Antioxidant activity of *Clitorea ternatea* L. and *Origanum vulgare* L.: A comparative analysis

Sharad Vats

Department of Bioscience and Biotechnology, Banasthali University, P.O. Banasthali Vidyapith-304022, Rajasthan (India)
vats_sharad@yahoo.co.in

Abstract: In the present work phytochemicals and antioxidant activity of leaves of *Clitorea ternatea* L. and *Origanum vulgare* L. was evaluated. The Total Phenolic Content and Total Flavonoid Content of *C. ternatea* were found to be less than *O. vulgare*. The results of antioxidant activity revealed that *C. ternatea* showed better DPPH radical scavenging activity as compared to *O. vulgare*. Similar results were obtained for FRAP assay where ferric reducing potential was more of *C. ternatea* than *O. vulgare*. This can be attributed to the different types and amount of phenolics and flavonoids present in plant extract.
[Vats S. **Antioxidant activity of *Clitorea ternatea* L. and *Origanum vulgare* L.: A comparative analysis.** *Researcher* 2014;6(11):56-58]. (ISSN: 1553-9865). http://www.sciencepub.net/researcher. 8

Keywords: *Clitorea ternatea*; *Origanum vulgare*; phytochemicals; antioxidant activity

Introduction

Reactive oxygen species (ROS) and reactive nitrogen species (RNS) initiate oxidation process and affects metabolism of organisms. Overproduction of these free radicals leads to severe pathological conditions. Organisms possess antioxidants and antioxidant enzymes to combat these free radicals but external supplementation of antioxidants is equally needed.

Plants have always been a favoured source of medicine and bioactive compounds (Mathur et al., 2007; Vats and Kamal, 2013; Vats and Kamal, 2014). Vegetables, fruits and other plant based eatables contain good amount of these compounds having potential to neutralize the effect of free radicals. Moreover, natural antioxidants are safer than synthetic ones and thus, there is an upsurge in the use and research of the same.

Clitorea ternatea L. (Fabaceae) is commonly known as Butterfly pea. The roots, seeds and leaves of the plant have been used as a brain tonic, which enhances learning and memory (Taranalli and Cheeramkuczhi, 2000; Mukherjee et al., 2007). The roots have known to possess laxative and diuretic properties and also used to treat indigestion, swollen joint, and eye disorders (Anonymous, 1935). Presence of pentacyclic triterpenoids and antimicrobial flavonol glycosides has been reported in roots (Yadav and Verma, 2003). Seeds have been known to possess flavonol glycosides, tetrahydroxyflavone and β-sitosterol. Flowers contain anthocyanins ternatins, flavonoids (Kaempferol, Quercetin and myricetin) and leaves β-sitosterol and glycosides of kaempferol. Other activities of the plant which have been scientifically validated are antidepressant, tranquilizing, sedative, Anti-inflammatory, analgesic, antipyretic and antidiabetic activities (Mukherjee et al., 2008).

Origanum vulgare L. (Lamiaceae) is an important aromatic plant commonly called as oregano. Major essential oils detected in this plant are γ-terpinene, α-terpinene, *p*-cymene and thymol (Quiroga et al., 2013). Presence of apigenin, luteolin, chrysoeriol, diosmetin, quercetin, eriodictyol, cosmoside, vicenin-2, caffeic acid and rosmarinic acid in the aerial parts of the plant has also been reported (Koukoulitsa et al., 2006). The plant possesses antioxidant, antimicrobial and antiviral activity (Mancini et al., 2014). The present study aims to investigate the antioxidant potential of *C. ternatea* and *O. vulgare* in search of natural antioxidants.

Materials and methods

Extraction

The test plants were collected locally. The leaves were air-dried and finely powdered. 1 g sample of both the experimental plants were extracted in methanol in orbital shaker at 50°C overnight at 110 rpm. The extracts were filtered and kept at 4°C for further use.

Total phenolic content (TPC)

The total phenolics were determined colorimetrically according to the Folin-Ciocalteaeu method (Vats, 2012) and expressed as gallic acid equivalents (GAE as Mean ± S.D).

Total Flavonoid content (TFC)

Total flavonoid content was estimated using the method of Vats and Tiwari (2014) and expressed as quercetin equivalent (Mean ± S.D). Extracts (0.5 mL) were mixed with 95% ethanol (1.5 mL), 10% aluminum chloride (0.1 mL), 1M potassium acetate (0.1 mL) and distilled water (2.8 mL). After

incubation at room temperature for 30 min, the absorbance of the reaction mixture was measured at 415 nm.

DPPH assay

Plant extracts (1ml) were mixed with 1ml of 0.3 mM DPPH reagent and allowed to stand at room temperature for 30 minutes in dark. The absorbance was taken at 517nm. Radical scavenging activity was expressed as IC 50 (Mean ± S.D) value (Vats et al., 2012).

FRAP

25ml of acetate buffer (300 mM), 2.5ml TPTZ solution (10mM in 40 mM HCl) and 2.5ml $FeCl_3.6H_2O$ solution (20mM) was mixed to make working solution. 50µl of sample extract was mixed with 1.5ml of FRAP reagent and monitored up to 5 min at 593nm. Absorbance was compared with calibration curve of aqueous solution of known Fe (II) concentration (µM/L). Values are expressed as Mean ± S.D (Vats and Alam, 2013).

Results and discussions

The total phenolic content in *C. ternatea* and *O. vulgare* was found to be 204±1.2 and 247.91±0.09 µg GAE/mg of extract, respectively. The total flavonoid content was found to be less than the total phenolic content. TFC was estimated to be 80 µg/mg of extract in *C. ternatea* and 108 µg/mg of extract in *O. vulgare* (Fig. 1). Phenolic compounds and flavonoids possess good antioxidant potential. Consumption of these phytocompounds helps in lowering the adverse effect of free radicals in the body. These compounds apart from being potential antioxidants have also reported to be useful in combating several diseases (Ross and Kasum, 2002).

The DPPH scavenging activity revealed that *C. ternatea* had better activity than *O. vulgare* with IC_{50} value 480±1.5 µg/ml and 595±0.08 µg/ml, respectively (Fig. 2). DPPH assay is a simple and convenient method to determine the antioxidant potential of plant extract. The IC_{50} value is the concentration of the plant extract which inhibits the initial DPPH concentration to 50%. Like DPPH activity the ferric reduction activity was observed to be more in *C. ternatea* (1600 µM/L) as compared to *O. vulgare* (1310 µM/L). The antioxidant potential of both the test plants can be attributed to the phenolic and flavonoid contents (Vats and Alam, 2013). Phenolic compounds adverse effect of free radicals and enhance activity of antioxidative enzymes. The results suggest that the test plants possess good phenolic contents and antioxidant potential which make them a better source of dietary antioxidants but with proper validation.

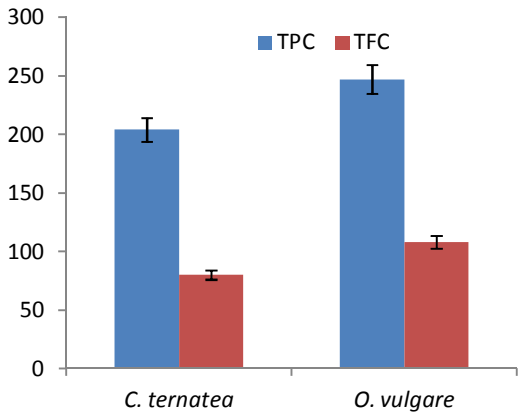

Fig. 1: TPC and TFC (µg/mg of extract) of the test plants

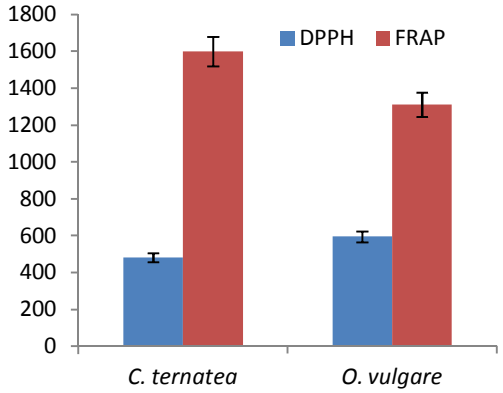

Fig. 2: DPPH activity (µg/ml) and FRAP activity (µM/L) of the test plants

Corresponding Author:
Dr. Sharad Vats
Department of Bioscience and Biotechnology
Banasthali University
P.O. Banasthali Vidyapith-304022
Rajasthan (India)
e-mail: vats_sharad@yahoo.co.in

References

1. Anonymous. Indian Medicinal Plants, vol. 2. Orient Longman, Madras, 1935; 129–132.
2. 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; 54(15): 5388-5392.
3. Mancini E, Camele I, Elshafie HS, De Martino L, Pellegrino C, Grulova D, De Feo V. Chemical composition and biological activity of the essential oil of *Origanum vulgare* ssp.

hirtum from different areas in the Southern Apennines (Italy).Chemistry and Biodiversity 2014; 11(4): 639-651.
4. Mathur V, Vats S, Jain M, Bhojak J, Kamal R. Antimicrobial Activity of Bioactive Metabolites Isolated from Selected Medicinal Plants. Asian Journal of Experimental Sciences 2007**;** 21(2): 267-272.
5. Mukherjee PK, Kumar V, Kumar NS, Heinrich M. The Ayurvedic medicine *Clitoria ternatea*— From traditional use to scientific assessment. Journal of Ethnopharmacology 2008; 120: 291-301.
6. Mukherjee PK, Rai S, Kumar V, Mukherjee K, Hylands PJ, Hider RC. Plants of Indian origin in drug discovery. Expert Opinion in Drug Discovery 2007; 2: 633–657.
7. Quiroga PR, Grosso NR, Lante A, Lomolino G, Zygadlo JA, Nepote V. Chemical composition, antioxidant activity and anti-lipase activityof *Origanum vulgare* and *Lippia turbinata* essential oils. International Journal of Food Science and Technology 2013; 48: 642-649.
8. Ross J A, Kasum CM. Dietary flavonoids: bioavailability, metabolic effects, and safety. Annual review of Nutrition 2002; 22(1): 19-34.
9. Taranalli AD, Cheeramkuczhi TC. Influence of *Clitoria ternatea*on memory and central cholinergic activity in rats. Pharmaceutical Biology 2000; 38: 51–56.
10. Vats S and Alam A. Antioxidant activity of *Barbula javanica* Doz. et Molk.: A relatively unexplored bryophyte. Elixir Applied Botany 2013; 65: 20103-20104.
11. Vats S and Tiwari R. Evaluation of antioxidant and antimicrobial potential of *Bacopa monnieri* L. Researcher 2014; 6(9):20-23.
12. Vats S, Kamal R. 2014. *Cassia occidentalis* L. (a new source of rotenoids): Its *in vitro* regulation by feeding precursors and larvicidal efficacy. Plant Cell Tissue and Organ Culture 2014; 116(3): 403-409.
13. Vats S, Kamal R. *In vivo* and *in vitro* evaluation of sterols from *Gymnema sylvestre* R. Br. Pakistan Journal of Biological Sciences 2013; 16(23): 1771-1775.
14. Vats S, Tiwari R, Alam A, Behera KK, Pareek R. Evaluation of Phytochemicals, antioxidant and antimicrobial activity of *in vitro* culture of *Vigna unguiculata* L. Walp. Researcher 2012; 4(11): 70-74.
15. Vats S. Antioxidant activity of callus culture of *Vigna unguiculata* (L.) Walp. Researcher 2012; 4(6): 22-24.
16. Yadav RN, Verma V. Antimicrobial activity of a novel flavonol glycoside isolated from the roots of *Clitoria ternatea* Linn. Asian Journal of Chemistry 2003; 15: 842–846.

11/5/2014