INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD
ISSN(O): 2455-0620 [Impact Factor: 7.581]
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value : 86.87
Volume - 9, Issue - 5, May - 2023 Publication Date: 10/05/2023

DOIs:10.2015/IJIRMF/202305002 --:-- Research Paper / Article / Review

Monstera deliciosa Liebem (Araceae): a review on its plant profile and pharmacological activities.

[1]Sindhu DK, [2]Mr. Ananda v, [3]Dr. D. Visagaperumal, [4]Dr. Vineeth chandy,
[1]Sindhu D K, Department of Pharmaceutical Chemistry, T. John College of Pharmacy, Gottigere, Bengaluru.
[2]Mr . Ananda v, Department of Pharmaceutical Chemistry, T. John College of Pharmacy, Gottigere, Bengaluru.
[3]Dr. D. Visagaperumal, Department of Pharmaceutical Chemistry, T. John College of Pharmacy, Gottigere, Bengaluru.
Email - [1]dhanusindhudk@gmail.com, [2]anandav186@gmail.com, [3]visagapd@tjohngroup.com.

Abstract: *Monster deliciosa is a medicinal plant, which originated from the tropical forests of southern Mexico and Panama. Araceae is the family in which the plant is from. There are several chemical compounds in the plant that have distinct pharmacological characteristics. Phytochemical constituents like Alkaloids, coumarins, glycosides, amino acids, ligans, tannins, flavonoids and phenolic compounds are found in this plant. Antibacterial, anti-cancer, anti-oxidant, cytotoxicity and anti-fungal, anti-diabetic, anti-inflammatory are some of the pharmacological properties of Monstera species. In this review article, we focused on the information about the plant extract of Monstera deliciosa that exhibits cytotoxic activity, antimicrobial, antibacterial, and anticancer and antioxidant properties. The pharmacological effect of Monstera deliciosa are basically dependent on their phytochemical constituents that have been found in extracts of Monstera deliciosa Liebem.*

Key Words: *Monstera deliciosa, phytochemical constituents, cytotoxic activity antibacterial, anticancer, antioxidant.*

1. INTRODUCTION:

Natural substances with therapeutic capabilities have been used for medicinal purposes since the dawn of human civilization, and for a very long time, the primary sources of medications were minerals, plants, and animals. An increasing number of people around the world lack access to conventional pharmacological treatment and causing ineffective of conventional medicines, folk medicine and environmental awareness suggest that natural products are safe and conventional. Additionally, abusing or incorrectly using synthetic drugs can cause side effects and other issues[1]. In order to identify and comprehend the function of elements like alkaloids, flavonoids, coumarins, glycosides, amino acids, ligans, tannins, and many others, we found a set of medicinally significant chemical families present in plants[2]. There are thousands of known and undiscovered phytochemicals. Phytochemicals, which are found in ancient plants, have the ability to treat a wide range of illnesses in other organisms, including humans and phytochemicals that are present in the historical plants not only protect and develop the plant species themselves but also has the potential to heal various diseases.

The 105 genera and over 3000 species of herbaceous monocotyledons that make up the family Araceae are primarily tropical in distribution, with the tropics home to 90% of the genera and roughly 95% of the species. Several well-known cultivated foliage and flowering plants, including Philodendron, Monstera, Spathiphyllum, and Anthurium, are members of this family [3]. *Monstera deliciosa*, one of the most commonly cultivated aroids, is a morphologically variable species. It is a type of flowering plant that is indigenous to the tropical forests of southern Mexico and Panama. Common names for *Monstera deliciosa* include Swiss cheese plant and split-leaf philodendron.It is cultivated extensively as a houseplant in temperate regions. Since ancient times, the Araceae family has drawn attention for its traditional uses. With antioxidant, hepatoprotective, antibacterial, anticancer, nutritional, and antinutritional qualities, this family of species is used as a phytomedicine.

2. PLANT PROFILE :

Vegetative shoots of *Monstera* are normally unbranched, though lateral buds may be released in very old portions of a stem or in injured stems. Flowering is always accompanied by cryptic sympodial branching; the

INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD
ISSN(O): 2455-0620 [Impact Factor: 7.581]
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value : 86.87
Volume - 9, Issue - 5, May - 2023 Publication Date: 10/05/2023

inflorescence is terminal and the continuation shoot arises in the axil of the leaf preceding the leaf which subtends the inflorescence [4]. *Monstera adansonii* species of the same genus, the popular name "Swiss cheese plant" is also used. Even though neither plant belongs to the genus Philodendron, his popular name "split-leaf philodendron" is also applied to the species Thaumatophyllum bipinnatifidum. "Delicious" refers to the edible fruit when the specific epithet *deliciosa* is used. The name *Monstera*, which means "monstrous" or "abnormal" in Latin, refers to the peculiar leaves with built-in holes that the species' members have. It is often believed that its common name as a houseplant, "Swiss cheese plant," or simply "cheese plant," refers to the "eyes" or holes that form in its leaves and resemble the holes in various Swiss-type cheeses, such as Emmental cheese. The leaves are alternate, leathery, dark green, very large, from 25–90 centimetres (9.8–35.4 in) long (up to 130 centimetres (51 in) long in *M. dubia*) and 15–75 centimetres (5.9–29.5 in) broad, often with holes in the leaf blade. The fenestrated leaves allow for the leaves to spread over greater area to increase sunlight exposure, and to allow light to reach other leaves below, by using less energy to produce and maintain the leaves [5].

The genus *Monstera* comprises roughly 50 species of flowering plants that are indigenous to the tropics of the Americas and belong to the arum family. The Swiss cheese plant, *Monstera deliciosa*, is named by its distinctively shaped, deep-divided, glossy green leaves that resemble Swiss cheese. The names "hurricane plants" and "Mexican breadfruit" are also used frequently. It is an epiphyte with aerial roots, able to grow up to 20m (66 ft.) high .While they rarely flower indoors, outdoors they produce flowers that develop into edible fruit and it is said to taste like a fruit salad. It is a tropical fruit that flourishes in muggy, humid temperatures. Traditionally, several societies in Mexico and Peru use the roots as rope and basket weaving material. Infusions of the roots have been used medicinally by Mexicans to treat arthritis pain, and the roots are also used in Martinique to treat snakebites. Brazilians warm the leaves and mash them to cauterise wounds, while pieces of the *Monstera* plant are used in China to treat fever, infections, bruises, coughs, and bruises [7].

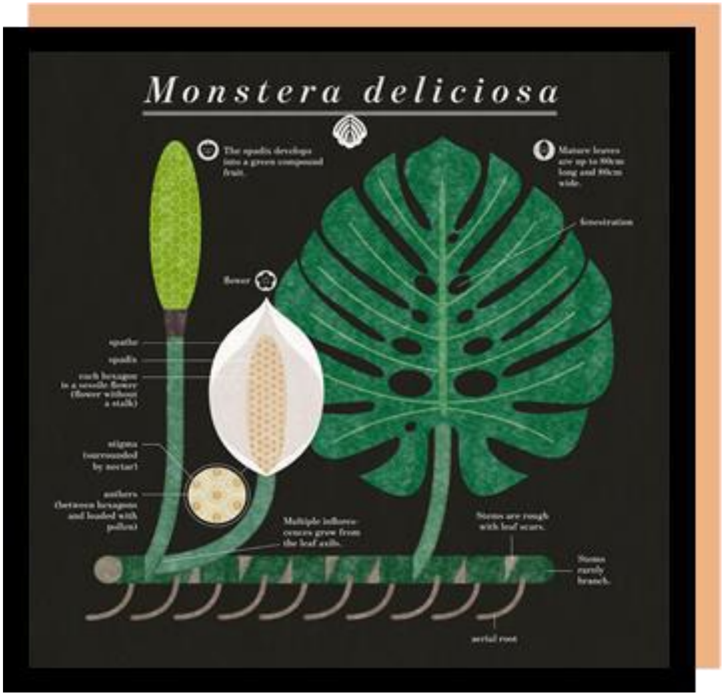


Fig: 1 different parts of *Monstera deliciosa* [6] .

Fig 2: various species of *Monstera deliciosa*

Vernacular Names

- **Brazil:** Banana-Do-Brejo, Banana-Do-Mato (Portuguese)
- **Chinese:** Gui Bei Zhu
- **Columbia**: Hojadillo
- **Dutch:** Gatenplant Vensterblad, Vingerplant.
- **French:** Ananas De Mexico, Anana Du Pauvre, Cériman, Monstère Délicieux, Monstera, Philodendron Monstéra, Philodendron À Feuilles Incisées.
- **German:** Philodendron, Fensterblatt, Köstlicher Kolbenriese, Zimmer-Philodendron.
- **India:** Amar-Phal;
- **Italian:** Monstera;
- **Japanese:** Monsutera Derishioosa.
- **Martinique:** Siguine Couleurr.
- **Mexico:** Piñanona.
- **Nepalese:** Lahare Karkalo.
- **Portuguese:** Banana De Brejo, Banana De Macao, Banana Do Mato, Deliciosa, Fruta De México, Costela De Adão, Balaço, Tornélia.
- **Russian:** Monstera Delikatesnaia, Monstera Lakomaia, Monstera Prelestnaia, Monstera Privlekatel'naia.
- **Spanish:** Balazo, Pinanona, Costilla de Adán, Piñanona monster, Cerimán De México, Hojadillo, Huracán, Ojal, Piña Anona, Piñanona Monstera .

Synonyms

- *Monstera borsigiana* K.Koch, *Monstera deliciosa* var. *borsigiana* Engl.,
- *Monstera deliciosa* var. *sierrana* G.S.Bunting,
- *Monstera lennea* K.Koch,
- *Monstera tacanaensis* Matuda,
- *Philodendron anatomicum* Kunth,
- *Tornelia fragrans* Gut. Ex Schott nom. illeg.

For the more intrepid *Monstera* plant parent, there's also an eclectic mix of *Monstera* plant types to discover:

- *Monstera epipremnoides*
- *Monstera obliqua*
- *Monstera punctulata*
- *Monstera karstenianum (Monstera sp. Peru)*
- *Monstera standleyana*
- *Monstera pinnatipartita*
- *Monstera siltepecana*
- *Monstera variegata*
- *Rhaphidophora tetrasperma (Mini Monstera)*[8].

Table: 1 scientific classification

Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms

Clade	Monocots
Order	Alismatales
Family	Araceae
Subfamily	Monsteroideae
Genus	Monstera
Species	*M. deliciosa*

3. DESCRIPTION:

This hemiepiphyte has aerial roots and belongs to the arum family (Araceae). The name of the genus, which relates to the odd leaves with built-in holes that some members of the species have, comes from the Latin meaning "monstrous" or "abnormal." In the wild, it can reach a height of 20 m (66 ft), and its enormous, glossy, pinnate, leathery, heart-shaped leaves are 25–90 cm (10–35.5 in) long by 25–75 cm (10–29.5 in). Young plants have tiny, complete leaves without lobes or holes, but as they mature, they rapidly develop lobes and fenestrate leaves. Although it can reach heights of up to 3 m (6.6 ft) in the wild, it only reaches heights of 2–3 m (6.6–9.8 ft) when grown inside. The typical big perforations are more prevalent on the leaves of an older plant. In *Monstera deliciosa*, there are three different kinds of roots: aerial roots, aerial roots that have penetrated the ground (aerial-subterranean roots), and lateral roots that develop on aerial-subterranean roots (lateral-subterranean roots). The anatomical maturation and growth of the three root types varied. Aerial roots had the greatest elongation rate and greatest elongation zone. The accelerated elongation rate of aerial roots was correlated with an elongation zone that enlarged with time [9].

Fig: 3 plant of *Monstera deliciosa*

Fig: 3.1 leaves of *Monstera deliciosa*

Next, when they come across a tree trunk, wild seedlings start to travel upward, climbing up the tree. At first, they move into the darkest location they can find. The inflorescence is adorned with a cream-white spathe that has a uniform, velvety appearance. It serves as a hood for a yellowish-white spadix that measures 3 cm (1.2 in) in diameter and 10 to 15 cm (3.9 to 5.9 in) high. Self-pollinating flowers are those that include both androecium and gynoecium. The presence of both structures in this plant allows it to self-pollinate.

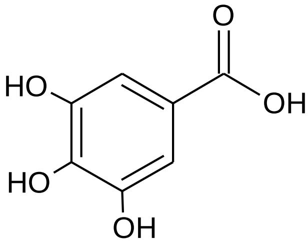
Synonyms, common names, uses

- **Synonym**: Philodendron pertusum Kunth & Bouche.
- **Common names**: *Monstera*, split-leaf philodendron, ceriman, Mexican breadfruit, Swiss-cheese plant, breadfruit vine, hurricane plant, fruit-salad plant, window plant, cut-leaf philodendron.
- Traditional Medicinal Uses: In Mexican traditional medicine, a leaf or root infusion is taken daily to relieve arthritis. A preparation of the root is employed in Martinique as a cure for snakebite.
- Other Uses: They are frequently raised inside as houseplants. The most well-known member of the species, *Monstera deliciosa*, is also grown for its edible fruit, which has a flavour similar to a cross between banana and pineapple. Due to its lengthy vase life and eye-catching foliage design, *Monstera deliciosa's* cut foliage is frequently utilised in flower arrangements. There aren't many commercially significant variegated *Monstera* .

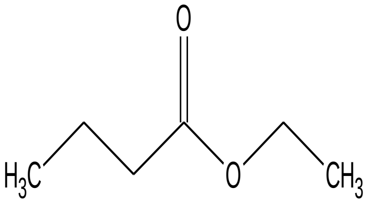
INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD
ISSN(O): 2455-0620 [Impact Factor: 7.581]
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value : 86.87
Volume - 9, Issue - 5, May - 2023 Publication Date: 10/05/2023

4. CHEMICAL CONSTITUENTS :

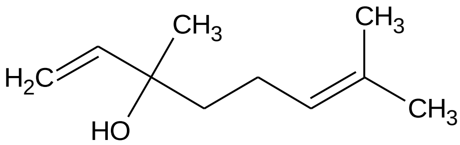
Primary substances including chlorophyll, proteins, and common sugars are examples of secondary compounds found in *Monstera deliciosa* (for e.g., alkaloids, phenolics, terpenoids, and other chemical constituents). For instance, alkaloids, saponins, steroids, and triterpenoids demonstrate that the secondary metabolites described above are responsible for *Monstera deliciosa's* anti-analgesic, antidiuretic, anti-inflammatory, anticancer, antiviral, anti-bacterial, and antifungal properties. In addition to other phytochemicals including gallic acid, quercetin, and catechin, the pharmacological examination of *Monstera deliciosa liebem* extracts revealed that it contains considerable levels of tannins, steroids, flavonoids, alkaloids, and saponins. It has a delightful blend of consistency, sweetness, flavour, and aroma, along with a slight acidity and astringency. Ethyl butanoate and linalool, limonene and ethyl butanoate were found in the fruit. *Monstera deliciosa* contained large amounts of lignin (6.5% w/w) and traces of suberin (0.5% w/w). The chemical characterization of endodermal cell walls from five different species revealed that lignin was the dominant cell wall polymer in the Casparian band of *M. deliciosa* [10].



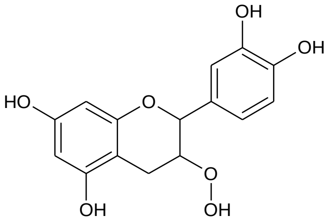
Catechin



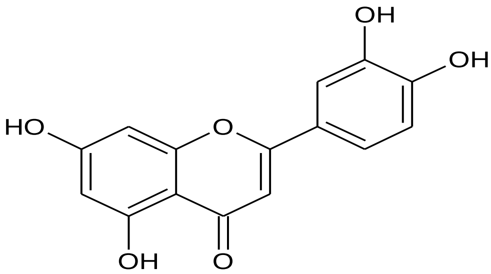
linalool



Ethyl butanote



Gallic acid



Quercetin

5. LITERATURE REVIEW:

Antibacterial and antioxidant activities

V. Umamaheshwara Rao *et al.*, had studied the evaluation of phytochemical constituents, antibacterial and antioxidant activities of *Monstera deliciosa liebm*. Stem extracts. *Monstera deliciosa* plant stem extracts contain significant amounts of Phenolics, Flavonoids, alkaloids and Tannins. Different extracts of this plant have different phytochemicals, potential antibacterial and antioxidant activities. The goal of the current study was to examine the preliminary phytochemical screening, total phenolic, tannin, and flavonoid content, in vitro antibacterial activity, and antioxidant activity of several solvent extracts of *Monstera deliciosa* stem. Phytochemical screening was done following accepted procedures. The diffusion through agar wells method was used to test the antibacterial activity and the DPPH (2, 2-diphenyl-1-picryl-hydrazyl) method was used to test the antioxidant activity. Both the Gram positive and Gram negative microorganisms examined were susceptible to hexane extract's antibacterial properties. Compared to normal streptomycin, ethyl acetate extract showed a wider zone of inhibition against *Serratia marcescens*. Hexane, Chloroform, Ethyl acetate and Methanol extracts at 100µg/ml and 200µg/ml concentrations exhibited more free radical scavenging activity than the standard Ascorbic acid, whereas hexane and chloroform extracts at 300µg/ml concentrations showed more free radical scavenging than the standard Ascorbic acid. The findings of this study indicate that this plant has therapeutic value due to the presence of numerous phytochemicals [11].

Chakraborty Mainak *et al.*, had studied the *in vitro* antioxidant activity and total phenolic content of *Monstera deliciosa*. On the basis of antioxidant properties and total phenol content was estimated for methanol extract of *Monstera deliciosa* (MEMD). The antioxidant effect of *Monstera deliciosa* was determined by different *in vitro* standard methods. These are inhibiting the cell damage by free radicals and also exhibits the total phenolic content present in stem of *Monstera deliciosa*. The free radical scavenging capacity and total phenolic content of *Monstera deliciosa's* methanol extract are assessed in the current study, by using a variety of in vitro standard techniques, including the 1,1-diphenyl-2-picrylhydrazil radical (DPPH), nitric oxide, superoxide anions, and hydroxyl radicals, the antioxidant properties of the aforementioned extract of *Monstera deliciosa* were assessed. The phenol content for the methanol extract of *Monstera deliciosa* was evaluated based on antioxidant capabilities (MEMD) [12].

Zhu HongXia ***et al.*****,** studied the Effect of NaCl stress on physiological and biochemical characteristics of *M. deliciosa* Liebm. A pot experiment was conducted to study the influence of different concentrations (0, 50, 100, 200, 300 mmol/L) of NaCl on the osmotic adjustment substances content, chlorophyll content, antioxidant enzyme activity of *M. deliciosa* Liebm. The results showed that with the NaCl concentration increasing and salt-stress time extending, contents of soluble sugar, soluble protein and proline presented a tendency of elevating first and then decreasing, which enhanced at lower NaCl concentrations (≤100 mmol/L) compared with the control, whereas began to descend under higher NaCl treatment (≥300 mmol/L) except proline content at 40 d after stress. The change tendency of malondialdehyde content was opposite, showing a trend from declining to rising. Chlorophyll content was stimulated firstly and then inhibited by the increase of NaCl concentration, and the variation width under long-salt-stress was less obvious than that under short-salt-stress. With the NaCl concentration increasing and salt-stress time extending, SOD, POD and CAT activities increased first and then showed downward trend, which were increased compared with the control whether at lower NaCl concentrations or higher. In conclusion, under the stress of lower NaCl concentrations (≤100 mmol/L) *M. deliciosa* Liebm could increase osmotic adjustment substances and induce antioxidant defense mechanism to minimize the damage by NaCl stress [13].

Anticancer activity

Pal Prosanta ***et al*****.,** had studied the evaluation of anticancer activity of methanol extract of *Monstera deliciosa* in EAC Induced Swiss Albino Mice on Ehrlich ascites carcinoma (EAC) treated mice. The reduction in antioxidant enzyme catalase activity in EAC control mice was improved in liver by the treatment with MEMD (methanol extract of *Monstera deliciosa*). The goal of the study was to determine whether the methanol extract of *Monstera deliciosa* (MEMD) had any anticancer and antioxidant effects on mice treated with Ehrlich ascites carcinoma (EAC). Materials and procedures the try pan blue and MTT assay method has been used to evaluate the in vitro cytotoxicity assay. The evaluation of in vivo anticancer efficacy was carried out utilising mouse groups that had been infected with EAC cells (n = 12). The groups received MEMD treatments for 9 days in a row at dosages of 50 and 100 mg/kg body weight, respectively. After 24 hours from the last injection, half of the mice were killed while the other half were kept alive to gauge any gain in life expectancy. By analysing tumour volume, viable and nonviable tumour cell count, tumour weight, haematological parameters, and biochemical estimates, the anticancer potential of MEMD was evaluated. Moreover, estimates of liver tissue enzymes were used to test antioxidant properties. MEMD demonstrated dose-dependent direct cytotoxicity on the EAC cell line. In mice bearing EAC tumours, MEMD significantly (P 0.05) decreased tumour volume, viable cell count, and tumour weight while increasing survival time. In mice treated with MEMD, the haematological profile, biochemical assessments, and tissue antioxidant assay returned to normal levels. The results of the experiments showed that MEMD has strong anticancer and antioxidant effects. Further investigation is being done to determine the active principle(s) of MEMD in order to better comprehend the mechanism of its antitumor and antioxidant activity [14].

Antimicrobial activities

Evgeny Savitsky ***et al.*****,** had studied the dynamics of the seasonal activity of exometabolites for the lianas from the families: *Araceae — Epipremnum aureum* G.S. *Bunting, Monstera deliciosa Liebm*. var. *borsigiana* H *Araliaceae — Hedera helix* L. and *Schefflera octophylla* (Lour.) Harms. By exposing inoculated microbial test cultures of Staphylococcus epidermidis, Escherichia coli, and Candida albicans to plant volatile emissions in Petri dishes, the antibacterial activity of intact plants was assessed. The scale of phytoncide activity was used to compare the antimicrobial effect to the reference. Exometabolites of intact plant leaves' antibacterial activity were shown to be species- and season-specific. The resistance to *S. epidermidis* in all the tested plants showed a moderate seasonal variation. There was found to be ongoing seasonal activity for *S. octophylla*. Strong anti-E coli activity was displayed by H. helix, *M. deliciosa* var. borsigiana, and S. octophylla, whilst E. aureum and *S. octophylla* had antifungal properties. S. epidermidis was the subject of intense antifungal and antiviral treatment during the summer's rapid development and the autumn-winter period. S. epidermidis was the target of significant antifungal and antibacterial activities. These experimental results demonstrate species-specific antibacterial activity of plants against the test objects at various times of seasonal development [15].

Cytoxicity activities

Dilshad Noor Lira *et al.*, had studied the assessment of cytotoxic activities of *Phyllanthus amarus* and *Monstera deliciosa. The* two ethno-pharmacological medicinal plants were chosen and screened by brine shrimp lethality bioassay which is simple, reliable and convenient method for evaluation of bioactivity of medicinal plants. A straightforward, trustworthy, and practical approach for determining the bioactivity of medicinal plants, the brine shrimp lethality bioassay, was used to study the cytotoxicity of *Phyllanthus amarus* and *Monstera deliciosa*. The plants were taken out of their native environment, allowed to dry out in the shade, and then extracted using ethyl acetate. In this investigation, the ethyl acetate extract of *Phyllanthus amarus* demonstrated strong cytotoxicity, with LC50 values for the leaves and the entire plant being 9.15 g/ml and 20.16µg/ml, respectively. *Monstera deliciosa* showed cytotoxicity, with LC_{50} values for the leaves and branches of 36.60µg/ml and 300.4µg/ml respectively. The results indicate that *Phyllanthus amarus* extracts have cytotoxic properties and are far more potent when used on the leaves as opposed to the entire plant. In case of *Monstera deliciosa* the extractives of leaves exhibited very mild mortality while the extractives of branches did not show considerable cytotoxicity [16].

Other Activities

Shanan *et al.*, had studied the influence of some chemical compounds as anti-transpirant agents on vase life of *Monstera deliciosa* leaves. Use of anti-transpirant agents for increasing the vase life of *Monstera deliciosa* by sodium carbonate and glycerol treatment that decreasing in the reduction rate of leaf weight, the treatment had a slight rate of water loss and has a slight reduction rate of leaf weight, which may be reflected on decreasing of transpiration rate. The effects of MgCO3, Na2CO3, and glycerol at four concentrations on the lengthening of the vase life of cut *Monstera deliciosa* leaves (2, 4, 6, and 8%). Two tests were conducted for this goal over the years 2008 and 2009. Two, four, and six days after cutting the leaves, each treatment was sprayed three times. The results showed that glycerol at 2 or 4% considerably increased the vase life of *M. deliciosa* cut leaves by 7 times over the control (7 days) and outperformed the other treatments. Moreover, glycerol treatment at the specified doses demonstrated the least amount of water loss and leaf weight loss, both of which had a noticeable impact on the length of the leaf vase's life. The response of glycerol on prolonging leaf vase life was accompanied by a decrease in the degradation of pigments and protein as well as decrease the percentage of defense enzymes (superoxide dismutase and catalase) and this correlated with decreasing leaf water loss [17]

Dewi R *et al.*, had studied the english narrative review*: Monstera deliciosa* sebagai antibakteri dalam sediaan spray hydrogel 3 in 1. *Monstera deliciosa*, have many volatile components that have shown the antibacterial activity including the components like 1,6-Cyclodecadiene, 6,10,14-trimethyl-2-Pentadecanone, naphthalene, limonene, 1–methyl–5–methylene–8-(1-methylethyl), and 2-Furanmethanol, thus *monstera deliciosa* can be used as an antibacterial agent in spray hydrogel 3 in 1 spray dosage form[18].

Vitor Spínola *et al.*, had studied the establishment of *Monstera* deliciosa fruit volatile metabolomic profile at different ripening stages using solid-phase microextraction combined with gas chromatography–mass spectrometry. Using headspace solid-phase micro extraction (HS-SPME) along with gas chromatography-quadrupole mass spectrometry detection, three ripening stages, including ripe, half-ripe, and unripe, were identified (GC–qMS). The quantitative and qualitative composition of *M. deliciosa* fruits at various stages of ripeness showed extraordinary variances [19].

Renata Unnep *et al.*, had studied the non-photochemical quenching-related thylakoid membrane reorganisations discovered by small-angle neutron scattering of *Monstera deliciosa* leaves. The non-photochemical quenching-related thylakoid membrane reorganisations discovered by small-angle neutron scattering of *Monstera deliciosa* leaves. Thylakoid membrane reorganisation caused by non-photochemical quenching and small-angle neutron scattering of *Monstera deliciosa* leaves. This illustrates how lighting affects the way thylakoid membranes are organised in *Monstera deliciosa* leaves. This medicinal species is known to exhibit unusually substantial NPQ (non-photochemical quenching), which serves as a form of self-defence against the harmful effects of intense light [20].

T. Barros *et al.*, had studied Characterization of the *monstera deliciosa* fruit's physicochemical properties and distillate production capability. The physical-chemical, dietary, and sensory properties of *M. deliciosa* fruit were identified. Also, the volatile profiles of the fruit, the fermented pulp, and the distillate were compared, as well as experimental distillate production and characterization. Fruit from *M. deliciosa* has a pleasing blend of consistency, sweetness, flavour, and scent that may be attributed to the presence of volatiles such ethyl butanoate and linalool. It also has a slight acidity and astringency [21].

V Bertolini *et al.*, had studied the growth of *Monstera acuminata Koch* and *Monstera deliciosa Liebm* (Araceae) in an aseptic manner from leaves, as well as the stimulation of *M. acuminata K* in *vitro* organogenesis from stem discs of early shoots. To achieve this, several cleaning procedures were used on mature leaves and immature shoots. Leaf explants measuring roughly 1 cm2 and stem discs measuring approximately 1 mm thick were then removed. In order to induce organogenesis and maintain aseptic conditions, the explants were grown in semi-solid media with various hormone therapies. Less oxidation was encouraged in the leaf explants of both species following disinfection with 3% sodium hypochlorite (NaClO) for 20 min. and 50% Murashige and Skoog media with plant tissue culture preservative (PPM). After 49 days in culture, *M. deliciosa* explants in both treatments that were grown in PPM-added media and at different disinfection protocols persisted, exhibited no evidence of contamination, and were healthy. After 35 days of development, disinfection in Tween-20 + 20% ethanol + 2.5% NaClO, and planting of explants in MS media supplemented with 1 mg/L of BAP, 0.5 mg/L of AIA, and 0.1 mg/L of ANA, seven new shoots of stem discs were induced. In vitro conditions were favourable for *Monstera deliciosa's* growth. The foundation for ex-situ conservation of local populations is improvements in the aseptic environment and the induction of organogenesis in native Araceae for wicker production [22].

M.M. Farahat *et al.*, had studied the RESPONSE OF *Monstera deliciosa Liebm* TO PLANT SPACING AND NITROGEN SOURCES FERTILIZER i.e., mineral nitrogen (MN) and organic nitrogen (ON); on the growth of ceriman (*Monstera deliciosa Liebm*). 70 cm separated each row, with plant spacing treatments of 50, 60, and 75 cm between plants. Control, 100% MN, 100% ON, 75% MN+25% ON, 50% MN+50% ON, and 25% MN+75% ON were the fertilisation treatments for MN and ON. According to the study's findings, a distance of 50 cm between plants resulted in the highest values for plant height, while a distance of 75 cm between plants produced the highest values for stem diameter, number of leaves per plant, petiole length, leaf width, area (cm2), and fresh and dry weights of all plant organs. Interaction between plant spacing and nitrogen sources resulted in the maximum values of the number of leaves/plant, petiole length, leaf length, leaf width, leaf area and fresh and dry weights of all plant organs with spacing of 75 cm between plants and applying 100% MN fertilization, except, the maximum value of plant height under spacing 50 cm treated with 100% MN fertilization [23].

6. RESULT AND CONCLUSION :

The phytochemical screening investigation of *M. deliciosa* revealed the presence of numerous phytochemicals in various solvent extracts and extraction techniques. The *M. deliciosa* was found to include tannins, free anthraquinones, steroids, and carbohydrate compounds. All of the solvent extracts contained flavonoids, with the exception of the ethyl acetate extract. Alkaloids, saponins, monosaccharides, free reducing sugars, and mixed reducing sugars were only present in the methanol extract. All solvent extracts, excluding hexane, contained cardiac glycosides. But every solvent extract was found to be devoid of terpenoids and soluble starch.

7. CONCLUSION:

Studies conducted for the current inquiry found a variety of phytochemicals that showed possible antibacterial, antioxidant, antimicrobial, cytotoxic, and anticancer properties. The therapeutic benefit of *Monster deliciosa* is found in its phytochemical components, which have a clear physiological function. Primary phytochemicals include chlorophyll, proteins, and common sugars, while secondary phytochemicals include terpenoids, alkaloids, and phenolics. It was discovered that the medicinal plant used for this investigation was a reliable supplier of the secondary metabolites (Alkaloids, Flavonoids, Terpenoids, Tannins and reducing sugars).

REFERENCES:

1. Rates, S. M. K. (2001). Plants as source of drugs. *Toxicon*, *39*(5), 603-613.
2. Boylan, M. (2007). Hanson B. Understanding Medicinal Plants. Their Chemistry and Therapeutic Action. *Journal of the Australian Traditional-Medicine Society*, *13*(1), 45-46.
3. Boyce, P. (1995). Introduction to the family Araceae. *Curtis's Botanical Magazine*, *12*(3), 122-125.
4. Madison, M. (1977). A revision of Monstera (Araceae). *Contributions from the Gray Herbarium of Harvard University*, (207), 3-100.
5. https://en.wikipedia.org/wiki/Monstera Assessed on (28/02/2023).
6. https://www.plantcelltechnology.com/blog/tissue-culture-propagation-of-*monstera-deliciosa*/. Assessed on (28/02/2023).

7. Mounika, K., Banerjee, A., Panja, B., & Saha, J. (2017). Anthracnose disease of Swiss cheese plant [Monstera deliciosa Liebm.] caused by Colletotrichum sp. from West Bengal.
8. Lim, T. K. (2012). *Edible medicinal and non-medicinal plants* (Vol. 1, pp. 656-687). Dordrecht, the Netherlands: Springer.
9. Hinchee, M. A. (1981). Morphogenesis of aerial and subterranean roots of Monstera deliciosa. *Botanical Gazette*, *142*(3), 347-359.
10. Zeier, J., & Schreiber, L. (1998). Comparative investigation of primary and tertiary endodermal cell walls isolated from the roots of five monocotyledoneous species: chemical composition in relation to fine structure. *Planta*, *206*, 349-361.
11. Rao, V. U., Viteesha, V., Suma, K., & Nagababu, P. (2015). Evaluation of phytochemical constituents, antibacterial and antioxidant activities of Monstera deliciosa Liebm. stem extracts. *World J Pharm Pharm Sci*, *4*(11), 1422-1433.
12. Prosanta, P., Mainak, C., Indrajit, K., Sagnik, H., Avratanu, D., & Kanti, H. P. (2015). In vitro Antioxidant Activity and Total Phenolic Content of Monstera deliciosa. *International journal of pharmacognosy and phytochemical research*, *7*(3), 416-419.
13. Zhu, H., Guo, H., & Zhang, J. (2016). Effect of NaCl stress on physiological and biochemical characteristics of M. deliciosa Liebm. *Journal of Henan Agricultural Sciences*, *45*(9), 98-106.
14. Prosanta, P., Mainak, C., Indrajit, K., Sagnik, H., Avratanu, D., & Kanti, H. P. (2015). Evaluation of anticancer activity of methanol extract of Monstera deliciosa in EAC induced Swiss albino mice. *Int. J. Toxicol. Pharmacol. Res*, *7*, 165-170.
15. Savitsky, E., Fershalova, T., & Tsybulya, N. (2020). Seasonal antimicrobial activity of the volatile exometabolites of some tropical lianas during introduction. In *BIO Web of Conferences* (Vol. 24, p. 00074). EDP Sciences.
16. Lira, D. N., Uddin, M. A., Uddin, M., & Rouf, A. S. S. (2014). Assessment of cytotoxic activities of Phyllanthus amarus and Monstera deliciosa. *Journal of Applied Pharmaceutical Science*, *4*(7), 110-113.
17. Shanan, N. T., & Shalaby, E. A. (2011). Influence of some chemical compounds as antitranspirant agents on vase life of Monstera deliciosa leaves. *Afr J Agric Res*, *6*(1), 132-139.
18. Dewi, R. D. S., Janna, M., & Saranani, S. (2021). NARRATIVE REVIEW: MONSTERA DELICIOSA SEBAGAI ANTIBAKTERI DALAM SEDIAAN SPRAY HYDROGEL 3 IN 1. *Berkala Ilmiah Mahasiswa Farmasi Indonesia*, *8*(2), 1-11.
19. Spínola, V., Perestrelo, R., Câmara, J. S., & Castilho, P. C. (2015). Establishment of Monstera deliciosa fruit volatile metabolomic profile at different ripening stages using solid-phase microextraction combined with gas chromatography–mass spectrometry. *Food Research International*, *67*, 409-417.
20. Ünnep, R., Paul, S., Zsiros, O., Kovács, L., Székely, N. K., Steinbach, G., ... & Nagy, G. (2020). Thylakoid membrane reorganizations revealed by small-angle neutron scattering of Monstera deliciosa leaves associated with non-photochemical quenching. *Open biology*, *10*(9), 200144.
21. Barros, T., Galego, L., & Pires-Cabral, P. (2018). Monstera deliciosa fruit: physicochemical characterization and potential for distillate production. *Journal of Food Measurement and Characterization*, *12*(4), 2874-2882.
22. Palomeque, N. M. C., Bertolini, V., & Donjuan, L. I. (2021). In vitro establishment: Monstera acuminata Koch and Monstera deliciosa Liebm. *Trends in Horticulture*, *4*(1), 13-21.
23. Darwesh, M. A., El-Shiaty, O. H., Farahat, M. M., & Ibrahim, A. S. (2011). RESPONSE OF Monstera deliciosa Liebm. TO PLANT SPACING AND NITROGEN SOURCES FERTILIZER. *Egyptian Journal of Agricultural Sciences*, *62*(1), 81-92.