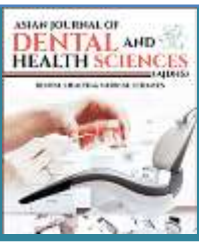

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Iris ensata Thunb: Review on Its Chemistry, Morphology, Ethno Medical Uses, Phytochemistry and Pharmacological Activities

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Abstract

Medicinal plants are mainly used as herbal medicine and play an essential role in primary health care, ethno-medicine system and production of appropriate drugs. Due to this multi-usage, trade network demand for the different medicinal species can extend to national as well as international boundaries. As only little studies are done on this plant, the purpose of current review is to make accessible up-to-date information on, botany, morphology, ecological biodiversity, therapeutic uses, phytochemistry and pharmacological activities on diverse parts of *Iris ensata* Thunb. The plant Iris ensata Thunb belongs to the family Iridaceae. It has been praised by the physicians of all times as a panacea and is broadly used in a huge number of disases. It heals up the chronic ulcers and absess, useful in insect bite, burns, vitiligo, weakness of muscles, itching and dandruff. It is emmenagogue, anti-inflammatory, anti orchitis, used in cold cough, in all humours, pneumonia, dyspnoea. The egesta accumulated in the chest are attenuated and resolved by Irsa, it is emetic and purgative. Ibne Sina recommends its efficacious actions in strengthening the wisdom and intellect, cures head injuries skull bone fractures, phlegmic and hot swelling. Ibne Baitar quoted that it is useful in tooth ache, dyspnoea, spleenomegaly, rigidity of uterus, flatulence, it is abortifacient, anti tussive. The fermentation with sosan is benifecial in endometritis, adenitis and hard swelling. Its efficacy in dyspnoea, asthma, thorasic pain, hydropes, jaundice, haemorrhoids, liver complaints, and sciatica. Root of Iris ensata Thunb are reach source of glycosides steroids, resins, proteins, phenolic compounds and also tannins. Flowers of this plant also contains anthocyanin 5-0-glucosyltransferase (R2) and anthocyanin-flavone e.g. malvidine 3KGaC5G, petunidine 3KGac5c, delphinidine 3RGac5G, petunidine(R2) . The epigeal parts of this plant contain mangiferin(R) and leteolin C-glycosides. This review highlights the traditional, ethnobotanical, phytochemical, pharmacological information available on *Iris ensata*, which might be helpful for scientists and researchers to find out new chemical entities responsible for its claimed traditional uses.

Keywords: *Iris ensata* Thunb, Phytochemistry, Pharmacological activity, Ayurveda, Medicinal uses

INTRODUCTION

Plant diversity is an important segment for biological diversity and is also useful for successful regulation of the ecosystem. Plants are performing as important ingredients in nature and are used in multifold directions among the human beings[1]. From the ancient time, herbal medicines have been used for the welfare of mankind as medicines to cure the series of diseases. New drugs of plant derivation are crucial because they are cheap, have little side effects and in accordance with WHO, about 80% of the world population are still depends mainly on plant based drugs[2,3]. As of now, it is well established that medicinal plants serve as lead molecules in modern medicines and nutraceuticals because of their derived phyto-constituents[4]. Iris L., commonly known as Iris, are perennial plant growing from creeping rhizomes (rhizomatous Irises) in temperate region (1000-3000 m altitude) or, they can also grow in drier climates, from bulbs (bulbous Irises) belonging to the Iridaceae a family placed under the order Asparagales[5]. Almost cosmopolitan in distribution, it is one of the most important and prized group of plants in horticulture and floriculture. Plants of genus Iris comprise over 3000 species in the world of which twelve species are reported in India[6] but most commonly Iris species found in India are Iris croceae, Iris ensata, Iris germanica, Iris hookerian, Iris kumaonensis and Iris kashmiriana specially found in Himalayan regions. Medicinal plants belongs to this genus has been named Irsa in Iranian traditional medicine. Iris is a genus of variety of species of flowering plants with showy flowers. Several cultures have used species of Iridaceae as food, ornamental, condimental, or medicinal plants. The Navajo, the largest Native American tribe of North America used decoctions of Iris missouriensis as an emetic[7]. Pieces of the rhizome of the same species were used to relieve toothaches[8] or earaches[9].The mashed roots of Iris versicolor were applied to wounds, presumably as an antiseptic[10] and the infusions of dry roots of the same species were used to calm pain. Sisyrinchium acre was used in Hawaii in different ways. Leaves or leaf-sap were used as a dye, to give the blue color to tattoos. The use of the leaves, macerated with salt, sugar and other spices was recommended to clean the skin and cure skin diseases[11]. Iris ensata was used in India as anthelmintic and diuretic, and, mixed with other species, to treat venereal diseases[12]. Therefore, in this study, the ethno pharmacological review of *Iris ensata* was carried out aimed at providing a detailed précis of the botany, ethnomedicinal uses, pharmacological activities and chemical composition of the species.

RESEARCH METHODOLOGY

To recognize pertinent information on the botany, medicinal uses, phytochemistry and biological activities of *C. latifolium*, a review was compiled based on scientific literature from various sources including Google Scholar, Web of Science, SciFinder, Scopus, Science direct, PubMed, Scielo, Springerlink, Google Patents, Espacenet, BioMed Central (BMC) and Medline. The keywords used for recognition of relevant data included dissimilar scientific name and synonyms, common English names and the terms: biological activities, medicinal uses, ethnobotany, ethnopharmacology, medicinal, pharmacology, phytochemistry and therapeutic value, *C. latifolium*, Irsa, Sosun, Marjal, Iris. Further literatures were obtained from books, book chapters, theses, websites and conference proceedings.

Phytoconstituents and biological activities of Iris plants

The intensive phytochemical investigations of various species of Iris have resulted in the isolation of variety of secondary metabolites. Approximately more than three hundred compounds have been reported from the genus Iris which flavonoids[13], isoflavones (irigenin, nigricin, irisflorentin, iriskumaonin, irilon, iriflogenin, etc.) [14] and their glycosides; C-glucosyl xanthones[15], quinines[16] , triterpenoids[17], stilbene glycosides[18]. Other groups of secondary metabolite recorded in the family are saponins, fructans, non-protein amino acids, sterols and bufadienolides. Some individual metabolites are of economic importance. The sesquiterpene α -irone from Iris florentina L. is valued for its characteristic scent of violets and is used in perfumery. The yellow carotenoid-like pigment crocein from styles of *Crocus sativus* is employed as a food colorant. Again, the isoflavones iridin is a major component of orris root, obtained from the rhizome of Iris florentina, and still used in perfumery. Here, attention will be mainly focused on the more recent survey of phenolic patterns in the family, which covered 255 species from 57 genera[19]. The rhizomes of irises also contain carbohydrates, fatty oil, organic acids, tannins and essential oil, which is used in perfumery and cosmetics[20,21], while the leaves are a source of ascorbic acid and vitamins[18]. Iris plants have immense medicinal importance and tremendous pharmacological potential and biological roles have been reported. The peeled and dried rhizomes of Iris species, collectively known as rhizome iridis enjoyed popularity due to their emetic, cathartic, diuretic stimulant and expectorant properties[22]. The dried rhizomes of iris has been used in folk medicine of European countries as a diaphoretic for bronchitis, in dental practice-in order to accelerate teething in infants; as anti-inflammatory for the treatment of pancreatic and salivary glands and the vegetative neurosis[23].The rhizomes of Iris hookeriana exhibit significant anthelminthic activity against gastrointestinal nematodes of sheep. Extracts of Iris species in general possess strong total antioxidant, effective reducing power and exhibit free radical scavenging, metal chelating activities and inhibition of lipid peroxidation[24]. Powder of roots of Iris songarica, mixed with curd is used to cure diarrhea[25].These species have been introduced as diuretic and expectorant at low doses and as a strong purgative and emetic in high doses. It has been reported that Irsa is useful for pulmonary, asthma, liver and uterus diseases as well as hemorrhoid and gripe[26]. The iris essential oil has expectorant properties[17, 21]. The isoflavone rich dietary consumption is reported to reduce risk of cancer particularly breast and prostate cancer[27, 28]. The role of isoflavones in cancer[27, 29], osteoporosis, cardiovascular diseases and menopausal symptoms in addition to their antioxidant[30], antimicrobial[31] [31], anti-inflammatory and estrogenic activities[27, 32].

Iris ensata

The plant *Iris ensata* belongs to the family Iridaceae. It is known by several names in the vernacular language, they are Hindi - Irsa, Sosun; Kashmiri - Marjal, Unarjal; Urdu - Irsa; English -Iris. Japanese iris or Japanese water iris is a rhizomatous beardless perennnial iris that grows in slowly expanding clumps to 2-4′ tall. Rhizomes creeping, stout, prostrate. Leaves ensiform, 25-70 cm long, straight, tough with prominent midrib, margins scarious, apex acuminate, base dark purple. Aerial stem tufted, short, 20-100 cm high, stout or slender, bearing a single terminal or lateral head; spathes 3, unequal, lanceolate, 4-7.5 cm long, 1-3 flowered, veins distinct, raised; basal spathe shorter, apex usually acute; apical spathe longer, apex usually obtuse. Flowers lilac or reddish purple; pedicel 1.5-3.5 cm long. Falls and standards often with purplish veins, stalked. Perianth tube absent or very short; blade of falls rhomboidly ovate, entire, shorter than the claw, molted yellow at centre; standards erect, oblanceolate. Stamens about 3.5 cm long; anthers purple. Ovary cylindric; style purple, 5cm long. Capsule ellipsoid, 6- ribbed, beaked. Seeds reddish-brown, semi orbicular, flat[33, 34].

Flowering period: May-July

Altitudinal range: 1600-2600 m

Chromosome number: 2n = 24

Distribution: Kashmir

Scientific classification

Kingdom: Plantae

(Unranked): Angiosperms

(Unranked): Monocots

Order: Asparagales

Family: Iridaceae

Genus: Iris

Subgenus: Limniris

Species: *Iris Ensata*

Binomial name: *Iris Ensata* Thunb

Synonyms: *Iris kaempferi* Siebold ex Lem.

Figure 1 ***Iris Ensata***

Phytoconstituents and medicinal properties

Iris ensata (Irsa) is the supreme one among its comrade drugs used in respiratory ailments. It has been praised by the physicians of all times as a panacea and is broadly used in a huge number of disases. Dioscorides, cited by Razi, it heals up the chronic ulcers and absess, useful in insect bite, burns, vitiligo, weakness of muscles, itching and dandruff. It is emmenagogue, anti-inflammatory, anti orchitis, used in cold cough, in all humours, pneumonia, dyspnoea. The egesta accumulated in the chest are attenuated and resolved by Irsa, it is emetic and purgative. Razi quotes Galen (199 A.D.) in his book the container (Al- Hawi) that it has emmenagogue, anti tussive, anti-epileptic, astringent, regenerative and anti pleuritic actions, it is useful in pneumonia, pneumothorax, eclampsia, palpitation, chill, liver pain and spermatorrhoes. Ibn-e-Masewaih describes the white sosan as hot phlegmic pains of nerves and uterus are cured, Maseeh reported its efficacy in headache, the poultice for ulcers and wounds, vitiligo itch, baldness, nerve injuries and redness of skin[35-37]. Ibne Sina recommends its efficacious actions in strengthening the wisdom and intellect, cures head injuries skull bone fractures, phlegmic and hot swelling. Ibne Baitar quoted that it is useful in tooth ache, dyspnoea, spleenomegaly, rigidity of uterus, flatulence, it is abortifacient, anti tussive. The fermentation with sosan is benifecial in endometritis, adenitis and hard swelling. Antaki (1597 A.D.) states its efficacy in dyspnoea, asthma, thorasic pain, hydropes, jaundice, haemorrhoids, liver complaints, and sciatica. Its clyster is employed in all aforesaid disorders. Dymock (1890) reported that a century back it is used in asthma, cough, fever, dyspnoea and skin diseases[38]. Root of Iris ensata Thunb are reach source of glycosides steroids, resins, proteins, phenolic compounds and also tannins. Flowers of this plant also contains anthocyanin 5-0-glucosyltransferase (R2) and anthocyanin-flavone e.g. malvidine 3KGaC5G, petunidine 3KGac5c, delphinidine 3RGac5G, petunidine(R2) . The epigeal parts of this plant contain mangiferin(R) and leteolin C-glycosides[39].

Reported activity of *Iris ensata*

Yabuya et al., (2001): reported Malvidin and petunidin 3-(p-coumaroyl)rhamnosyl glucoside-5-glucosides as well as nonacylated 3-rhamnosylglucoside-5-glucoside of these anthocyanidins were detected as major anthocyanins in cyanic flowers of Iris ensata. Enzyme extracts from flower buds of this plant catalyzed the transfer of the p-coumaroyl moiety from p-coumaroyl-CoA to both the anthocyanidin 3-rhamnosylglucoside and 3-rhamnosylglucoside-5-glucoside to form the anthocyanidin 3-(p-coumaroyl) rhamnosylglucoside and 3-(p-coumaroyl) rhamnosylglucoside-5-glucoside, at a ratio of ca. 1 to 4, respectively. The activities of this enzyme were also examined for various cyanic and acyanic cultivars, in addition to the characterization of the p-coumaroyltransferase. The sequence of acylation and 5-glucosylation in the anthocyanin biosynthesis of this plant is discussed[40].

Yabuya et al., (2002): characterized Anthocyanin 5-O-glucosyltransferase in flowers of Iris ensata containing malvidin and petunidin 3-(pcoumaroyl)rhamnosylglucoside-5-glucosides as well as nonacylated 3-rhamnosylglucoside-5-glucoside of these anthocyanidins as major anthocyanins. Enzyme extracts from flower buds catalyzed the transfer of the glucosyl moiety from UDP-glucose to the 5- position of anthocyanidin 3-rhamnosylglucoside to form the anthocyanidin 3-rhamnosylglucoside-5-glucoside, but not to the anthocyanidin 3-glucoside and 3-(p-coumaroyl)rhamnosylglucoside. In addition to the characterization of the 5-O-glucosyltransferase, the activities of this enzyme were also examined for various cyanic and acyanic cultivars. The sequence of 5-O-glucosylation and p-coumaroylation in the anthocyanin biosynthesis in this plant is discussed in detail[41].

Boltenkov and Zarembo (2005); tested the differentiation and morphogenetic capacity of floral organs of Iris ensata, I. setosa, and I. sanguinea cultured in vitro. Organogenesis through direct formation of shoots from explants, callogenesis, and floral organogenesis were demonstrated in I. ensata callus culture in vitro. These processes depended on the plant species and on the content of phytohormones in the medium. Adventitious shoots proved to develop on the basal part of the perianth tube and on the apical part of the ovary, while roots were not formed. Direct organogenesis was induced by the following phytohormones: α-naphthylacetic acid and 6-benzylaminopurine for I. ensata and 2,4-dichlorophenoxyacetic acid and 6-benzylaminopurine for I. setosa and I. sanguinea; while callogenesis was induced by 2,4-dichlorophenoxyacetic acid. The obtained data indicate that development of adventitious structures from iris floral organs requires the presence of 6-benzylaminopurine in the growth medium[42].

Inoue et al., (2006): Characteristics such as flower form, size and color of outer and inner perianths, anthocyanins in outer perianths, size, color and fertility of pollen and self-fertility of diploid and tetraploid lines regenerated via protoplast culture of Iris fulva were examined and compared with those of the diploid wild line. Among these characteristics, flower forms, inner and outer perianth sizes of the tetraploid lines were noticeable, because these lines had upward flower forms and bigger flowers than diploid lines. Furthermore, reciprocal crosses between diploid or tetraploid lines of I. fulva and I. ensata and those of I. fulva and I. laevigata were performed. Three seedlings were obtained from the cross of tetraploid I. fulva diploid I. laevigata through embryo rescue. One of them was identified as the interspecific hybrid between tetraploid I. fulva and I. laevigata by flow cytometoric (FCM), cytological and molecular (RAPD) analyses. This is the first report on production of hybrids from these lines. I. fulva has unique brown flowers, and this trait could be very useful for flower color breeding of I. laevigata which lacks this color. Therefore, the hybrid of I. fulva (4) I. laevigata may be the best available gene source for brown color breeding of this species[43].

Yan et al., (2010): reported severe mosaic disease was observed on Iris ensata Thunb. in Spring 2008, in Hangzhou, China and it was found to be widely distributed in that region. Detection of viruses by electron microscopy resulted in the occurrence of a potyvirus in most symptomatic seedlings. Sequencing 1745 nucleotides of the 3 -terminal region of the genome of the typical viral isolate revealed that it was a new isolate of Iris severe mosaic potyvirus (ISMV), tentatively named ISMV-PHz .This strain shared high nucleotide identity with ISMV. Phylogenetic analysis also showed that this isolate clustered with iris severe mosaic potyvirus (ISMV) and onion yellow dwarf virus (OYDV) into a monophyletic group, and was closest in similarity to ISMV. The divergence of potyvirus-infecting iris species had a higher degree of relevance with natural host but not with the region from which it was isolated. This is the first report of ISMV isolated from I. ensata in China[44].

Ahmad et al., (2012): reported the extracts of dried root of Iris ensata Thunb were screened for their effects on Hypoglycmic and antihyperglycemic activities in normal rabbits and STZ induced diabetic rabbits. The plant root extracts exhibited antihyperglycaemic effect in glucose loaded rabbits. Oral admisntration of Iris ensata root for 21 days significantly reduced blood glucose level in STZ induced diabetic rabbits and in normal rabbits. The study reveals for the first time the antihyperglycemic and hypoglycemic activities of Iris ensata root on rabbits[45].

Wani et al., (2012): reports the antibacterial activity of different extracts of five different Iris plant species growing in Kashmir Himalayas. Water, methanol and hexane extracts of the rhizome of Iris croceae, Iris ensata, Iris germanica, Iris hookeriana and Iris kashmiriana were prepared and screened for phytochemical studies and antibacterial activities against five bacterial strains including both Gram positive and Gram negative. The different extracts of these species showed broad spectrum antibacterial activity with methanol extract showing highest zone of inhibition followed by hexane and aqueous extracts. The phytochemical analysis of the different extracts of these five species revealed the presence of flavonoids, isoflavonoids, glycosides and tannins, while as Alkaloids were absent in these plant species[46].

Xiao et al., (2012): reported microsatellite primers were developed in Iris ensata (Iridaceae) to provide polymorphic markers for further studies into population genetics. Thirteen polymorphic microsatellite loci were isolated from I. ensata. These loci were successfully amplified in two natural populations of I. ensata from eastern China (Longwangshan, Zhejiang Province) and northeastern China (Jinchuan, Jilin Province). There was no significant linkage disequilibrium found for any pair of loci. These loci contained between two and 12 alleles per locus across all 48 individuals of I. ensata. The number of alleles per locus varied from two to 10 at the population level and the observed and expected heterozygosities ranged from 0.167 to 0.958 and from 0.284 to 0.853, respectively. These loci showed high levels of polymorphism and could be used to study the population genetic structure, genetic relationships, and phylogeography of I. ensata[47].

Kitahara et al., (2014): reported Six anthocyanins were isolated from the flowers of the Nagai line of Iris ensata Thunb. They were identified as petunidin and malvidin 3-O-beta-[(4'''-Z-p-coumaroyl-alpha-rhamnopyranosyl)-(1-->6)-beta-glucopyranoside]-5-O-beta-glucopyranosides (1 and 3) and their E-forms (2 and 4), and petunidin and malvidin 3-O-rutinoside-5-O-glucosides (5 and 6). Though the E-form of petunidin 3-O- [(4'''-p-coumaroylrhamnosyl)-(1-->6)-glucoside]-5-O-glucoside has been reported, its Z-form was found for the first time. The presence of Z- and E-forms of malvidin 3-O-[(4'''-p-coumaroylrhamnosyl)- (1-->6)-glucoside]-5-O-glucoside is also reported for the first time. Fifty-one cultivars of Nagai line and their wild form (I. ensata var. spontanea) were divided into four anthocyanin patterns, i.e. 1) the presence of 1-4, 2) the presence of 2 and 4, 3) the presence of 5 and 6, and 4) no anthocyanin[48].

Haleem et al., (2015): study was designed to standardize herbal drug-Irsa. Irsa (Iris ensata) belong to the family Iridaceae, its root is used in respiratory diseases such as asthma, cough, diphtheria and pneumonia. An effort has been made to carry out the physicochemical and phytochemical studies of plant. I. ensata was standardized on physicochemical parameters as Extractive Values: pet. Ether (2.9%), di-ethyl ether (4.58%), chloroform (2.20%), acetone (3.54%), alcoholic (10.03%), aqueous (14.13%); Solubility: Water (9.44 %) & Alcohol (1.16 %); Moisture contents (3.45 %), Total Ash values (6.93%), pH of 1% (6.76) & 10% solution (6.16) and loss on drying (5.3%). Phytochemical Analysis revealed the presence of almost all the phyto-constituents in the test drug sample i.e. alkaloid, flavonoids, glycoside, carbohydrate, tannin, protein, amino acids, starch and resins[38].

Mirza et al., (2015): reported to conduct a clinical trial for cervicitis management with Irsa. Irsa was given in the form of majoon, 10 gm in two divided doses after menses for 15 days for three cycles. Extract of Irsa (10ml) was prepared and used locally in the form of humool (pessary) OD after menses for 15 days for three cycles. All the patients were assessed by subjective parameters and per speculum examination once in fifteen days for three cycles. Low backache was relieved in 16 (53.3%) patients, lower abdominal pain was relieved in 21 (72.4%) patients and dyspareunia was relieved in 12 (85.7%). After the completion of the treatment 9 (100%) patients had shown improvement in abnormal vaginal odour. Relief in pruritis vulvae was observed in 20 (80%) patients. Dysuria was relieved in 19 (86.4%) patients. All the patients i.e. 30 (100%) complained of vaginal discharges. After the completion of treatment 13 (43.3%) recovered completely and on per speculum examination 30 (100%) patients had cervical discharge at the beginning of trial. After the completion of treatment 15 (50%) had shown improvement. Cervical swab culture was positive in 5 (16.7%) patients at the beginning of trial. After the completion of treatment 4 (80%) patients had shown improvement. The study revealed that the test drug is effective. So, the trial drug can be recommended to manage it[49].

Kim et al., (2016): This study was aimed to evaluate the in vitro effects of medicinal herb extracts (MHEs) on ruminal fermentation characteristics and the inhibition of protozoa to reduce methane production in the rumen. A fistulated Hanwoo was used as a donor of rumen fluid. The MHEs (T1, Veratrum patulum; T2, Iris ensata var. spontanea; T3, Arisaema ringens; T4, Carduus crispus; T5, Pueraria thunbergiana) were added to the in vitro fermentation bottles containing the rumen fluid and medium. Total volatile fatty acid (tVFA), total gas production, gas profiles, and the ruminal microbe communities were measured. The tVFA concentration was increased or decreased as compared to the control, and there was a significant ($p \le 0.05$) difference after 24 h incubation. pH and ruminal disappearance of dry matter did not show significant difference. As the in vitro ruminal fermentation progressed, total gas production in added MHEs was increased, while the methane production was decreased compared to the control. In particular, Arisaema ringens extract led to decrease methane production by more than 43%. In addition, the result of real-time polymerase chain reaction indicted that the protozoa population in all added MHEs decreased more than that of the control. In conclusion, the results of this study indicated that MHEs could have properties that decrease ruminal methanogenesis by inhibiting protozoa species and might be promising feed additives for ruminants[50].

Guoa and Wilson (2018): investigated before anthesis, older floral organs enclose younger ones forming a bud, within which the shape and relative size of floral organs are largely determined. The floral diversity in Iris, including sepal ornamentation, limited development of petals or sepals in some species and presence of petaloid style branches in all but one species, provides a unique opportunity to compare organ development within the confined space of a bud. Using transverse serial sections, light microscopy and measurement software, we investigated floral packing geometry (relative size and spacial relationships of floral organs) in seven species focusing on five species where we studied changes across three developmental stages. In this study, we found that floral packing geometries are diverse even among species with similar floral organ morphologies. The "filling law" proposed for vegetative buds is not applicable during floral bud development with empty space increasing as bud size increased for each of the five species that were examined. Other key findings include the presence of space between anther thecae in some species, the enlargement of sepal outgrowths and petal margins into space between thecae, differences in the relative growth of anthers versus petaloid style branches and the curvature of connectives, petals and style branches in some species. This study clarifies the integration of floral bud growth and illustrates a largely ignored yet important aspect of flower development: coordinated growth of floral organs within the bud[51].

Uniyal et al., (2018): reported in this study, T. asahii was procured from MTCC and its sensitivity was checked against different solvents (Methanol, Ethanol, Acetone, and Chloroform) of Iris ensata, a medicinal plant. Zone of inhibition and MIC were evaluated using Agar well diffusion assay and Tube dilution broth assay. Ketoconazole and Nystatin B were used as positive controls. Phytochemical screening was done to determine the phytochemicals present in the plant. The methanol extract was found to be most effective compared to other solvent extracts and positive controls. Phytochemicals play a major role in this anti Trichosporon activity[52].

Luo et al., (2018): reported in 2016, a severe leaf spot disease was found on Iris ensata Thumb. in Nanjing, China. The symptom was elliptical, fusiform, or irregularly necrotic lesion surrounded by a yellow halo, from which a small-spored Alternaria species was isolated. The fungus was identified as Alternaria iridiaustralis based on morphological characteristics. The pathogenicity tests revealed that the fungus was the causal pathogen of the disease. Phylogenic analyses using sequences of ITS, gpd, endoPG, and RPB2 genes confirmed the morphological identification. This study is the first report of A. iridiaustralis causing leaf spots on I. ensata in China[53].

CONCLUSIONS

The Iris species (Iridaceae) have long been utilized to treat several diseases around the globe. Interestingly, different species have been used in treating the same disease. As highlighted in the present review, the immense medicinal value of the Indian *Iris ensata* is a signal of their remarkable potential globally. The plant *Iris ensata* has rich potential to treat many disorders among human society. It has multiple ethno medicinal uses as reported by many researchers. Scientific reports on its enormous phyto constituents and pharmacological application of *Iris ensata* showing its wide range of ethno medicinal uses. Based on the above utility and valuation to treat certain disorders this plant should not be overexploited, much spread for maintaining their existence for coming future.

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