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A SYSTEMATIC REVIEW ON PHARMACOLOGICAL USES OF CROTON BONPLANDIANUM IN TRADITIONAL INDIA

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ABSTRACT :

About 80% of people worldwide still primarily receive their primary medical treatment from plant-based traditional medicine systems, which continue to play a significant part in the healthcare system. According to current research on medical plants, at least 25% of medications and many more are synthetic equivalents based on prototype chemicals that were discovered from medicinal plants. Growing trust in herbal therapy is the cause of the continued expansion of medicinal plant identification. The link between herbal medicines and human physiology and mental function is the topic of numerous conflicting hypotheses. To address the problems of unfavorable criticism of Ayurvedic formulations and a growth in toxicity complaints, evaluation data must be developed employing advanced modern procedures of standardization of Ayurvedic formulations. Understanding the phytochemical composition and safety of herbal formulations will be aided by these types of phytochemical investigations, both qualitative and quantitative. Ban Tulsi, also known as Jungle Tulsi, is another name for Croton bonplandianum Baill. The plant's parts are used extensively in traditional medicine for a variety of purposes, including hepatoprotection, reducing body swelling, curing ringworm and skin diseases, antihypertensive, antioxidant, wound healing, antifungal, antibacterial, antidiabetic, antitumor, anticancer, internal abscesses, nematicide, anticoronary, anti-inflammatory, larvicidal activity, antifertility, antispasmodic, antiseptic, antidote, analgesic, insect repellent qualities, and severe constipation. The plant is in high demand because of its slow pace of ordinary multiplication. We gathered data on the taxonomy, monographs, distribution, morphology, phytochemistry, traditional uses, and pharmacological investigations of the Croton bonplandianum Baill plant for this review report.

Keywords: Pharmacological uses, Croton bonplandianum, phytochemical, herbal medicine, ayurvedic formulation, biological activity, bioactive compounds

INTRODUCTION :

Nowadays, a great deal of research is being done on the various plant species that are consumed by local or tribal groups around the world, as well as their therapeutic principles, in order to evaluate traditional medicine worldwide. Herbal medicines, according to indigenous thought, are based on experiences and beliefs that have been passed down through the generations [1].Traditional medical methods have evolved in line with the society's cultural norms and way of life. Around the world, traditional knowledge of herbal remedies combined with hands-on practical training has improved. Herbal therapy has developed as an alternative and complementary treatment for a variety of illnesses brought on by pathogenic microorganisms, stress, anxiety, industrial dangers, and other factors. Herbal remedies continue to have a role in contemporary medicine and daily therapy despite the availability of synthetic medications and antibiotics.

Ayurveda, the science of long life, has its roots in India's Vedic era [2]. The foundation of the Ayurvedic medical system, Susrata Sanhita and Charaka Sanhita, discussed the therapeutic use of several medicinal herbs. Croton bonplandianus Baill is one of the plants that are listed in Ayurveda. Therefore, the review is predicated on C. bonplandianus's therapeutic and medical qualities.

TAXONOMICAL POSITION:

KINGDOM **:** Plantae
DIVISION : Magnoliophyta
CLASS : Magnoliopsida
ORDER : Malpighiales
FAMILY: Euphorbiaceae
GENUS : Croton L.
SPECIES : Croton bonplandianu

Fig. 1. Croton Bonpladianum

GENUS CROTON:

Small trees or deciduous shrubs with lepidote scales or stellate hairs are members of the genus Croton. stipulates a minute. blooms that are monoecious, dioecious, or a combination of the two typically terminal inflorescence racemose.[3] Females frequently have vestigial petals, five-merous flowers, three-locular ovaries, and males with tiny disk glands and stamens five to thirty. Take a pill of fruit. Seeds might be tiny or ecarunculate.[4]

ETHNOPHARMACOLOGY AND TRADITIONAL USE OF C. BONPLANDIANUS

Among its many therapeutic uses is C. bonplandianus' ability to repel insects . Analgesic, nematicide antibacterial [5], antifungal , antioxidant , anti-coronary , hepatoprotective , and wound-healing properties are also possible. Locals in isolated parts of West Bengal utilize the leaf extract as a treatment for high fever and the root as a remedy for snake venom [6]. C. bonplandianus has been used to treat skin conditions, ringworm, and liver disorders. This plant's leaves are highly valuable medicinally and are used to treat wounds, cuts, and blood pressure. Internal abscesses, abdominal dropsy, acute constipation, and jaundice are all treated with C. bonplandianus seeds. Tribal communities utilize the plant's fresh juice to treat pimples on the head [7]. Additionally, some migrant laborers use the plant to heal skin conditions. The plant's juice is used less frequently to treat toothaches and helminthiasis [8].

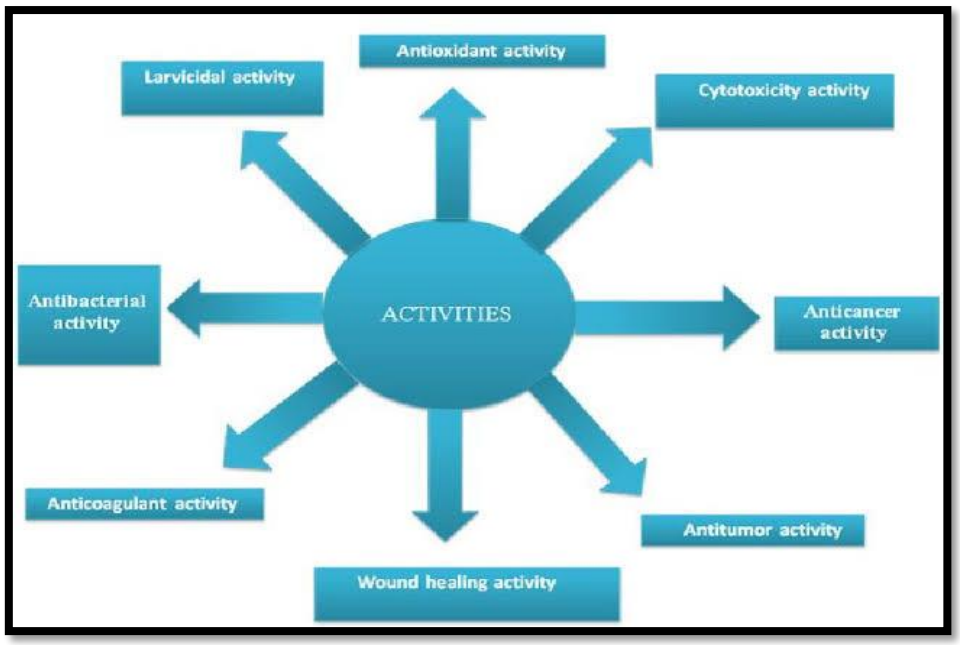
BIOMOLECULES OF C. BONPLANDIANUS

C. bonplandianus has a number of biomolecules or bioactive substances that are in charge of preventing a number of illnesses. According to reports, the plant's phytochemical components include rutin, crotsporinine, crotosparine, and its methyl derivatives, aphorbol, which are important for wound healing. Steroids, unsaturated steroids, phenolics, alkaloids, flavon, flavonols, carotinoids, leuco-anthocyanine, and flavonoids are all abundant in C. bonplandianus [7]. Additionally, the plant contains two families of compounds: glycosides and terpinoids.

The chemicals obtained from the root of C. bonplandianus include 3-α hydroxyl-urs 12, 15-dien of ursane skeleton, oleanolic acid, ursolic acid, and β-sitosterol . The alkaloids identified from the extract of C. bonplandianus include 3-methoxy 4, 6-hydroxymorphinandien-7-one, and norsinoacutin. Bio-polymers including cellulose, hemicellulose, and lignin are abundant in C. bonplandianus. This facility can be used to make ethanol and oil.[9]

- **PHARMACOLOGICAL ACTIVITIES OF C. BONPLANDIANUS**

Fig.2 Role of Croton Bonplandianus in different activities



1] ANTIOXIDANT ACTIVITY OF CROTON:

The impact of free radicals, reactive oxygen species (ROS), and reactive nitrogen species (RNS) that may result in biological harm is known as "oxidative stress." It simply refers to the imbalance that exists between oxidants and antioxidants, with the oxidants being the natural byproduct of aerobic metabolism. Many different types of illnesses are caused by reactive oxygen species (ROS). Numerous plant-based compounds have a remarkable ability to scavenge reactive oxygen species. Sridhar et al. (2013) assessed C. bonplandianus's antioxidant capacity [10]. They suggested that, in comparison to normal BHT, the plant extract possesses DPPH scavenging action with an IC 50 value of 416.82 µg/ml.

2] ANTIMICROBIAL

The National Committee for Clinical Laboratory Standards (1997) states that the aqueous extracts (say) of Croton bonplandianus were tested for their in vitro antibacterial activity against three strains of Gram-positive and four strains of Gram-negative bacteria using the agar disc diffusion technique.[11] Following the removal of the sterile nutrient medium and the maintenance of a temperature between 45 and 50˚C, 100 µL of bacterial suspension with 108 colony-forming units (CFU)/mL was combined with sterile liquid nutritional agar and placed in the sterile Petri plates. This was done by first dip-soaking the nutrient-dense agar medium plates in several quantities of extract (10, 25, 50, 75, and, for example, 100 mg/mL). After allowing the plates to solidify, 5 mm-diameter filter discs were positioned on top of them. The plates were incubated at 37°C for a whole day. It was autoclaved for 15 to 20 minutes to create the nutritious agar (HI Media Laboratories Limited, Mumbai, India). The zone of inhibition's diameter, which includes the 5 mm disc diameter, was measured using a scale.. To minimize error, each experiment was carried out three times, and the average outcomes were reported. [12]

3] ANTICANCER ACTIVITY

Originally from Southeast Asia, Croton bonplandianum is a leafy shrub belonging to the Euphorbiaceae family. The plant's seed oil, also known as croton oil, or its main active ingredient, 12-O-tetradecanoylphorbol-13-acetate (TPA), is an inflammatory and irritating substance that has been used extensively as a tumor promoter (typical dosage = 5–16 nmol, twice weekly) on the skin of mice that had previously been exposed to 7,12-dimethylbenz(a)anthracene or other polycyclic aromatic hydrocarbons. Growth suppression was the outcome of treating prostate cancer LNCaP cells with clinically achievable TPA concentrations (1–1.6 nM), and apoptosis was the outcome of treating these cells with TPA at concentrations several times higher.[13] .The growth of cultured prostate cancer LNCaP cells was shown to be inhibited by TPA and ATRA working in concert, while the growth of Treatment with TPA or ATRA prevented the growth of pre-existing LNCaP tumors in immunocompromised rats. A combination of TPA and ATRA administered to these tumor-bearing mice caused some tumor regression in all of the treated animals, but tumor regressions were seen in a number of the mice that were treated.The molecular mechanisms by which TPA and ATRA work together to inhibit LNCaP cell growth and induce apoptosis are unknown.[14]

4] ANTHELMINTIC ACTIVITY

The procedure was followed for doing the anthelmintic activity. The adult Indian earthworm, Pheretima pothuma, shares morphological and physiological characteristics with intestinal roundworm parasites in humans. [15] Three different concentrations of Croton bonplandianum (pet ether, ethanol, and water extract) solutions (20, 40, and 60 mg/ml) were added to a petridish containing Pheretima pothuma. Each petri dish was filled with six worms, and the paralysis or death of the worms was tracked. The time of worm death (min) was measured once it was established that the worms did not move when shaken or when exposed to external stimuli. When the worm did not move at all—aside from when it was shaken violently—the mean time for paralysis was noted. In the same manner, albendazole was introduced as a reference material. Samples treated with albendazole (20, 40, and 60 mg/ml) as the reference chemical were compared to the test results [16].

5] ANTI – BACTERIAL ACTIVITY

To investigate the antibacterial qualities of the plant's components, 500 mg of each extract was combined with 5 milliliters of sterile 10% dimethyl sulfoxide (DMSO) to create 10% w/v test solutions of Leaves, fruits, and latex extracts of C. bonplandianum, along with fresh latex. Calculations of 25, 50, 75, and 100 extracts from the same source were used to assess fresh latex; the resulting bactericidal activity was 2.5, 7.5, and 10 mg, respectively. In each well of Mueller Hinton Agar (MHA) plates that had previously been infected with the matching bacterial cultures, the Different concentrations of 2.5, 5, 7.5, and 10 mg of C. bonplandianum whole plant and latex extracts were given. The plates were then incubated for the full day at 37ºC Streptomycin (10 µ g) and 10% DMSO, respectively, were used as the solvents in the study's positive and negative control groups. After incubation, a zone reader was used to measure the diameter of the inhibition zone (in millimeters) surrounding the well.[17]

6] DIPHENYL - 2 - PICRYIHYDRAZYL (DPPH) SCAVENGING EFFECT

When an electron or hydrogen atom is accepted, diphenyl-2-picrylhydrazyl (DPPH) creates a stable molecule, which is why it can be used to measure the radical scavenging activity of natural compounds [18]. When an antioxidant interacts with DPPH, it transforms into the free radical 1, 1-diphenyl-2-picrylhydrazine. The degree of decolorization reveals the antioxidant drug's capacity for scavenging . Three milliliters of extract solution in ethanol at several concentrations (10, 20, 40, 80, and 100 µg/ml) were mixed with one milliliter of a 0.1 mm solution of DPPH in ethanol. After half an hour, the absorbance was measured at 517 nm. Higher free radical scavenging activity is shown by the reaction mixture's lower absorbance. Using the following formula, the capacity to scavenge the DPPH radical was determined. The IC value, which is the concentration (µg/ml) of extracts that prevent 50% of free radical production, was 50/50. [19]

7] LARVICIDAL ACTIVITY

Research has been done on the larvicidal activity of C. bonplandianus methanolic extract at several concentrations. The mosquito Aedes aegypti is effectively inhibited by an IC 50 value of 124 ppm . According to their proposal, C. bonplandianus leaf extract, at 124 parts per million, is more effective at controlling mosquitoes.[20]

8] WOUND HEALING ACTIVITY

In daily life, wounds—which can be mild or major—are common clinical entities. Wound healing can be divided into five stages: collagenation (cellular phase), contraction (wound contraction), collagen deposition (collogenation), epithelialization (epithelialization), and scar remodeling (cicatrixization). Wound contraction is the process by which the wound area shrinks, while wound healing is the process by which damaged tissue is returned as nearly to its normal state as feasible. The rate of wound concentration is significantly increased by the alcoholic leaf extract of Croton

bonaplandianum. Ramachandran et al. concluded that herbal extract ointments containing leaf extracts from Croton bonaplandianum significantly increase the rate of wound concentration.[21]

TRADITIONAL USES

This plant was found to have originated in South America and Asia. Because of its antiseptic properties, C. bonplandianum is used to treat skin conditions, including ringworm infection, respiratory issues, and body inflammation. The bark and roots of C. bonplandianum are cholagogue and purgative [22]. The leaves of the plant C. bonplandianum are used to cure cholera, venereal sores, and wounds and blemishes on the body. [23] In the West Bengal, C. bonplandianum is abundantly grown. After being collected, the ash is kept in a bottle for five or six daysAsh and warm water can be combined to create a detergent for cotton clothes. Ethnic tribes in rural West Bengal, India, employ the leaves and roots of C. bonplandianum to treat high fever and snake venom .[24].

SOME OTHER USES OF CROTON SPECIES INCLUDE:

1. Treatment of diabetes
2. Treatment of high blood cholesterol
3. Treatment of gastrointestinal disturbances
4. Treatment of hepatic disturbances
5. Treatment of weight loss

FUTURE DIRECTIONS :

Mankind has always been driven by scientific research and inventions, which are primarily to blame for the high standard of living that he enjoys now. An important factor in a nation's economic success is its natural resources. Even before humans existed, there were plants. It is impossible to overstate the role that plants play in medical care. C. bonplandianum, is frequently used as a possible source for medications with anti-inflammatory, anticancer, antimicrobial, insectifuge, nematicide, anti-coronary, wound-healing, and hepatoprotective properties, showed broad-spectrum antibacterial activity against bacterial isolates of both Gram-positive and Gram-negative bacteria. Therefore, more investigation is required to separate, identify, describe, and clarify the structure of these bioactive substances that provide C. bonplandianum its therapeutic benefits. Twenty-one main phytocompounds were found in the current study in various parts of C. bonplandianum, including the fruit, latex, and leaves.[25]

CONCLUSION :

For many decades, various medicinal herbs have been used extensively in traditional cancer treatment approaches. One of the biggest genera of flowering plants is Croton, and several of its species are widely utilized in ethnomedicine to cure a variety of illnesses, including cancer. As a result, this genus has drawn increasing attention for phytochemical screening and the isolation of any and all anticancer chemicals. The quest for enhanced cytotoxic agents remains a crucial avenue in the advancement of contemporary anticancer pharmaceuticals For the longest period, people have been using phytomedicine. One such plant that is widely utilized in ethnomedical traditions around the globe to cure a variety of ailments is Croton bonplandianus. The herb is quite safe and useful for usage as medicine against a variety of ailments, according to traditional and ethnomedical literature. In natural drug discovery, reverse pharmacological methods can be used to explore a plant for a safe and effective medicine.

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