de Guanacaste, Costa Rica (Zamora et al., 2016).	The use of species belonging to the family Myrtaceae has been reported in the treatment of influenza and cough (Eucalyptus globulus and Eucalyptus citriodora), abdominal pains (Pimenta ozua) ,as an antiemetic (Pimenta dioica), to treat toothache (Pimenta racemosa and Syzygium aromaticum) and rheumatism (Pimenta racemosa), to calm nerve crises, diarrhea, vomiting, abuse of alcoholic beverages, and to treat rashes (Psidium guajava) (Germosén-Robineau, 2014). The Myrtaceae family is well known among the Brazilian population, which justifies its use as an astringent, anti-inflammatory, and antihypertensive agent, as well as for treating gastrointestinal disorders. The main bioactive constituents of these species include carotenoids, phenolic compounds, monoterpenes, and sesquiterpenes (Antonelo et al., 2023).
	Myrcia paulii-jonesii Aguilar, D. Santam., & A. Estrada, sp.nov.	Plantae, Spermatophyta, Magnoliopsida, Myrtales, Myrtaceae, Myrcia (Santamaría-Aguilar et al., 2014).	Endemic species of Costa Rica, found in the surroundings of Bahía Chal, Osa Peninsula (Santamaría-Aguilar et al., 2014).	
	Myrcia riverae A. Estrada, D. Santam., & Aguilar, sp.nov.	Plantae, Spermatophyta, Magnoliopsida, Myrtales, Myrtaceae, Myrcia (Santamaría-Aguilar et al., 2014).	Endemic species of Costa Rica, found in Golfo Dulce and Península de Osa (Santamaría-Aguilar et al., 2014).	
Chrysobalanaceae	***Hirtella crusa*** Aguilar & D. Santam., sp.nov.	Plantae, Spermatophyta, Magnoliopsida, Violales, Passifloraceae, Passiflora (Estrada-Chavarría & Rivera, 2014).	Species endemic to Costa Rica (Estrada-Chavarría & Rivera, 2014).	Passiflora edulis Sims leaves contain a glycoside called passiflorine, which has calming and sedative properties. In Las Guayanas, an infusion of these mixed with Ricinus communis is used to treat liver inflammation. Infusions from the Passiflora foetida L. plant for the expulsion of intestinal parasites. It is also used to fight cases of flu, cold and tuberculosis. Infusion of the leaves of this plant is used to treat stomach conditions (González, 2013). Passiflora quadrangularis L. roots have emetic, diuretic and verfuge properties (expel intestinal parasites) and can be used to treat skin conditions. The pulp of the fruits contains passiflorine. Moreover, it has been used to fight asthma, diarrhea, headache, dysentery, scurvy, insomnia, and neurasthenia (González, 2013). Likewise, larvae of the butterfly Philethria dido have been seen eating from its leaves (Estrada et al., 2016).
	Passiflora chimuensis A. Estrada, G. Rivera, J. Solano., sp.nov.	Plantae, Passifloraceae, Passiflora L., Astrophea, Pseudoastrophea (*Passiflora chimuensis*) (Estrada et al., 2016).	Endemic to Costa Rica, in very humid forests of the Caribbean, in the foothills of the Central Volcanic Range and Talamanca, at an elevation between 340 and 770m (Estrada et al., 2016)	
Orchidaceae	***Dracontia montis-mortense*** Karremans & Bogarín, sp.nov.	Plantae, Tracheophyta, Liliopsida, Asparagales, Orchidaceae, Stelis (Karremans & Bogarín, 2013)	Species endemic to Costa Rica, in the area known as Cerro de la Muerte (Karremans & Bogarín, 2013).	Some genera of this amily, such as Calanthe, Phaius, Acanthephippium, and Tainia, are medicinally important due to their rich content of starch and alkaloids (Zhou et al., 2023) Rhynchostylis retusa (L.) Blume is traditionally used for the treatment of pain, inflammation, and skin diseases. Traditionally, the whole plant is used to treat

	Dracontia pileata Karremans & Bogarín, sp.nov.	Plantae, Angiospermae, Liliopsida, Orchidales, Orchidaceae, Stelis (Karremans & Bogarín, 2013)	Species endemic to Costa Rica, found in the surroundings of San Isidro del General and on the Pacific side of the Cordillera de Talamanca (Karremans & Bogarín, 2013).	dysentery, gout, asthma, rheumatic pain, tuberculosis, epilepsy, menstrual disorders, skin diseases, and inflammation. The aerial roots are used to treat inflammation, pain, and malarial fever (Al-Amin et al., 2023). Some species of the Orchidaceae family are widely used in traditional medicine for the treatment of various diseases, including cancer and inflammation (Qi et al., 2021). On the other hand, literature on medicinal plants of the Orchidaceae family describes them as rich in dihydrophenanthrenes (DPs), flavonoids, triterpenoids, alkaloids, and bibenzyls, among other secondary compounds. Modern pharmacological studies have shown that DPs in medicinal plants of the Orchidaceae family exhibit anti-inflammatory, antitumor, antioxidant, and antibacterial activities (Qi et al., 2021).
	Dracontia hydra Karremans & C.M.Sm., sp.nov. C.M. Sm	Plantae, Angiospermae, Lilidae, Orchidales, Orchidaceae, Stelis (Karremans & Smith, 2012).	Species endemic to Costa Rica, only in Cerro Urán and Cerro Buena Vista (Karremans & Díaz-Morales, 2017).	
	Stelis aenigma Karremans & M.Díaz, sp.nov.	Plantae, Equisetopsida, Asparagales, Orchidaceae, Stelis (Karremans & Díaz-Morales, 2017).	Species endemic to Costa Rica, only known in Cerro Arbolado and Cerro Utyum, Cordillera de Talamanca (Karremans & Díaz-Morales, 2017).	
	Epidendrum jorge-warneri Karremans & Hágsater, sp. nov.	Plantae, Tracheophyta, Liliopsida, Asparagales, Orchidaceae, Epidendrum L (Fernández et al., 2014).	It is only known in Costa Rica, only found on the Tinuk hill and grows in an isolated part of moor about 2400m high (Fernández et al., 2014).	
	Platystele sylvestrei Karremans & Hágsater, sp. nov.	Plantae, Tracheophyta, Liliopsida, Asparagales, Orchidaceae, Platystele Schltr. (*Platystele sylvestrei*) (Fernández et al., 2014).	Known only in Costa Rica and Panama. In Costa Rica it grows in mature wet premontane forest, between 1410 and 1650m tall. It is in the Tapantí National Park in Cartago, near San Ramón de Alajuela, in the Monteverde area of Puntarenas and on the border between Costa Rica and Panama) (Fernández et al., 2014).	
	Platystele tica Karremans & Bogarín, sp. nov.	Plantae, Tracheophyta, Liliopsida, Asparagales, Orchidaceae, Platystele Schltr. (*Platystele sylvestrei*) (Fernández et al., 2014).	Known only in Costa Rica in the South Pacific area and in the El General Valley, it may be present in southern Colombia. Epiphytic plant in the premontane secondary forest humid at an altitude of 300 and 450 m (Fernández et al., 2014).	
	Sobralia danjanzenii Dressler & Pupulin, sp.nov.	Plantae, Angiospermae, Lilidae, Orchidales, Orchidaceae, Sobralia (Dressler & Pupulin, 2014)	Species endemic to Costa Rica, found from the Guanacaste mountain range to the Cerros de Turrubares, south of San José (Dressler & Pupulin, 2014). Utility: No medicinal uses have been reported for this species.	
	Sobralia zebrina Dressler & Pupulin, sp.nov.	Plantae, Angiospermae, Lilidae, Orchidales, Orchidaceae, Sobralia (Dressler & Pupulin, 2014)	Species endemic to Costa Rica, found in the northern part of the Talamanca mountain range (Dressler & Pupulin, 2014).	
	Trichosalpinx sanctuarii Mel. Fernández & Bogarín, sp.nov.	Plantae, Angiospermae, Lilidae, Orchidales, Orchidaceae, Trichosalpinx (Fernández & Bogarín, 2013).	Species endemic to Costa Rica (Fernández & Bogarín, 2013).	
	Vanilla karen-christianae Karremans & P. Lehm., sp. nov.	Plantae, Equisetopsida, Asparagales, Orchidaceae, Vanilla (Karremans & Lehmann Calderón, 2018).	Species endemic to Costa Rica, Known only in the vicinity of the border with Panama, Corredores de Puntarenas (Karremans & Lehmann Calderón, 2018).	
Quararibea	***Quararibea nigrescens*** N. Zamora, Cascante & S.Y. Kim., sp.nov.	Plantae, Magnoliophyta, Magnoliopsida, Malvaceae, Quararibea. (Quararibea nigrescens) (Zamora et al., 2017).	It is endemic to Costa Rica, found on the Caribbean slope of the Cordillera de Guanacaste, Cordillera de Tilarán and Cordillera Volcanic Central, between 400 and 1100 meters above sea level (Zamora et al., 2017).	Genera such as *Quararibea cordata* have antioxidant potential associated with immune system enhancement (Berto et al., 2015). According to the literature, this family contains bioactive metabolites effective against dysentery, stomach discomfort, fever, enteritis, hepatitis, cough, sore throat, arthritis, and diabetes. Notable metabolites include flavonoids, saponins, terpenoids, phenols, and tannins (Zafar et al., 2023).

Hymenaea	***Hymenaea osanigraseminae*** Aguilar, Poveda, D. Santam., sp.nov.	Plantae, Leguminosae, Hymenaea. (Hymenaea osanigraseminae) (Aguilar Fernández et al., 2018).	It is known only in Costa Rica in the Central Pacific, in the Manuel Antonio National Park and in the South Pacific in Golfito and in the Osa Peninsula. It has been observed on the Lomas of Piro in the Osa Peninsula and in Herradura, specifically in the canton of Garabito. It is found in very humid forests between 23-200 m elevation and on the Osa Peninsula it is in primary forest, on clay soils above the mountain rows (Aguilar Fernández et al., 2018).	*Hymenaea courbaril* is known for its antibacterial, antifungal, antiparasitic, and nutritional properties (Alzate Tamayo et al., 2008). In Costa Rica, indigenous people use the vapors from the resin that comes out of the bark to treat asthma; the leaves and bark's infusions are used as a hypoglycemic against diabetes. In the Atlantic region: The decoction of the fruit's rind is used to treat high blood pressure and rheumatism. In the Guanacaste region: the decoction of the leaves and the bark of the trunk and the root are used to relieve stomach pain and as an antidiarrheal (Núñez Melendez, 1975).
Tachia	***Tachia blancoi Al.*** Rodr. & J. Sánchez-Gonz., sp. nov.	Plantae, Leguminosae, Tachia. (*Tachia blancoi)* (Sánchez-González & Rodríguez, 2017)	Endemic to Isla del Coco National Park, it is located at 425 meters above sea level. It has only been observed in the south of the island, near Iglesias Bay and Jesús Jiménez and Las Madres hills (Sánchez-González & Rodríguez, 2017).	Peru's indigenous use the infusion of the *Tachia occidentalis* plant as a bath to treat general ailments. Mayongong Indigenous in Brazil use the plant to treat blood conditions (Struwe & Kinkade, 2013)
Miconia	***Miconia cocoensis*** Almeda & Kriebel., sp. nov.	Plantae, Tracheophyta, Magnoliopsida, Myrtales, Melastomataceae, Miconia Ruiz & Pav. (*Miconia cocoensis*) (Kriebel & Almeda, 2012).	Endemic to Isla del Coco National Park, Costa Rica, found on Iglesias hills and in the foothills near Iglesias Bay and Tesoro Escondido hills (Kriebel & Almeda, 2012).	There are studies on the phytochemical composition of this family that recommend further investigation of this genus (Oliveira Sabbag Cunha et al., 2019). In addition, the *Miconia prasina* plant has been used to treat infected wounds caused by fish bones in Guayanas (González, 2013). And *Miconia fallax* and *M. albicans* have been studied for the treatment against *Bothrops atrox* snake venom (Mourão De Moura et al., 2013).
	Miconia diegogomezii Almeda & Kriebel., sp. nov.	Plantae, Tracheophyta, Magnoliopsida, Myrtales, Melastomataceae, Miconia Ruiz & Pav. (*Miconia diegogomezii)* (Kriebel & Almeda, 2012).	Endemic to the Isla del Coco National Park, Costa Rica, 50-500 m high (Kriebel & Almeda, 2012).	
	Miconia kappellei Kriebel & Almeda., sp. nov.	Plantae, Tracheophyta, Magnoliopsida, Myrtales, Melastomataceae, Miconia Ruiz & Pav. (*Miconia kappellei)* (Kriebel & Almeda, 2012).	It is known only in the Cordillera de Talamanca in Costa Rica, at an altitude of 2000-2100 m (Kriebel & Almeda, 2012). Utility: No medicinal uses have been reported for this species.	
	Miconia ricardoi Almeda & Kriebel., sp. nov.	Plantae, Tracheophyta, Magnoliopsida, Myrtales, Melastomataceae, Miconia Ruiz & Pav. (*Miconia ricardoi*) (Kriebel & Almeda, 2012).	Costa Rica. Cartago. Guarco canton Tapantí-Macizo de la Muerte National Park, between Salsipuedes and Loma del Indio (Kriebel & Almeda, 2012).	
Alismatales	***Spathiphyllum abelianum*** A. Rojas & J. M. Chaves, sp.nov.	Plantae, Tracheophyta, Liliopsida, Alismatales, Spathiphyllum Schott. (*Spathiphyllum abelianum*) (Rojas-Alvarado & Chaves-Fallas, 2011).	Only one of 0.5 hectares, 1 hectare and 1.5 hectares in the western plateau at an elevation of 350-400m is known on Cocos Island by three populations (Rojas-Alvarado & Chaves-Fallas, 2011).	NASA conducted a study in 1989 that studied different houseplants and their potential to purify the air of pollutants, Spathiphyllum, known as "cunas de Moisés" had good results (Wolverton et al., 1989).
Polypodiaceae	***Lellingeria vargasiana*** A. Rojas & J. M. Chaves, sp.nov.	Plantae, Tracheophyta, Polypodiopsida, Polypodiales, Polypodiaceae, Lellingeria A.R. Sm & R.C. Moran. (*Lellingeria vargasiana*) (Rojas-Alvarado, 2011)	Known only in Costa Rica at an elevation of 400-500m on Isla del Coco (Rojas-Alvarado, 2011)	*Polypodium vulgare* L. has ethnoveterinary uses for the treatment of varicose diseases, jaundice, and parasitic infections. In the EMA, it has been approved for herbal medicinal use as an expectorant for coughs, colds, and occasional constipation (Farràs et al., 2021). Ferns have been medicinally used since ancient Greece, initially the ancient botanists and pharmacists used their roots for topical application. Central and South American Indigenous communities have also used them to treat skin tumors and inflammation. In addition, empirical studies have shown effectiveness against skin conditions such as vitiligo, psoriasis, and atopic dermatitis. The molecular composition of these plants has not been fully defined, but some compounds responsible for these actions and antioxidants have been found, such as caffeic acid, chlorogenic acid, coumaric acid, vanillic acid and ferulic acid, as well as non-phenolic compounds such as adenosine (Parrado et al., 2014).
	Stenogrammitis grammitoides A. Rojas, sp. nov	Plantae, Pteridophyta, Pteridopsida, Polypidiales, Polypodiaceae, Stenogrammitis (Rojas-Alvarado, 2013)	Known only at the place of collection, endemic to Isla del Coco, Costa Rica (Rojas-Alvarado, 2013)	

Rubiaceae	***Bouvardia costaricensis*** C. M. Taylor, sp. nov.	Plantae, Magnoliophyta, Magniolopsida, Gentianales, Rubiaceae, Bouvardia. (*Bouvardia costaricensis*) (Taylor & Gereau, 2010).	It is found in humid forests at 1000-1900 m altitude in the central part of Costa Rica (Taylor & Gereau, 2010).	The predominant secondary metabolites in this family, which have been found over the years, since it is from the oldest families, are iridoids, anthraquinones, triterpenes, indole alkaloids, and other classes. They also contain flavonoids and phenolic derivatives. Bioactive alkaloids are emphasized as they have pharmacological effects. This family has great potential in terms of structural and pharmacological diversity, some of these plants have demonstrated anti-inflammatory, antibacterial, analgesic, mutagenic, antiviral, antioxidant effects and have effects on the vascular and central nervous system (Martins & Nunez, 2015)
	Pentagonia osaensis C. M. Taylor, sp. nov.	Plantae, Magnoliophyta, Magniolopsida, Rubiales, Rubiaceae, Pentagonia. (*Bouvardia costaricensis*) (Taylor & Gereau, 2010)	It is found in humid forests at 1-750 m high in Golfo Dulce, Osa Peninsula and Puriscal (Taylor & Gereau, 2010).	
	Pentagonia gambagam Hammel & Aguilar, sp. nov.	Plantae, Spermatophyta, Magnoliopsida, Rubiales, Rubiaceae, Pentagonia (Hammel, 2015).	Only known in the La Gamba biological corridor, Gambagam sanctuary, Golfito, Costa Rica (Hammel, 2015).	
	Pentagonia osapinnata Aguilar, N. Zamora, & Hammel, sp. nov.	Plantae, Spermatophyta, Magnoliopsida, Rubiales, Rubiaceae, Pentagonia (Hammel, 2015).	Distribution: Endemic plant of the Osa Peninsula, Costa Rica (Hammel, 2015).	
Monstera	***Monstera limitaris*** M. Cedeño, sp. nov.	Plantae, Angiospermae, Araceae, Monstera Adans. (*Monstera limitis*) (Cedeño-Fonseca et al., 2018).	It is found only on the border between Costa Rica and Panama on the banks of small rivers (Cedeño-Fonseca et al., 2018). Utility: No medicinal uses have been reported for this species.	*Monstera deliciosa*'s pulp and ripe tips are used to treat pimples, dry skin on the elbows and feet, as well as to soothe sunburned skin. The soft cover is used as a poultice on bruises and sprains, it is also applied to wounds and contusions (Roberts, 2000). *Monstera adansonii Schott*'s sap is used in the Guyanas to treat necrotic ulcers. The decoction of the crushed plant is used to eliminate boils (González, 2013).
Fabaceae	***Phaseolus angucianae*** Debouck & Araya, sp. nov.	Plantae, Angiospermae, Equisetopsida, Fabales, Fabaceae, Phaseolus (Debouck et al., 2018).	Endemic species of Costa Rica, Fila Costeña Sur, Cerro Anguciana and Fila Cruces (Debouck et al., 2020).	*Cassia fistula L*. a Fabaceae family species, is reported as a laxative and blood purifier, the pulp has anti-inflammatory effects on bumps and bruises. The bark is astringent, and the root is used to treat skin diseases, it is astringent and purgative. The crushed fruits in infusion can be used for calculations and constipation (Rodríguez Navas, 2000).
	Phaseolus albicarminus Debouck & Chaves sp. Nov	Plantae, Angiospermae, Equisetopsida, Fabales, Fabaceae, Phaseolus (Debouck et al., 2020).	An endemic species of Costa Rica, found in the Llano Bonito Hills, south of the Central Valley (Debouck et al., 2020).	
Dryopteridaceae	***Elaphoglossum dragonense*** A. Rojas, sp. nov.	Plantae, Equisetopsida, Polypodiidae, Polypodiales, Dryopteridaceae, Elaphoglossum. (A. Rojas, sp. Nov.) (Rojas Alvarado & Baaijen-Harteveld, 2017).	Endemic, known only in the Cerro Caraigres Protective Zone at 2420-2500 m. (I. Chinchilla & A. Rojas 1978, CR, K, MO) (Rojas Alvarado & Baaijen-Harteveld, 2017).	*Elaphoglossum latifolium* is used in Honduras as an antitussive and emmenagogue. In addition, *Tectaria incisa* leaves' infusion is used in Guyanas as an infertility treatment (González, 2013).
	Elaphoglossum flavosquamum A. Rojas & Baaijen, sp. nov.	Plantae, Equisetopsida, Polypodiidae, Polypodiales, Dryopteridaceae, Elaphoglossum (Rojas Alvarado & Baaijen-Harteveld, 2017).	Endemic, known only in the Cerro Caraigres Protective Zone at 2350-2400 m (Rojas Alvarado & Baaijen-Harteveld, 2017).	
	Elaphoglossum pacificum A. Rojas, sp. nov.	Plantae, Equisetopsida, Polypodiidae, Polypodiales, Dryopteridaceae, Elaphoglossum (A. Rojas, sp. Nov.) (Rojas Alvarado & Baaijen-Harteveld, 2017).	Endemic to Costa Rica in the Cordillera de Talamanca, Chirripó National Park at 2600-2900 m (A. Rojas 2877, CR, INB, MO) and Cerro Caraigres Protective Zone at 2300-2350 m (I. Chinchilla & A. Rojas 1946, CR, MO, USJ) (Rojas Alvarado & Baaijen-Harteveld, 2017).	
	Elaphoglossum pallidosquamum A. Rojas & P. Muñoz, sp. nov.	Plantae, Equisetopsida, Polypodiidae, Polypodiales, Dryopteridaceae, Elaphoglossum (A. Rojas & P. Muñoz, sp. Nov.) (Rojas Alvarado & Muñoz Cambronero, 2017).	Only in the Caribbean sector of the Cordillera de Talamanca in Costa Rica and Cordillera de Los Andes in Ecuador at 2850-3200 m (Rojas Alvarado & Muñoz Cambronero, 2017).	
	Tectaria x epilithica A. Rojas, nothosp. nov.	Plantae, Dryopteridaceae, Tectaria (A. Rojas, nothosp. Nov.) (Rojas Alvarado, 2017a)	Endemic to Isla del Coco at 75-150 m elevation (Rojas Alvarado, 2017a).	

Lomariopsidaceae	***Elaphoglossum x intermedium*** A. Rojas, nothosp. nov.	Plantae, Lomariopsidaceae, Elaphoglossum (A. Rojas, nothosp. Nov.) (Rojas Alvarado, 2017a).	Endemic to Isla del Coco at 350-400 m elevation (Rojas Alvarado, 2017a).	In the Amazon region, their main use is medicinal. There are records of their uses not only to cure diarrhea and the flu, heal wounds, unswell hematomas, soothe pain in the body, stomach, teeth and kidneys but also to cure animals (Gonçalves dos Santos et al., 2024).
Hymenophyllaceae	***Hymenophyllum densipilosum*** A. Rojas, sp. nov.	Plantae, Equisetopsida, Polypodiidae, Hymenophyllales, Hymenophyllaceae, Hymeniphyllum (A. Rojas, sp. Nov.) (Rojas Alvarado, 2017c).	Only known from the Cordillera de Talamanca in Costa Rica at 2435-3000 m (Rojas Alvarado, 2017c).	In the Guyanas they use the whole plant of the Hymenophyllum polyanthos spice, in the form of smokes, inhalations, or rubbing the ashes on their cheeks, as a remedy against vertigo and fainting spells; its infusion is used to wash hands and feet, when pain or cramps (González, 2013).
	Hymenophyllum multicristatum A. Rojas, sp. nov.	Plantae, Equisetopsida, Polypodiidae, Hymenophyllales, Hymenophyllaceae, Hymeniphyllum (A. Rojas, sp. Nov.) (Rojas Alvarado, 2017c)	Known only from the Pacific slope of the Cordillera de Talamanca in Costa Rica at 1680–1766 m (Rojas Alvarado, 2017c).	
Pteridaceae	***Pteris arbelaeziana*** A. Rojas, sp. nov.	Plantae, Equisetopsida, Polypodiidae, Polypodiales, Pteridaceae, Pteris (A. Rojas, sp. Nov.) (Rojas Alvarado, 2017b)	Known only on the Pacific slope of the Cordillera de Talamanca at 2400-2800 m. Costa Rica and probably Panama (Rojas Alvarado, 2017b).	The presence of certain metabolites in Argyrochosma nivea, a species of the Pteridaceae family, could confer pharmacological activities. Various ethnobotanical studies report its uses as antibacterial, hypoglycemic and for spiritual cleansing in aqueous preparations of the leaves of the plant (Minchán-Herrera et al., 2020).
	Pteris caridadae A. Rojas, sp. nov.	Plantae, Equisetopsida, Polypodiidae, Polypodiales, Pteridaceae, Pteris (A. Rojas, sp. Nov.) (Testo et al., 2015).	In the Cordillera de Tilarán, north slope of the Cordillera Central and the Caribbean slope of the Cordillera de Talamanca at 800–1600 m (Rojas Alvarado, 2017b).	

Table II.
Summary of Findings from the Bibliographic Review Across Various Databases

Plant Family	Number of Species	Plant Species	Geographic Distribution	Uses
Gentianaceae	1	Voyria crucitasensis	Very humid tropical forest of the Caribbean slope, Crucitas de Cutris, Alajuela	No medicinal uses have been reported for this species.
Myrtaceae	3	Calyptranthes guanacastensis, Myrcia paulii-jonesii,Myrcia riverae.	Northwest region of Cordillera de Guanacaste, surroundings of Bahía Chal, Osa Peninsula	No medicinal uses have been reported for this species.
Chrysobalanaceae	1	Hirtella crusa	Restricted to the Osa Peninsula in the community of Agua Buena de Rincón	No medicinal uses have been reported for this species.
Passifloraceae	2	Passiflora soliana, Passiflora chimuensis,	Puntarenas and very humid forests of the Caribbean	No medicinal uses have been reported for this species.
Orchidaceae	13	Dracontia montis-mortense, Dracontia pileata, Dracontia viridi-flava, Dracontia hydra, Stelis dies-natalis, Stelis aenigma, Epidendrum jorge-warneri, Platystele sylvestrei, Platystele tica, Sobralia danjanzenii, Sobralia zebrina, Trichosalpinx sanctuarii, Vanilla karen-christianae	Surroundings of San Isidro del General and on the Pacific side of the Cordillera de Talamanca	No medicinal uses have been reported for most of the species identified; however, Vanilla karen-christianae has been associated with a potential commercial use as a fragrance.
Quararibea	1	Quararibea nigrescens,	Found on the Caribbean slope of the Cordillera de Guanacaste	No medicinal uses have been reported for this species.
Hymenaea	1	Hymenaea osanigraseminae	In the Central Pacific, in the Manuel Antonio National Park and in the South Pacific in Golfito and in the Osa Peninsula	No medicinal uses have been reported, but in certain areas, its wood is used, the fruit pulp is utilized in confectionery, and the seeds are employed in handicrafts.
Tachia	1	Tachia blancoi	Endemic to Isla del Coco National Park	No medicinal uses have been reported for this species.
Miconia	4	Miconia cocoensis, Miconia diegogomezii, Miconia kappellei, Miconia ricardoi	Some are endemic to Cocos Island National Park, while others are native to the Talamanca Mountain Range.	No medicinal uses have been reported for this species.
Alismatales	1	Spathiphyllum abelianum	Cocos Island	No medicinal uses have been reported for this species.
Polypodiaceae	2	Lellingeria vargasiana, Stenogrammitis grammitoides	Cocos Island	No medicinal uses have been reported for this species.
Rubiaceae	4	Bouvardia costaricensis, Pentagonia osaensis, Pentagonia gambagam, Pentagonia osapinnata.	Some are high in humid forests at 1000-1900 m altitude in the central part. Other in Golfo Dulce, Osa Peninsula and Puriscal	No medicinal uses have been reported for this species.
Monstera	1	Monstera limitaris	Found only on the border between Costa Rica and Panama	No medicinal uses have been reported for this species.
Fabaceae	2	Phaseolus angucianae, Phaseolus albicarminus	Endemic species of Costa Rica, Fila Costeña Sur, south of the Central Valley	No medicinal uses have been reported for this species.
Dryopteridaceae	5	Elaphoglossum dragonense, Elaphoglossum flavosquamum, Elaphoglossum pacificum, Elaphoglossum pallidosquamum, Tectaria x epilithica A	Endemic, known only in the Cerro Caraigres Protective Zone at 2420-2500 m.	No medicinal uses have been reported for this species.
Lomaripsidaceae	1	Elaphoglossum x intermedium	Endemic to Isla del Coco at 350-400 m elevation	This family does not report any ethnobotanical use.
Hymenophyllaceae	2	Hymenophyllum densipilosum, Hymenophyllum multicristatum	Only known from the Cordillera de Talamanca in Costa Rica at 2435-3000 m	No medicinal uses have been reported for this species.
Pteridaceae	2	Pteris arbelaeziana, Pteris caridadae	Only on the Pacific slope of the Cordillera de Talamanca at 2400-2800 m	No medicinal uses have been reported for this species

This table considers a comprehensive review of original articles, both in English and Spanish, focusing on species from Costa Rica that are endemic, recently discovered (2010–2020), have limited studies, exhibit ethnobotanical uses, or belong to families with reported medicinal uses.

Conclusions

The present review identified 46 plant species discovered in Costa Rica between the years 2010-2020, distributed in 18 botanical families that can be found in different parts of the country, the vast majority belonging to families with documented traditional medicinal uses, however the findings revealed a significant unexplored pharmacological potential of the species of almost 85%.

Therefore, it is necessary to study more extensively the large number of plant species that have been discovered in Costa Rica, the main limitations include at this time the scarcity of detailed phytochemical studies and the lack of systematic documentation of the traditional uses of these species, so specific research is required on the molecular and phytochemical profiles of these species, prioritizing those belonging to families with documented medicinal uses such as species of the Myrtaceae family that has been reported in the treatment of influenza, cough, diarrhea, antiemetic, among others; or as the Passifloraceae family that has been described its use in respiratory tract congestion, insomnia, skin conditions, also in the treatment of intestinal parasitosis.

Likewise, it is important for the preservation of Costa Rican culture to carry out updated research on the ethnic uses of endemic plants in Costa Rica, thus preserving their traditional use and the potential of natural medicine in the country.

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