



Exploring the Wonders of *Callisia Repens*: A Comprehensive Research Insight

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Abstract: Medicinal plants are a blessing to humans since they are being used to treat existing and emerging ailments, either directly or indirectly. However, the availability of such plants, as well as their characteristics, has an essential impact. The creeping inch plant, traditionally recognized as *Callisia repens* or turtle vine, is a perennial herb that belongs to the Commelinaceae family. Due to its many therapeutic qualities, this plant has attracted interest. Flavonoids, saponins, phenolic compounds and essential oils are the phytochemical composition of *Callisia repens* contribute to its therapeutic potential. The presence of phenolic compounds and flavonoids in large quantities largely explains its antioxidant character that helps in free radical scavenging as well as oxidative stress reduction. Moreover, *Callisia repens* has revealed potential in controlling diabetes. Generally, *Callisia repens* has a considerable medicinal value, whose efficacy is supported by both modern research and traditional use. It is important that more scientific evidence on the pharmacology of this plant should be found through additional studies along with identifying its potential value in modern medicine. The aim of this review is to provide a detailed information of the plant *Callisia repens*.

Index Terms: *Callisia repens*, General information, Morphological Characteristics, Genetic Studies, Phytochemical and Medicinal Properties.

I. INTRODUCTION

In the field of botany and traditional medicine there has been a growing interest in *Callisia repens* due to its medicinal properties that are highly regarded and also belongs to the family Commelinaceae. This creeping herb characterized by bright leaves and small blossoms contains many phytochemicals which make this shrub have antioxidant effect as well as an inhibition of microbial activity. By looking at *Callisia repens* very closely, we can increase our knowledge about plant-based medicines. Also, find out the new medical solutions through natural resources all the time. Our goal, in this study, is to give comprehensive research insight into this particular plant species by shedding light on some possible advantages as well as applications of such plants for medicinal purposes all over the world thereby laying a basis for further scientific pursuits”.

By explore *Callisia repens* deeply, from its general information to its morphological characteristics. Also, we shall look at its taxonomy and nomenclature in relation to the classification and evolutionary context. Distribution and habitat of *Callisia repens* will be covered in addition, since it helps us understand more about its ecological preferences as well as conservation status. Analysis of the phytochemicals holds and genetic studies reveals the mechanisms underlying its total phenolic content known for its antioxidant activity. In other words, the various health benefits as well as medicinal uses of *Callisia repens* with an eye to setting out prospects for further research and gaps that exist in exploiting all the capabilities inherent in it.

II. GENERAL INFORMATION

Callisia repens or inch plant or turtle vine, is a succulent plant hailing from the Commelinaceae family. It comes from Central and South America where it has been noticed due to its different growing habits that make it good for decorations like in the house. It is always there because it can grow each year; hence makes long intertwined thin carpets along trailing flowering stems, which makes it look pretty on different landscape designs.



• Scientific and Common Names

Callisia repens Jacq. L. is the scientific name of this species given in 1760 when it was first established. However, this particular plant also goes by many vernacular names depending on where it is found including Bolivian jew, chain plant, creeping inch-plant, inch plant, inch vine, turtle vine. Such names indicate the worldwide recognition and cultural significance of this plant.

International Common Name	English	Bolivian jew Chain plant Creeping inch-plant Inch plant Inch vine Striped creeping inch plant Turtle vine Water weed
	Spanish	Canutillo hierba de pena lengua de gallina picadillo
	French	Belle mere soleil Bon dieu mouri Bon dieu soleil Mais marron Petit bon dieu mouri
Local Common Name	Cuba	Canutillo rastrero
	Dominican Republic	Cohitre enano Suelta con suelda Ti-bon bieu mouri
	Germany	Kriechendes Schönpolster
	Haiti	Ti-bon bieu mouri
	Lesser Antilles	Oreillo di raton Yerbaa de awa
	Puerto Rico	Belleza Cohitre enano Lengua de gallina

III. TAXONOMY AND NOMENCLATURE

Callisia repens belongs to the Commelinaceae family and is commonly referred to as creeping inch plant or turtle vine. It is a succulent plant originating from centralized America and southward America that is widely known for its creeping growth habit; henceforth normally grown for ornamental use.

Hierarchy of classification Within the plant kingdom as follows:

Kingdom: Plantae
Phylum: Streptophyta
Class: Equisetopsida
Subclass: Magnoliidae
Order: Commelinales
Family: Commelinaceae
Genus: *Callisia*
Species: *Callisia repens*

The classification emphasizes how the plant evolved and fits in the commelinaceae family which is also shown by similar characteristics between it and other commelinaceae species.

A systematic way of calling *Callisia repens* enhances its naming process for easier comprehension among scientists thus promoting clear botanical studies and horticultural practices in general.

IV. MORPHOLOGICAL CHARACTERISTICS

➤ Leaf Structure

Callisia repens is well known for its versatile and showy foliar arrangements that help it thrive in various environments. Its leaves are mostly succulent and fragile, showing a decrease in size from the base of the shoot to the tip. Normal leaf blades are usually elliptic to lanceolate measuring 1-3.5 centimeters long and 0.6-1 centimeters wide; however, in some cases they reach up to 4 x 2

centimeters long and wide with acute tip and round base. The leaf margins have a distinct number of hairs on them, which adds a hairy appearance to them. ovate leaves having an opposite arrangement which is also leathery while glossy at the same time; closely hidden are these veins making their outer surface such smooth ones lest you may mistake it for something else other than what it appears when seen close up You will always find the leaves always remaining greenish especially during their growing periods under normal conditions but they also respond different colors starting from purplish ones up to some reddish when the light becomes so intense exhibiting this ability that looks like that of chameleon.

➤ Flower Structure

The blooming of *Callisia repens* is an interesting part. The flowers in this species occur in the tubules formed in the distal leaves. The latter usually yield a few pairs of open cymes. During the summer, many of these flowers develop into hermaphrodites. Furthermore, the length of the white and unobtrusive lanceolate bracts that subtend the staminate flowers is 3-6 mm. These low-growing plants have odorless blossoms. Blooms are small, white and borne in cymes at the leaf axil rendering aesthetic worth to the plant. Six stamens are attached to some of them with filaments that don't have hairs on them and others examples can be seen which don't have them at all; Some have three, others two but this is seen to have taken several forms. Each flower has between zero and six stamens with smooth filaments, and the ovary is bipartite, topped with a brush-like scar. When it finishes blooming, a capsule will grow that will contain small seeds about one millimeter long. This gives rise to possible variations where some flowers are found without any hairs at all while others do not have more than two or three of these structures.

➤ Stem and Root System

Stem and Root Structure *Callisia repens* is known for its creeping growth habit, due to which it forms extensive mats through its rooting system. Several dozen centimeters long, these stems which are tend to break when carelessly handled are fragile. With their color being deep purple, they bring out a sharp difference in comparison to the alternate, sheathing green leaves. The overall growth of this plant is characterized by its compact nature which doesn't make it outgrow 15cm but can reach up to a meter in width. Through rooting at nodes, this plant spreads very fast enabling it to cover surfaces rapidly forming large mats. To grow and multiply this creeping succulent relies on its stems and roots which are significant in cultivating and caring for it.

➤ Flowering and Reproduction

In the axils of the distant leaves of the flower shoot, *Callisia repens* inflorescences appear having paired cymes. Flowering time corresponds with summer, having bisexual and unscented flowers. They have small, white, linear bracts not exceeding three to six millimeters in length. Anther filaments may be glabrous, with 0-6-stamens and an ovary not divided into a single locule bearing a brush-like stigma at the apex. One-millimeter large seeds are enclosed in the capsule fruits produced after the flowering period.

➤ Habitat and Cultivation

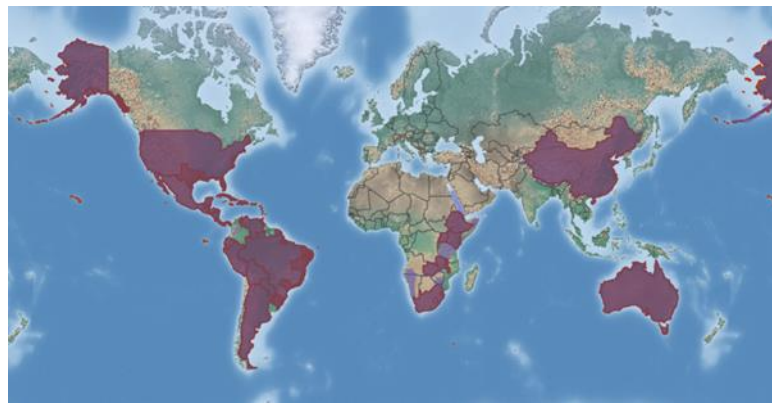
Callisia repens is an extremely adaptable plant that can be used for any number of gardening purposes. Its possible applications for landscaping include an eye-catching presence of whitish ornamental leaves; growing it on roofs for cooling effect of plant transpiration; using it vertically along buildings to absorb more sunlight during winter months; having it hang down from above pots because water never flows there anymore, placing them within boxes near doors or windows where little space allows only small plants with limited root zones and more. It takes a moderate amount of water and can thrive on dry soils in drought conditions, but full sun environments can still be survived by this adaptable plant. It can also be propagated through stem cutting or seeds to make it available for all gardeners.

➤ Utilization and Environmental Considerations

Callisia repens is loved for its solid green alternative leaves and capability of generating dense mats via runners or stolon's since it is an herbaceous plant that remains green all the year round. Its bisexual flowers are white and mostly found in clusters with the inflorescence further adding to its ornamental value. Nonetheless, it is of key importance to manage the plant well if it will not spread too fast as well as take root at nodes hence become invasive in non-indigenous environments.

Simply, *Callisia repens* is an interesting research subject. This is because of its unique morphological character traits as well as diverse habitats where you can find it thriving, such as gardens or even fields; it also has various uses when it comes to gardening or landscaping. For this reason, many people like taking care of *Callisia*; besides, it can grow fast and propagate easily which explains why most people like it in their flower beds while some argue that it may become wild if not taken care of properly.

V. DISTRIBUTION AND HABITAT



A widespread range in birds from the southeastern United States, which includes Texas and Florida, through the West Indies as far south as Argentina represents a wide distribution pattern in *Callisia repens*; it is found in many types of environments ranging from subtropical to tropical forests mainly shady places of rocks or gravel substrates.

Native Range and Habitats

1. **Origin and Spread:** *Callisia repens* is an America native plant, grown in many different ecological niches. This plant thrives best in damp and shaded environments that lie within the low to upper middle levels of high mountains or hills and may even be found close to the seaside, from zero altitude all the way up to 830 meters above sea level.”
2. **Soil Preferences:** In general, the tree grows on rocky bands or sandy or gravelly soils that can range from slightly acidic to very acidic, therefore showing that it can thrive in various types of soil.

➤ Invasive Status and Ecological Impact

Australia's Western region is where *Callisia repens* is identified invasive species. It spread by forming a dense groundcover which quickly spreads rapidly due to its rapid growth rate together with its ability to withstand different environmental conditions it contributes towards the plant being an obnoxious invasive species in this area as it tends to kill many other plants around. Consequently, there may be no more life left for those plants that had been in that area before because they are completely covered up by it while their seeds cannot sprout thus causing possible extinction among them all for fear of losing their habitats when people come into contact with them accidentally either through grazing animals or stepping on them during walks these previous statements imply that destroying of native plants by introduced weeds result into devastation within individual ecosystems such islands coastal plains valleys etc. there would only remain few remaining original plant species normally these are only found far away from civilization such as mountains which humans have not reached because they cannot be reached by aircraft up to date and still retain their self-sustaining.

➤ Human Influence on Distribution

Human activities have also helped *Callisia repens* to spread. *Callisia repens* spreads a lot because estates and hanging baskets that have it look more beautiful. For this reason, it has been introduced in areas where it has never been seen before leading to its escape from gardens and growth in natural conditions.

VI. GENETIC STUDIES

➤ Chromosome Analysis

Cytogenetic study of *Callisia repens*, we counted chromosomes carefully and deduced karyotype formulas from measurements of these metaphase chromosomes as observed in the photomicrographs; while their morphology was described basing on known cytogenetic terminologies at such. We observed that all the five varieties of *Callisia repens*, including turtle vine, green, pink lady, gold and Bianca; consistently had a chromosome count of 12 (2n). Despite of their morphological differences they have uniformity in their genetic base.

➤ Karyotype Variations

The karyotype analysis revealed distinct formulas for each variety, indicating variations in chromosome structure:

1. Turtle Vine: 2 metacentric (m) + 2 submetacentric (sm) + 8 sub telocentric (st)
2. Green: 2m + 10st
3. Pink Lady: 8m + 4st
4. Gold: 2m + 4sm + 6st
5. Bianca: 2m + 2sm + 8st

The research outcomes underscore different chromosomal arrangements associated with those kinds of plants, which are crucial for embracing their genetic variations. On the other hand, PCA showed that some groups could be separated by these indexes after calculating them for each group – this was done regardless of how closely related they appeared morphologically.

In addition, a separate principal component analysis (PCA) of the centromeric index (CI) and leaf colors distinguished all five varieties, confirming the appropriateness of these genetic markers for identifying and grouping them. This genetic characterization is

an important addition to our karyological information about *Callisia repens* and ultimately lays solid ground for future genetic and evolutionary studies.

VII. PHYTOCHEMICAL PRESENT

In our exploration of *Callisia repens*, we have isolated and identified several compounds through chromatographic techniques, which underscore its significant phytochemical profile. The following details provide insights into the specific phytochemicals present in *Callisia repens* and their properties:

Flavonoids: Quercetin, Kaempferol, Myricetin

Phenolic Compounds: Gallic acid, Caffeic acid, p- Coumaric acid

Steroids: Sitosterol, Stigmasterol

Saponins: Triterpenoid saponins

Tannins: Catechins, Proanthocyanidin

The antibacterial, anti-inflammatory, and antioxidant qualities of *Callisia repens* are facilitated by these compounds. The plant's capacity to scavenge free radicals and lessen oxidative stress is linked to the presence of flavonoids and phenolic chemicals in particular, which may support a number of therapeutic uses.

Callisia repens may also include a variety of additional small phytochemicals, such as essential oils and alkaloids, which would further improve its therapeutic qualities. Nevertheless, the precise makeup may differ based on elements like the plant's growth environment and the portion of the plant that is utilized (leaves, stems, etc.).

VIII. MEDICINAL PROPERTIES

➤ Antioxidant Properties

Callisia repens' antioxidant capabilities have been widely researched, with special attention to their leaf extracts in order to produce silver nanoparticles (AgNPs). Our research shows that the AgNPs derived from these leaves have much stronger antioxidant power than just using regular extracts alone. We have found out that those AgNPs that are compared with more extracts have superior antioxidant properties. Tests like AgNPs demonstrate the highest score in Total Phenolic Content (TPC), Ferric Reducing Antioxidant Power (FRAP) and phosphomolybdate assays used for this study implying their improved performance which makes them potentially relevant for therapy. Thus, they can serve as reducing agents against excess free radicals thereby reducing oxidation effects.

➤ Antimicrobial Activity

We analyzed how good *Callisia repens* is for fighting off germs using different research methods which included agar well-diffusion test. We subjected bacterial and fungal strains to the two types of treatment- *Callisia repens* silver nanoparticles and *Callisia repens* leaf extracts. The findings showed that *Callisia repens* is very useful in the fight against harmful microorganisms and its parts can be used to manufacture medicinal drugs with biological activity. The antibiotic properties of *Callisia repens* help redefine its purpose and make it an ideal selection when coming up with fresh.

➤ Phytoremediation Potential

According to studies, *Callisia repens* possesses potential with respect to phytoremediation too, as it can cut down the concentration of dyes in polluted water by approximately 68.77% within 72 hours. The practical application of this choice for phytoremediation strategies in aquatic environments is reinforced by the polyvalence of its habitat and its efficiency as an absorbent medium for pollutants.

IX. CONCLUSION

In this detailed study on *Callisia repens*, we have focused on the amazing genetic variability, invasive potential, and important medicinal properties that this species possesses. Our study has been able to throw some light on the complex genetic makeup and immense possibilities of therapeutic utilities offered by *Callisia repens* through its cytogenetic analysis and examination of the phytochemical compounds. Similarly, the invasive behavior of this species reveals the need for conscious cultivation and management strategies to mitigate environmental impacts in nonnative habitats.

The results of this study will contribute to an improved understanding of *Callisia repens* but also provide the impetus for further studies now focused on the exploitation of its pharmacological potential and ecological challenges. The study demonstrates the need for continuous research in the area of sustainable management practices and new therapeutic agents from *Callisia repens*, underpinning the importance of genetic diversity and the species' adaptability. This work laid the bases for further investigation of the ecological implications, management, and valorization of *Callisia repens*, marking an important step toward exploiting its benefits while minimizing its risks.

X. REFERENCES

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