**International Journal of Research in Pharmacy and Life Sciences**
**CODEN (USA): IJRPL | ISSN: 2321–5038**
Journal Home Page: www.pharmaresearchlibrary.com/ijrpls

**REVIEW ARTICLE**

# A Phytopharmacological Review of *Bidens Pilosa*

G. Sindhu*, A. Sreehasa, J. Divya, T. Usha Kiran Reddy, K. Muni Raja Lakshmi, Ch. Appa Rao

*S.V.U College of Pharmaceutical Sciences, Sri Venkateswara University, Tirupati*

**ABSTRACT**
*Bidens Pilosa* is a representative perennial herb, globally distributed among temperate and tropical regions. Major chemical constituents (including 301 compounds) belonging to polyacetylenes, polyacetylene glycosides, flavonoids, flavone glycosides, aurones, chalcones, okanin glycosides, phenolic acids, terpenes, pheophytins, fatty acids and phytosterols have been identified or isolated from the different parts of this plant.It has been reported to possess effective pharmacological properties like antibacterial activity, anti-inflammatory and antiallergic activity, antimalarial activity, T helper cell modulator, immunosuppressive antihyperglycemic, anti-hypertensive, antiulcerogenic, hepatoprotective, anti-leukemic, anticancer, antipyretic, anti-viral, anti-angiogenic, antirheumatic, antibiotic. The traditional use of *B. Pilosa* in over 40 diseases, scientific studies investigating the potential medicinal uses and its constituent phytochemicals for a variety of disorders are presented and discussed. However, this herb is known as hyperaccumulator and as excluder.
**Keywords:** *Bidens Pilosa*, polyacetylenes, terpenes, flavonoids, phenolic acids, biological activity.

**ARTICLE INFO**

***Corresponding Author***
*G. Sindhu M. Pharmacy,( Ph.D),*
*Assistant Professor,*
*S.V.U. College of Pharmaceutical sciences,*
*Sri Venkateswara University,*
*Tirupati - 517502. A.P, India.*

**ARTICLE HISTORY: Received** 15 May 2021, **Accepted** 11 August 2021, **Available Online** 9 October 2021



**Citation:** *G. Sindhu.* A Phytopharmacological Review of *Bidens Pilosa*. *Int. J. Res. Pharm, L. Sci.,* 2021, 9(1): 39-43.

**CONTENTS**



## 1. Introduction

***Bidens Pilosa* L.** is a plant of the Asteraceae family and belongs to the Bidens genus, which comprises approximately 280 species[1]. *B. Pilosa* is an erect, perennial herb widely distributed from temperate and tropical regions[2]. Itis commonly called by many vernacular names, such as hairy beggar tick; Spanish needles; devil needles; black jack; railway daisy; and pitchforks[3] Despite its preference for full sun and semidry soil, *B. Pilosa* can grow in arid and barren lands at different altitudes. Food and Agricultural Organization actively promoted the culture of *B. Pilosa* in Africa in 1970s due to its fast-growing advantage[4]. Apart from its use as food ingredient, *B. Pilosa* is used as herbal medicines for

diabetes and 40 other diseases[5]. All parts of *B. Pilosa* plant, the whole plant, the aerial parts (leaves, flowers, seeds, and stems), and/or the roots, fresh or dried, are used as ingredients in folk medicines. Dry powder, decoction, maceration, and tincture are usual formulations for its internal as well as external use[6].

*B. Pilosa* is an easy-to-grow herb that is widely distributed all over the world. It is considered to be a rich source of food and medicine for humans and animals[7,8]. The present review focuses on recent studies on the botany, traditional usage, phytochemistry, pharmacology, and toxicology of *B. Pilosa*

## 2. Plant Profile

**Scientific Classification:**

| | | |
|---|---|---|
| Kingdom | : | Planate |
| Subkingdom | : | Tracheobionta |
| Superdivision | : | Spermatophyta |
| Division | : | Magnoliophyta |
| Class | : | Magnoliopsida |
| Subclass | : | Asteridae |
| Order | : | Asterales |
| Family | : | Asteraceae |
| Genus | : | Bidens |
| Species | : | *Bidens Pilosa L.* |
| Temperature | : | ambient. |
| Run time | : | 7min. |

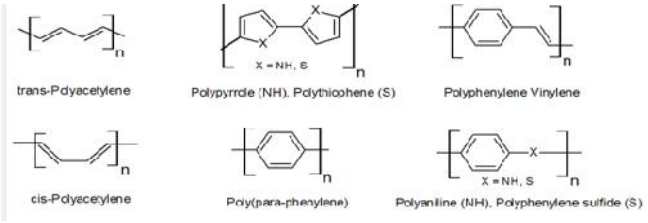
Figure: 1 Bidens Pilosa L Plant

**Plant Description:**

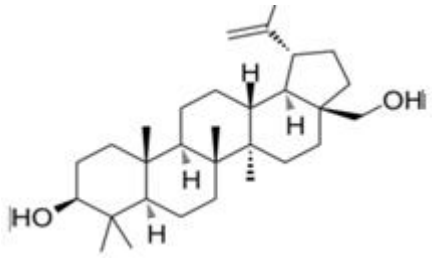
*B. Pilosa* is either glabrous or hairy, with green opposite leaves that are serrate, lobed, or dissected. It has white or yellow flowers, and long narrow ribbed black achenes (seeds). It grows to an average height of 60 cm and a maximum of 150 cm in favourable environments[9]. The seeds are dark brown or black, slender, reach 1 cm in length, and are clustered on the end of the stalk.A single plant can produce 3000–6000 seeds. The optimum temperature of seed germination is 15 – 40oC. Dry mature seeds from *B. Pilosa* can be germinated in 3 to 4 days in moist soil or after being soaking in water. Seeds are viable for at least 3 years[10]. Minimal agricultural techniques are required for *B. Pilosa* cultivation. Due to its invasive tendencies, *B. Pilosa* is generally considered to be a weed[11].

**Chemical Composition:**

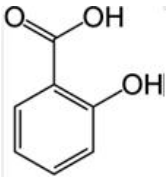
*B. Pilosa* has been paid much attention due to its empirical and traditional use as a therapeutic agent and its known bioactive constituents. The phytochemical composition of *B. Pilosa* includes 301 compoundsthat belong to following major chemical classes: polyacetylenes[12, 13, 14, 15, 16, 17], flavonoids[18,19,20,21], phenolic acids, terpenes (monoterpenes, sesquiterpenes, diterpenes, triterpenes)[22, 23, 24], pheophytins, fatty acids and phytosterols[25]. The major substances identified in *B. Pilosa* are polyacetylenes, flavonoids, triterpenes and some essential oils; these are considered as main active constituents responsible for the various pharmacological actions of the plant.



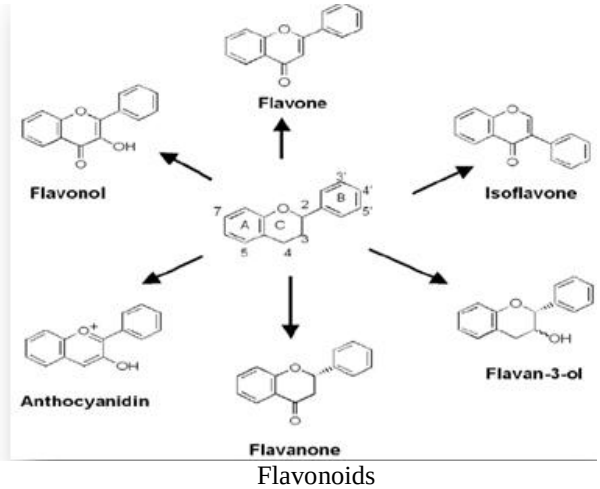

Polyacetylenes




Triterpenes




Phenolic Acid




Flavonoids

## 3. Pharmacological Properties

- **Antidiabetic Activity:** Accordingly, the butanol fraction of *B. Pilosa* effectively prevented T1D in non-obese diabetic (NOD) mice[26]. Consistently, this prevention involved downregulation of The

cells or up regulation of Th2 cells. This was proven by intraperitoneal injection of the butanol fraction. Mounting evidence from epidemiological studies proposes environmental and genetic factors as the primary causes of T2D. Both factors contribute to insulin resistance and loss of $\beta$-cell function, leading to impairment in insulin action, insulin production, or both. *B. Pilosa* has scientifically been investigated for anti-diabetic activity. One seminal study by Ubillas et al. showed that the aqueous ethanol extract of the aerial part of*B. Pilosa* at 1 g/kg BW lowered blood glucose in db/db mice, a T2D mouse model[27].

- **Anticancer Activity:** *B. Pilosa* extracts and isolated compounds possess anti-cancer activities against a variety of cancer cells. Several studies have used bioassay guided isolation and fractionation methods to discover new compounds from *B. Pilosa*. Consistent with the antitumor activities of *B. Pilosa* extracts and fractions, some of its phytochemicals also showed anticancer activity. Among them, luteolin[28], a well-studied flavonoid with multiple bioactivities, was more effective against tumour cell proliferation than its derivatives with IC50 values ranging from 3 $\mu$M to 50 $\mu$M in cells, and 5 to 10 mg/kg in animals. Luteolin was also found to fight canceras a food additive at concentrations of 50 to 200 ppm and prevent skin cancer [29] and cancer invasion[30].
- **Anti-inflammatory activity:** *B. Pilosa* is commonly used to treat inflammatory disorders. Cyclooxygenase-2 (COX-2) is a physiologically important enzyme that converts arachidonic acid to prostaglandin ($PGE_2$). Its expression is induced by a wide variety of external stimuli indicating its involvement in inflammatory diseases, and it is used as an inflammatory marker[31].
- **Antioxidant Activity:**Free radicals can damage cellular components via a series of chemical reactions[32] leading to development and progression of cardiovascular disease, cancer, neurodegenerative diseases and ageing[33]. Free radicals, nitric oxide (NO), and superoxide anions can be produced in macrophages to kill microbes. Essential oils from *B. Pilosa* flowers and leaves are also reported to possess antioxidant activity. With the aim of replacing chemically synthesized additives, Deba and colleagues[34] worked on the antioxidant, antibacterial, and antifungal activities of essential oils and water extracts of *B. Pilosa*'s leaves and flowers.
- **Immunomodulatory Activity:** *B. Pilosa* is thought to be an immunomodulatory plant and is reported to be effective in the treatment of immune disorders such as allergy [35], arthritis, and T1D [36].The phytochemical constituents of *B. Pilosa* exert their functions on different immune cells to modulate immune response. It is possible that some of the compounds may have agonistic or antagonistic effects on immune response.
- **Antimalarial Activity:** The use of chemical drugs against pathogens has resulted in drug-resistant mutants. A study of the anti-malarial activity of the leaf extracts of *B. Pilosa* using a combination of phytochemistry and bioassays showed that compound 49 ((R)-1,2-dihydroxytrideca-3,5,7,9,11-pentayne) showed activity against a malaria parasite (P. falciparum NF54 strain) with an IC50 value of 6.0 $\mu$g/mL[37].
- **Antibacterial Activity**:Chang and co-worker's isolated centaurein and centaureidin from *B. Pilosa* extract[38]. Centaurein enhances expression of IFN-$\gamma$, a key cytokine for macrophage activation and, consequently, enhances bactericidal activity in macrophages. Extract and/or compounds of *B. Pilosa* also showed direct bacteriostatic and/or bactericidal action. One study reported that essential oils and leaf/flower extracts of *B. Pilosa* could suppress the growth of gram positive and gram-negative bacteria as evidenced by zone of inhibition assays[39].
- **Antifungal Activity:***B. Pilosa* has traditionally been used to treat microbial infection. Recently, different parts of *B. Pilosa* have been tested for antifungal activities. Deba and colleagues first evaluated the antifungal effect of the hot water extracts of the *B. Pilosa* roots, stems, and leaves against *Corticium rolfsii, Fusarium solani, and Fusarium oxysporum*. They discovered that *C. rolfsii* was most suppressed by treatment with *B. Pilosa* as its growth was reduced at almost all the tested doses, followed by *F. oxysporum and F. solani*[40]. However, the fungicidal activities of the stems, and roots were greater than the leaves.
- **Wound Healing Activity:***B. Pilosa* has been traditionally used to treat tissue injury in Cameroon, Brazil, and Venezuela. Histological examination also revealed better collagenation, angiogenesis, and organization of wound tissue seven days after application. Epithelialization and total healing time in *B. Pilosa*-treated rats were comparable to those of neomycin sulphate. Together, these data suggest that *B. Pilosa* may be a viable alternative to neomycin lotion for the treatment of wounds[41].

**Phytochemistry:** Broad application of *B. Pilosa* all over the world has led to over 120 publications on its exploitation and use in medicines, foods, and drinks. *B. Pilosa* is an extraordinary source of phytochemicals and 201 compounds have so far been identified from this plant, including 70 aliphatics (36 polyenes), 60 flavonoids, 25 terpinoids, 19 phenylpropanoids, 13 aromatics, 8 porphyrins, 6 other compounds[42].

## 4. Conclusion

*Bidens Pilosa* is a worldwide plant and widely used as folk remedies and foods. It has long used to treat diabetes in different continents. However, a comprehensive up-to-date review of research on *B. Pilosa* for diabetes has hitherto been not available. In this paper, scientific studies on the

use of *B. Pilosa* as an anti-diabetic remedy have been summarized and critically discussed from botanical, phytochemical, pharmacological, and toxicological aspects. Thirty-six polyenes identified from this plant were identified and three of which were showed to treat both T1D and T2D. The anti-diabetic utility of *B. Pilosa* and its modes of action in relation to its known polyenes were discussed herein. Cautions should be taken in the anti-diabetic use of *B. Pilosa* alone and in combination with other medicines since its overdose may cause dramatic hypoglycaemia.

## 5. References


[1] Holm LG, Plucknett DL, Pancho JV, Herberger JP. The world's worse weeds distribution and biology. University Press of Hawaii, Honolulu, 1997.

[2] M. J. Alcaraz and M. J. Jimenez, "Flavonoids as anti-inflammatory agents," Fitoterapia, vol. 59, no. 1, pp. 25–38, 1988.

[3] Mitich LW, Beggarticks. Weed Technol 8:172–175, 1994.

[4] FAO U, "Agriculture food and nutrition for Africa," in A Resource Book for Teachers of Agriculture, Publishing Management Group, FAO Information Division, Rome, Italy, 1997.

[5] A. P. Bartolome, I. M. Villasenor, and W. C. Yang, "Bidens pilosa L. (Asteraceae): botanical properties, traditional uses, phytochemistry, and pharmacology," Evidence-Based Complementary and Alternative Medicine, vol. 2013, Article ID 340215, 51 pages, 2013.

[6] K. Redl, W. Breu, B. Davis, and R. Bauer, "Anti-inflammatory active polyacetylenes from Bidens campylotheca," Planta Medica, vol. 60, no. 1, pp. 58–62, 1994.

[7] P. O. Karis and O. Ryding, Asteraceae Cladistics and Classification, Bremer K. Eds, pp. 559–569, Timber press, Portland, Ore,USA, 1994.

[8] O. N. Pozharitskaya, A. N. Shikov, M. N. Makarova et al.,"Anti-inflammatory activity of a HPLC-fingerprinted aqueousinfusion of aerial part of Bidens tripartita L," Phytomedicine, vol. 17, no. 6, pp. 463–468, 2010.

[9] M. J. Alcaraz and M. J. Jimenez, "Flavonoids as anti-inflammatory agents," Fitoterapia, vol. 59, no. 1, pp. 25-38, 1988.

[10] M. B. Rokaya, Z. Munzbergova, B. Timsina, and K. R. Bhattarai, "Rheum australe D. Don: a review of its botany, ethnobotany, phytochemistry and pharmacology," Journal of Ethnopharmacology, vol. 141, no. 3, pp. 761–774, 2012.

[11] P. H. Young, Y. J. Hsu, and W. C. Yang, "Bidens pilosa L. andits medicinal use," in Recent Progress in Medicinal Plants Drug Plant II, A. S. Awaad, V. K. Singh, and J. N. Govil, Eds., Standium Press, Houston, Tex, USA, 2010.

[12] Zulueta MCA, Tada M, Ragasa CY A diterpene from Bidens pilosa. Phytochemistry 38:449–450, 1995.

[13] Brandao MG, Krettli A, Soares L, Nery CG, Marinuzi HC Antimalaria activity of extracts and fractions from Bidens pilosa and other Bidens species (Asteraceae) correlated with the presence of acetylene and flavonoid compounds. J Ethnopharmacol 57:131–138, 1997.

[14] Chang M, Wang G, Kuo YH, Lee CK. The low polar constituents from Bidens pilosa L. var. minor (Blume) Sheriff.J Chin Chem Soc 47:1131–1136, 2000.

[15] Redl K, Breu W, Davis B, Bauer R. Anti-inflammatory active polyacetylens from Bidens campylotheca. Planta Med 60:58–62, 1994.

[16] Bohlmann F, Burkhardt T, Zdero C Naturally Occurring Acetylenes. Academic Press Inc, New York, 1973.

[17] Chien SC, Young PH, Hsu YJ, Chen CH, Tien YJ, Shiu SY, Li TH, Yang CW, Marimuthu P, Tsai LFL, Yang WC. Anti-diabetic properties of three common Bidens pilosa variants in Taiwan. Phytochemistry 70:1246–1254, 2009.

[18] Ballard RE, Biosystematic and chemosystematic study of theBidens pilosa complex in north and Central America. Ph. D.dissertation, University of Iowa, 1975.

[19] Chang SL, Chiang YM, Chang CLT, Yeh HH, Shyur LF, Kuo YH, Wu TK, Yang WC. Flavonoids, centaurein and centaureindin, from Bidens pilosa, stimulate IFNc expression. J Ethnopharmacol 112:232–236, 2007.

[20] Wang J, Yang H, Lin ZW, Sun HD. Flavonoids from Bidens pilosa var. radiata. Phytochemistry 46:1275–1278, 1997.

[21] Hoffmann B, Ho¨lzl J. Further acylated chalcones from Bidens pilosa. Planta Med 54:450–451, 1988.

[22] Khanh TD, Cong LC, Xuan TD, Uezato Y, Deba F, Toyama T,Tawata S. Allelopathic plant: 20. Hairy beggarticks (Bidens pilosa). Allelopathy J 24:243–254, 2009.

[23] Chiang YM, Chuang DY, Wang SY, Kuo YH, Tsai PW, Shyur LE. Metabolite profiling and chemopreventive bioactivity of plant extracts from Bidens pilosa. J Ethnopharmacol 95:409–419, 2004.

[24] Deba F, Xuan TD, Yasuda M, Tawata S. Herbicidal and fungicidal activities and identification of potential phytotoxins from Bidens pilosa L. var. radiata Scherff. Weed Biol Manag 7:77–83, 2007.

[25] Lee TH, Lu CK, Kuo YH, Lo JM, Le CK. Unexpected novel pheophytin peroxides from the leaves of Bidens pilosa. Helv Chim Acta 91:79–84, 2008.

[26] S.L. Chang, C. L.-T. Chang, Y.-M. Chiang et al., "Polyacetylenic compounds and butanol fraction from Bidens pilosa can modulate the differentiation of helper T cells and prevent autoimmune diabetes in non-obese diabetic mice," Planta Medica, vol. 70, no. 11, pp. 1045–1051, 2004.

[27] R. P. Ubillas, C. D. Mendez, S. D. Jolad et al., "Antihyperglycemic acetylenic glucosides from Bidens pilosa," Planta Medica, vol. 66, no. 1, pp. 82–83, 2000.

[28] J. A. Beutler, J. H. Cardellina, C. M. Lin, E. Hamel, G. M. Cragg, and M. R. Boyd, "Centaureidin, a cytotoxicflavone fromPolyamine fruticose, inhibits tubulin polymerization," Bioorganic and Medicinal Chemistry Letters, vol. 3, no. 4, pp. 581–584, 1993.

[29] G. Seelinger, I. Merfort, U. Wolfle, and C. M. Schempp, "Anti- ¨ carcinogenic effects of the flavonoid luteolin," Molecules, vol. 13, no. 10, pp. 2628–2651, 2008.

[30] W. J. Lee, L. F. Wu, W. K. Chen, C. J. Wang, and T. H. Tseng, "Inhibitory effect of luteolin on hepatocyte growth factor/scatter factor-induced $HepG_2$ cell invasion involving both MAPK/ERKs and PI3K-Akt pathways," Chemico-Biological Interactions, vol. 160, no. 2, pp. 123–133, 2006.

[31] N. Yoshida, T. Kanekura, Y. Higashi, and T. Kanzaki, "Bidens pilosa suppresses interleukin-1$\beta$-induced cyclooxygenase-2 expression through the inhibition of mitogen activated protein kinases phosphorylation in normal human dermal fibroblasts," Journal of Dermatology, vol. 33, no. 10, pp. 676–683, 2006.

[32] M. Muchuweti, C. Mupure, A. Ndhlala, T. Murenje, and M. A. N. Benhura, "Screening of antioxidant and radical scavenging activity of Vigna ungiculata, Bidens pilosa and Cleome gynandra," American Journal of Food Technology, vol. 2, no. 3, pp. 161–168, 2007.

[33] Y. M. Chiang, D. Y. Chuang, S. Y. Wang, Y. H. Kuo, P. W. Tsai, and L. F. Shyur, "Metabolite profiling and chemopreventive bioactivity of plant extracts from Bidens pilosa," Journal of Ethnopharmacology, vol. 95, no. 2-3, pp. 409–419, 2004.

[34] F. Deba, T. D. Xuan, M. Yasuda, and S. Tawata, "Chemical composition and antioxidant, antibacterial and antifungal activities of the essential oils from Bidens pilosa Linn. var. Radiata," Food Control, vol. 19, no. 4, pp. 346–352, 2008.

[35] M. Horiuchi and Y. Seyama, "Improvement of the antiinflammatory and antiallergic activity of Bidens pilosa L. var. radiata SCHERFF treated with enzyme (Cellulosine)," Journal of Health Science, vol. 54, no. 3, pp. 294–301, 2008.

[36] C. L. T. Chang, S. L. Chang, Y. M. Lee et al., "Cytopiloyne, a polyacetylenic glucoside, prevents type 1 diabetes in nonobese diabetic mice," Journal of Immunology, vol. 178, no. 11, pp. 6984– 6993, 2007.

[37] P. Kumari, K. Misra, B. S. Sisodia et al., "A promising anticancer and antimalarial component from the leaves of Bidens pilosa," Planta Medica, vol. 75, no. 1, pp. 59–61, 2009.

[38] S. L. Chang, Y. M. Chiang, C. L. T. Chang et al., "Flavonoids, centaurein and centaureidin, from Bidens pilosa, stimulate IFN-$\gamma$ expression," Journal of Ethnopharmacology, vol. 112, no. 2, pp.232–236, 2007.

[39] F. Deba, T. D. Xuan, M. Yasuda, and S. Tawata, "Chemical composition and antioxidant, antibacterial and antifungal activities of the essential oils from Bidens pilosa Linn. var. Radiata," Food Control, vol. 19, no. 4, pp. 346–352, 2008.

[40] F. Deba, T. D. Xuan, M. Yasuda, and S. Tawata, "Herbicidal and fungicidal activities and identification of potential phytotoxins from Bidens pilosa L. var. radiata Scherff: research paper," Weed Biology and Management, vol. 7, no. 2, pp. 77–83, 2007.

[41] A. K. Hassan, O. Deogratius, J. F. Nyafuono, O. Francis, and O.P. Engeu, "Wound healing potential of the ethanolic extracts of Bidens pilosa and Ocimum suave," African Journal of Pharmacy and Pharmacology, vol. 5, no. 2, pp. 132–136, 2011.

[42] F. L. Silva, D. C. H. Fischer, J. F. Tavares, M. S. Silva, P. F.De Athayde-Filho, and J. M. Barbosa-Filho, "Compilation of secondary metabolites from Bidens pilosa L," Molecules, vol. 16, no. 2, pp. 1070–1102, 2011.