

## Phytotherapy in Aspergillus: An overview of the most important medicinal plants affecting Aspergillus

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**Abstract:** Aspergillosis can cause wide range of diseases such as abortion, respiratory infections and food poisoning. The emergence of drug-resistant fungal species has caused attention to be focused on developing new therapies against fungi. Some plant species have been identified antifungal properties. Because of the importance of fungal diseases, such as Aspergillus, in this study the effect of antifungal medicinal plants native to Iran, was introduced. The review carried out by searching scientific databases such as Google Scholar, SID, etc, key words, including fungi, Aspergillus, herbs and Iran to relevant articles were searched and were studied. Diagram of the present review were as follows. *Zataria multiflora* Boiss., *Thymus eriocalyx*, *Mentha pulegium*, *Satureia hortensis*, *Secale montanum*, *Artemisia*, *Petroselinum crispum*, *Acimum basilicum*, *Anethum graveolens*, *Mentha viridis*, *Cuminum cyminum*, *Cinnamomum zeylanicum*, *Aloe vera*, *Rosa damascena*, *Coriandrum sativum* *Origanum majorana*, *Myrtus Communis* L and *Glycyrrhiza glabra* are the most important medicinal plants against Aspergillosis. Important compounds such as Carvacrol, Thymol, Palmitic acid, Apiol, Methyl chavicol, Caryophyllene oxide, Cimonene, Camphene, Mircen and Myrtenal, Menthol, Caryophyllene, Mentone and ect includes the active compounds of medicinal plants that have antibacterial and antifungi effects, which can be described as a combination of proven anti-Aspergillus context.

**Keywords:** fungus, Aspergillus, herbs, Iran.

### Introduction

Aspergillosis is the name given to a wide variety of diseases caused by infection by fungi of the genus Aspergillus. Disease may be manifested by food poisoning, allergies due to inhalation of fungal conidia or due to aspergilloma, granulomatous inflammation and necrosis of lung and other visceral organs and rarely deadly visceral disease (1). These fungal diseases in animals can cause some problems such as abortion, respiratory infections and food poisoning. Primary aspergillosis is rare and more common in adult men. Whereas secondary aspergillosis in feeble patients observed, is not dependent on age or sex, and the incidence increases with certain situation such as the use of antibiotics, steroids, cytokines and toxins and due to some disease for instance cancers, blood diseases such as leukemia, renal transplantation, enterocolitis, pneumonia, alcoholism, and

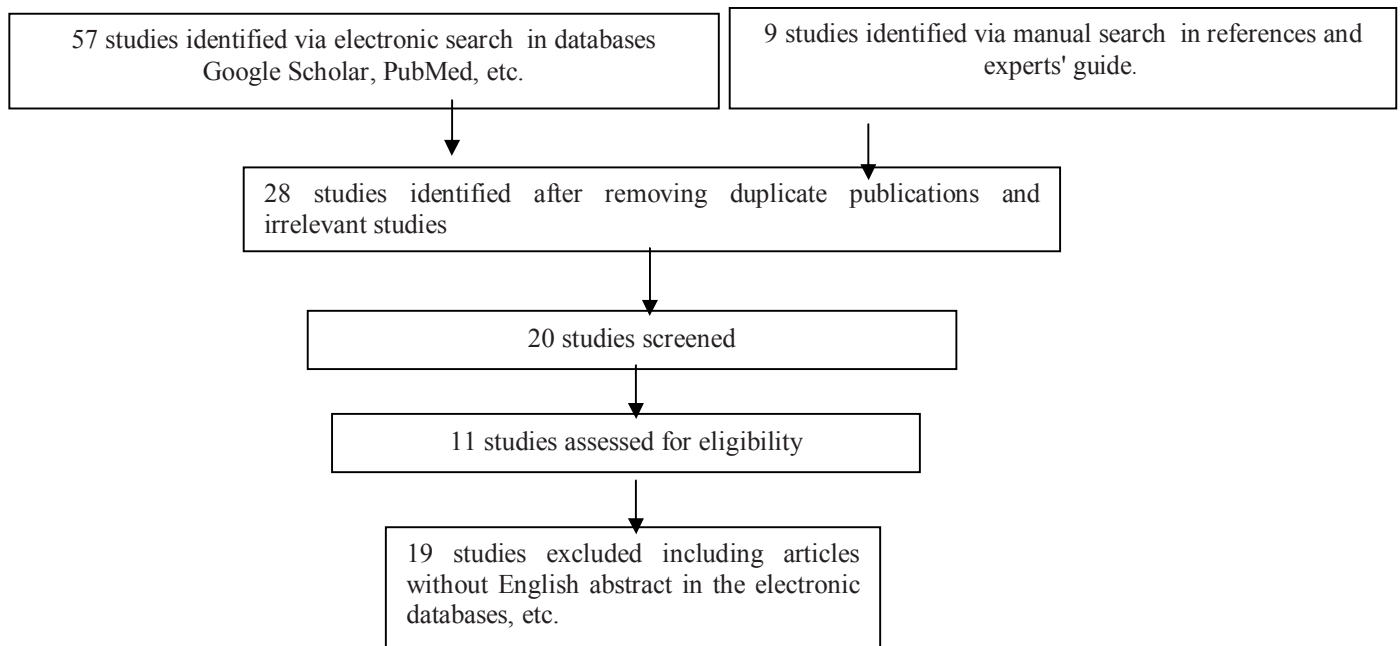
tuberculosis (2). One of aflatoxin producing fungi in human and animal food is *Aspergillus flavus*. According to research conducted *Aspergillus* species is isolated from soft shell, hard shell and pistachios of Iran (3). The most important fungi are produced aflatoxin which can be separated from pistachios include *A. parasiticus* and *Aspergillus flavus*. These two species produce G1, B2, B1, G1 toxins (4).

Consumption of food contaminated with aflatoxins causes acute or chronic diseases such as cancer and liver if taken in high doses, can be fatal (5).

The medicinal plants are the rich source to treat diseases such as diabetes, kidney stones, colds, hyperlipidemia, parasitic and infectious diseases, constipation, dysmenorrhea, pain, sinusitis, and others (6-13). The presence of drug-resistant fungal species has caused attention to be focused on developing new therapies to elimination fungi diseases(14). Some plant species have been identified antifungal properties (15). Given the importance of fungal diseases, such as *Aspergillus*, in these study medicinal plants native to Iran with the anti-fungal effects is reported.

## Method

The review carried out by searching scientific databases such as Google Scholar, SID, etc, key words, including fungi, *Aspergillus*, herbs and Iran to relevant articles were searched and were studied. Diagram of the present review were as follows.



**Figure. Flow diagram for the study review**

## Results

Based on these results, the herb *Zataria multiflora* Boiss., *Thymus eriocalyx*, *Mentha pulegium*, *Satureia hortensis*, *Secale montanum*, *Artemisia*, *Petroselinum crispum*, *Acimum basilicum*, *Anethum graveolens*, *Mentha viridis*, *Cuminum cyminum*, *Cinnamomum zeylanicum*, *Aloe vera*, *Rosa damascena*, *Coriandrum sativum*, *Origanum majorana*, *Myrtus Communis* L and *Glycyrrhiza glabra* reported the most important medicinal plants are native to Iran with anti-*Aspergillus*. Additional information regarding the scientific name and dosage and effect of each herb mentioned in Table 1.

**Table 1. The scientific name, dose and efficacy of medicinal plants native to Iran with anti-Aspergillus**

Row	The scientific name of the plant	The family	The Persian name of the plant	The medical effect of plant
1	<i>Zataria multiflora Boiss.</i>	Lamiaceae	Avishane Shirazi	Based on the results obtained in vitro situation, minimum inhibitory concentration of <i>Thymus vulgaris</i> extract on the growth of <i>Aspergillus flavus</i> was determined 90 ppm concentration of 30% ethanol extract. The thyme alcoholic extract at a concentration of 48% at the dose of 2500 ppm in the whey coating composition in sterile kernel , fully prevented the growth of <i>Aspergillus flavus</i> on the nuts (16).
2	<i>Thymus eriocalyx</i>	Lamiaceae	Avishane Korki	The results of a study showed that the concentration of 500 ppm of essential oil of thyme fluffy growth hibition was 22 mm (17) which reveal extraordinary power of these Fungicides oils and preservatives.
3	<i>Menthapulegium</i>		Pooneh	Results of a study showed that the essential oil of oregano inhibited <i>Aspergillus niger</i> growth with MIC 2.5 micrograms per ml (18).
4	<i>Satureia hortensis</i>	Labiatae	Marzeh	Results of a study showed that savory essential oil inhibited <i>Aspergillus niger</i> growth the MIC 2.5 micrograms per ml (19).
5	<i>Secalemontanum</i>	Poaceae	Chavdar Koohi	Rye oregano essential oil with humidity of 65, 75 and 86% and at 15, 25 and 35 temperature with concentration of 10 <sup>6</sup> spores per ml <i>Aspergillus flavus</i> applied antifungal effect (20).
6	<i>Artemisia</i>	Asteraceae	Dermaneh	The results of the effect of the <i>Artemisia</i> on 12 different genus of <i>Aspergillus</i> showed that the MIC was identified in the range of 6.25, 12.5 and 25, as well as their MFC 12.5, 25 and 50 (21).
7	<i>Petroselinum crispum</i>		Apiaceae Jafari	Results of a study showed that at a dose of 4 micro liters per ml of parsley had antifungal effect and inhibited the growth of <i>Aspergillus parasiticus</i> imposed on (22).
8	<i>Acimum basilicum</i>		Lamiaceae Reyhan	Results showed that <i>Acimum basilicum</i> with dose 3 micro liters in milliliters had antifungal effect and applied prevention the growth of <i>Aspergillus parasiticus</i> (22).
9	<i>Anethum graveolens</i>	Apiaceae	Shevid	Results of a study showed that <i>Anethum graveolens</i> at a dose of 1.5 micro liters per ml had antifungal and inhibitory effect on <i>Aspergillus parasiticus</i> (22).
10	<i>Mentha viridis</i>	Lamiaceae	Naana	Results of a study showed that peppermint at a dose of 1.5 ml per ml revealed antifungal and inhibitory effect on <i>Aspergillus parasiticus</i> (22).
11	<i>Cuminum cyminum</i>	Apiaceae	Zire Sabz	Results of a study showed that <i>Cuminum cyminum</i> at the cause the minimum inhibitory at the concentrations between 3.125 to 12.5 micrograms per ml and

				the MBC equal to 6.5 to 25 micrograms per ml on <i>Aspergillus fumigatus</i> and <i>Aspergillus nidulans</i> (23).
12	<i>Cinnamomumzeylanicum</i>	Lauraceae	Zilanikoom	The results of a study that was conducted on 27 isolates of <i>Aspergillus</i> was determined that the MIC for eight isolates was 1.18 micrograms per ml, 0.59 micrograms per ml for the six isolates, for four isolates was 0.29 micrograms per ml, to five isolators was 0.14 micrograms per milliliter and for four other isolates was 0.07 micrograms per ml (24).
13	<i>Aloe vera</i>	Liliaceae	Sabre Zard	Results of a study showed Aloe vera acetone extract has 100 percent antifungal activity at a concentration of $10^5$ . The inhibition of aflatoxin in concentrations of 2000 $\mu$ l /50 ml culture medium equal to 40.94% and a concentration of 2 $\mu$ l / 50 ml culture medium was reported 18.14% (25).
14	<i>Rosa damascena</i>	Rosaceae	Gole Mohammadi	Results of a study showed that MIC of the extract of <i>Rosa damascena</i> on <i>Aspergillus fumigatus</i> recorded $437.5 \pm 87.8$ and MFC of extract was $500 \pm 20.41$ mg /ml (25).
15	<i>Coriandrum sativum</i>	Apiaceae	Geshniz	Results of a study showed that MIC of <i>Coriandrum sativum</i> extract against <i>Aspergillus fumigatus</i> was $387.5 \pm 27.32$ and MFC extract on the fungus was $387.5 \pm 27.32$ mg /ml (26).
16	<i>Origanum majorana</i>	Lamiaceae	Marzanjoosh	Results of a study showed that the MIC and MLC of <i>Origanum majorana</i> - <i>Thymus eriocalyx</i> oil mixtures, was determined respectively, 63 and 500 micrograms per ml and the MIC and MLC to mix <i>Origanum majorana</i> - <i>Satureia hortensis</i> essential oils as well as 63 and 500 micrograms per ml for <i>Aspergillus</i> (27).
17	<i>Myrtus Communis L</i>	Myrtaceae	Moort	Results of a study showed that a concentration of 100 micrograms per milliliter of <i>Myrtus Communis L</i> essential oils on <i>Aspergillus fumigatus</i> and <i>Aspergillus flavus</i> , at the dose of 50 micrograms per ml on <i>Aspergillus nidulans</i> and <i>fumigatus</i> and the dose of 25 micrograms per ml against <i>Aspergillus niger</i> and <i>nidulans</i> (28) .
18	<i>Glycyrrhizaglabra</i>	Fabaceae	Shirin bayan	Results of a study showed that the highest inhibitory of <i>Glycyrrhizaglabra</i> was observed at 500 mg /ml. HPLC analysis also showed that the most effective concentration of licorice extract was concentration of 10 mg/ml, respectively, which inhibits aflR toxin gene produces as much as 99.99 percent (29).

## Discussion

Pharmaceutical active ingredients such as phenols, flavonoids, tannins, Anthocyanin and... cause having therapeutic effects in herbal plants (30-32).

Based on these results *Zataria multiflora* Boiss, *Thymus eriocalyx*, *Mentha pulegium*, *Satureia hortensis*, *Secale montanum*, *Artemisia*, *Petroselinum crispum*, *Acimum basilicum*, *Anethum graveolens*, *Mentha viridis*, *Cuminum cyminum*, *Cinnamomum zeylanicum*, *Aloe vera*, *Rosa damascena*, *Coriandrum sativum*, *Origanum majorana*, *Myrtus Communis* L and *Glycyrrhiza glabra* are the most important medicinal plants against Aspergillosis native to Iran. Based on phytochemical studies, the active components of medicinal herbs analyzed and listed below. The most important phenolic compounds of thyme plant are Carvacrol and Thymol (34,35) It's known that palmitic acid and apical meristem are important compounds of Parsley. Methyl chavicol, caryophyllene oxide and limonene are important compounds extracted from Basil. The phytochemical results show that the effective ingredients of Dill includes decaron, limonene and alpha phellandrene. Menthol, pulgone, mentone, sabinene, piperitone, penine and methyl acetate are the most compound of peppermint oil (36-38). The active ingredients of *Cuminum cyminum* includes cumin, simonin, camphene, myrcene, myrthen, caryophyllene, phellandrene, cineole, gamma terpinene have been identified (39,40). *Glycyrrhiza glabra* contains trepens, coumarin, flavonoids and isoflavonoids which can have anti fungi effects (41). *Aloe vera* contains combinations such as phenolic compounds, saponins and anthraquinone (42) The combination of quercetin 3-o-glucoside, kaempferol-3-o-rutinoside in extracts of rose, kaempferol-3-o-arabinoside in rose's essence and geraniol, citronellol and nerol been identified (43). *Myrtus* essence contains flavonoids and tannins (44). The most important compound of Rosemary is alpha-pinene (45).

Because of the infectious diseases have high outbreak and spread (46-57), Therefore medicinal plants through their active ingredients have a good therapeutic effect (58-70). Medical plants listed in this article have antibacterial and antifungi effects, which can be described as a combination of proven anti-Aspergillus context.

## References

1. Kwon Chung KJ, Bennett JE. Medicalmycology.2nd ed. Lea&Febrrger. Philadelphia1992, pp: 201 - 10.
2. Zeini F, BasiriJahromi S H. Study of fungalinfections in patients with Leukemia. Iran. J. Pubheal. 1994; 1 (4): 89 - 103.
3. Rahimi P, Sharifnabi B and Bahar M. Detectionof Aflatoxin in Aspergillus Species Isolated fromPistachio in Iran. J. of Phytopathol.2008; 156: 15 -20.
4. Yu J, Chang PK, Ehrlich KC, Cary JW,Bhatnagar D, Cleveland TE, Payne GA, Linz JE,Woloshuk CP and Bennett W. Clustered pathway genes in aflatoxin biosynthesis. Applied Environmental Microbiol.2004; 70: 1253 - 62.
5. Sergent T, Ribonnet L, Kolosova A, Garsou S,Schaut A, De Saeger S, et al. Molecular and cellular effects of food contaminants and secondary plantcomponents and their plausible interactions at theintestinal level. Food ChemToxicol 2008; 46(3):813-41.
6. Rahimi-Madiseh M, Bahmani M, KarimianP and Rafieian-kopaei M. Herbalism in Iran: A systematic review. Der PharmaChemica, 2016, 8(2):36-42.
7. Bahmani, M., Saki, K., Shahsavari, S., Rafieian-Kopaei, M., Sepahvand, R., Adineh, A. Identification of medicinal plants effective in infectious diseases in Urmia, northwest of Iran. Asian Pacific Journal of Tropical Biomedicine Volume 2015; 5(10): 858-864.
8. Bahmani, M., Shirzad, H., Mirhosseini, M., Mesripour, A., Rafieian-Kopaei, M. A Review on Ethnobotanical and Therapeutic Uses of Fenugreek (*Trigonellafoenum-graceum* L). Journal of Evidence-Based Complementary and Alternative Medicine 2015; 21(1): 53-62.
9. Nasri, H., Bahmani, M., Shahinfard, N., Nafchi, A.M., Saberianpour, S., Rafieian-Kopaei, M. Medicinal plants for the treatment of acne vulgaris: A review of recent evidences. Jundishapur Journal of Microbiology 2015; 8(11): Article number e25580.
10. Parsaei P, Bahmani M, Naghdi N, Asadi-Samani M and Rafieian-Kopaei M. A review of therapeutic and pharmacological effects of thymol. Der Pharmacia Lettre, 2016, 8 (2):150-154.

11. Hasper, A., Trindade, L.M., Van der veen, D., Van ooyen, A.J. and Graaff, L.H. 2004. Functional analysis of the transcriptional activator XlnR from *Aspergillus niger*. *Microbiology*, 150: 1367-1375.
12. Amin, M. and Kapadnis, BP. 2005. Heat Stable Antimicrobial activity of *Allium ascalonicum* against bacteria and fungi. *Indian Journal of Experimental Biology*, 43: 751-754.
13. Javanmard M, Ramazan Y. Application of Edible Coatings Incorporated *Avishan-e Shirazi* (*Zataria multiflora*) Alcoholic Extract for Inhibition of *Aspergillus flavus* Growth on the Pistachio Kernel. *JMP*. 2009; 2 (30): 61-70.
14. Fakoorl M.H., Allameh A, Rasooli I and Mazaheri M. Antifungal effects of *Zataria multiflora* Boiss. and *Thymus eriocalyx* (Ronniger) *Jalas* essential oils on aflatoxin producing *Aspergillus parasiticus*. *Iranian Journal of Medicinal and Aromatic Plants* 2007, 23(2): 269-277.
15. Memarian M, Malekzadeh F, Razavi MR, Dakhili M. Evaluation of antifungal essential oils of the herb thyme, oregano and fennel on inhibiting the growth of the fungus *Aspergillus niger* spores and formation and cell growth. *Journal The findings Biology* 2011; 7(3):
16. Dehghan M, Sharifzadeh F, Javanenikkhah M. Rye seeds of radish and *Aspergillus*. *Science and Technology Seed Iran* 2013; 1(1): 28-37.
17. Mahboubi M and Feizabadi MM. The antimicrobial effect of essential oil of fennel fungi *Aspergillus niger*, *Aspergillus flavus*. *J Med Plants* 2009; 9(30): 127-144.
18. Enayati M, Baiat M, Mohsenifar A. Nanokytyvzan effects of wormwood and fennel contain essential oils on *Aspergillus* species isolated from fish meal factory in Mazandaran province. *Comparative pathobiology* 2014; 11(2): 1303-1310.
19. Noorbakhsh F, Rezaie S, Arab M. Evaluation the Antifungal Activity and Chemical Composition of Essential Oils of *Petroselinum crispum*, *Acimum basilicum*, *Anethum graveolens*, *Mentha viridis* on *Aspergillus parasiticus*. *Journal of Microbial World* 2010; 3(2): 129-136.
20. Enayati M, Mokhtari AR, Baiat M, Mohsenifar A, Khansari R. Study the hydropathic clinics cumin and fennel essential oils nano Maysan impact on the species of fish meal manufactured Shzh Sprshylvs attractive plants in Mazandaran province. *Journal of Food Microbiology* 2014; 1(1): 43-48.
21. Mohammadi R, Shokooh Amiri M, Mousavi S, Sepahvand A, Shams Ghahferokhi M, Yadegai M, et al .Antifungal Activity of *Cinnamomum zeylanicum* Essential Oil Against Clinical Isolates of *Aspegillus*. *JMP*. 2010; 4 (36) :66-71
22. Babaei A, Tavafi H, Manafi M, Fahimifar A. Comparing the in vitro antifungal activity of various *Aloe vera* leaf extracts on *Aspergillus flavus* growth and aflatoxin B1 production. *KAUMS Journal ( FEYZ )*. 2014; 17 (6) :537-544
23. Sima Yahyaabadi; Elnaz Zibanejad; Monir Doudi. Effect of some of plant extracts on the growth of two *Aspergillus* species. *J Herbal Drugs* 2011; 2(1): 69-81.
24. Hejazi S, Shirani - Bidabadi L, Zolfaghari – Baghbaderani A, Saberi S, Nilforoushzhadeh M, Moradi S, et al . Comparision Effectivness of Extracts of Thyme, Yarrow, Henna and Garlic on Cutaneous Leishmaniasis Caused by *L. major* in Animal Model (Balb/c). *JMP*. 2009; 2 (30) :129-136.
25. Mohammadi R, Mirhendi Esfahani SH, Shadzi SH, Moattar F. Antifungal Activity of *Myrtus Communis* L. Essential Oil Against Clinical Isolates of *Aspergillus*. *Journal of Isfahan Medical School* 2008; 26(89): 105-111.
26. Mohseni R, Nasrolahi-Omran A, Nourbakhsh F, Rezaei S, Hosseinjani HD. The effect of licorice extract on gene regulation process aflR and the aflatoxin production in *Aspergillus parasiticus* Real Time PCR method. *J Biological Pathology* 2012; 15(3): 63-77.
27. Hashish Kh.I., Rawia A. Eid, Magda M. Kandil and Azza A.M. Mazher(2015), Study on Various Level of Salinity on Some Morphological and Chemical composition of *gladiolus* Plants by Foliar Spray with Glutathione and Thiamine, *International Journal of ChemTech Research*, Vol.8, No.9, pp 334-341.
28. Mahmoud Khaled F.; Azza A. Amin; Effat I. Seliem; Manal F. Salama(2016), Nano Capsulated Polyphenol Extracted from Oyster Mushroom (*Pleurotus ostreatus*), Characterization and Stability Evaluation, *International Journal of PharmTech Research*, 2016, Vol.9, No.3, pp 103-113.
29. Mervat Sh Sadak, Mitigation of drought stress on Fenugreek plant by foliar application of trehalose(2016), *International Journal of ChemTech Research*, Vol.9, No.02 pp 147-155.
30. Nadia Gad and Abdel-Moez, M. R.(2015) , Effect of cobalt on growth and yield of fenugreek plants, *International Journal of ChemTech Research*, Vol.8, No.11 pp 85-92.

31. Aligiannis N, Kalpoutzakis E, Chinou IB, Mitakou S, Gikas E, and Tsbopoulos A. Composition and antimicrobial activity of the essential oils of *Wave taxa of Sideritis* from Greece. *J. of Agricultural and Food Chem.* 2001;49: 811–5.
32. Sahin, F., Karaman, I., Gulluce, M., Ogutcu, H., Sengul, M., Adguzel, A., Ozturk, S., Kotan, R. (2003): Evaluation of antimicrobial activities of *Saturejahortensis*. *J. ethnoph.* 87:61-65.
33. Rojhan M. *Medicine and herbal treatment*. 4th Ed. Tehran Alavi Press. 2000; 20-22.
34. Amin G. *Popular medicinal plants of Iran*. Iranian Research Institute of Medicinal Plants. Tehran. 1999.
35. Omidbaigi R. *Production and processing of medicinal plants*. Vol 2. AstanghodseRazaviPublication, Tehran. 2000; P438.
36. Cowan, M.M. 1999. Plant products as antimicrobial agents. *Clin Microbiol Rev.* 12: 564-82.
37. Khosravi, A.R., Minoeeian Haghighi, M.H., Shokri, H., Emami, S.A., Alavi, S.M., and Asili, J. 2011. The potential inhibitory effect of *Cuminumcyminum*, *Ziziphoraclinopodioides* and *Nigella sativa* essential oils on the growth of *Aspergillusfumigatus* and *Aspergillusflavus*. *Brazil J Microbiol.* 42: 216-224.
38. Akram M, Uddin S, Ahmed A, Usmanghani K, Hannan A, Mohiuddin E, Asif M, Ali Shah SM. *Glycyrrhizaglabra L. (Medicinal uses)*. *JMPR* 2011; 5(25): 5658-61.
39. Thiruppathi S, Ramasubramanian V, Sivakumar T, Thirumalai Arasu V. Antimicrobial activity of *Aloe vera (L.) Burm.f.* against pathogenic microorganisms. *J Biosci Res* 2010; 1(4): 251-8.
40. Yassa, N., Masoomi, F., Rohani, S.E. and Hadjiakhoondi, A. 2009. Chemical composition and antioxidant activity of the extract and essential oil of *Rosa damascena* from Iran, population of Guilan. *Daru*, 3: 175-180.
41. Rechinger KH. *Flora Iranica*. 5th ed. Verlagsanstalt: Akademische Druck; 2001. p.55-9.
42. Bahaa El-Din Mekki, Hebat-Allah Hussien, Hanaa Salem (2016). Role of Glutathione, Ascorbic Acid and  $\alpha$ -Tocopherol in Alleviation of Drought Stress in Cotton Plants, *International Journal of ChemTech Research*, Vol.8, No.4, pp 1573-1581.
43. Helmina Br. Sembiring, Tonel Barus, Lamek Marpaung, and Partomuan Simanjuntak (2015), *International Journal of PharmTech Research*, Vol.8, No.9, pp 24-30.
44. Kartini Zailanie, Hartati Kartikaningsih, Umi Kalsum, Yushinta Aristina Sanjaya (2015), *Fucoxanthin Effects of Pure Sargassum filipendula Extract Toward HeLa Cell Damage*, *International Journal of PharmTech Research*, Vol.8, No.3, pp 402-407.
45. Yasser A. A. El-Nomeary R. I. El- Kady and A. A. El-Shahat (2015), *Effect of Some Medicinal Plant Seed Meals Supplementation and their Effects on the Productive Performance of Male Rabbits*, *International Journal of ChemTech Research*, Vol.8, No.6, pp 401-411.
46. Monalisha Mallick, Anindya Bose, Sangeeta Mukhi (2016), *Comparative Evaluation of the Antioxidant Activity of Some commonly used Spices*, *International Journal of PharmTech Research*, (2016), Vol.9, No.1, pp 01-08.
47. D. Saravanan, M. Radhakrishnan (2016), *Antimicrobial activity of mangrove leaves against drug resistant pathogens*, *International Journal of PharmTech Research*, (2016), Vol.9, No.1, pp 141-146.
48. Sneha J Anarthe, Aleeti Pravalika, Enishetty Malavika and M. Ganga raju (2016)., *Assessment of immunomodulatory activity of Ficus benghalensis Linn. aerial roots*, *International Journal of PharmTech Research*, (2016), Vol.9, No.1, pp 153-163.
49. Haider Salih Jaffat, Afyaa Sabah Nasir (2016), *Effect of turmeric extract (Curcuma longa) on physiological parameters and neurotransmitters in rats treated by lithium carbonate*, *International Journal of PharmTech Research*, (2016), Vol.9, No.2, pp 89-97.
50. Benjamin E. Ezema, Emmanuel I. Odoemelam, Mathias O Agbo (2016)., *Phytochemical and Antibiotic Evaluation of the Methanol Extract of Loranthus micranthus Linn Parasitic on Kola Accuminata*, *International Journal of PharmTech Research*, (2016), Vol.9, No.2, pp 176-181.
51. Masitha Dewi Sar, Aslim D Sihotang, Aznan Lelo (2016)., *Ginkgo Biloba Extract Effect on Oxidative Stress Marker Malonildialdehyde, Redox Enzyme Glutathion Peroxidase, Visual Field Damage, and Retinal Nerve Fiber Layer Thickness in Primary Open Angle Glaucoma*, *International Journal of PharmTech Research*, (2016), Vol.9, No.3, pp 158-166.
52. Nasdiwaty Daud, Rosidah, M Pandapotan Nasution (2016), *Antidiabetic Activity of Ipomoea batatas L. Leaves Extract In Streptozotocin-Induced Diabetic Mice*, *International Journal of PharmTech Research*, (2016), Vol.9, No.3, pp 167-170.

53. Luqman Agung Wicaksono, Yunianta, and Tri Dewanti Widyaningsih(2016), Anthocyanin Extraction from Purple Sweet Potato Cultivar Antin-3 (*Ipomoea batatas* L.) using Maceration, Microwave Assisted Extraction, Ultrasonic Assisted Extraction and Their Application as Anti-Hyperglycemic Agents in Alloxan-Induced Wistar Rats, *International Journal of PharmTech Research*, (2016), Vol.9, No.3, pp 180-192.
54. Rise Desnita, Maria Veronika, Sri Wahdaningsih(2016), Topical Microemulsion's Formulation of Purple Sweet Potato (*Ipomoea batatas* L.) Ethanol Extract as Antioxidant by using Various Concentration of Span 80, *International Journal of PharmTech Research*, (2016), Vol.9, No.3, pp 234-239.
55. Vijay D. Tambe, Rajendra S. Bhambar(2016), Studies on Diuretics and Laxative Activity of the *Hibiscus Tiliaceus* Linn. Bark Extracts, *International Journal of PharmTech Research*, (2016), Vol.9, No.3, pp 305-310.
56. Pushpendra Kumar Jain, Debajyoti Das, Puneet Jain(2016), Evaluating Hair Growth Activity of Herbal Hair Oil, *International Journal of PharmTech Research*, (2016), Vol.9, No.3, pp 321-327.
57. Rubila. S, Ranganathan T.V.(2016), Effect of *Allium sativum* paste against Antimicrobial, Antioxidant and Cytotoxicity activity, *International Journal of PharmTech Research*, (2016), Vol.9, No.3, pp 328-332.
58. Jitendra O. Bhangale, Niyati S. Acharya, Sanjeev R. Acharya(2015), Neuroprotective effect of pet ether extract of *Ficus religiosa* (L.) leaves in 3-nitropropionic acid induced Huntington Disease, *International Journal of PharmTech Research*, (2015), Vol.8, No.10, pp 57-69.
59. A.M.Shaikh, B.Shrivastava, K.G.Apte, S.D.Navale(2015), Effect of Aqueous Extract of *Curcuma zedoaria* and *Gloriosa superba* Against DMH-Induced Colon Carcinogenesis In Wistar Rats, *International Journal of PharmTech Research*, (2015), Vol.8, No.10, pp 88-94.
60. Mona Al-Terehi, Ali H. Al-Saadi, Haider K. Zaidan, Zahraa H. Alkaim,
61. Rajaa Ali Habeeb, Noora Majed (2015), Some herbal medicinal plants activity against *Candida* spp which resistance to antifungal drugs, *International Journal of PharmTech Research*, (2015), Vol.8, No.10, pp 146-150.
62. Mona Al-Terehi, Ali H. Al-Saadi, HaiderK.Zaidan, Russul Hikmat Behjet, Zahraa Haleem(2015), Some plants extracts Synergism effects in Pathogenic bacteria, *International Journal of PharmTech Research*, (2015), Vol.8, No.10, pp 158-164.
63. Ragavan Balliah, Monisha Sudhakar(2015), In Vitro Evaluation of Cytotoxic and Antiproliferative Activity of a Polyherbal Extract against H9c2 Cardiac Cells, *International Journal of PharmTech Research*, (2015), Vol.8, No.10, pp 191-197.
64. R.Jasmine, Sakthivel H(2015), Role of compounds from *Terminalia chebula* exhibiting Anti-Cholesterol property, *International Journal of PharmTech Research*, (2015), Vol.8, No.10, pp 210-215.
65. Helmina Br. Sembiring, Tonel Barus, Lamek Marpaung, and Partomuan Simanjuntak(2015) , Antioxidant and Antibacterial Activity of Some Leaves Extracts (Methanol, Ethyl Acetate and N-Hexane) of *Scurrula fusca* G.Don, *International Journal of PharmTech Research*, Vol.8, No.9, pp 24-30.
66. Aprilita Rina Yanti, Maksum Radji, Abdul Mun'im, and FD Suyatna(2015), Antioxidant effects of Methanolic extract of *Phaleria macrocarpa* (Scheff.) Boerl in fructose 10%-induced rats, *International Journal of PharmTech Research*, (2015), Vol.8, No.9, pp 41-47.
67. Jansen Silalahi, Dwi Pertiwi, Aminah Dalimunthe, Yosy C E Silalahi(2015), Effect of Acute Consumption of Coconut and Palm Oil on Swimming Capacity Endurance of Mice (*Mus musculus*), *International Journal of PharmTech Research*, (2015), Vol.8, No.9, pp 55-59.
68. Hossein Kamali, Tooba Ahmadzadeh sani, Peyman Feyzi, Ameneh Mohammadi (2015), Chemical composition and antioxidant activity from Essential oil of *Capsella bursa-pastoris*, *International Journal of PharmTech Research*, (2015), Vol.8, No.8, pp 01-04.
69. T. G. Nithya, Isah Mansur Aminu(2015), Antibacterial activity of *Murraya koenigi* leaves against Urinary Tract Infection causative pathogens, *International Journal of PharmTech Research*, Vol.8, No.8, pp 112-117.
70. D.Subhashini, T. Nandini (2015), Antioxidant Efficacy of Iron Nanoparticles from Aqueous Seed Extract of *Cuminum Cyminum*, *International Journal of PharmTech Research*, (2015), Vol.8, No.7, pp 19-25.

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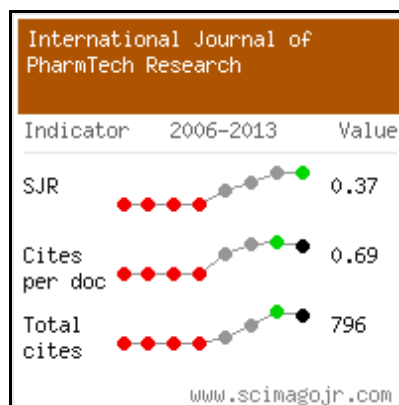
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