GTRP JOURNALS

Int. J. Biological Technology (IJBT) ISSN: 0976-4313 (Print)

International Journal of Biological Technology

Phytochemicals identification and evaluation of antimicrobial activity of *Cirsium arvense* (L.) Scop. (Asteraceae)

M. Maridass

Fissd's Research Institute of Conservation Ecology, Tirunelveli-627011,Tamilnadu

***Corresponding Author Email: fissdrice@gmail.com**

Abstract

Aims of this work to evaluate the preliminary phytochemical investigation and antimicrobial potential of methanolic extracts of *Cirsium arvense* (L.) Scop. (Asteraceae) on human pathogens. An investigation of phytochemicals constituents of the plant parts of *Cirsium arvense* (L.) Scop. (Asteraceae) were extracted with different solvents in soxhlet apparatus for 4 h and Agar well diffusion method has been used to determine the antimicrobial activities of plant extracts against *Escherichia coli*, *S. aureus*, *Bacillus cereus, Salmonella enteritidis*, *Klebsiella pneumoniae*, and *Pseudomonas aeruginosa* and one fungus *Candida albicans*. The results of the present study observed by the plant parts of *Cirsium arvense* (L.) Scop. were extracted and high quantify of yielded in the methanol extract. The methanolic extracts of plant parts were exhibited both antibacterial and antifungal activities against tested microorganisms. The conclusion of the results indicated that the plant extracts were significantly active against of Gram-positive, Gram-negative bacteria and fungi. The conclusion of the present report was methanolic plant extracts are great value as natural antimicrobials and can be use ointments of skin diseases.

Key words: Cirsium arvense, plant parts, extracts, medicinal values, phytochemicals, antibacterial activity, antifungal activity.

Received Date: 21-11-2021 | **Accepted Date: 12-2-2022** | **Published Date: 15-04-2022**

Reference Cited in this Article: Maridass, M. (2022). Phytochemicals identification and evaluation of antimicrobial activity of Cirsium arvense (L.) Scop. (Asteraceae). International Journal of Biological Technology,13 (1):1-5. www.gtrpcompany.com/ijbt.htm

Original Research Paper

1. INTRODUCTION

Today's, microbial infections, resistance to antibiotic drugs, have been the biggest challenges, which threaten the health of societies (Khameneh et al., 2019). Microbial infections are responsible for millions of deaths every year worldwide. In 2013, 9.2 million deaths have been reported because of infections i.e. about 17% of total deaths [WHO,2013; Gupta et al.,2019]. World Health Organization (WHO) reports that more than 80% of the world's population still depends upon the traditional medicines for various diseases. Globally, approximately 85% of the traditional medicines have been used in primary healthcare and derived from plant species (Farnsworth,1988). Therefore, medicinal plants are the indigenous heritage of global importance (Purohit and Vyas ,2004). Around, 50,000 flowering plants are used as medicinal purposes (Parmesan,2006), out 422,000 reported species of flowering plants (Govaerts,2001). Traditionally, the crude extracts of different parts of medical plants, including root, stem, flower, fruit, and twigs, were widely used for treatments of some human diseases (Khan et al., 2013). Medicinal plants contain several phytochemicals such as flavonoids, alkaloids, tannins, and terpenoids, which possess antimicrobial and antioxidant properties (Talib and Mahasneh, 2010). The antimicrobial activities of some plant species have been widely researched (Alzoreky and Nakahara, 2003; Castro et al., 2008).

The species of Cirsium arvense (L.) Scop. is belongs to the family Asteraceae. It is a perennial species and it is found to be throughout countries of Europe, Western Asia, Northern Africa and India. The standard English name in its native area is creeping thistle. It is also commonly known as Canada thistle and field thistle. The medicinal values of Cirsium arvense root is a prepare the tonic and cure for the several diseases such as diuretic, astringent, antiphlogistic and hepatic. It has been chewed as a remedy for toothache. A decoction of the roots has been used to treat worms in children. A paste of the roots, combined with an equal quantity of the root paste of *Amaranthus spinosus*, is used in the treatment of indigestion. The leaves are antiphlogistic. They cause inflammation and have irritating properties. The plants contain a alkaloid and a glycoside of cnicin. Previously, active principles of α-tocopherol, octadecatrienoic acid, tracin, hispidulin and luteolin were isolated from the methanolic extract (Khan et al.,2013). The aim of this study was to evaluate the preliminary phytochemical screening and antimicrobial activity of medicinal plant of *Cirsium arvense* (L.) Scop.

2. MATERIAL AND METHODS

2.1.1 The plant materials

The plant material of Cirsium arvense (L.) Scop was collected from Rajagopalapuram ponds, Palayamkottai, Tamilnadu. The plant materials were identified by the help of reginal flora. The specimen (Rice - 2021151) was deposited in the Herbarium of Conservation of Ecology, Tirunelveli, Tamilnadu.

2.1.2 Extraction and isolation

Fresh plant materials were air-dried for 2 weeks and grinded into coarsely powdered form, by using a grinder, kept in plastic bags, and subjected later to extraction. The methodologies of Harbone (1983) and Wagner et al. (1984) were used to process the different polarity solvents from the plant parts.

2.2 Antimicrobial Screening

2.2 .1 Antibacterial assay

The antibacterial activities were determined using agar well diffusion method (Boakye et al., 1977). Bacterial culture was grown in nutrient broth at 37°C for 18 to 24 h. 0.5 ml of broth culture of test organism was added by sterile pipette into molten agar (50 ml) which were then cooled to 40°C and poured into sterile petri dish. Sterile cork borer was used to make well of 6 mm in diameter in nutrient agar plate. The wells were filled with given extracts of (10µl/disc) and the plate was allowed for 1 to 2 h. The plates were incubated at 37°C for 18 to 24 h. Finally, the diameter of inhibition was measured.

2.2 .2 Antifungal assay

The antifungal assay was carried out using agar well diffusion method (Hadacek et al., 2000). Sterile dimethyl sulfoxide (DMSO) was used to dissolve the test sample. Sabouraud dextrose agar (SDA) was prepared by mixing Sabouraud 3% glucose agar and agar-agar in distilled water. The required amount of fungal strain was suspended in 2 ml Sabouraud dextrose broth. This suspension was uniformly streaked on petri plates containing SDA media by means of sterile cotton swab. Tested extracts(10µl/disc) were applied into well using same technique for bacteria. These plates were then seen for the presence of zone of inhibitor and result was noted.

3. RESULTS AND DISCUSSION

3.1 Phytochemical Screening

The phytochemical screening and extraction values of different solvents of petroleum ether, chloroform, ethyl acetate, methanol and water were represented in the results seen in the table 1 and 2 respectively. The maximum yield of the methanolic leaf extract was 12.45% and minimum yield of the petroleum ether root extract was 3.45 %. Previously, similar result was observed that the highest extraction yield on the methanolic leaf extract of *Severinia buxifolia* (Dieu-Hien Truong et al.,2019). The preliminary phytochemical composition of the plant parts of roots, stem and leaves of *Cirsium arvense* (L.) Scop were extracted with methanol for 4hr and results seen in the table-2. Similar results were observed by the *Moringa oleifera* leaf extract contains alkaloids, polyphenols, flavonoids, anthraquinones, coumarins, tannins, triterpenes, sterols, saponins, and some other secondary metabolites (Atef et al.,2019).

Table-1: Percentage of extracts of Cirsium arvense (L.) Scop. (Asteraceae)

Sl.No	Solvents	Presence / Absence of Active compounds		
		Roots	Stem	Leaves
1.	Petroleum ether	3.45	4.98	5.23
2.	Chloroform	4.22	6.24	8.92
3.	Ethyl Acetate	3.12	4.93	5.22
4.	Methanol	6.34	10.12	12.45
5.	Water	5.11	6.12	7.11

Table-2: Preliminary phytochemical screening of methanolic extracts of *Cirsium arvense* (L.) Scop. (Asteraceae)

Sl. No	Active Compounds	Presence / Absence of Active compounds		
		Roots	Stem	Leaves
1.	Alkaloids	+	+	+
2.	Flavonoids	+	+	+
3.	Terpenoids/Essential oils	+	+	+
4.	Tannins	+	+	+
5.	Saponnins	+	+	+

3.2 Antimicrobial activity

The results of the methanolic extracts of the plants parts of roots, leaf and stem of *Cirsium arvense* were exhibited varying degrees of inhibition activity against the tested bacteria and fungi (Table -3); and the results were expressed in the diameter of the growth of zone inhibition (Table-3).

Table-3: Antimicrobial activity of methanolic extract of plant parts of Cirsium arvense (L.) Scop. (Asteraceae)

Sl.No	Pathogens	Presence / Absence of Active compounds		
		Roots	Stem	Leaves
1.	*Escherichia coli*	12	13	11
2.	*Staphylococcus aureus*	9	14	14
3.	*Klebsiella pneumoniae*	13	13	19
4.	*Pseudomonas aeruginosa*	8	12	15
5	*Salmonella enteritidis*	11	13	16
6	*Bacillus cereus*	9	15	13
7	*Candida albicans*	18	16	14

The methanolic crude leaf extract showed high activity against *K. pneumoniae* (19 mm), and moderate activity against *S. aureus* (14 mm) and *P. aeruginosa* (15 mm) and fungi *Candida albicans* (14 mm). The methanolic crude root extract showed high activity against *Candida albicans* (18 mm), and moderate activity against *K. pneumoniae* (13 mm) and *Escherichia coli* (12 mm) and the lowest activity against *P. aeruginosa* (8mm). The methanolic crude stem extract showed high activity against *Candida albicans* (16 mm), and moderate activity against *B. cereus* (15 mm) and the lowest activity against *P. aeruginosa* (12mm). Previous studies, the screenings of the several medicinal plants showed that some of the screened plants are high potential source of antibacterial agents (Dabur et al.,2007). Antifungal activity of both extracts of chloroform and hexane of S. surattense was active against *S. typhi, E. coli, P. aeruginosa and S. aureus*, while methanolic extract was inhibited in the growth of *C. albicans* (Dabur et al.,2007). According to Daotam et al. (2016) who reported that the methanol extract of *M. oleifera* leaves showed different inhibition patterns against *E. coli, E. aerogenes, K. pneumoniae* and *P. aeruginosa*. Abdalla and Abdelgadir, (2016) reported that water and methanol extracts of *M. chamomilla* showed different degrees of antibacterial activities against *P. aeruginosa, S. aureus, B. cereus* and *E. coli*.

3.3 Conclusions

The present study reports the methanolic extract of plant parts of Cirsium arvense (L.) Scop. (Asteraceae) were observed by the highest yield of methanolic leaf extract and preliminary phytochemicals screening of leaf, stem and roots contains the active constituents of alkaloids, flavonoids, and terpenoids were identified. This study concluded that methanolic crude extracts of *Cirsium arvense* (L.) Scop. Active against both the Gram-positive, Gram-negative bacteria, and fungi. The active compounds of alkaloids, flavonoids, terpenoids were identified by the plant parts of Cirsium arvense (L.) Scop. (Asteraceae) were identified and their active constituents were may be acted as antimicrobial activity. Further studies will be isolation of active compounds from the plant parts of Cirsium arvense (L.) Scop. (Asteraceae).

4. REFERENCES

1. Khameneh, B., Iranshahy, M., Soheili, V. et al. (2019). Review on plant antimicrobials: a mechanistic viewpoint. Antimicrob Resist Infect Control 8, 118 https://doi.org/10.1186/s13756-019-0559-6.
2. WHO, (2013). WHO methods and data sources for global burden of disease estimates 2000–2011. Geneva: Department of Health Statistics and Information Systems.
3. Gupta, M., Sharma, R., Kumar, A. (2019). Comparative potential of simvastatin, Rosuvastatin and Fluvastatin against bacterial infection: an in silico and in vitro study. Orient Pharm Exp Med.,1–17. https://doi.org/10.1007/s13596-019-00359-z.
4. Farnsworth, NR. (1988). Screening plants for new medicines.In: Wilson E.O., Ed., Chapter 9 in Biodiversity, National Academy Press, Washington DC.
5. Purohit, S., Vyas, S.(2004). Medicinal Plant Cultivation: A Scientific Approach: Including Processing and Financial Guidelines. Agrobios (India).
6. Parmesan, C. (2006). Ecological and evolutionary response storecent climate change. Annual Review of Ecology, Evolution, and Systematics, 637–669.
7. Govaerts, R. (2001) How many species of seed plants are there? Taxon, 1085–1090.
8. Khan, U.A., Rahman, H., Niaz, Z., Qasim, M., Khan, J., Tayyaba, et al. (2013). Antibacterial activity of some medicinal plants against selected human pathogenic bacteria. Eur. J. Microbiol. Immunol. 3, 272–274. doi: 10.1556/EuJMI.3.2013.4.6.
9. Talib, W.H., and Mahasneh, A.M. (2010). Antimicrobial, cytotoxicity and phytochemical screening of Jordanian plants used in traditional medicine. Molecules 15, 1811–1824. doi: 10.3390/molecules15031811.
10. Alzoreky, N. S., and Nakahara, K. (2003). Antibacterial activity of extracts from some edible plants commonly consumed in Asia. Int. J. Food Microbiol. 80, 223–230. doi: 10.1016/S0168-1605(02)00169-1.
11. Castro, S.B. R., Leal, C. A., Freire, F.R., Carvalho, D.A., Oliveira, D.F., and Figueiredo, H.C.P. (2008). Antibacterial activity of plant extracts from Brazil against fish pathogenic bacteria. Braz. J. Microbiol. 39, 756–760. doi: 10.1590/S1517-838220080004000030.
12. Harbone, J.B. (1984)Phytochemical Methods. Chapman & Hall, London, 1983, 288 p.
13. Wagner, H.; Blandt, S.; Zgainski, E.M.1984. Plant Drug Analysis. Spring-Verlag, New York, 320 p.
14. Boakye, Y.K., Fiagbe, N. and Ayim, J. (1977). Antimicrobial properties of some West African medicinal plants. J. Nat. Prod. 40:543-545.
15. Hadacek, F. and Greger, H. (2000). Testing of antifungal natural products: methodologies, comparability of results and assay choice. Phytochem. Anal. 11:137-147.
16. Dieu-Hien Truong , Dinh HieuNguyen, Nhat ThuyAnhTa,AnhVoBui,TuongHaDo, and Hoang Chinh Nguyen, (2019). Evaluation of the Use of Different Solvents for Phytochemical Constituents, Antioxidants, and In Vitro Anti-Inflammatory Activities of Severinia buxifolia. Journal of Food Quality, 1-9; Volume 2019 |Article ID 8178294 | https://doi.org/10.1155/2019/8178294.
17. Atef, N.M., Shanab, S.M., Negm, S.I. et al. (2019). Evaluation of antimicrobial activity of some plant extracts against antibiotic susceptible and resistant bacterial strains causing wound infection. Bull Natl Res Cent 43, 144 https://doi.org/10.1186/s42269-019-0184-9
18. Dabur, R., Gupta, A., Mandal, T. K., Singh, D. D., Bajpai, V., Gurav, A. M., & Lavekar, G. S. (2007). Antimicrobial activity of some Indian medicinal plants. African journal of traditional, complementary, and alternative medicines:

AJTCAM, 4(3), 313–318. https://doi.org/10.4314/ajtcam.v4i3.31225.

19. Dabur R, Ali M, Singh H, Gupta J, Sharma G L. (2004). A novel antifungal pyrrole derivative from Datura metel leaves. Pharmazie. 59(7):568–570.
20. Daotam JK, Touani FK, Kuete V (2016) Antibacterial and antibiotic-modifying activities of three food plants (Xanthosoma mafaffa Lam., Moringa oleifera (L.) Schott and Passiflora edulis Sims) against multidrug-resistant (MDR) Gram-negative bacteria. BMC Complement Altern Med 16(1):9.
21. Abdalla RM, Abdelgadir AE (2016) Antibacterial Activity and Phytochemical Constituents of Cinnamomum verum and Matricaria chamomilla from Sudan. Bio Bulletin 2(2):01–00.