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### A PHYTOPHARMACOLOGICAL REVIEW ON ARID REGION MEDICINAL PLANT- *AERVA PSEUDOTOMENTOSA*

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#### ABSTRACT

*Aerva pseudotomentosa* Blatt. & Hallb. (Amaranthaceae) is arid region plant of Amaranthaceae family. It is commonly known as Bui. It is used in folk medicine for the treatment of various ailments such as pain and inflammatory hyperalgesic disorders, rheumatic pain, fever, treatment of wounds and urinary disorders. *Aerva pseudotomentosa* is a valuable ethnoveterinary medicine to treat health ailments of live stock. Aim of current review to search literature for ethnomedicinal use, pharmacological property, safety/toxicity study, pharmacognostic and physicochemical standardization, preliminary phytochemical investigation of *Aerva pseudotomentosa*. This compiled data will enable the researchers to identify and differentiate the plant *Aerva pseudotomentosa* from other similar aerva species and to explore the medicinal properties of different parts of this desert vegetation which are yet to be discovered.

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## INTRODUCTION

### Herbal medicine

Herbal traditional medicine is based on the knowledge, skills and practices and experiences of indigenous of different cultures, used in the treatment of various diseases conditions. Over the past few decades, the development of chemically synthesized molecules has a major contribution in healthcare across the world. However majority of population of different regions still rely on Herbal medicine for the remedy of various ailments. In Indian subcontinent 70% of the population prefer use of herbal medicine in order to meet their health care needs around 960 plant species used as herbal medicine in India [1]. In these, various plants used as folk medicine to treat fever, pain, inflammation, rheumatism including other analgesic activity, in spite of these facts very little work has been done on the desert vegetation of the India. Therefore in this study plant of arid region has been selected for comprehensive review of its existing literature about folklore traditional uses, pharmacological profile, pharmacognostic and physicochemical standardization, preliminary phytochemical investigation. This extracted information will pave the way for the researcher to unfold the concept of pharmacological properties based on folklore traditional uses and bioactive compounds residing in various parts of *Aerva pseudotomentosa*.

### Pharmacological significance of *Aerva* genus

Family Amaranthaceae includes 180 genera and around 2,500 species. Species of Amaranthaceae family are halophytes found in salty soils and sandy dunes. The genus *Aerva* of Amaranthaceae family comprise of about 29 species [2]. *Aerva* species are varying from each other on the basis of geographical occurrence, climate condition. Various species of *Aerva* genus such as *Aerva lanata*, *Aerva sanguinolenta*, *Aerva javanica* var. *javanica* is well known for their analgesic, anti-inflammatory, wound healing properties [3-5]. Phytochemical investigation of these species revealed the presence of many phytoconstituents such as flavonoids (aervanone, isorhamnetin-3-O- $\beta$  [4"-p-coumaroyl- $\alpha$  rhamnosyl (16) galactoside]), ecdysteroids, ascorbic acid,  $\beta$  sitosterol, gallic acid, rutin, oleanolic acid, alkaloids, terpenoids and phenolic compounds. *Aerva pseudotomentosa* is infra specific taxon and type variety of *Aerva javanica* var. *javanica*. [6-10]

*Aerva pseudotomentosa* Blatt. & Hallb. (*Aerva javanica* var. *bovei* Webb) of Amaranthaceae family is a perennial herb or under shrub found in arid zones of western parts of India and Nara desert of Pakistan, commonly known known as "Bui". It is used as folk medicine by the rural population of arid region for the treatment of various ailments such as pain, fever, inflammation, rheumatism, treatment of wound and urinary disorders.

### Members of the genus *Aerva*

*A. bengalensis*, *A. bovei*, *A. brachiata*, *A. elegans*, *A. glabrata*, *A. javanica* (Java *Aerva*), *A. lanata* (*Aerva*), *A. persica*, *A. platyphylla*, *A. pseudo-tomentosa*, *A. sanguinolenta*, *A. tomentosa*.

### Plant profile

#### Scientific classification

Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Caryophyllales
Family	Amaranthaceae
Genus	<i>Aerva</i>
Species	<i>Aerva javanica</i>
Variety	<i>bovei</i>
Botanical name	<i>Aerva javanica</i> var. <i>bovei</i> Webb



Figure 1. Plant of *A. pseudotomentosa*

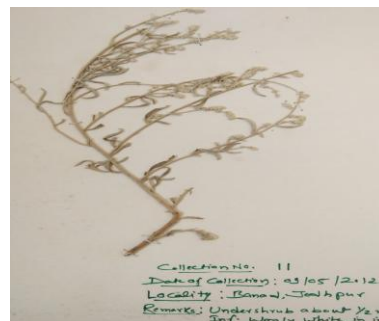


Figure 2. Herbarium specimen of *A. pseudotomentosa*

**Botanical description****Morphological characters**

Herbs or subshrubs, branches many from the base with simple stem with ascending branches, stem erect, stoloniferous or climbing. Leaves linear to narrowly linear-oblong-ovate, up to 6 mm wide, margins plane or involute, sometimes falcate-recurved. Outer tepals 2 mm long, flowers perfect, unisexual or dioecious, small or very small. Inflorescences spikes terminal or axillary. Bracts and bracteoles membranous persistent or bracteoles falling off with perianth in fruit. Tepals 4 or 5, ovate or oblong, membranous or papery, lanose, with only 1 vein. Stamens 4 or 5; filaments subulate, unequal, united to short cup at base, alternating with pseudostaminodes, pseudostaminodes subulate to oblong; anthers 2-loculed. Ovary obovoid or subglobose, glabrous; style persistent; stigmas 2, capitate. Utricles ovoid, compressed, membranous, indehiscent or irregularly dehiscent (bursting), falling off with perianth. Seeds reniform-orbicular, lenticular, compressed. Differs from type variety in panicles being leafy, spikes more slender, often interrupted with oblong globose lateral clusters, all spikes except the terminal are frequently shortly cylindrical or oblong. Flowering and fruiting from July to January [11].

**Distribution**

Perennial herbs or under shrubs it is common in sandy soils, distributed from the Indian dry desertic zones through Pakistan and Iran to Palestine, Egypt and Sahara. In India it is found in arid and semiarid region of Rajasthan state mainly in Jodhpur, Barmer, Bikaner, Churu, Jaisalmer, Jhunjhunu, Sikar and Shri Ganganagar districts and is locally known as Bui, Buari.

**Traditional uses**

Thari *people* of Pakistan use the decoction of the whole plant to relieve toothache, Tribes of Rohri hills, and Nara desert of Pakistan use paste of leaves and inflorescence topically for healing of wounds additionally this paste also used for the treatment of inflammation of joints [12-14]. Powdered seeds are taken with water against rheumatism and gastric troubles [15]. In Somalia the decoction of fresh roots administered to stop bleeding after delivery or to stop excessive menstruation, remedy for impotence and to treat pain in lower part of abdomen [16].

Sudanese people use whole plant for its antipyretic property [17]. Powdered root is taken orally with water to cure stomachache and the bed is made from inflorescence of this plant and the patient having backache is advised to sleep over it for few days to get relief from pain. Similarly wooly seeds of the plant are used as cushion material of pillows to provide relief from headache and rheumatic pain. *Aerva pseudotomentosa* possess diuretic and demulcent properties; provide relief in urinary disorders [18]. Rural community of Karachi and Baluchistan used this plant as alexipharmic (warmed inflorescence is applied on the site of bite) and to treat asthma, headache and rheumatism [19].

**Ethnoveterinary use**

*Aerva pseudotomentosa* is used in animal healthcare practices by livestock owners for the treatment of various ailments such as gastric trouble and as anthelmintic in cattle. In Somalia decoction of inflorescence given for the treatment of East coast fever, poultice of the inflorescence is applied externally to cure muscular injury of the animal [15, 20]. Apart from this leaves of *Aerva pseudotomentosa* is a prominent source of fodder for the animals of arid region.

**Phytochemical screening**

Phytochemical analysis of *Aerva pseudotomentosa* indicated the presence of flavonoids, alkaloids, terpenoids, saponins, fixed oils, steroids, glycosides. The flavanoid content was found to be 248.5 mg quercetin equivalents/g of extract similarly phenolic content was found to be 359.3 mg tannic acid equivalents/g of the extract respectively. Notably, flavonoid content and phenolic content were found more than other *aerva* species [21]. Recently four new ecdysteroids *Aerva* ecdysteroids A-D (1-4) and three acylated flavonoid glycosides have been isolated from inflorescences of this species. Additionally heptacosane and pentacosane were identified as the major components of the seed oil of *Aerva pseudotomentosa* [22-23].

**Pharmacognostic study**

A detailed pharmacognostic study for morphological character, macroscopic features, physicochemical parameters such as ash value, moisture content, loss on drying, swelling index, water soluble and ethanol soluble extractive value of inflorescence of *Aerva pseudotomentosa* were studied. Powder microscopic examination of the inflorescences powder revealed the presence of starch, tannin, cellulose, mucilage and lignified tissue. The loss on drying was found to be (6.5% w/w), total ash value (11.18% w/w), acid-insoluble ash value (2.44% w/w) and water soluble ash value was found (7.18% w/w) in the inflorescences powder. Water soluble extractive value (18.22% w/w) was found to be more than alcohol soluble extractive value (17.1% w/w) [24].

**Pharmacological Study****Acute toxicity study:**

Acute toxicity studies revealed no lethality or any toxic reactions or moribund state up to the end of the study period APAE was safe up to a dose level of 2000 mg/kg of body weight (limit test) and LD<sub>50</sub> observed was more than 2500 mg/kg. [21].

**Analgesic activity**

Analgesic activity of *Aerva pseudotomentosa* leaves aqueous extract was evaluated by four classical analgesic models. Two dose levels (200 and 400 mg/kg) of the extract were administered by oral route to laboratory mice and rats. Peripheral nociception was induced in rodents using (acetic acid induced abdominal writhing and formalin induced paw licking), supra spinal (hot plate) and spinal (tail immersion) behavioral models of acute pain were used. The *Aerva pseudotomentosa* at dose 400 mg/kg exhibited significant anti-nociceptive effect ( $p < 0.001$ ) in all tests [21]. Similarly ethanolic extract of *Aerva pseudotomentosa* inflorescence at two different doses (200 and 400 mg/kg) were evaluated for analgesic effect in hot plate model, The extract exhibited dose dependent analgesic effect, the percentage inhibition was found 50.00% and 65.51% respectively [25].

**Anti-inflammatory activity:**

Ethanolic extract of *Aerva pseudotomentosa* inflorescences at dose 400 mg/kg demonstrated significant anti-inflammatory effect against carrageenan induced paw edema [25].

**Antipyretic activity:**

Antipyretic effect was evaluated by brewer's yeast induced pyrexia method. Fever is induced by brewer's yeast in normal saline 12.5% of 1 ml/100 gm body weight subcutaneously. The rectal temperature was noted after 18 h. The *Aerva pseudotomentosa* at dose 200 mg/kg and 400 mg/kg exhibited antipyretic effect but pronounced antipyretic effect at 3 hr was observed at dose 400 mg/kg which is comparable to paracetamol treated group [21].

**Anticancer activity:**

Dhawan *et al.* found 50% ethanolic extract of whole plant is effective against human epidermoid carcinoma of nasopharynx [26].

**Antioxidant activity**

Qasim *et al.* studied antioxidant activity of methanolic extract of *Aerva pseudotomentosa* they have reported  $IC_{50}$  value  $798.36 \mu\text{g/mL}^{-1}$  for DPPH (1, 1-diphenyl-2-picryl-hydrazil) free radical scavenging activity where as FRAP (ferric oxide reducing potential) was found to be  $1.34 \text{ mMol Fe}^{+2} \text{ g}^{-1}$  [27].

**CONCLUSION**

The review of all documented literature of *Aerva pseudotomentosa* revealed that this desert herb enriched with several medicinal properties for the treatment of human being as well as livestock, additionally this plant has been pharmacologically claimed for analgesic, anti-inflammatory, anticancer, antipyretic and antioxidant property. Phytochemical investigation revealed presence of alkaloids, glycosides, flavonoids, ecdysteroids, acylated flavonoids. Apart from extensive review of literature available it can be concluded that there is still need of extensive research on this useful medicinal herb to explore its various medicinal properties and isolation of bioactive compounds responsible for the pharmacological effect.

**CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest.

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