INTERNATIONAL RESEARCH JOURNAL OF PHARMACY
www.irjponline.com
ISSN 2230 – 8407

Review Article

PHARMACOLOGICAL AND PHYTOCHEMICAL STUDIES OF *ORIGANUM VULGARE*: A REVIEW

Pankaj Singh *, Preeti Kothiyal, Parminder Ratan
Division of pharmaceutical sciences, Shri Guru Ram Rai Institute of Technology & Sciences, Dehradun, Uttarakhand, India
*Corresponding Author Email: Pankajpanwar315@gmail.com

Article Received on: 29/05/18 Approved for publication: 25/06/18

DOI: 10.7897/2230-8407.09685

ABSTRACT

Origanum vulgare has been used traditionally for treatment of various ailments. Almost every part of *O.vulgare* including roots, leaves, stem and flower are used in the systems of medicines for the treatment of various diseases. In modern scientific literatures, the plant has been reported to have potential efficacy against diabetes, antibacterial, antifungal, and anthelminthic activities etc. *O.vulgare* is reported to contain various biologically active phytochemicals such as carvacrol, thymol, limonene, piene, ocimenes, caryophyllene, p-Cymene, terpenes etc. The present review highlights the traditional uses of *O.vulgare* and its phytochemical constituents with therapeutic activity and the evidence based studies on various pharmacological effects of the plant.

Keywords: *origanum vulgare,* thymol ,carvacrol, terpenes.

INTRODUCTION

Origanum vulgare is a species of Oregano, family (Lamiaceae). It is firstly introduced in south western Eurasia [1]. In India, it is represented by a single species, Origanum vulgare L. ssp, widely distributed in the sub-temperate/temperate region of the Himalayas [2]. It is a mounding herb, which can grow from 20–80 cm tall, with leaves 1–4 cm long and will develop in a Ph near to the 7.12 [3]. The flowers are whitish-purple, 3–4 mm (0.12–0.16 in) long, produced in erect spikes [4]. It is also known as wild marjoram which is in family related to *Origanum majorana* [5]. Oregano is the anglicized kind of the Italian word origano, or maybe of the Medieval Latin organum[6]. Both were drawn from the Latin word origanum, which referred to sweet marjo, and wit was derived from the the type of Greek strain or species, which simply referred to an acrid herb [7]. The etymology of the Greek name is regularly particular as oros means mountain + ganos means brightness [8]. Oregano is interrelated to the majo, body referred to as wild marjoram. Oregano has purple flowers and spade-shaped, olive color leaves [9]. It is a perennial, though it is grown-up as an twelve-monthly in colder climates, as it frequently does not live through the winter [10]. Oregano is planted in the month of March, and they are planted at space of 45 cm at a in soil which is rich in iron, with best sunlight. It prefers a hot, rather parched climate, but does all right in other environments [11].

Subspecies of oregano been developed by humans for their unique flavours and characteristics. [12]. And tastes are of next level like sweet and spicy. Oregano which are sold in shops or plant stores are not as good as the wild one cause they don't have some characteristic like they are not bushier, with a tasteless remarkable and pungent [13]. It can pollinate other added complex strains, but the offspring are not better if developed in future [14]. *Origanum onites* from Greece and *Origanum syriacum* from West Asia have similar flavours [15]. Some plants show a flavour between oregano and sweet marjoram [16].

GEOGRAPHICAL DISTRIBUTION OF *ORIGANUM VULGARE*

In India Jammu and Kashmir, Himanchal Pardesh, Uttar Pradesh, and Sikkim.

In northern Himalayan region: O.Vulgare found in seven districts of Uttarakhand situated at different geographical locations:
1. Nainital (1480–2240 m);
2. Uttarakashi (2500–2800 m);
3. Rudrapryag (3555 m);
4. Chamoli (3260 m);
5. Bageshwar (2260 m);
6. Champawat (1840 m); and
7. Almora (2220 m) [17].

O. vulgare can also be found in other places like Portugal, Spain, Afghanistan, China, Nepal, Pakistan, Denmark and also in Europeon parts of Russia [18].

MORPHOLOGY

Origanum vulgare is an aromatic, woody-based perennial, which grows to 20-30 cm in height, and flowering season is between May to October [19]. The leaves are ovate (egg-shaped, with wider end at the base), 10-44 mm long and 5-25 mm wide, and are opposite to each other on the stem [20]. The edges of the leaves are smooth and tips vary shapes from acute (pointed) to obtuse (rounded) [21]. The bunch is many-flowered gropued together, with flowers grouped into terminal spike. The corolla is whitish purple in colour and 5-8 mm long. The calyx has five sepals in it. Each flower has four stamens (male parts).Fruits has four small nutlets (single-seeded units) [22].

Fig 1. *Origanum vulgare* [2]

TRADITIONAL USES

- The oregano herb is used as a remedy of for narcotic poisons, convulsions and dropsy[23].
- Oregano essential oil and leaf extract are both strong natural antibacterial agents due to the high concentration of thymol in it [24].
- The air dried leaves are used in painful swellings and rhumetoid.
- Oregano tea is used to treating cold, fevers and menstrual pain because of antiseptic ability [25].
- Bile flow is stimulated by the oregano and the herb also aid in alleviating the discomfort of flatulence and excess abdominal gas [26].
- Diluted oregano essential oil is used in toothaches and different kind of joint pain in patient.
- The oregano was also used as an antidote for venomous bites of snakes and insects [27].

ETHNOMEDICINAL USES

In India, *Origanum vulgare* has been used to treat food poisoning, indigestion, bloating, cough, urinary problem, bronchial problems, and headache [28]. It has been used in past to relives fever, vomiting and jaundice. It contain numerous phytonutrients -like rosemaric acid, ursolic acid, thymol *etc*, that have also been shown to function as potent antioxidants that can prevent oxygen-based damage to cell structures throughout the body [29].

PRELIMINARY PHOTOCHEMICAL STUDY

Preliminary phytochemical investigation reveals that these chemical compounds are present in various forms of extraction of *Origanum vulgare* like in water extract, methanolic extract and essential oil, the primary metabolites are like Carvacrol, thymol, peresent in the major contents of aerial parts of the plant [30]. Chemical compounds present in the dried plant material were made up of four main components, which are also found in fresh oregano, thymol, carvacrol, c-terpinene, p-cymene [31] Fig. [2-11].

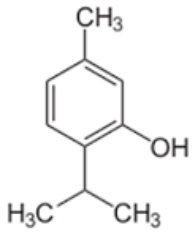

Fig 2. Thymol
$C_{10}H_{14}O$

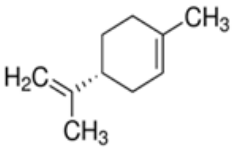

Fig 3. Limonene
$C_{10}H_{16}$

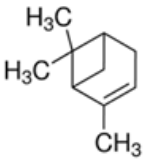

Fig 4. Piene
$C_{10}H_{16}$

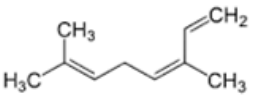

Fig 5. Ocimenes
$C_{10}H_{16}$

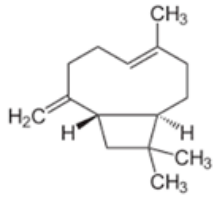

Fig 6. Caryophyllene
$C_{15}H_{24}$

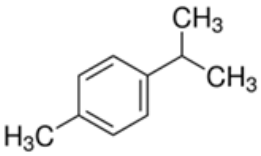

Fig 7. P-cymene
$C_{10}H_{14}$

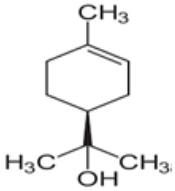

Fig 8. Terpenes
$(C_5H_8)_n$

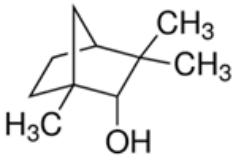

Fig 9. Fenchol
$C_{10}H_{18}O$

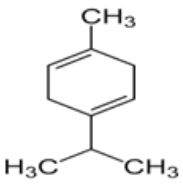

Fig 10. Terpenieol
$C_{10}H_{18}O$

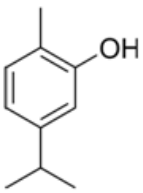

Fig 11. Carvacrol
$C_{10}H_{14}O$

Fig 2. Phytochemical constituents

PHARMACOLOGICAL SCREENING OF *ORIGANUM VULGARE*

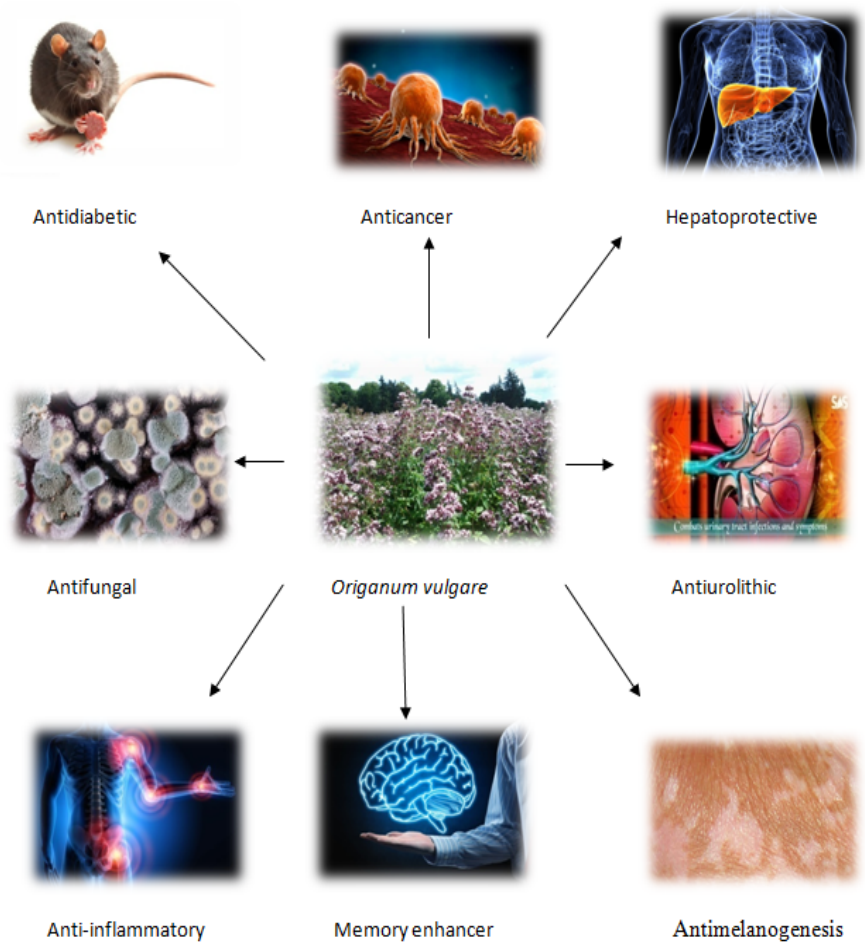

Fig 3. Pharmacological screening of O. vulgare

PHARMACOLOGICAL ACTIVITIES OF *ORIGANUM VULGARE* PLANT

ANTIDIABETIC ACTIVITY

A. Lemhadri et al. (2004) studied the anti-hyperglycaemic activity of *Origanum vulgare* (OV) on diabetic rats, which was induced by STZ (65 mg/kg i.v.). OV aqueous extract at a dose of (20 mg/kg p.o.) shown its blood glucose lowering activity [32].

ANXIOLYTIC ACTIVITY

Tajmah Mombeini et al. (2015) investigated the anxiolytic activity of *Origanum vulgare* (ORG) aqueous extract in rats. Rats were administered with ORG at the doses (50,100,200 mg/kg i.p.) and diazepam as standard drug. Then with the help of elevated plus maze (EPM) and open field test (OFT) ORG extract has anxiolytic potential [33].

ANTI-INFLAMMATORY ACTIVITY

Samar Javadian et al; (2015) evaluated the anti-inflammatory activity of *Origanum Vulgare*. By using Methanolic Leaf extract at a dose of (1.5, 2.25and 2.7 mg/ml). leaf extract showed anti-inflammatory effects on the activated mixed and microglial cells through inhibition of iNOS [34].

ANTIOXIDANT ACTIVITY

B. Teixeira et al. (2013) investigated the in vitro antioxidant activity of *Origanum vulgare* by three extracts hot water extract, ethanol extract and cold water extract in DPPH and FRAP assay. According to DPPH assay hot water had showed most powerful effect, followed by ethanol extract and cold water extract and in FRAP assay cold water showed the potential [35].

ANTINOCICEPTIVE ACTIVITY

M. R. Afarineshe Khaki et al. (2013) studied the Antinociceptive activity of Aqueous Extract of *Origanum vulgare* at the dose of (1,3,6 µg/ rat i.c.v) and for the behavioural assessment tail flick test model as behavioural parameters has been used by which the antinociceptive activities of aqueous extract of Origanum vulgare have been observed [36].

ANTIUROLITHIC ACTIVITY

Aslam Khan et al. (2011) investigated the antiurolithic activity of the *Origanum vulgare* (Ov) on animal model of CaOx urolithiasis. Rats were treated with administration of crude methanolic and aqoueus extract of (OV) at a dose of (10 and 30 mg/kg). Antiurolithic effect of origanum observed by analyzing the urine and serum samples [37].

ANTI-CANCER ACTIVITY

Peter Kubatka et al. (2016) investigated the anti-tumour effects of oregano in the in vivo and in vitro. Induction of carcinogem in rats by N-nitroso-N-methylure. Origanum orally administration at the dose of (3 and 30 g/kg). According to results, tumour-suppressive effect of oregano in the breast cancer model has been observed for the first time [38].

ANTIFUNGAL ACTIVITY

Suncica Kocic-Tanackov et al. (2012) studied the inhibitory effect of oregano extract on growth of Aspergillus spp and on STC biosynthesis. By using the AGAR plate and yeast extract sucrose (YES) broth method. The increase in oregano extract concentration (0.2 and 2.5 mL/100 mL) showed the antifungal activity of oregano extract [39].

HEPATOPROTECTIVE ACTIVITY

Mohammad Sikander et al. (2012) studied the hepatoprotective effect of aqueous extract of *Origanum vulgare* leaves against CCl4-induced toxicity at the doses of (50,100,150 mg/kg p.o.). Researcher found that the antioxidant potential of OV can protect against hepatotoxicity induced CCL_4 [40].

MEMORY ENHANCER ACTIVITY

Vahid Sheibani et al. (2010) studied the effect of *Origanum vulgare* L. ssp. viridis leaves extract increases the discrimination learning and improve the LTP induction. At a dose of (150, 300 and 450 mg/kg) of origanum vulgare aqueous extract. And with the help of T-maze apparatus and Electrophysiological recording author concluded that Origanum aqueous extract can improve the learning criteria in rats [41].

ANTIMELANOGENESIS

Liang et al. (2010) Origanoside has been noted to inhibit tyrosinase activity in cell culture at 10-20µg/mL by 16.9–28.6% (melanoma B16 cells). When applied to the skin of mice, a topical gel containing origanoside over 10 days showed whitening properties associated with reducing the expression of pigment-forming genes (MITF, tyrosinase, and TRP-2)[42].

CONCLUSION

O.vulgare is an excellent medicinal plant which holds numerous bioactive phytochemicals. Almost every part of this plant has been used in traditional system of medicines for treatment of various diseases. In modern scientific literatures, plant extracts have been reported to have potential efficacy against diabetes, cancer, inflammation, etc. Various parts have been found to possess biological activity more specifically towards overcoming metabolic ailment. Further focus on developing contemporary formulations after extensive analysis of its bioactivity, pharmacokinetics and pharmacodynamics, safety, etc. using appropriate animal models followed by clinical trials will provide a novel entity for the treatment of various diseases from *O.vulgare*.

REFERENCES

1. Ivask K, Orav A, Kailas T, Raal A, Arak E, Paaver U. Composition of the essential oil from wild marjoram (Origanum vulgare L. ssp. vulgare) cultivated in Estonia. Journal of Essential Oil Research. 2005 Jul 1;17(4):384-7.
2. Mastelić J, Milos M, Jerković I. Essential oil and glycosidically bound volatiles of Origanum vulgare L. ssp. hirtum (Link) Ietswaart. Flavour and fragrance journal. 2000 May;15(3):190-4.
3. Baricevic D. The Biological-pharmacological activity of the Origanum genus.--p. 177-213. Oregano: the genera Origanum and Lippia.--London, GB: Taylor & Francis, 2002;.
4. Bharti V, Vasudeva N. Oreganum vulgare Linn. leaf: An Extensive Pharmacognostical and Phytochemical Quality Assessment. Advanced pharmaceutical bulletin. 2013 Dec;3(2):277.
5. Lukas B, Schmiderer C, Novak J. Phytochemical diversity of Origanum vulgare L. subsp. vulgare (Lamiaceae) from Austria. Biochemical systematics and ecology. 2013 Oct 1;50:106-13.
6. Mockute D, Bernotiene G, Judzentiene A. The essential oil of Origanum vulgare L. ssp. vulgare growing wild in Vilnius district (Lithuania). Phytochemistry. 2001 May 1;57(1):65-9.
7. DESHAPRABHU S. The Wealth of India: Raw Materials, Vol. VII; N-Pe. The Wealth of India: Raw Materials, Vol. VII; N-Pe.. 1966.
8. Wogiatzi E, Gougoulias N, Papachatzis A, Vagelas I, Chouliaras N. Chemical composition and antimicrobial effects of Greek origanum species essential oil. Biotechnology & Biotechnological Equipment. 2009 Jan 1;23(3):1322-4.
9. Yazdani E, Sendi JJ, Hajizadeh J. Effect of Thymus vulgaris L. and Origanum vulgare L. essential oils on toxicity, food consumption, and biochemical properties of lesser mulberry pyralid Glyphodes pyloalis Walker (Lepidoptera: Pyralidae). Journal of Plant Protection Research. 2014 Jan 1;54(1):53-61.
10. Kumar M, Sheikh MA, Bussmann RW. Ethnomedicinal and ecological status of plants in Garhwal Himalaya, India. Journal of ethnobiology and ethnomedicine. 2011 Dec;7(1):32.
11. Prakash O, Kanyal L, Chandra M, Pant AK. Chemical diversity and antioxidant activity of essential oils among different accessions of Origanum vulgare L. collected from Uttarakhand region.
12. EFSA Panel on Food Additives and Nutrient Sources added to Food (ANS). Scientific Opinion on the use of oregano and lemon balm extracts as a food additive. EFSA Journal. 2010 Feb;8(2):1514.
13. Kintzios SE, editor. Oregano: the genera Origanum and Lippia. CRC press; 2003 Aug 27.
14. Esen G, Azaz AD, Kurkcuoglu M, Baser KH, Tinmaz A. Essential oil and antimicrobial activity of wild and cultivated Origanum vulgare L. subsp. hirtum (Link) letswaart from the Marmara region, Turkey. Flavour and Fragrance Journal. 2007 Sep 1;22(5):371-6.
15. Koukoulitsa C, Karioti A, Bergonzi MC, Pescitelli G, Di Bari L, Skaltsa H. Polar constituents from the aerial parts of Origanum vulgare L. ssp. hirtum growing wild in Greece. Journal of agricultural and food chemistry. 2006 Jul 26;54(15):5388-92.
16. De Falco E, Mancini E, Roscigno G, Mignola E, Taglialatela-Scafati O, Senatore F. Chemical composition and biological activity of essential oils of Origanum vulgare L. subsp. vulgare L. under different growth conditions. Molecules. 2013 Dec 4;18(12):14948-60.
17. Fournomiti M, Kimbaris A, Mantzourani I, Plessas S, Theodoridou I, Papaemmanouil V, Kapsiotis I, Panopoulou M, Stavropoulou E, Bezirtzoglou EE, Alexopoulos A. Antimicrobial activity of essential oils of cultivated oregano (Origanum vulgare), sage (Salvia officinalis), and thyme

(Thymus vulgaris) against clinical isolates of Escherichia coli, Klebsiella oxytoca, and Klebsiella pneumoniae. Microbial ecology in health and disease. 2015 Dec 1;26(1):23289.
18. Raina AP, Negi KS. Chemical diversity among different accessions of Origanum vulgare L. ssp. vulgare collected from Central Himalayan region of Uttarakhand, India. Journal of Essential Oil Research. 2014 Nov 2;26(6):420-6.
19. Lukas B, Schmiderer C, Mitteregger U, Novak J. Arbutin in marjoram and oregano. Food Chemistry. 2010 Jul 1;121(1):185-90.
20. Force M, Sparks WS, Ronzio RA. Inhibition of enteric parasites by emulsified oil of oregano in vivo. Phytotherapy Research. 2000 May;14(3):213-4.
21. Jerković I, Mastelić J, Miloš M. The impact of both the season of collection and drying on the volatile constituents of Origanum vulgare L. ssp. hirtum grown wild in Croatia. International journal of food science & technology. 2001 Aug 1;36(6):649-54.
22. Kikuzaki H, Nakatani N. Structure of a new antioxidative phenolic acid from oregano (Origanum vulgare L.). Agricultural and Biological Chemistry. 1989 Feb 1;53(2):519-24.
23. Kaul VK, Singh B, Sood RP. Essential oil of Origanum vulgare L. from North India. Journal of Essential Oil Research. 1996 Jan 1;8(1):101-3.
24. Vagi E, Rapavi E, Hadolin M, Vasarhelyine Peredi K, Balazs A, Blazovics A, Simandi B. Phenolic and triterpenoid antioxidants from Origanum majorana L. herb and extracts obtained with different solvents. Journal of agricultural and food chemistry. 2005 Jan 12;53(1):17-21.
25. Sezik E, Tümen G, Kirimer N, Özek T, Baser KH. Essential oil composition of four Origanum vulgare subspecies of Anatolian origin. Journal of Essential Oil Research. 1993 Jul 1;5(4):425-31.
26. Nowak R, Wójciak-Kosior M, Sowa I, Sokołowska-Krzaczek A, Pietrzak W, Szczodra A, Kocjan R. HPTLC-densitometry determination of triterpenic acids in Origanum vulgare, Rosmarinus officinalis and Syzygium aromaticum. Acta poloniae pharmaceutica. 2013;70(3):413-8.
27. Picq M, Cheav SL, Prigent AF. Effect of two flavonoid compounds on central nervous system. Analgesic activity. Life sciences. 1991 Jan 1;49(26):1979-88.
28. Koldaş S, Demirtas I, Ozen T, Demirci MA, Behçet L. Phytochemical screening, anticancer and antioxidant activities of Origanum vulgare L. ssp. viride (Boiss.) Hayek, a plant of traditional usage. Journal of the science of food and agriculture. 2015 Mar 15;95(4):786-98.
29. Chalchat JC, Pasquier B. Morphological and chemical studies of Origanum clones: Origanum vulgare L. ssp. vulgare. Journal of Essential Oil Research. 1998 Mar 1;10(2):119-25.
30. Alkam T, Nitta A, Mizoguchi H, Itoh A, Nabeshima T. A natural scavenger of peroxynitrites, rosmarinic acid, protects against impairment of memory induced by Aβ25–35. Behavioural brain research. 2007 Jun 18;180(2):139-45.
31. Koukoulitsa C, Karioti A, Bergonzi MC, Pescitelli G, Di Bari L, Skaltsa H. Polar constituents from the aerial parts of Origanum vulgare L. ssp. hirtum growing wild in Greece. Journal of agricultural and food chemistry. 2006 Jul 26;54(15):5388-92.
32. Lemhadri A, Zeggwagh NA, Maghrani M, Jouad H, Eddouks M. Anti-hyperglycaemic activity of the aqueous extract of Origanum vulgare growing wild in Tafilalet region. Journal of ethnopharmacology. 2004 Jun 1;92(2-3):251-6.
33. Mombeini T, Mazloumi S, Shams J. Pharmacological Effects of Origanum Vulgare L. in the Elevated Plus-Maze and Open Field Tests in the Rat. Journal of Basic and Clinical Pathophysiology. 2015 Sep 10;3(2):29-36.
34. Javadian S, Sabouni F, Haghbeen K. Origanum Vulgare L. Extracts Versus Thymol: An Anti-Inflammatory Study on Activated Microglial and Mixed Glial Cells. Journal of food biochemistry. 2016 Feb 1;40(1):100-8.
35. Teixeira B, Marques A, Ramos C, Serrano C, Matos O, Neng NR, Nogueira JM, Saraiva JA, Nunes ML. Chemical composition and bioactivity of different oregano (Origanum vulgare) extracts and essential oil. Journal of the Science of Food and Agriculture. 2013 Aug 30;93(11):2707-14.
36. Afarineshe MK, Pahlavan Y, Sepehri GH, Sheibani V, Pahlavan B. Antinociceptive Effect of Aqueous Extract of Origanum vulgare L. in Male Rats: Possible Involvement of the GABAergic System. Iranian journal of pharmaceutical research: IJPR. 2013;12(2):407-13.
37. Khan A, Bashir S, Khan SR, Gilani AH. Antiurolithic activity of Origanum vulgare is mediated through multiple pathways. BMC complementary and alternative medicine. 2011 Dec;11(1):96.
38. Kubatka P, Kello M, Kajo K, Kruzliak P, Výbohová D, Mojžiš J, Adamkov M, Fialová S, Veizerová L, Zulli A, Péč M. Oregano demonstrates distinct tumour-suppressive effects in the breast carcinoma model. European journal of nutrition. 2017 Apr 1;56(3):1303-16.
39. Adam K, Sivropoulou A, Kokkini S, Lanaras T, Arsenakis M. Antifungal activities of Origanum vulgare subsp. hirtum, Mentha spicata, Lavandula angustifolia, and Salvia fruticosa essential oils against human pathogenic fungi. Journal of Agricultural and Food Chemistry. 1998 May 18;46(5):1739-45.
40. Sikander M, Malik S, Parveen K, Ahmad M, Yadav D, Hafeez ZB, Bansal M. Hepatoprotective effect of Origanum vulgare in Wistar rats against carbon tetrachloride-induced hepatotoxicity. Protoplasma. 2013 Apr 1;250(2):483-93.
41. Abbasnejad M, Mirtajadini M, Afarinesh MR, Hassibi N. Valuation of Origanum vulgare (leaves, stems and flowers) extract on spatial learning in male rats. Physiology and Pharmacology. 2006 Mar 10;10(2):143-50.
42. Liang CH, Chou TH, Ding HY. Inhibition of melanogensis by a novel origanoside from Origanum vulgare. Journal of dermatological science. 2010 Mar 1;57(3):170-7.

Cite this article as:

Pankaj Singh *et al*. Pharmacological and phytochemical studies of *Origanum vulgare*: A review. Int. Res. J. Pharm. 2018;9(6):30-34 http://dx.doi.org/10.7897/2230-8407.09685

Source of support: Nil, Conflict of interest: None Declared