



A Comprehensive Review on "An Ethnomedical, Pharmacological and Phytochemical Study of Ammanniabaccifera": An Overview

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Abstract :-

Ammanniabaccifera L. is commonly used in traditional medicine in India and China to raise blisters in rheumatism and in the treatment of scabies, ringworm, parasitic skin infections, common cold, typhoid, strangury, spinal disease, gastroenteropathy and aphrodisiac. The present review covers all the available information on *Ammanniabaccifera* from scientific journals, books, thesis, reports and conference proceedings via academic libraries and electronic search databases accepted worldwide (Pubmed, Pubmed central, Tropicos, Google scholar, Scopus, Internet archive). These sources were scrutinized and evaluated about its botany, traditional uses, biological aspects, chemical constituents and pharmacological relevance. The in vivo studies of extracts from *Ammanniabaccifera* showed antitumor, anti-inflammatory, antiarthritic, antianalgesic, antipyretic, antidiuretic and wound healing pharmacological activities which can be attributed to the presence of flavonoids, tannins, polyphenols, triterpenes and sterols. The plant was evaluated and validated for the medicinal activity against microorganisms and antimalarial properties using in vitro studies. Tetrolane derivatives were found to have antitubercular activity and high toxicity against brime shrimp.

Key Words: Traditional Medicine, Gastroenteropathy, Parasitic Skin Infections,

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Introduction :-

Ammanniabaccifera Linn commonly known as blistering ammannia is a weed in rice fields. It is a medicinal herb belonging to the family of Lythraceae and commonly distributed throughout tropical and sub tropical regions. In Ayurveda, the leaves are considered to have laxative, stomachic, hepatopathy and aphrodisiac properties. In Siddha, the whole plant is used in the treatment of glandular swelling, leukorrhea, snake bite poisoning abscesses, ulcer and polyuria. The herb is reported to have anti-typhoid, anti tubercular, anti-oxidant, anti-inflammatory, antinociceptive and anti-tumour properties.[1-3] In the development of new drugs and effective health care systems, medicinal plants and herbs continuously play an important role. It was

of plant origin can be considered as important drugs of which 74 % have been discovered through the isolation of the active substances from plants used in traditional medicine. Conventional medicines using plant extracts continue to provide health coverage for 80 % of world population. [5]

Several studies on *Ammanniabaccifera* were available in literature and the plant was proved to have a broad spectrum of therapeutic and pharmacological properties. Therefore, this review was carried out to enumerate the benefits of the species *Ammanniabaccifera*. The aim of this review is to provide a contemporary overview of botany, traditional uses, biological activities, ethnopharmacological relevances and chemical constituents.

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It is observed that at least 117 chemical substances





1. History, Background And Distribution :-

The plant *Ammanniabaccifera* Linn (*Lythraceae*) is an important Ayurvedic and Unani herb known as Blistering ammannia (Eng), Kurandika, Agnipatri (Sanskrit). This erect glabrous reddish herb is very common in rice fields and marshy localities all over India. Leaves are oblong or narrow elliptic, round usually obtuse; flowers reddish in dense axillary clusters, apetalous; fruits depressed globose capsules covered by calyx.[6]

2. Regional And Other Names :-

Gujarati : Jalaagio
Hindi : Aginbuti, Ban mirich, dadmari, jungle mehendi, Kuranta
Bengali : Banmarich
Kannada : Kaadugida
Konkani : Dadmaria
Malyalam : Kallurvanchi, nirumelneruppu
Marathi : Aginbuti, bharajambhula, dadmari
Nepalese : Ambar
Punjabi : Dadarbooti
Tamil : Kal-l-uruvi, nirummelneruppu
Telugu : Agnivendapaku

3. Scientific Classification :-

Kingdom : Plantae

Clade. : Tracheophytes
Clade : Angiosperms
Clade. : Eudicots
Clade. : Rosids
Order. : Myrtales
Family : Lythraceae
Genus : Ammannia
Species : AmmanniaBaccifera

4. Parts Used :-

Root, stem, inflorescence, leaves, whole plant.

5. Description :-

Terrestrial, annual, erect herb, up to 60 cm tall.

Root: Root is taproot; white or brown.

Fruit: a capsule, opening irregularly, transversely.

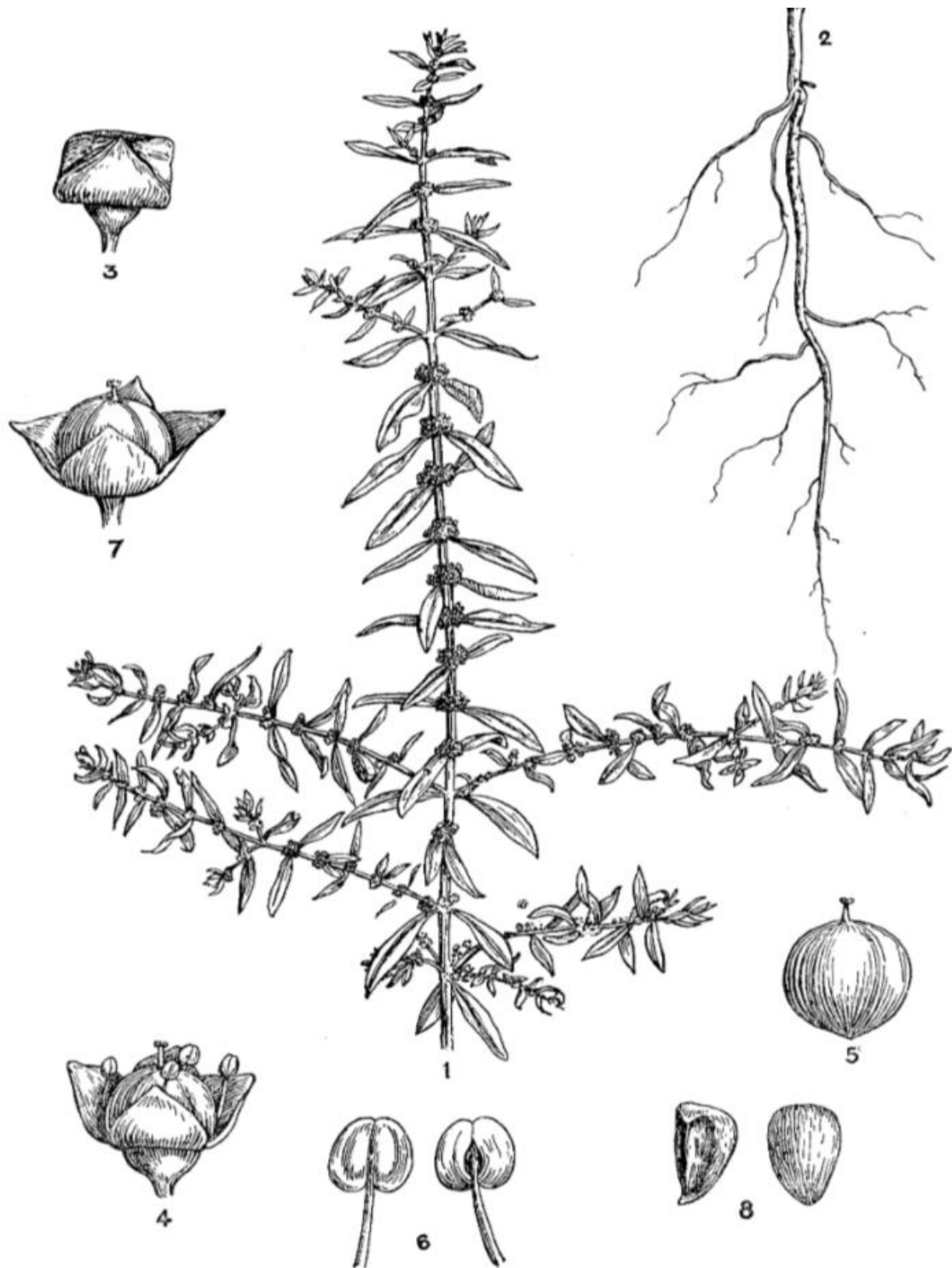
Stem: erect branched, smooth, and slender, with somewhat 4 - angled stems.

Leaf: the leaves are narrow - oblong, oblanceolate or narrowly elliptic, about 3.5 cm long those on the branches very numerous, small and 1-1.5 cm long with narrowed base and pointed or somewhat rounded tip.

Flower: the flowers are small, about 1.2 mm long, greenish or purplish, and borne in dense clusters in leaf axils. The capsules are nearly spherical, depressed, about 1.2 mm in diameter, purple in colour, petals are absent

Seed: he seeds are black





AMMANNIA BACCIFERA, Linn.

PLATE 56.—Figs. 1. Branch. 2. Root system. 3. Flower bud. 4. Flower. 5. Pistil. 6. Anthers. 7. Fruit with calyx. 8. Seed.

6. Ayurvedic Description:-**Sanskrit:** Agnigarbha**Synonyms:** Brahmasoma, Kshetrabhusha, Kshetravashini, Mahasyama, Pasanabheda**Properties :**

Rasa : Katu, Tikta

Guna : Laghu, Tiktsna, Sara

Virya : Usna

Vipaka : Katu

Actions : Kaphavatahari, pittajanani, dipani, pacani**Therapeutic Use:** Kasa, kustha, asmari [10]**7. Natural Distribution :-**

The plant is native to tropical and subtropical Asia and Africa but widely distributed throughout India and also found in Greece, Australia, north to Formosa in the Pacific, Europe, Bhutan, Myanmar, Nepal, Ceylon, Afghanistan, Pakistan and China. In India, the species spread in Darjeeling, Gujarat, Goa, Uttar Pradesh, Karnataka, Andhra Pradesh and Tamil Nadu.

8. Biological Aspects of Ammanniabaccifera :-

The plant was reported with activities like hypothermic, hypertensive, antisteroidogenic, antimicrobial, antiurolithic, antiinflammatory, antitumor, antitubercular, antipyretic, antidiuretic, antityphoid and CNS depressant activity.[26,27,28] A field study was conducted in Rakhamine, Jharkhand (India) and found that roots of *Ammanniabaccifera* having accumulation of more Zn and Ni in their underground tissue when compared to shoots.[29] Higher than toxic levels of metal concentration indicates the presence of internal metal detoxification, tolerance mechanism mainly to copper tailings and Cu accumulator in metal mine waste.[30,31]

9. Physicochemical Properties:-

The physicochemical properties for stem and leaf of Ammanniabaccifera were : misfortune on drying at 105° C : 5.47 [% w/w], debris esteem at 450° C : 13.13 [% w/w], corrosive insoluble debris at 450° C : 0.02 [% w/w], water solvent extractive : 18 [% w/w] and liquor dissolvable extractive : 16 [% w/w].

The physicochemical properties for the root were : misfortune on drying at 105° C : 0.5 [% w/w], debris esteem at 450° C : 13.33 [%w/w], corrosive insoluble debris at 450° C :

0.03 [% w/w], water dissolvable extractive : 7.4 [% w/w] and liquor solvent extractive : 33.8 [% w/w].[32]

10. Chemical Constituents :-

The plant is reported to contain hentriacontane, dotriacontanol, betulinic acid, lupeol, ellagic acid, quercetin, and lawsone. The root contained flavonoids, phenols and carbohydrate, the total amount of tannins were 0.42 and poly phenols were 4.04 %. Vitamin C, steroid, triterpenes, coumarines, flavanol, and tannin were also isolated from different parts of *Ammanniabaccifera*. The stem and leaves of *Ammanniabaccifera* contained tannin, flavonoids, phenols, carbohydrates, the total tannin was 4.141%, while, the total phenols was 3.53 %. The plant is also reported to contain tetralone derivatives i.e. (-)-(4R)-Hydroxy-1-tetralone, (-)-(4S)-acetoxy-1-tetralone, (-)-(4S)-hydroxy-1-tetralone-4-O-β-D-glucoside, β-sitosterol and β-sitosterol-β-D-glucoside. [33,34,35]

11. Compound isolated :-

Two new terpenic compounds - Ambacinol, ambacinin, four known compounds - β-sitosterol - 3 - 0 - β - glucopyranoside, Quercetin - 3 - rutinoside (Rutin), kaempferol - 3 - 0 - β - glucopyranoside and Quercetin - 3 - 0 - α - L - rhamnoside (Quercetrin) have been isolated. The identity of all these four steroidal and flavonoid glycosides were established on the basis of chemical shifts and spectral data.[36]

12. Traditional/Ethno Medicinal Uses :-

In Ayurveda, the leaves are used as bitter appetizer, laxative, stomachic, aphrodisiac, to remove vata, kapha, seminal weakness, renal and vesicular calculi rheumatism, intermittent fevers and herpetic eruptions, is a rich source of vitamin C and reported to possess antityphoid, antitubercular, laxative, diuretic and antibacterial properties. In Yunani leaves are used as appetizer. The leaves are exceedingly acrid: they are used universally by natives to raise blisters in rheumatic pains fevers etc. The fresh leaves bruised and applied to the part intended to be blistered. The leaves are applied to cure herpetic eruptions. Infusion of dried plant has been cited to be used orally by male adults in India as aphrodisiac and against syphilis.[6,37,38,33,34,35,39,40]



14. Traditional Uses And Extract Preparation :-

Sr.No	Geographical region/ state	Tribes/ village people (group)	Plant parts /preparations	Ethnomedical uses	Referances
1.	Orissa	Jhara,keuta, Dhivara	5-6 shoots are grinded with 7 fruits of piper nigrum, the mixture applied to cure ring worm with in half to one hour	Ring worm	[46]
2.	Orissa (eastern ghat region)	KutiaKandha	Leaf juice with honey in empty stomach,plant leaves with common salt was also used to cure.	Typhoid skin disese ring worm	[47]
3.	Western Ghats	Kanikkars	10gms of A.baccifera mixed with citrus aurantifolia (chrishm)swingle juice applied 2 times a day for a week.	Eczema	[48]
4.	Andhra Pradesh	Sugali	Oral administration of 20g whole plant powder for every four hours with how cow milk works against bungarus fasciatus (banded krait) bite	Snake bite	[49]
5.	Kerala	Muthuvas	Leaf juice	Poisonous bites	[50]
6.	North- west Himalaya	Gujjars and Bhotiyas	The decoction prepared from 10g of fresh leaves with 10g of cyperusrotundus roots and 5g of fresh ginger is used. Whole plant is burned and ashes are mixed with til oil (sesamum indicum) and the ashes of whole plant mixed with til oil. Leaf infusion with warm water	Intermittent fever Skin eruptions Decrease sexual desire in axon	[51]
7.	Gujarat	Mehar	Two sponful decoction of entire plant was taken orally twice a day for a week.	Gonorrhoea	[52]
8.	Rajasthan Shekhawati		Decoction of whole plant is taken twice a day. Leaf paste and inflorescence to skin.	Fever Itching	[53]
9.	Jaipur	Santal-Kantabania	Leaves bruished and applied externally.	Ringworm, parasites, skin infection	[54]
10.	Bennin	Bariba and Wama Ethnic groups	Leaves	Jaudice, fever, malaria, eliminates blood clots	[55]

Pharmacologicalrelevance/ReportedBiological activities Of Ammanniambaccifera :-

Scientific Investigation on the medicinal properties of Ammanniambacciferadates back to the 1930s. A summary of the findings of these studies is presented below.

• Anti-inflammatory and analgesic effects :-

The antiinflammatory and anti-arthritis activities of different extracts of *Ammanniambaccifera* Linn was evaluated in acute inflammation induced by carrageenan in

rat hind paw and in chronic inflammation induced by Freund's adjuvant induced arthritis models in comparison with indomethacin (10mg/kg bw) as a standard drug. The ethanol extract of *Ammanniambaccifera* exhibited significant dose dependent activity in acute inflammation and the doses of 100 and 200 mg/kg produced 38.27% and 43.39% inhibition respectively after 3h as compared with that of the standard drug which showed 48.52% inhibition. In Freund's adjuvant induced arthritis model, the doses of 100 and



200 mg/kg bw of the ethanol extract produced (38.83%) and (44.08%) inhibition respectively after 19 days when compared with that of the standard drug (55.47 %).[56]

The ethanolic extract of the *Ammanniabaccifera*(whole plant) at doses of 200, 400 and 600 mg/kg IP produced an inhibition of 20.7%, 43.4% and 72.9%, respectively, of the abdominal writhes induced by acetic acid in mice. In the formalin test, the administration of 200, 400 and 600 mg/kg IP had no effects in the first phase (5 min) but produced a dose dependent analgesic effect on the second phase (1540 min) with inhibitions of the licking time of 27.3%, 47.7% and 57.4%, respectively. [57] The methanolic extract exhibited significant anti- inflammatory and analgesic activities at the dose of 100 and 200 mg / kg. The effect of the higher dose of the extract (200mg/kg) was comparable with the standard drugs aspirin and morphine. Tripathy found that ethanol extract of aerial parts of *Ammanniabaccifera* exhibited better antiarthritic activity than aqueous extract on cotton pallet induced granuloma and complete Freund's adjuvant induced arthritis models in albino rats. [58]

• Anti-Tubercular Activity :-

80% ethanolic extract of the whole plant exhibited antimycobacterial activity.[59,66] The phyto compound 4-hydroxy- α -tetralone and 4-O-myricitoyl- α -tetralone to have in vitro anti tubercular activity against *Mycobacterium tuberculosis* H37RV by BACTEC - 460 radiometric susceptibility assay with MIC as 50 μ g/ml. The lower concentration of bioactive compound inhibited the growth of the organism and exhibited significant antitubercular activity. [61]

• Wound Healing :-

The utilization of leaf concentrates of *Ammanniabaccifera*creams to the tained injury in rodents improved the recuperating movement and diminished the danger of further disease. The utilization of ethanolic leaf concentrates of *A.baccifera* was found to improve the various periods of wound fix, including collagen union and development, wound withdrawal and epithelialization.[62]

• Antiurolithic activity:-

The antlurolithic activity of *AmmanniaBaccifera*was tested in male albino rats. Urinary stones were induced by implantation of zinc discs in the urinary bladder. They found that the ethanolic extract of *Ammanniabaccifera*, (2g/kg/day) was effective in reducing the formation of stone and the in dissolving pre also in -formed one. There was a significant increase in the urinary excretion of calcium, magnesium and oxalate, four weeks after implantation of zinc discs. Treatment with *Ammanniabaccifera* has significantly reduced calcium and magnesium levels in the prophylactic group while it has reversed the levels of these ions to normal values in the curative groups. [63]

• Anti-fungal activity :-

Undiluted aqueous extract was found to be active against *Helminthosporiumturcicum* on agar plate model. [36,38]

• Hypotensive Activity:-

Hydro-alcoholic extract at 50 mg/kg body wt.intravenously in dogs exhibited positive hypotensive activity. [36]

• Antibacterial activity:-

The plant material was extracted with distilled water (aqueous) and methanol. The preliminary screening experiment revealed that methanol extracts were more potent than the aqueous extracts. The plant extracts were more active against gram-positive bacteria than gram-negative bacteria. The most susceptible bacteria were *K. pneumonia* and. the most resistant bacteria were *Esteretia coli*. *Bauhinia variegates* L. exhibited remarkable antibacterial activity. [36,65,66,67]

• Antipyretic and Diuretic Activity:-

Brewer's yeast induced pyrexia method is followed by Joanofarcto evaluate the antipyretic activity of the extracts of *Ammanniabaccifera* against wister albino male rats. Chloroform extract at 200 mg / kg dose level exhibited significant activity compared to 200 paracetamol at 100 mg /kg after 270 minutes of drug administration. The diuretic activity of ethyl acetate, ethanol and petroleum ether extracts was significant even at 4th hour where as petroleum ether extract showed significant level at 24th hour.



Chloroform extract was completely devoid of diuretic activity.[68] They also reported that the diuretic effect of PEE, EAE and EE may be like that of frusemide which brings about local prostaglandin synthesis.

• Antioxidant effects:-

The IC₅₀ value for free radical scavenging activity of the methanolic extract of *AmmanniaBaccifera* was significantly superior over the positive standards butylated hydroxyl anisole (BHA) and rutin.[69] The methanolic extract of *AmmanniaBaccifera* significantly decreased the levels of lipid per oxidation and increased the activities of GSH, GPX, SOD and CAT in mice.[32] In carbon tetrachloride induced oxidative stress in rats, the treatment with ethanolic extract of *AmmanniaBaccifera* was significantly prevented the accumulation of lipid per oxidation products in the plasma.[70]

• Cytotoxic Activity :-

Methanolic extract of *AmmanniaBaccifera* was screened for cytotoxic activity against healthy mouse fibroblasts (NIH3T3) and three human cancer cell lines (gastric: AGS; colon: HT-29; and breast: MDA-MB-435 S) using the MTT assay. It showed low toxicity (IC (50) >2.5 mg ML (-1)) against mouse fibroblasts but selective cytotoxicity (IC (50) 0.2 -2.3 mg ml (-1)) against different cancer cell lines.[71]

• Other effects:-

The plant was found to possess hypothermic, seminal weakness, flatulence and CNS depressant activities.[72]

15. Toxicity :-

Intense harmfulness examines uncovered no mortality up to the portion of 4000 mg/kg bw. Notwithstanding, intense and sub intense toxicological impacts of *AmmanniaBaccifera* were assessed on rodents. Intense oral toxicological examinations uncovered that all the creatures endured the test portions up to 2000 mg/kg body weight. In sub acute toxicological investigation, no noteworthy portion related changes in haematological, biochemical boundaries and histopathology of crucial inner organs with the utilizing of 50,100,250 and 500 mg/kg body weight /day.[73]

16. Conclusion :-

The extensive literature survey revealed *AmmanniaBaccifera* to be an important medicinal plant documented for diverse applications and used in Ethnomedical treatments. Pharmacological studies carried out for the crude extracts and isolated compounds of *AmmanniaBaccifera* provide a practical support for its numerous traditional uses. Recent studies have been focused on evaluating activity against inflammatory, analgesic, tubercular, fungal, steroidogenic, urolithic, bacterial, pyretic, activities. The mentioned treatments are conceivable by the presence of phytochemical constituents like alkanes, coumarins, flavonoids and sesquiterpenes. Some of the mentioned pharmacological studies were aimed on validating its traditional uses. It was found that, some of its traditional uses like anti-inflammatory, antibacterial etc had been extensively explored by research groups. However, no experimental evidence is available substantiating its traditional use in blood clots, gonorrhoea, etc., which can be explored further and there is a need of phytochemical standardization and bioactivity guided identification of bioactive metabolites. Further investigation is necessary to determine the possible benefits on formulation of *AmmanniaBaccifera* extracts to phytotherapeutic agents against urinary stone, common cold, skin eruptions and haemorrhoids problems. Studies on the mode of action are anticipated to lead the way for new agents with improved and intriguing pharmacological properties. The outcome of these studies will further expand the existing therapeutic potential of *AmmanniaBaccifera* and provide a convincing support to its future clinical use in modern medicine.

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