International Journal of Engineering Research & Management Technology
ISSN: 2348-4039
May-June-2016 Volume 3, Issue-3
Email: editor@ijermt.org www.ijermt.org

EXPLORATION OF BIOACTIVE COMPOUNDS IN AGERATUM CONYZOIDES LINN FOR ENHANCED ANTIMICROBIAL EFFICACY AGAINST SKIN PATHOGENS

Manju Oommen, Research Scholar, Sunrise University, Alwar

Dr. Vinesh Kumar, Professor, Sunrise University, Alwar

Abstract

Billygoat weed and Sadhandhi are local names for the Ageratum conyzoides L. plant, which belongs in the Asteraceae family. It has a wide range of traditional medical uses, including pain relief, antifungal, anti-inflammatory, hemostatic, smooth muscle relaxant, and anticoagulant effects, among many more.

Keywords: Ageratum conyzoides, antifungal, anticoagulant, network**,** plant.

INTRODUCTION

The Asteraceae family plant Ageratum conyzoides L. originally hails from tropical America but is currently cultivated all over the globe. It may be found in home gardens, among roadside vegetation, and in fields where sugarcane and other commodities are planted. This plant has traditional medicinal uses in several cultures, including the treatment of purgative, febrifuge, ophthalmia, colic, ulcers, and wounds. Insect and plant diseases are further targets for its usage. Isolation of alkaloids, coumarins, flavonoids, chromenes, benzofurans, sterols, and terpenoids has been accomplished by use of A. conyzoides. Precocene II and polymethoxy flavones are two antifungal substances found in A. conyzoides. Both the medical and agricultural fields have made use of A. conyzoides extracts. Nevertheless, there has been no published evidence that the extracts or isolated chemicals have antifungal properties against blast disease or sheath blight disease.

The annual aromatic plant Ageratum conyzoides L., a member of the Asteraceae family and a popular name for bUl goat weed, originated in tropical America but has since spread across Southeast Asia, including India (Wagner et al., 1999), The specific name "conyzoides" comes from the Greek word "konyz," which is the name of the Inula helenium L. that it resembles, while the generic term "ageras" means non-ageing and refers to the lifespan of the blooms or the whole plant (Kissman and Groth, 1993). The Indian states of Bihar, Bengal, Haryana, Himachai Pradesh, Punjab, and Uttar Pradesh are seeing its rapid expansion. It has become a major problem in Uttar Pradesh's farmed land, where it goes by the name "Ujaroo" (meaning "destructive") because of the widespread destruction it has caused.

No one knows for sure how it will enter the Indian market. Imported food grains may have been one of its entry points. A fragrant plant known as Ageratum conyzoides grows to a height of Im or more every year. In mountainous regions, weeds grow all year round, whereas in plains, they don't show up until April or May. This plant's stem is upright, branching, cylindrical, and drooping. All of the plant's aerial sections are coated with tiny hairs called trichomes. On both sides of the opposing, ovate, triangular, pubescent leaves are trichomes. The leaves also have a lengthy petiole. At maturity, the plant's inflorescence (capitulum) changes color from blue to violet to white.

A fragrant invasive herb native to tropical and subtropical parts of the globe, Ageratum conyzoides L. is an annual plant belonging to the Asteraceae family. In addition to its purported history of usage as a wound dressing, antibacterial, and mouthwash, it has also been used in the treatment of dysentery, diarrhea, skin illnesses, and other conditions by indigenous peoples. Presenting the antifungal ability of the medicinal plant and its secondary metabolites against diverse fungal infections is the fundamental theme of this study.

LITERATURE REVIEW

The life history, morphology, and physiological characteristics of two exotic Bidens weeds—one invasive and one naturalized—were examined by Hsu and Kao (2014) in Taiwan. Their research indicates that B. pilosa var. radiata outperforms its congener B. bipinnata in two key respects: its rapid growth (as a result of a higher SLA and more biomass allocated to leaves and roots) and its greater spreading ability (as a result of two reproductive modes).

M. micrantha has remarkable phenotypic flexibility and does better at lower altitudes, according to research by Prabhu et al. (2014), which found that its photosynthetic capacity is unaffected by differences in altitude.

As part of their 2014 study, Singhal and Narayan looked at how the congeners Sida cordifolia and Sida acuta strategically changed the biomass allocation to various plant components. The photosynthesizing leaf component of S. acuta was allotted a disproportionately greater biomass. The reproductive structural components of S. cordifolia received a comparatively larger amount of biomass.

VEGETATIVE STRATEGIES OF POPULATION ESTABLISHMENT

Plants of both species were sampled in five-replica sets for this experiment, with cuttings obtained from the apical, middle, and base parts of the plant. Each position's plant components were planted in 6-inch-diameter polybags filled with garden soil. To keep the moisture in and provide an ideal growing environment, the polybags were marked and covered with see-through polybags. Within the greenhouse, an experiment was planned using a fully randomized block design (CRBD). Every other day, someone checked on it and pulled weeds as needed.

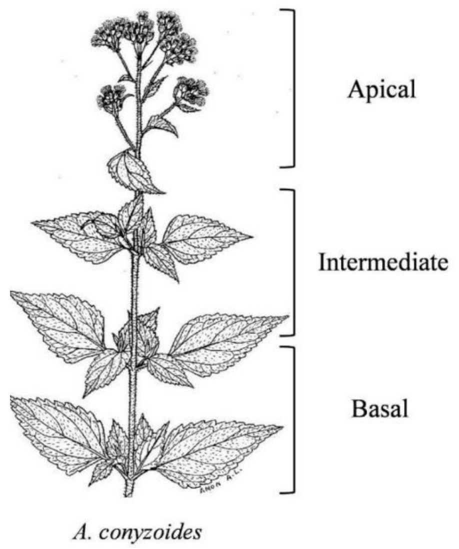

Fig.1. Plant parts used for vegetative stem and leaf cutting experiment

Data analysis

The data were evaluated using analysis of variance (ANOVA) and presented as Mean ± SE for statistical purposes. This study used SPSS 20 for its statistical analysis.

Function as an Antimicrobial

The indicator organisms employed in this study were pure cultures of Escherichia coli and Enterobacter cloacae, which were procured from SMS Medical College in Jaipur, India. In a Nutrient Broth medium (made by autoclaving 8% Nutrient Broth of Difeco - Laboratories, Detroit, USA, in distilled water at 15 lbs pressure for 25-30 min) and incubated at 37oC for 48 hours, these bacteria were cultured. After every 48 hours of transfer, the bacterial cultures were further maintained on the same medium. Before each antimicrobial experiment, a new suspension of the test organism in saline solution was made from a newly grown agar slant (Isenberg, 1992).

Mycology and Microbiology Laboratory, Department of Botany, University of Rajasthan, Jaipur, India supplied the Aspergillus flavus and Penicillium pubesulum utilized as indicator fungus for culture and maintenance. The PDA medium, which stands for fresh potato dextrose agar, was made following the steps outlined by Isenberg (1992).

Rotenoids: The experiment consisted of collecting, drying, and powdering distinct plant parts and tissue samples of D. Indica. These samples were then submitted to extraction and quantification for rotenoids (Delfel, 1973).

Table 1. Here are some traditional applications of Ageratum conyzoides L.;

Country	Traditional Uses	Plant Part/Medicinal Preparation(s)/Doses
Nigeria	Diarrhea	Plant decoction of leaves and aerial branches of *A. conyzoides* L. and stem bark of *Annona senegalensis* Pers. (Annonaceae) is taken thrice a day
	Diabetes	Whole plant/macerated with two other herbs—*Stachytarpheta indica* Vahl. (Verbanaceae) and *Sorghum guinensis* (Linn) Moench (Poacea)—is consumed twice a day
	Earache	Warm leaves exudate squeezed as ear drops
	Eaten by Igbo communities	Part of "olulu-ogwai" soup
Brazil	Diarrhea, menstrual cramps, rheumatism, and arthritis	Aerial parts (dried or fresh, externally and internally as infusions or tinctures) and in medicinal teas
	Analgesic and anti-inflammatory	
Cameroon	Syphilis condition	Leaves (mixed with other herbs)
	Craw-craw (itching skin disease)	NS
Ghana	Eyetroubles	Rub and squeeze (Topical)
	Antifungal and antibacterial	NS
	To augment hair growth and in constipation (as an enema)	Children's eyebrows scrubbed with charcoal punched young stems of plant
Western Nepal	Wounds and cuts	Juice of leaves
Gabon	In helminthiasis	Decoction of leaves
	and malaria	NS
Congo	Treating chronic pain, analgesic, antimicrobial, and anti-inflammatory	Leaf extract
African countries	To cure contagious and psychological diseases, diabetes, snake bite antidote	NS
	Pneumonia, wounds, and burns	NS
	Cure scabies, anti-asthmatic, dyspnea, antispasmodic, and hemostatic effects	NS
Tanzania	Stomachache	Leaves are chewed
	Wound healing	Pounded fresh leaves
	Cough and chest congestion	Roots
Indonesia	Against fungal infection	NS
	Wounds, eczema, ulcers and in bacterial infections	NS
India	To stop bleeding	Leaf extract
	Anthelmintic and wound healing	Stem and Leaf
	Wounds and cuts	Leaf paste
	Eye discharge and leprosy	Oil lotion

Determination of Antimicrobial activity

For each plate, a control was made using the 'Filter paper disc technique' (Gould & Bowie, 1952; 6 mm in diameter) that was saturated with 0.04 ml of the extract and a known amount of standard reference antibiotics (mycostatin). The standard disc, which was purchased from SMS Medical College in Jaipur and had a concentration of 10 µg/ml, was also utilized.

Each test organism's spore suspension (5 ml) was added to 100 ml of sterilized PDA medium at 35-40°C and well mixed in order to conduct anti-fungal screening. The culture was incubated for 72 hours. To start, 100 U/ml of mycostatin, the reference antibiotic, and the extract(s) were placed on paper discs and then added to the petri plates. For every experiment, we ran five separate runs and averaged the results.

FINDINGS AND ANALYSIS

The process of vegetative propagation using A. conyzoides stem and leaf cuttings Root propagation was seen in A. conyzoides stem cuttings taken from the apical, middle, and basal regions, indicating the potential to propagate vegetatively.

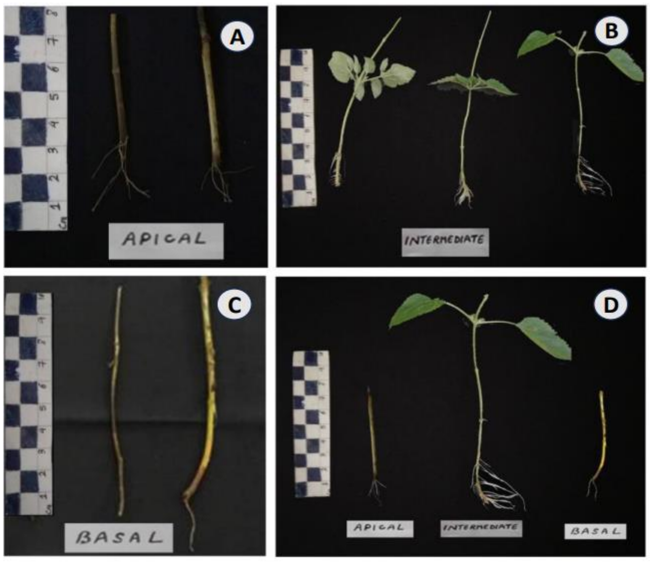

Fig 2. Stem cutting of A. conyzoides from apical, intermediate and basal position.

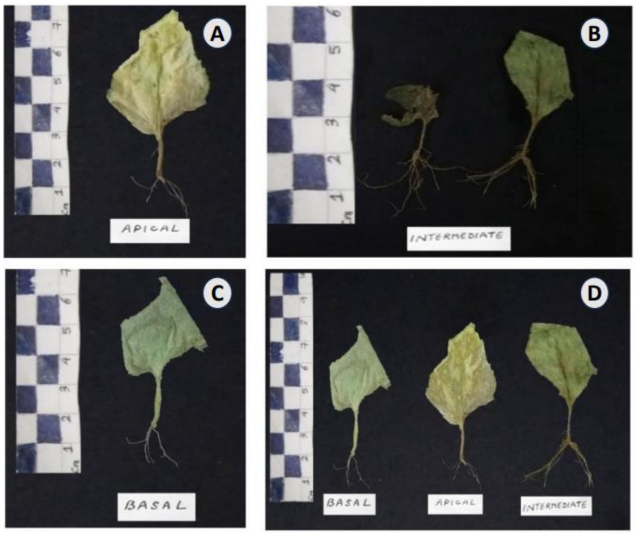

Fig 3. Cuttings of leaf petiole of A.conyzoides from apical, intermediate and basal position

Table 2. Vegetative propagation in A. conyzoides (Blue)

Sl. No.	Parameters	Control			Clipping once			Clipping twice			F	*p* value
		Min	Max	Mean ± SE	Min	Max	Mean ± SE	Min	Max	Mean ± SE		
1	Plant height (cm)	38.5	63.0	51.7 ± 2.31	24.5	64.0	46.82 ± 3.57	49.2	66.4	54.7 ± 1.79	2.235	0.126
2	Root length (cm)	3.4	10.0	5.67 ± 0.57	4.2	9.0	6.25 ± 0.52	6.1	12.0	8.5 ± 0.67	6.378	0.005*
3	Leaf flush	12.0	93.0	39.6 ± 6.87	18.0	58.0	35 ± 4.08	7.0	37.0	23.9 ± 2.89	2.707	0.085
4	Number of flowers	4.0	28.0	13.6 ± 2.29	8.0	20.0	13.9 ± 1.62	7.0	17.0	11.4 ± 0.87	.649	0.531
5	Number of buds	10.0	62.0	24.7 ± 4.96	6.0	33.0	17.9 ± 3.09	4.0	28.0	16.3 ± 2.26	1.523	0.236
6	Number of aerial roots	0.0	2.0	1 ± 0.26	0.0	6.0	3 ± 0.68	0.0	5.0	± 0.56	4.737	0.017*
7	Number of nodes	9.0	12.0	10.4 ± 0.43	8.0	11.0	9.6 ± 0.31	10.0	13.0	11.1 ± 0.28	4.798	0.016*
8	Leaf area (cm^2)	4.9	14.0	10.052 ± 1.08	9.9	19.0	15.7 ± 0.76	8.7	24.1	16.06 ± 1.51	9.261	0.001*

Table 3. Vegetative propagation in A. conyzoides (White)

Sl. No.	Parameters	Control			Clipping once			Clipping twice			F	*p* value
		Min	Max	Mean ± SE	Min	Max	Mean ± SE	Min	Max	Mean ± SE		
1	Plant height (cm)	39.7	75	55.54 ± 3.84	21.8	102	45.71 ± 6.91	26.5	72.3	50.98 ± 4.15	0.911	0.414
2	Root length (cm)	4.9	11	7.46 ± 0.6	5.2	13	7.49 ± 0.74	5.8	12	7.79 ± 0.58	0.080	0.923
3	Leaf flush	2	32	17.8 ± 3.16	10	50	28.0 ± 4.39	8	38	15.2 ± 2.92	3.638	0.040*
4	Number of flowers	4	44	19.4 ± 3.76	3	53	16.0 ± 4.78	6	36	16 ± 2.9	0.254	0.777
5	Number of buds	2	30	16.8 ± 3.09	3	58	19.1 ± 4.92	12	33	19.7 ± 2.55	0.175	0.841
6	Number of aerial roots	0	1	0.2 ± 0.13	0	5	1.7 ± 0.72	1	3	1.9 ± 0.18	4.607	0.019*
7	Number of nodes	8	12	10.3 ± 0.47	8	12	9.3 ± 0.54	10	13	11.9 ± 0.28	8.746	0.001*
8	Leaf area (cm^2)	4.5	26.5	12.726 ± 2.42	4.2	10.7	8.149 ± 0.7	4.4	16.8	8.695 ± 1.45	2.221	0.128

Table shows the results of bactericidal and fungicidal effectiveness tests conducted on ethanolic extracts of D. indica flavonoids and Rotenoids, W. somnifera and T. belerica.

Table 4. Rotenoids from various plant parts, flavonoids from Derris indica leaves, ethanolic root extract of Withania somnifera, and ethanolic fruit extract of Terminalia belerica have antibacterial and antifungal properties.

Plant species / Microrganism	D.indica						W.somnifera	T. belerica
	Flavonoids			Rotenoids			Ethanolic Extract	Ethanolic Extract
	Pet.Ether	EtAc	Diethyl-ether	Stem	Leaf	Pods	Roots	Fruit
Fungi *Aspergillus flavus* IZ	Residual toxicity	5	6	6	6	5	3	5
AI		0.33	0.4	0.4	0.6	0.5	0.3	0.5
Penicillium tubesulum IZ	4	3	6	5	4	6	5	6
AI	0.4	0.3	0.6	0.33	0.26	0.4	0.33	0.6
Bacteria *Escherichia coli* IZ	2	4	2.5	3	4	5	4	3
AI	0.4	0.4	0.25	0.3	0.4	0.5	0.4	0.6
Enterobacter cloacae IZ	2	1.5	2	3	2.5	3	1	1.5
AI	0.2	0.15	0.2	0.3	0.25	0.3	0.1	0.1

IZ= Inhibition zone (in mm) excluding the diameter of disc (6mm)

AI= Activity index = Inhibition zone of the sample/ inhibtion zone of the standard

The bactericidal and fungicidal activities of various plant parts, flavonoids of D. Indica, and ethanolic root and fruit extracts of W. somnifera and T. belerica were studied against indicator human pathogenic bacteria (E. coli and E. cloacae) and fungi (A. flavus and P. tubesulum) in order to assess their biological and pharmacological significance. When tested for antibacterial activity, every single plant extract came up with a positive result. In terms of efficacy against E. coli, the izoloid fraction of D. Indica pods and flavonoid extracts (IZ; 5 and 4 mm, respectively) were comparable to the ethanolic root extract of W. somnifera (4 mm). Significant IZ (3 mm) was seen against E. cloacae when rotenoids derived from D. indica pods and stems were tested. For A. flavus, the antifungal activity of flavonoids and Rotenoids (6mm) isolated from D. indica stems and leaves was comparable to that of Rotenoids isolated from D. indica pods and the ethanolic fraction of fruits of T. belerica against P. tubesulum. Flavonoids and Rotenoids (6mm) isolated from D. Indica stems and leaves have strong antifungal activity against A. flavus, comparable to that of Rotenoids isolated from D. Indica pods and the ethanolic fraction of T. belerica fruits against P. tubesulum.

CONCLUSION

Forest service agencies, agriculture managements, etc., have been worried about it. As a result, controlling the spread of invasive plants has become an international concern. The ability of invasive weed plants to thrive and take over an area that would not be ideal for native plant growth is dependent on a number of factors. The capacity to proliferate vegetatively, mostly from stems and leaves, and to reproduce prolifically, with the help of seeds, a variety of dispersion systems, and pollinators or carriers. When it comes to being intrusive, allelopathy is also considered a crucial fact. Chemicals released by plants that inhibit the development of neighboring plants are known as allelopathy. Additionally, it protects the plant from herbivores. Additional study on many weeds, including A. conyzoides, is necessary for scientists. The distribution and quantity of plants are affected by a number of environmental conditions, such as soil, rainfall, and temperature. The link between plant abundance and distribution, together with environmental variables, has to be identified.

REFERENCES

1. Hsu, H. & Kao, W. (2014). Vegetative and Reproductive Growth of an Invasive Weed Bidens pilosa L. var. radiata and its Noninvasive Congener Bidens bipinnata in Taiwan. Taiwania, 59(2), 119-126.

2. Prabhu, N. R., Stalin, N. & Swamy P. S. (2014). Eco-physiological attributes of Mikania micrantha, an exotic invasive weed, at two different elevations in the tropical forest regions of the Western Ghats, South India. Weed Biology and Management, 14, 59-67.

3. Singhal, S. & Narayan, R. (2014). Differential biomass allocation to above-ground plant components by two invasive Sida congeners in a dry tropical peri-urban vegetation in India. International Journal of Scientific and Research Publications, 4(6), 1-7.

4. Smith, M.D. & Knapp, A. K. (2003). Dominant species maintain ecosystem function with non-random species loss. Ecology Letters, 6, 509–517.

5. Soares, T. L., Silva, S. O., Costa, M. A. P. C., Santos-Serejo, J. A., Souza, A. S., Lino, L. S. M., Souza, E. H. & Jesus, O. N. (2008). In vitro germination and viability of pollen grains of banana diploids. Crop Breeding and Applied Biotechnology, 8, 111-118.

6. Sol, D. (2001). Predicting invaders. Trends in Ecology and Evolution, 16, 544.

7. Sousa, M.P., Matos, M.E.O., Matos, F.J.A., Machado, M.I.L. & Craveiro, A.A. (2004). Constituintesquímicosativos e propriedadesbiológicas de plantasmedicinaisbrasileiras. Editora UFC, Fortaleza.

8. Stebbins, G. L. (1974). Adaptive shifts and evolutionary novelty: A compositionist approach. In Studies in the Philosophy of Biology (pp. 285-306). Palgrave, London. Stebbins, G.L. (1950). Variation and Evolution in Plants. Columbia University Press, New York. https://doi.org/10.7312/steb94536.

9. Stebbins, G.L. (1985). Polyploidy, Hybridization, and the Invasion of New Habitats. Annals of the Missouri Botanical Garden, 72 (4), 824-832.

10. Steinlein, T., Dietz, H. & Ullmann, I. (1996). Growth patterns of the alien perennial Bunias orientalis L. (Brassicaceae) underlying its rising dominance in some native plant assemblages. Vegetation, 125, 73-82.

11. Stephens, L.C., Ascher, P.D. & Widmer, R.E. (1982). Genetics of self-incompatibility in diploid Ageratum houstonianum Mill. Theoretical and Applied Genetics, 63, 387-394

12. Stephenson, A. G. (1992). The regulation of maternal investment in plants. In: Marshall, C., Grace, J. (Eds.), Fruit and Seed Production. Aspects of Development. Enviromental Physiology and Ecology. Cambridge University Press, Cambridge, UK. pp. 151-171.

13. Stout, J. C. & Goulson, D. (2002). The influence of nectar secretion rates on the responses of bumblebees (Bombus spp.) to previously visited flowers. Behavioral Ecology and Sociobiology, 52, 239-246.