WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 9, Issue 14, 1499-1506. Review Article ISSN 2277– 7105

ANTIFUNGAL ACTIVITIES OF *EUPHORBIA* SPP AND ITS USE IN TRADITIONAL MEDICINES: A REVIEW.

***[1]Shobha Johari and [2]Ashwani Kumar**

[1]Associate Professor, Department of Botany, L.B.S. Government College, Kotputli- 303018.

[2]Former Head, Department of Botany, University of Rajasthan, Jaipur 302004.

Article Received on
24 Sept. 2020,

Revised on 14 Oct. 2020,
Accepted on 04 Nov. 2020

DOI: 10.20959/wjpr202014-19241

***Corresponding Author**
Shobha Johari
Associate Professor,
Department of Botany,
L.B.S. Government College,
Kotputli- 303018.

ABSTRACT

Euphorbia are used in traditional medicine, mainly as emetic and purgative agents, to treat digestive skin and respiratory disorders, and inflammatory conditions, migraine, intestinal parasites and gonorrhoea, and as wart cures The extracts and secondary metabolites from *Euphorbia* plants may act as active principles of medicines for the treatment of many human ailments. Some species of genus Euphorbia have been used for the treatment of various conditions such as asthma, leukemia, cancer, skin diseases and intestinal parasitic infections. Candida species constitute an important group of opportunistic fungi, which cause various clinical diseases. The purpose of this study was to evaluate and compare the traditional used and antifungal activities of Euphorbia spp.

KEYWORDS: Antifungal. Traditional medicines, Euphorbia, terpenoids.

INTRODUCTION

Euphorbia genus (Euphorbiaceae family), is the third major genus of flowering plants, comprising of ca. 2000 recognized species, is used all over the world in traditional medicine, especially in the traditional Chinese medicine. From the 243 Euphorbia species assessed by the IUCN Red List of Threatened species, 170 (70%) are threatened with extinction (categories vulnerable, endangered, and critically endangered).[4] More than 5% of species of Euphorbia are used in traditional medicine, mainly as emetic and purgative agents, to treat digestive skin and respiratory disorders, and inflammatory conditions, migraine, intestinal parasites and gonorrhoea, and as wart cures The usable parts of the Euphorbia species include roots, seeds, latex, wood, barks, leaves, and whole plants (Webste 2006; Kumar et al. 2010;

Özbilgin et al. 2012;Ernst et al. 2015; Pascal et al. 2017). Euphorbia species have these curative properties due to the presence of various phytochemicals, which constitute the secondary metabolites of these plants. They belong mainly to the terpenoids, flavonoids and polyphenols classes which also exhibit a great variety of biological effects. This review presents different uses of Euphorbia in traditional medicines and its antifungal activities.

MATERIAL AND METHODS

This review is based on our own studies as well from literatue collection ancient literatue etc.. According to literature review, evaluation of the antifungal effectiveness of latex from Euphorbia species has been performed majorly by disc diffusion or agar plug method (Al-Mughrabi et al. 2003; Darwish et al. 2011) whereas Clinical and Standard Institute (CLSI) dilution methods CLSI dilution methods have been rarely applied (Wayne et al. 2008).

Traditional medicinal uses

More than 5% of species of *Euphorbia* are used mainly in skin and inflammatory conditions, emetic and purgative agents, and to treat digestive and respiratory disorders, migraine, gonorrhoea warts and intestinal parasites. Three most-referenced plants used as traditional medicines were *E. hirta* L., *E. thymifolia* L., and *E. lathyris* (Ernst et al. 2015). In this review, broad range of biological activities, and with potential usages in health maintenance, is described. Euphorbia have been used for the treatment of various conditions such as asthma, leukemia, cancer, skin diseases and intestinal parasitic infections. A number of these species also possess antiviral, antibacterial, antifungal and cytotoxic properties (Yu et al. 2005; Betancur-Galvis et al. 2002; Yang et al. 2006). Salehi et al. (2019) reported diterpene ingenol mebutate identified on *E. peplus* L., as well as on *E. lathyris* L., *E. nivulia* Buch.-Ham., *E. esula* L., *E. antiquorum* L., *E. serpens* Kunth, and *E. fischeriana* Steud. Latex from *E. hirta* is also applied to treat skin diseases and fever mostly in Asia[6] and to treat gonorrhoea in Malaysia (Colley 1978) and other conditions such as malaria, candidiasis, and ringworm infections (Ernst 1978). The *E. lathyris* has emetic and purgative actions in the seeds which are used to treat snakebites, ascites, schistosomiasis, and hydropsy (Lai et al. 2004). A recent review has been published showing that *E. tirucalli* beneficial effects on leprosy, syphilis, cancer, asthma, and intestinal parasites (Mali et al. 2017). Mali et al. (2017b) also published a review where they report the various applications in traditional medicine of *E. neriifolia* L. Its latex is used as a carminative and expectorant, as well as in the treatment of tumours, skin

and abdominal, problems asthma, leprosy, and kidney stones, while the roots are used in the treatment of scorpion stings and snake bites.

Antimicrobial activity

Plants belonging to the genus *Euphorbia* are also of the great interest in the matter of their antimicrobial activity (Salehi, et al. 2019) In fact, these plants are also widely used in the traditional medicine in the microbial infections (Ashraf et al. 2015). Ashraf et al. (2015) reported that the hexane extract of *E. royleana*, when compared with methanol and water extracts, is the one with highest phenolic and flavonoid contents and the best antimicrobial agent. The methanol extracts of *E. hirta* L. and *E. tirucalli* L. exhibit similar activity against a broad spectrum of bacteria and fungi associated with skin infections (Chanda and Baravalia 2010). Several diterpenes isolated from stem bark of *E. neriifolia* exhibit anti-HIV-I activity (Yan et al.).

Goyal et al. (2015) reported the inhibitory properties of *E. caducifolia* latex on *C. albicans* and *Aspergillus niger* MICs. Sumathi et al. (2011) reported the strong inhibitory activities of *E. antiquorum* latex against *C. albicans, A. flavus* and *A. fumigatus*. The stems and leaves of *E. macroclada* contain some quantities of polyphenols, flavonoids, tannins, alkaloids, saponins and terpenoid compounds (Mozaffari et al. 1996; Farhan et al. 2012 Killedar et al. 2011). Mahmoudi et al. (2015) studied *E. macroclada* (LEM) and fluconazole, as a conventional antimycotic agent, against 150 pathogenic Candida isolates

Chemical composition

Salehi et al. (2019) described that *Euphorbia* genus (Euphorbiaceae family), has several natural products such as essential oils, extracts, and pure compounds, active in a broad range of biological activities, and with potential usages in health maintenance. Curative properties of *Euphorbia* species mainly to the terpenoids, flavonoids and polyphenols classes which also exhibit a great variety of biological effects such as cytotoxic, mammalian mitochondrial respiratory chain inhibition, HIV-1 and bacterial infection inhibition, anti-inflammatory, multidrug resistance modulators (see review Salehi et al. 2019).

However, Machado et al. (2016) described that some *Euphorbia* compounds are toxic, against predators (e.g., herbivores), compounds that have a caustic and irritating effect to the skin and promote tumours.

The chemical composition of essential oils from *Euphorbia* species revealed the presence of more than 80 phytochemicals, mainly oxygenated sesquiterpenes and sesquiterpenes hydrocarbons, while *Euphorbia* extracts contain secondary metabolites such as flavonoids, sesquiterpenes, sterols, diterpenes, and other polyphenols.

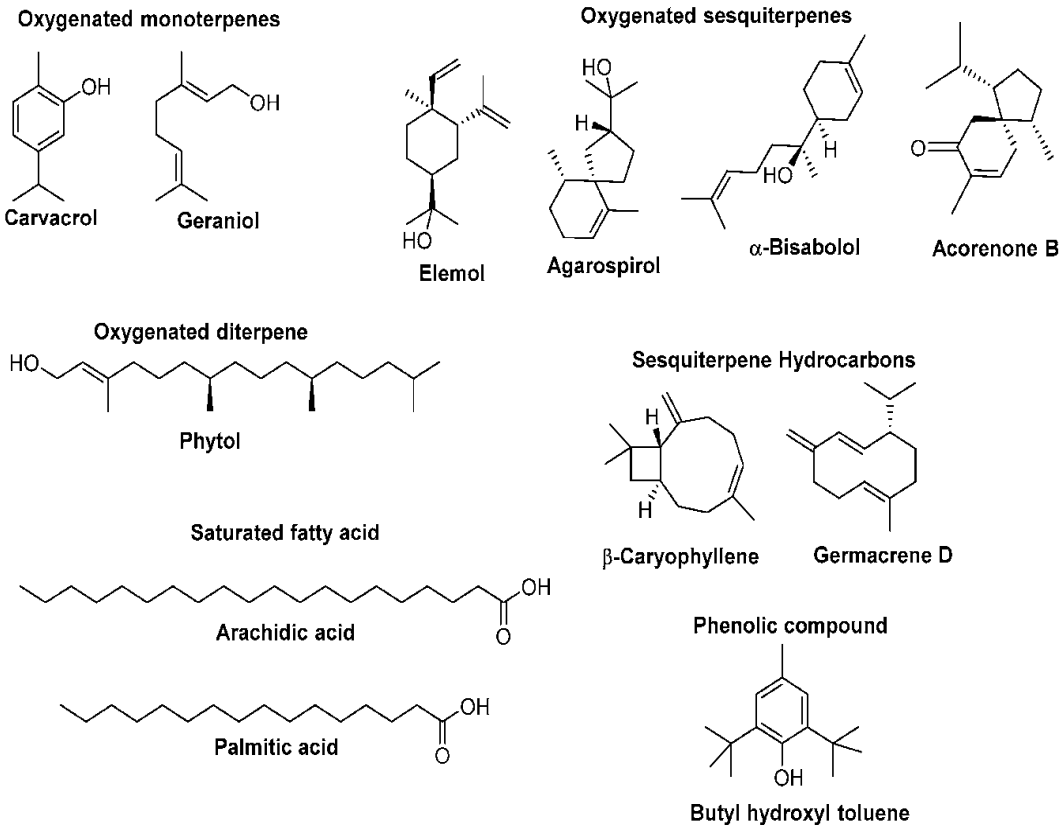

Fig 1: Euphorobia extracts contain secondary metabolites such as flavonoids, sesquiterpenes, sterols, diterpenes, and other polyphenols. (Soruce: Salehi, B.; Iriti, M.; Vitalini, S.; Antolak, H.; Pawlikowska, E.; Kręgiel, D.; Sharifi-Rad, J.; Oyeleye, S.I.; Ademiluyi, A.O.; Czopek, K.; Staniak, M.; Custódio, L.; Coy-Barrera, E.; Segura-Carretero, A.; Cádiz-Gurrea, M.L.; Capasso, R.; Cho, W.C.; Seca, A.M.L. *Euphorbia*-Derived Natural Products with Potential for Use in Health Maintenance. *Biomolecules* 2019, *9*, 337. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited).

DISCUSSION

The *Euphorbia* l*atex* has major constituents of essential oils oxygenated sesquiterpenes followed by sesquiterpene hydrocarbons. Their composition may vary according to the species, to the part of the plant, and the applied extraction methodology. This variability

could also be influenced by the different habitats, seasons, and dates of collection (Salehi et al. 2019). Different plants of Euphorbiaceae are used in traditional medicine include: *E. antiquorum, E. antisyphilitica, E. chamaesyce, E. cyparissias, E. helioscopia E. hypericifolia, E. lathyris, E. longifolia, E. milii, E. neriifolia, E. nivulia E. peplus, E. resinifera, E. royleana* (Upadhyay et al. 2010a and 2010b) The age-old tribal knowledge of plants is an important aspect of ethno botanical research. The tribal tracts are the storehouse of information and knowledge on the multiple uses of plants (Meena and **Kumar** 2012; Sharma and Kumar 2015; Sharma and Kumar 2011; 2016).). Plant-based antifungals have remarkable therapeutic potentials as they have fewer sideeffects, which are often associated with synthetic therapeutic agents. The first step towards using these potentials is testing the in vitro antifungal activities. Considering the global scarcity of studies on the antifungal effects of LEM, we aimed to evaluate the antifungal activity of the latex of endemicIranian E. macroclada and fluconazole against 150 clinical Candida isolates in hospitalized patients.

CONCLUSION

The *Euphorbia* species are plants well known for their applications, especially its latex, in traditional medicine around the world. Several studies reported and discussed above, confirmed the biological activities of *Euphorbia* extracts and pure compounds. The compounds and extracts of Euphorbia sp could be applied to the treatment of different diseases mainly related to microbial infections, as well as inflammation and cancer.*Euphorbia* plants extracts may lead to the development of new drugs for clinical use.

REFERENCES

1. Al-Mughrabi KI. Antimicrobial activity of extracts from leaves stems and flowers of Euphorbia macroclada against plant pathogenic fungi. Phytopathol Mediterr, 2003; 42(3): 245-50.
2. Ashraf A., Sarfraz R.A., Rashid M.A., Shahid M. Antioxidant, antimicrobial, antitumor, and cytotoxic activities of an important medicinal plant (*Euphorbia royleana*) from Pakistan. J. Food Drug Anal, 2015; 23: 109–115. doi: 10.1016/j.jfda.2014.05.007.
3. Betancur-Galvis LA, Morales GE, Forero JE, Roldan J. Cytotoxic and antiviral activities of Colombian medicinal plant extract of the Euphorbia genus. MemInst Oswaldo Cruz, 2002; 97(4): 541-6.
4. Chanda S., Baravalia Y. Screening of some plant extracts against some skin diseases caused by oxidative stress and microorganisms. Afr. J. Biotechnol, 2010; 9: 3210–3217.

5. Colley F.C. Traditional Indian medicine in Malaysia. J. Malays. Branch R. Asiat. Soc, 1978; 51: 77–109.
6. Darwish R, Aburjai TA. Antimicrobial Activity of some Medicinal Plants against Different Candida Species. Jordan J Pharma Sci, 2011; 4(1): 70-9.
7. Ernst, M.; Grace, O.M.; Saslis-Lagoudakis, C.H.; Nilsson, N.; Simonsen, H.T.; Rønsted, N. Global medicinal uses of Euphorbia L. (Euphorbiaceae). J. Ethnopharmacol, 2015; 176: 90–101.
8. Farhan H, Rammal H, Hijazi A, Hamad H, Badran B. Phytochemical screening and extraction of polyphenol from stems and leaves of a Lebanese Euphorbia macroclada schyzoceras Boiss. Ann Biol Res, 2012; 3(1): 149-56.
9. Geng D., Yi L.T., Shi Y., Min Z.D. Structure and antibacterial property of a new diterpenoid from *Euphorbia helioscopia*. Chin. J. Nat. Med, 2015; 13: 704–706. doi: 10.1016/S1875.
10. Goyal M, Sasmal D, Nagori BP. GCMS analysis and antimicrobial action of latex of Euphorbia caducifolia. J Intercult Ethnopharmacol, 2012; 1(2): 119-23.
11. IUCN Red List. The IUCN Red List of Threatened Species. Available online: https://www.iucnredlist.org/ (accessed on 1 June 2019).
12. Killedar SG, Desai RG, kashid UT, Bhore NV, Mahamuni SS. Antimicrobial activity and phytochemical screening of fresh latex of Euphorbia thymofolia linn. Int J Res Ayur Pharma, 2011; 2(5): 1553-5.
13. Kumar, S.; Malhotra, R.; Kumar, D. Euphorbia hirta: Its chemistry, traditional and medicinal uses, and pharmacological activities. Pharmacogn. Rev, 2010; 4: 58–61. [CrossRef] [PubMed]
14. Lai X.Z., Yang Y.B., Shan X.L. The investigation of Euphorbiaceous medicinal plants in southern China. Econ. Bot, 2004; 28: S307. doi: 10.1663/0013-0001(2004)58[S307:
15. Mali P.Y., Panchal S.S. *Euphorbia tirucalli* L.: Review on morphology, medicinal uses, phytochemistry and pharmacological activities. Asian Pac. J. Trop. Biomed, 2017; 7: 603–613.
16. Mali P.Y., Panchal S.S. *Euphorbia neriifolia* L.: Review on botany, ethnomedicinal uses, phytochemistry and biological activities. Asian Pac. J. Trop. Biomed, 2017; 10: 430–438.
17. Machado M.M., de Oliveira L.F., Zuravski L., de Souza R.O., Fischer P., Duarte J.A., Rocha M.O., Güez C.M., Boligon A.A., Athayde M.L. Evaluation of genotoxic and cytotoxic effects of hydroalcoholic extract of *Euphorbia tirucalli* (Euphorbiaceae) in cell

cultures of human leukocytes. An. Acad. Bras. Cienc. 2016;88:17–28. doi: 10.1590/0001-3765201520140076.

18. Mahmoudi S, Roustaei M, Zaini F, Kordbacheh P, Safara M. In vitro antifungal activities of *Euphorbia macroclada* and fluconazole against pathogenic *Candida* species. Curr Med Mycol, 2015 Jun; 1(2): 7-12. doi: 10.18869/acadpub.cmm.1.2.7. PMID: 28680982; PMCID: PMC5490307.
19. Mozaffari V. Dictionary of Iranian Plants names. Tehran: Farhang Moaser, 1996.
20. Meena R, and **Kumar A.** (2012) Ethnobotanical survey of medicinal plants from Baran District of Rajasthan, India. The Journal of Ethnobiology and Traditional Medicine. Photon, 117: 199-203.
21. Özbilgin, S.; Saltan Çitoˇglu, G. Uses of some Euphorbia species in traditional medicine in Turkey and their biological activities. Turk. J. Pharm. Sci, 2012; 9: 241–256.
22. Pascal, O.A.; Bertrand, A.E.V.; Esaïe, T.; Sylvie, H.A.M.; Eloi, A.Y. A review of the ethnomedicinal uses, phytochemistry and pharmacology of the Euphorbia genus. Pharma Innov. J, 2017; 6: 34–39.
23. Popp J, Harangi-Rákos M, Gabnai Z, Balogh P, Antal G, Bai A. Biofuels and Their Co-Products as Livestock Feed: Global Economic and Environmental Implications. Molecules, 2016 Feb 29; 21(3): 285. doi: 10.3390/molecules21030285.
24. Salehi B, Iriti M, Vitalini S, et al. *Euphorbia*-Derived Natural Products with Potential for Use in Health Maintenance. *Biomolecules*, 2019; 9(8): 337. Published 2019 Aug 2. doi:10.3390/biom9080337.
25. Salehi, Bahare et al. "*Euphorbia*-Derived Natural Products with Potential for Use in Health Maintenance." *Biomolecules* vol. 9,8 337. 2 Aug. 2019, doi:10.3390/biom9080337
26. Sharma, H. and Kumar**, A.** (2011): Ethnobotanical studies on medicinal plants of Rajasthan (India): A review. Journal of Medicinal Plants Research, **5:** 1107-1112.
27. Sharma M and A. Kumar (2015) Tribal medicines of India. Annals of Plant Sciences, 2015; 4(02): 954-959.
28. Sharma, A and A. Kumar (2016) Pharmacognostic studies on medicinal plants: *Justicia adhatoda*. World Journal of Pharmaceutical Research, 5(7): 1674-1704.
29. Sumathi S, Malathy N, Dharani B, Sivaprabha L, Hamsa D, Radha P, et al. Antibacterial and antifungal activity of latex of Euphorbia antiquorum. Afr J Microbiol Res, 2011; 5(27): 4753-6.
30. Upadhyay, B., Singh, K.P. and **Kumar, A.** (2010a): Pharmacognostical and antibacterial studies of different extracts of *Euphorbia hirta* L**. .** Journal of Phytology, **2:** 55–60

31. Upadhyay, B., Singh, K.P. and **Kumar A.** (2010b): Ethno-medicinal, phytochemical and antimicrobial Studies of *Euphorbia tirucalli* L. . Journal of Phytology, 2: 65–77.
32. Wayne P. Clinical and laboratory standards institute. Reference method for broth dilution antifungal susceptibility testing of filamentous fungi, approved standard, M38-A2, 2nd ed. Vilanova: Clinical and Laboratory Standards Institute, 2008.
33. Webster, G.L. Classification of the Euphorbiaceae. Ann. Mo. Bot. Gard, 2006; 81: 3.
34. Yan S.L., Li Y.H., Chen X.Q., Liu D., Chen C.H., Li R.T. Diterpenes from the stem bark of *Euphorbia neriifolia* and their in vitro anti-HIV activity. Phytochemistry, 2018; 145: 40–47. doi: 10.1016/j.phytochem.2017.10.006.
35. Yu FR, Lian XZ, Guo HY, McGuire PM, Li RD, Wang R, et al. Isolation and Characterization of methyl esters and derivatives from Eupharbia Kansui (Euphorbiaceae) and their inhibitory effects on the human SGC- 7901 cells. J Pharm Pharm Sci, 2005; 8(3): 528-35.
36. Yang CM, Cheng HY, Lin TC, Chiang LC, Lin CC. Eupharbia thymifolia suppresses herpes simplex virus 2 infection by directs inactivating virus infectivity. Clin Exp Pharmacol Physiol, 2005; 32(5-6): 346-9.