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Typhonium trilobatum (L.) Schott: Phytochemistry, Traditional Uses and It's Anti Inflammatory Activity

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ABSTRACT

***Typhonium trilobatum* (L.) Schott, a Araceae family plant less known but has been used traditionally for long by indigenous and folk practitioner's throughout South and Southeast Asia. It was applied in the treatment of inflammatory conditions, venomed bites, wounds and respiratory disorders principally in the use of the plant and in particular its underground tuber. Although it had been traditionally used in medicine until recently, modern scientific evaluation of its phytochemical and pharmacological properties is coming on stream. The anti-inflammatory activity and the ethnomedicinal uses of the *Typhonium trilobatum* are summarized with current knowledge on its phytochemistry to bring about the possibility on being natural therapeutic agent. Pharmaceutical study shows that the plant is rich it contains alkaloids; flavonoids; saponins; phenolic acids; tannins; terpenoids; steroids. The constituents of these are well known to have strong anti inflammatory, antioxidant, antimicrobial and analgesic properties. Methanolic and aqueous extracts have been demonstrated to possess the potential for anti inflammatory activity in experimental models by significantly reducing edema and denaturing protein. The review also emphasises the need to validate traditional knowledge using scientific research, especially in medicinal plants like *T. trilobatum* which are not well investigated. Preliminary studies however are promising and more in depth research is needed to isolate active constituents, explain mechanisms of action and assess safety profiles. Thus, with the escalating interest in plant based alternatives to synthetic anti inflammatory drugs *Typhonium trilobatum* holds considerable potential as a sustainable source for future therapeutic development. An attempt is herein made to bridge the gap between ethnomedicine and pharmacological science of this traditionally royalty venerated plant by this review which should stimulate further investigation into its medicinal potential.**

Keywords- *Typhonium trilobatum*, phytochemistry, traditional uses, anti-inflammatory activity.

I. INTRODUCTION

Inflammation is very important in hosting to injury, infection or tissue destruction, returning to normal status by removing the original reason for cell injury and starting process of tissue repair. Though this is a normal response, when it

is chronic or uncontrolled it is involved in the pathogenesis of many disorders such as arthritis, cardiovascular diseases, diabetes, neurodegenerative diseases and cancer. Long term synthetic anti-inflammatory drugs, non-steroidal anti-inflammatory drugs (NSAIDs) and corticosteroids are accompanied by unwanted side effects and limiting factors which is why safer natural alternatives are being explored. This context has resulted into medicinal plants as an important source of new bioactive compounds with potent anti inflammatory effects and minimal adverse effects[1].

Of these plants, *Typhonium trilobatum* (L.) Schott, a less known but traditional valuable one, is becoming more and more popular. *Typhonium trilobatum* known commonly as Greater greater yam, is a perennial herbaceous plant belonging to the family Araceae that is also widespread in the tropical and subtropical regions of Asia, India, Bangladesh, Sri Lanka and parts of Asia Southeast. It is found growing in moist, shaded places such as forest edge, wetland and agricultural fallows. The plant has gone by many local names such as: Bengal Arum, Ghatola, Oal and Kattu Chena and has been in use in folk medicine to treat such conditions as wounds, inflammation, respiratory disorders and poisonous bites[2].

It has a tree without a leaf, with its unique morphology, for instance glossy trilobed leaves and a tuberous rhizome planted underground. The most commonly used part in traditional medicine is the tuber which is acrid, toxic in raw state because of presence of calcium oxalate crystals. Once properly processed (e.g. sun drying) tuber becomes safe for use and is included in different traditional formulations. Tuber is pungent and astringent and for this reason it is used external application in case of inflammation and skin infection[3-5].

Typhonium trilobatum, with its rich phytochemical composition is strongly backed in the traditional applications of this plant. Preliminary phytochemical analyses have shown the presence of different classes of bioactive compounds, for instance alkaloids, flavonoids, phenolic acids, tannins, saponins, terpenoid and steroids. The pharmacological effects of these secondary metabolites are wide ranging, especially antiinflammatory, antimicrobial, antioxidant and analgesic effects. In particular, the presence of flavonoids and phenolic compounds has been closely related to the modulation of proinflammatory pathways, neutralization of reactive oxygen species (ROS) and inflammatory mediators, e.g., cytokines, prostaglandins and nitric oxide[6].

Historically, *T. trilobatum* has been used in treating inflammation; and, recently, the scientific investigations have started to verify those claims. The plant's anti inflammatory properties have been shown both in vivo and in vitro for reducing inflammation induced edema, stabilizing cell membranes, inhibiting protein denaturation and suppressing the release of inflammatory markers. Experimental models confirm the potential of the tuber and leaves extracts to be used in developing plant based anti inflammatory drugs; as all the tested extracts were found to have an effect in methanolic, ethanolic and aqueous extracts. Yet *Typhonium trilobatum* has been largely an underexplored plant in the scientific community and pharmacological studies are very limited[7].

The resurgence of ethnopharmacology and its role in herbal drug development recetly brought about a resurgence in interest in preserving and scientifically validating traditional knowledge. For many generations, indigenous communities have used plants such as *T. trilobatum*, as benign remedies of ailments, to their benefit, due to the scarcity of modern healthcare[8]. Such traditional practices are worth of documenting and understanding for providing possibilities to explore potential drug discovery, as well as biodiversity conservation and sustainable use of natural resources. *Typhonium trilobatum* is a convergence of the traditional wisdom with modern pharmacological investigation[9].

In addition, conventional antiinflammatory therapies are often limited in their effectiveness and thus the ongoing search for new natural source antiinflammatory agents is driven. Long term use of synthetic anti inflammatory drugs result in gastrointestinal irritation, renal impairment, cardiovascular risks, hormonal imbalances. However, plant derived agents exhibit wider range of bioactivities and usually operate through multiculear mechanisms, thus increasing their therapeutic potential and reducing their toxic side effect potential. The phytoconstituents of *T. trilobatum* are complex which is indicative of a multi target mode of action, hence could be considered as a resource for further exploration in chronic inflammatory conditions[10].

The integration of traditional medicine with evidence based approach offers strong potential of creating new therapeutic options, as well as new solutions to unmet medical needs in the landscape of global health and pharmaceutical development. Traditional medicine has been recognised by the World Health Organization (WHO) and the search for medicinal plants for the discovery of safe, effective and affordable treatments is being encouraged. Regarding this, *Typhonium trilobatum* seems to be a promising traditional remedy as well as a promising candidate for modern phytopharmaceutical development[11-13].

This review aims at an accoamplishing thorough picture of Phytochemical composition, ethnomedicinal significance and scientifically evaluated anti inflammatory properties of *Typhonium trilobatum* (L.) Schott. Keeping in view, compilation of previous knowledge, potential of plant to alleviate common ailments and the gaps of research which needs to be filled have been the aims of this article. In this way, this review aims at bridging the traditional use and modern evidence of *T. trilobatum*, to increase its therapeutic value and further promote research on its medicinal use[14].

Thus it can be concluded that *Typhonium trilobatum* is an important ethnobotanical and pharmacological plant. Though its historical use for inflammatory conditions has been known for some time along with some emerging scientific data, this suggests it to be a natural anti inflammatory. However, a complete phytochemical, pharmacological and

toxicological reviews are required to validate its efficacy and safety. Due to rising global interest in plant based medicine, *T. trilobatum* can be considered as a valuable resource for the search of alternative therapy for inflammation related disorders also[15].

Fig.1: *Typhonium trilobatum* (l.) schott

II. PLANT PROFILE

Table 1: Scientific classification of *Typhonium trilobatum* (L.) schott

Kingdom	Plantae
Clade	Angiosperms
Clade	Monocots
Order	Alismatales
Family	Araceae
Genus	Typhonium
Species	*Typhonium trilobatum* (L.) Schott

2.1. Botanical description

The small, herbaceous perennial with aerial culm is *Typhonium trilobatum* (L.) Schott belonging to the family Araceae. It grows up to 30–60 cm high from brown outside, white internally underground tuberous rhizome. Distinctive is the glossy, trilolbed, dark green leaves which are opposite, arranged alternately on long petioles[16]. The typical Araceae family characteristic inflorescence is a spathe and spadix. The spadix (with male and female flowers) is enclosed by the spathe which is often purple to brownish purple in color. It has a pungent odor to the plant and amarous acrid substances especially in its tuber whose is pricipally rich in calcium oxalate crystals. This tuberous structure which stores nutrients helps the plant to go through adverse periods. Being a plant with overall morphology suitable for moist, shaded habitats, this plant adapts well in tropical and subtropical regions.

III. PHYTOCHEMISTRY

The wide ranging pharmacological activities of *Typhonium trilobatum* makes it a rich source of diverse phytochemicals consisting of various primary and secondary metabolites which are the main source of drug development. In different parts of the plant particularly tubers and leaves, phytochemical investigations have shown alkaloids, flavonoids, saponins, tannins, phenolic compounds, terpenoids and steroids. The analgesic and antimicrobial properties of alkaloids and potent antioxidants and anti inflammatory properties of flavonoids are well reported. Astringent and wound healing properties are due to saponins and tannins. Oxidative stress and inflammation reduction is achieved mainly through phenolic compound action with their strong free radical scavenging activity. Terpenoids and steroids are thought to stabilize cellular membranes and inhibit inflammatory enzymes (e.g., cyclooxygenase). The bioactive constituents of *T. trilobatum* operate either mechanistically acting individually or synergistically indicating its potential crude drug for antiinflammatory and other therapeutic agents. These phytochemicals are in diverse and abundant amounts and the plant is therefore valuable medically and justifies the local uses of the plant as herbal formulations[17-20].

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IV. TRADITIONAL USES

Typhonium trilobatum has been used freely in the traditional and folk medicine many regions of South and Southeast Asia. But the tuber itself though acrid when raw is treated and used for its medicinally beneficial properties. Externally, it is applied commonly in the form of a paste for reduction of inflammation, swelling and pain (especially in case of boils, insect bites, wounds). It is used in some traditional healing practices as a remedy for snake bites and scorpion stings because of its belief as a neutralizing agent to the venom. In decoction or paste, the tuber is also taken to treat respiratory ailments such as asthma, cough and bronchitis. It also has been used to help in digestion and relieve constipation, only when properly cooked to diminish its irritating properties. Its use for treating skin infections and as an antiseptic agent is typified by ethnomedicinal knowledge. The plant is however used with care, since the presence of calcium oxalate crystals can be problematic and people generally use it with a traditional healer or having prepared adequately to ensure safety[21].

V. *TYPHONIUM TRILOBATUM* (L.) SCHOTT PHARMACOLOGICAL ACTIVITY

Bengal Arum, (*Typhonium trilobatum* (L.) Schott; family Araceae) is a medicinal plant. In Ayurveda and folk medicine it has been traditionally used. Among other things, its pharmacological activities are as follows.

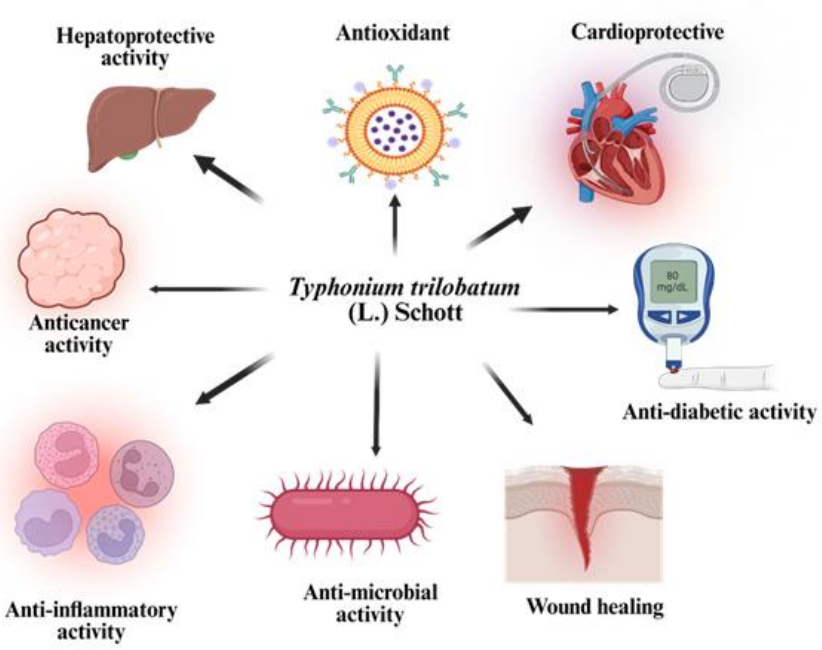

Fig.2: *Typhonium trilobatum* (L.) schott Pharmacological activities

5.1. Anti-inflammatory Activity

The plant extracts, particularly with ethanol and methanol extracts, result in appreciable inhibition of inflammation induced by a number of agents including carrageenan and formalin in experimental models. It is mainly its flavonoids, saponins, alkaloids and phenolic compounds that are responsible for these anti inflammatory effects. These phytochemicals interfere with the expression and activity of the pro inflammatory mediators among which are prostaglandins, leukotrienes and cytokines (interleukins and TNF-alpha). Flavonoids may also prevent enzymes like cyclooxygenase (COX) and lipoxygenase from functioning because enzymes act as key catalysts for the inflammatory process. The antioxidant properties of the plant may also synergistically lower the oxidative stress which just exacerbates inflammation. These scientific findings are well backed by traditional medicinal uses of *Typhonium trilobatum* to treat swellings, pain and inflammatory conditions. Furthermore, due to the lack of significant toxicity at therapeutic doses, this makes a potential candidate for development of natural anti inflammatory agents. Further studies must be carried out that would include isolation of individual bioactive compounds and delineating molecular mechanisms to fully understand its therapeutic potential[22].

5.2. Antioxidant Activity

Typhonium trilobatum has exhibited significant antioxidant activity which acts a major role in protecting the body against oxidative stress and related diseases of degeneration. Oxidative stress happens when the amount of free radicals

(reactive oxygen species) is exceeding the body's antioxidant capacity to neutralize them. *Typhonium trilobatum* is rich in polyphenols, flavonoids, tannins and other phytochemicals which have considerable antioxydative characteristics; methanolic and ethanolic extracts of the plant contain these substances. These compounds scavenge free radicals including DPPH (2, 2 diphenyl 1 picrylhydrazyl), superoxide and hydroxyl radicals and protects the cellular lipids, proteins and DNA[23].

Further in vitro studies using standard assays like DPPH radical scavenging and the FRAP (Ferric Reducing Antioxidant Power) have also been conducted and they clearly indicated the plant's capacity to neutralize free radicals. *Typhonium trilobatum* has dose dependent antioxidant capacity that is comparable to standard antioxidants; ascorbic acid. Other than its antiestrogenicity activity, also its antioxidant activity contributes to its other pharmacological activities including anti inflammation, hepatoprotection and anticancer activity by preventing oxidative damage at cellular level. The regular intake of antioxidants in natural source form (*Typhonium trilobatum*) can prevent the chronic diseases like cardiovascular diseases, diabetes, cancer and neurodegenerative disorders. Further studies are required to determine and characterise the specific compounds which account for these antioxidant effects[24].

5.3. Anticancer Activity

Results reveal anticancer activity of *Typhonium trilobatum* which indicates good potential as a natural cancer cure. Its extracts, especially ethanol and methanol extracts, have shown cytotoxic effects on various human cancer cell lines, including HeLa (cervical cancer), MCF-7 (breast cancer) and A549 (lung cancer) in various *in vitro* studies. Bioactive compounds present in the plant including flavonoids, alkaloids, terpenoids and saponins are known to induce apoptosis (programmed cell death), inhibit the proliferation of cancer cells and impair cancer cell mitochondrial function[25].

Through mechanism of actions, these phytoconstituents may interfere with the activation of caspase enzymes, interfere with the process of DNA fragmentation and modulates the signaling pathways that includes p53, Bcl-2/Bax ratio and NF-κB pathway which are related to the cancer development and progression. The antioxidant potential of the plant also helps to lower oxidative stress, a known proponent in carcinogenesis. In combination with its traditional medicinal use treating tumors and abnormal growths, this indicates a potential target for therapy in cancer.

Still, encouraging preliminary data exist, but in vivo experiments, clinical trials and toxicological evaluations are needed to verify both safety and efficacy. As with *Typhonium trilobatum*, plant extracts could be developed as lead candidates for cost effective, plant based anticancer agents if validated[26].

5.4. Antimicrobial Activity

Its antimicrobial activity against a wide range of bacterial and fungal pathogens has been shown to be of significant effect, that makes its role traditional in the treatment of infections and wound. Solvent extracts show inhibitory activity against Gram positive [*Staphylococcus aureus*, *Bacillus subtilis*] and Gram negative [*Escherichia coli*, *Pseudomonas aeruginosa*] bacteria, with particular activity of ethanol and methanol and also against fungal species such as *Candida albicans* and *Aspergillus niger*. Antimicrobial activity is related to the presence of phytochemicals viz alkaloids, flavonoids, phenolic compounds, tannins and saponins which render the microbes ineffective by destroying cell walls, blocking enzyme action and interference with DNA replication[27].

The plant extracts exhibited dose dependent bactericidal and fungicidal activities which have been confirmed by standard antimicrobial assays such as agar well diffusion and broth dilution methods. *Typhonium trilobatum* is effective against drug resistant strains and therefore can be offered as an alternative or complementary therapy to conventional antibiotic. In addition, its ability to stop microbial colonization increases its impact in the wound healing applications.

Although broad spectrum in activity, further work, including bioassay guided isolation of active compounds, mechanism of action studies and toxicity assays are necessary to validate and optimize this compound's role in modern antimicrobial therapy.

5.5. Analgesic Activity

Typhonium trilobatum has shown significant analgesic (pain relieving) activity in a number of experimental animal models and corroborates its traditional use in folk medicine for relief of pain and discomforts. The analgesic potential was assessed on standard models like hot plate, tail flick and acetic acid induced writhing tests in rodents. These studies revealed that both ethanol and methanol extracts of this plant have good analgesic properties and reduced the animals' pain responses indicating central and peripheral analgesia[28].

The analgesic action might be due to bioactive constituents that might modulate the activity of neurotransmitters like pain related neurotransmitters and inflammatory mediators like prostaglandins which are present in the form of flavonoids, alkaloids and terpenoids in Crens alba. In particular, the inhibition of cyclooxygenase (COX) enzymes by flavonoids leads to a reduction in the synthesis of prostaglandins which is the stimuli in nociceptors and magnifies pain signals. The central analgesic effect might also be by interacting with central opioid receptors or through inhibition of pain transmission in the central nervous system.

Unlike many synthetic analgesics; *Typhonium trilobatum* is reported to cause minimal side effects at therapeutic doses, therefore safer. Although its mechanism and therapeutic potential in pain management needs to be further explored through pharmacodynamic studies, isolation of analgesic compounds and clinical trials.

5.6. Hepatoprotective Activity

Typhonium trilobatum is found to have hepatoprotective activity that means that the drug has the ability to protect liver cells from damage due to toxic agents. The protective effect of glucagon in liver damage has also been investigated in experimental animal models in which injury to the liver was produced by hepatotoxins such as CCl_4 or paracetamol (acetaminophen). *Typhonium trilobatum* extracts administration significantly reduced elevated levels of liver enzymes that are indicative of the liver damage such as ALT (alanine aminotransferase), AST (Aspartate aminotransferase) and ALP (alkaline phosphatase).

Plant's hepatoprotective effects are chiefly due to antioxidant activity of the plant which inhibits oxidative stress and lipid peroxidation in the liver tissues. Flavonoids, polyphenols and saponins are bioactive constituents in the plant that scavenge sources of ROS, stabilize cell membranes and help prevent liver necrosis. Liver tissues of treated animals are analyzed histopathologically which exhibit better architecture, reduced inflammation and generation of hepatocytes in comparison to untreated control[29].

The combined antioxidant and the anti inflammatory action of *Typhonium trilobatum* put it forth as a promising candidate for the therapy of liver disorders including hepatitis, fatty liver disease and drug induced liver damage. Nevertheless, further studies incorporating identification of active priniples, pharmacokinetics and human clinical trials are required to demonstrate its hepatoprotection ability.

5.7. Antidiabetic Activity

Several studies in experimental set ups using diabetic animal models have proved that *Typhonium trilobatum* possesses promising antidiabetic potential. The aqueous and ethanolic preparations especially proved to reduce high blood glucose levels in streptozotocin- or alloxan-induced diabetic rats. This supports its traditional use as a treatment for diabetes and related metabolic disorders because of its hypoglycemic effect. It is postulated that antidiabetic mechanism involves multiple pathways. These compounds may involve flavonoids, alkaloids and saponins which may enhance insulin secretion from pancreatic β cells, enhance insulin sensitivities or increase glucose uptake by the muscles and adipose tissues. In addition, inhibition of carbohydrate digested enzymes such as αamylase and αglucosidase result in postponement of glucose absorption in the digestive system which improves glycemic control.

Typhonium trilobatum extracts may also help improve lipid profiles and reduce oxidative stress, the common complications associated with diabetes, besides lowering blood sugar. Its antioxidant properties may protect pancreatic cell from free radical induced damage and, therefore, preserve the β cell function.

Preclinical studies are encouraging but adequate clinical studies and toxicity evaluations are required to validate the safety, efficacy and optimal therapeutic range for use of *Typhonium trilobatum* in diabetes management[30].

5.8. Wound Healing Activity

Preclinical studies have shown that *Typhonium trilobatum* possesses important wound healing properties which are in line with its traditional use in skin injuries and ulcers treatment. The plant's extracts or gels such as topical application in animal model of excision and incision wounds, induce increased wound contraction, faster epithelialization and collagen synthesis. These effects together lead to faster tissue repair and wound closure. Several pharmacological actions of the plant such as antimicrobial, anti inflammatory and antioxidant are responsible for wound healing activity. *Typhonium trilobatum* serves to inhibit microbial colonization and infection of the given site of wound, thereby having prevented delaying of healing. It also has an anti inflammatory action which reduces swelling and pain bringing about a better environment for healing. The antioxidant compounds in the presence reduce oxidative stress that makes the tissue regeneration difficult. Moreover, bioactive constituents of the plant aid in stimulating the proliferation of fibroblasts and increase collusion and other extracellular matrix components associated with tissue remodeling. Treated wounds are examined histologically where improved angiogenesis (new blood vessel formation) and better organized architecture of the tissue can be observed with those parameters being important factors for good healing.

VI. *TYPHONIUM TRILOBATUM* (L.) SCHOTT ANTI-INFLAMMATORY ACTIVITY

Parvin *et al*.,2019 This research aimed to analyse the phytochemical content of a crude aqueous extract of *Typhonium trilobatum* and assess its protective and detrimental effects. *Allium cepa* was utilised for toxicity evaluation, whereas egg albumin and human erythrocytes were employed to examine anti-inflammatory properties and membrane stabilisation, as well as clot lysis capabilities, respectively. The findings indicate the existence of alkaloids, glycosides, tannins, saponins, flavonoids, and reducing sugars in the aqueous extract of *T. trilobatum*. A. cepa exhibited toxicity to the crude extract that was dependent on both time and concentration. The herb extract exhibiting the most significant suppression of root growth was observed after 72 hours of treatment at a 20% (v/v) concentration. The extract at low doses (2.5% and 5%) demonstrated a reduction in root growth inhibition capability over 24 and 72 hours, as evidenced by the anti-inflammatory, membrane stabilising, and anti-atherothrombosis assays. This may result from an alteration in the DNA damage profile inside the eukaryotic test system (*A. cepa*). The extract at concentrations between 0.02% and 0.08% (v/v) markedly diminished protein denaturation and membrane lysis in the second instance, while enhancing clot lysis capacity in the third scenario in a concentration-dependent manner ($p < 0.05$, $p < 0.01$, and $p < 0.001$). Ultimately, at elevated

concentrations, the extract proved toxic, yet at lower quantities, it exhibited protective properties. *T. trilobatum* may serve as a potential source of phytotherapeutic substances for the treatment of inflammatory and cardiovascular diseases and disorders [29].

Ali *et al*.,2012 Utilise animal models to examine the possible therapeutic effects of *Typhonium trilobatum* L. Schott's ethanolic leaf extract on inflammatory bowel disease, and diarrhoea. The plant extract significantly reduced writhing in the acetic acid-induced writhing test for mice compared to the control group ($P<0.01$). The extract significantly diminished xylene-induced ear oedema ($P<0.05$). The findings indicate that the plant's ethnopharmacological applications are corroborated by its significant analgesic and anti-inflammatory activities in the extract[30].

VII. CHALLENGES AND FUTURE PROSPECTS

Though *Typhonium trilobatum* (L.) Schott possesses considerable ethnomedicinal value and holds promising pharmacological potential, a number of constraints hinder its complete utilisation and integration into the mainstream therapeutics. However, detailed phytochemical and pharmacological investigations about any of Khaya species were scarce and thus posed as one of the foremost challenges. Very few studies have been conducted on the subsequent steps of isolating, identifying and characterizing the particular bioactive compounds responsible for the anti inflammatory and other therapeutic effects, since most of the studies focus on crude extracts and simple activity screenings. The gap in our understanding limits the capacity to determine the exact mode of action and to refine and develop standardized, effective formulation. A major bottleneck arises from the plant's natural toxicity stemming from calcium oxalate crystals present in the raw tubers which will lead to irritation and adverse reactions without proper processing. This risk can be mitigated by traditional detoxifications ways like boiling or sun drying but there is insufficient knowledge about the scientific validation and optimization of these methods. For approval and use in the clinic, safety must be guaranteed, without compromising therapeutic efficacy. Furthermore, toxicological studies and clinical trials are insufficient regarding safety profile, dosage guideline and its efficacy in humans of *T. trilobatum*. Pharmacological data are mainly obtained from in vitro or animal models which do not necessarily result in clinical outcomes. This represents an essential gap which should be filled before plant or its extracts can be suggested instead of being medicinally used. Many aspects of *Typhonium trilobatum* remains ethnobotany remain undocumented and face the risk of loss due to habitat destruction, modernization and even cultural changes. To preserve this valuable heritage it is necessary to conserve natural populations and systematically document indigenous uses. Therefore, forward looking *Typhonium trilobatum* has potential to be a source of novel anti-inflammatory agents. Chromatography and spectroscopy can isolate and help in structural elucidation of active phytochemicals using advanced analytical techniques. Mechanisms and target pathways that may be involved in inflammation could be clarified by molecular biology and pharmacological studies. In addition, biotechnological production of valuable metabolites can be supported by tissue culture and this reduces pressure on wild populations. However, the traditional claims must be standardized, thoroughly safety evaluated and subjected to well designed clinical trials in order to translate them into scientifically validated therapeutics. Given the increased global interest in plant based medicines and natural anti inflammatory agents, *Typhonium trilobatum* presents an attractive drug development and integrative health care.

VIII. CONCLUSION

Typhonium trilobatum (L.) Schott is of long historical interest in traditional medicine, more particularly in the Indian subcontinent and southeast Asia and is considered a potential medicinal plant. Empirical knowledge of its traditional use in treatments of inflammation, wounds, respiratory ailments and envenomation are supported by preliminary scientific studies. However, the plant's tuber, though toxic in raw form, becomes rich source of pharmacologically active constituent when properly processed and have been demonstrated its therapeutic potential.

Thorough phytochemical analyses reveal that the weedy plant contains lots of secondary metabolites (alkaloids, flavonoids, saponins, tannins, phenolics, terpenoids and steroids). These compounds are characterized by anti-inflammatory and antioxidant, antimicrobial and wound healing action of these compounds. In vitro and in vivo studies have similarly shown that extracts of *T. trilobatum* can modulate the inflammatory pathways, inhibit denaturation of protein and stabilization of cell membranes and suppress inflammatory mediators such as nitric oxide and prostaglandins. These findings verify its ethnomedicinal applications and imply that the plant acts through multi-targeted mechanisms towards targeting an ailment. *Typhonium trilobatum*, in spite of its rich phytochemical profile and high traditional usage profile is underexplored in modern pharmacological research. Comprehensive studies need to be carried out to isolate and characterize individually the specific bioactive compounds, to elucidate their mechanisms of action and to do standardized toxicity evaluations. Indeed, clinical studies are needed to confirm the efficacy and safety of this product in humans. However, since there are no such studies; the current understanding of and potential pharmaceutical application of, the use of this plant is limited. The need for natural and safer alternatives to the synthetic anti inflammatory drugs becomes more evident, making *T. trilobatum* into a promising candidate. It acts as a good link between modern science and traditional

knowledge. Further research and validation will put this plant to the whole new application in the development of novel phytopharmaceuticals as treatment of inflammatory disorders as well as related conditions.

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