Journal of Drug Metabolism and Toxicology

Sari et al., J Drug Metabol Toxicol 2012, 3:3
DOI: 10.4172/2157-7609.1000117

Research Article Open Access

Determination of MDA Levels in the Plant (Some Salvia L. Taxa Growing in Turkey)

Aysel Sari[1]*, Murat Kursat[2] and Şemsettin Civelek[3]

[1]Faculty of Science, Department of Chemistry, Firat University, 23169, Elazig/Turkey
[2]Faculty of Science and Arts, Department of Biology, Bitlis Eren University, 13000 Bitlis/Turkey
[3]Faculty of Science, Department of Biology, Firat University, 23169, Elazig/Turkey

Abstract

The aim of this study was to examine Malondialdehit (MDA) level in salvia. The amounts of malondialdehyde (MDA) that is the indicator of lipid peroxidation were determined in *Salvias* plants in seeds. In the present study, levels of MDA in mature seeds of the *Salvia* taxa [*S. suffruticosa* Montbret & Aucher ex Bentham, *S. trichoclada* Bentham, *Salvia multicaulis* Vahl, *S. candidissima* Vahl subsp. *candidissima, S. russellii* Bentham, *S. verticillata* L. subsp. *verticillata*, *S. virgata* Jacq., *S. aethiopis* L., *S. ceratophylla* L.] were examined. The amount of MDA in the seed was determined by HPLC (high performance liquid chromatography). The amount of MDA in the *S. trichoclada* (0.920 mg/l) was significantly higher than the MDA quantities in some other wild growing species, e.g. in *S. virgata* (0.556 mg/l), *S. aethiopis* (0.580 mg/l), *S. ceratophylla* (0.620 mg/l), *S. russellii* (0.632 mg/l), *S. Suffruticosa* (0.686 mg/l), *S. multicaulis* (0.687 mg/l), *S. verticillata* (0.788 mg/l) or *S. candidissima* (0.852 mg/l).

Keywords: *Salvia*; Malondialdehyde; High Performance Liquid Chromatography (HPLC)

Introduction

The genus *Salvia* is one of the most important aromatic and medicinal genera of the family *Lamiaceae* (subfamily *Nepetoideae*) and comprises nearly 900 species organized in five subgenera [1-5]. Turkey is an important country for export and usage of *Salvia* species in the world [6]. The flora of Turkey includes 88 species of the genus *Salvia*. Sage species are traditionally used as herbal tea in Turkey [7-9]. Endemism ratio of genus *Salvia* species in Turkey is 48 % and Anatolia is a major centre for the genus in Asia [9]. Many medical herbs contain a wide variety of free radical scavening molecules, such as phenolic compounds, terpenoids and vitamins and some other endogenous metabolites, which possess antioxidant activity [10]. Sage species have been used as a medication against perspiration and fever; as a carminative; a spasmolytic; an antiseptic/bactericidal; an astringent; as a gargle or mouthwash against the inflammation of the mouth, tongue, and throat; a wound-healing agent; in skin and hair care; and against rheumatism [11]. *Salvia virgata* is known as "yılancık" in Turkey and used for the treatment of skin diseases and wounds. The decoction from aerial parts of *S. virgata* is used against blood cancer in Western Turkey [12]. *Salvia halophila* is an endemic species for Turkey in traditional use as herbal tea. MDA is an important reactive carbon compound which is used commonly as an indicator of lipid peroxidation. Lipid peroxidation has a free radical chain reaction that causes degeneration of cell Supplementary files membranes [13,14]. Free radical species affect all important components of cells, such as lipids, proteins, carbohydrates and nucleic acids [15]. Lipid peroxides are disintegrated quickly and form reactive carbon compounds. Among these, MDA is an important reactive carbon compound which is used commonly as an indicator of lipid peroxidation [16]. Many environmental contaminants (or their metabolites) exert their toxic effects related to oxidative stress on plant in that media [17].

Purpose of present study was to determine MDA contents of nine *Salvia* taxa *S. suffruticosa* Montbret & Aucher ex Bentham, *S. trichoclada* Bentham, *S. euphratica* var. Montbret & Aucher ex Bentham *leiocalycina* (Rech. Fil.) Hedge, *S. candidissima* Vahl subsp. *candidissima, S. russellii* Bentham, *S. verticillata* L. subsp. *verticillata*, *S. virgata* Jacq., *S. aethiopis* L., *S. ceratophylla* L. grown in Turkey (in Elazig) by using HPLC.

Materials and Methods

Plant material

In the present study, the *Salvia* taxa [*S. suffruticosa* Montbret & Aucher ex Bentham, *S. trichoclada* Bentham, *Salvia multicaulis* Vahl, *S. candidissima* Vahl subsp. *candidissima, S. russellii* Bentham, *S. verticillata* L. subsp. *verticillata*, *S. virgata* Jacq., *S. aethiopis* L., *S. ceratophylla* L.] were examined. Sample plants were collected from the following habitats and details about the seed materials are given (Table 1).

Determination of MDA levels in the seeds

Seeds samples were mashed in a homogenizer and 1.0 g of homogenate paste per sample was taken for extraction of MDA, 1.0 mL aliquot of 0.5 mol/L $HClO_4$ was added into the homogenate, thus precipitating the proteins [18]. Total volumes were made up to 4.0 mL with adding distilled water. The mixture was centrifuged at 2500 rpm for 8 min at 4°C. The supernatant was filtered by Whatman No. 1 paper (Whatman Limited, UK) and vitamin C levels were determined with the method proposed by [19]. In HPLC on a Tecopak C18 reversed-phase column (Mundells Industrial Centre; 250 = 3.9 mm ID, 10 mm particle size). For vitamin C analysis, mobile phase of 3.7 mM phosphate buffer

***Corresponding author:** Dr. Aysel Sari, Firat University, Faculty of Science, Department of Chemistry, Firat University, 23169, Elazig/Turkey, Tel: +90 424 2370000; Fax: +90 424 2330062, E-mail: ayselsari@hotmail.com

Received February 04, 2012; **Accepted** March 24, 2012; **Published** March 26, 2012

Citation: Sari A, Kursat M, Civelek Ş (2012) Determination of MDA Levels in the Plant (Some Salvia L. Taxa Growing in Turkey). J Drug Metabol Toxicol 3:117. doi:10.4172/2157-7609.1000117

with pH 4.0 at a flow rate of 1 mL/min was used, with detection at 254 nm. MDA analysis was performed using 30 mM KH_2PO_4 buffer (pH 4)/ methanol (65:35 v/v) as the mobile phase at a flow rate of 1.5 mL/min, with detection at 254 nm.

Results and Discussion

In the present study, levels of MDA in mature seeds of the *Salvia* taxa [*S. suffruticosa*, *S. trichoclada*, *S. multicaulis*, *S. candidissima, S. russellii*, *S. verticillata*, *S. virgata*, *S. aethiopis*, *S. ceratophylla*] were examined (Table 2). As shown in the table above, the amount of MDA in the *S. trichoclada* (0.920 mg/l) was significantly higher than the MDA quantities in some other wild growing species, e.g. in *S. virgata* (0.556 mg/l), *S. aethiopis* (0.580 mg/l), *S. ceratophylla* (0.620 mg/l), *S. russellii* (0.632 mg/l), *S. Suffruticosa (*0.686 mg/l), *S. multicaulis (*0.687 mg/l) , *S. verticillata,* (0.788 mg/l) or *S. candidissima* (0.852 mg/l).

Conclusion

Lipid peroxides are disintegrated quickly and form reactive carbon compounds. MDA is an important reactive carbon compound which is used commonly as an indicator of lipid peroxidation [20,21]. MDA in the samples is important for the evaluation of oxidative stress in biological systems [22]. In the present study, levels of MDA in mature seeds of the *Salvia* taxa [*S. suffruticosa* Montbret & Aucher ex Bentham, *S. trichoclada* Bentham, *Salvia multicaulis* Vahl, *S. candidissima* Vahl subsp. *candidissima, S. russellii* Bentham, *S. verticillata* L. subsp. *verticillata*, *S. virgata* Jacq., *S. aethiopis L., S. ceratophylla* L.] were examined. These observations can be supported by the fact that the amount of MDA in the *S. trichoclada* (0.920 mg/l) was significantly higher than the MDA quantities in some other wild growing species, e.g. in *S. virgata* (0.556 mg/l), *S. aethiopis* (0.580 mg/l), *S. ceratophylla* (0.620 mg/l), *S. russellii* (0.632 mg/l), *S. Suffruticosa (*0.686 mg/l), *S. Multicaulis* (0.687 mg/l) , *S. Verticillata* (0.788 mg/l) or *S. candidissima* (0.852 mg/l). Purpose of present study was to determine MDA contents of nine *Salvia* taxa *S. suffruticosa* Montbret & Aucher ex Bentham, *S. trichoclada* Bentham, *S. euphratica* var. Montbret& Aucher ex Bentham *leiocalycina* (Rech. Fil.) Hedge, *S. candidissima* Vahl subsp. *candidissima, S. russellii* Bentham, *S. verticillata* L. subsp. *verticillata*, *S. virgata* Jacq., *S. aethiopis L., S. ceratophylla L.* grown in Turkey (in Elazig) by using HPLC. On the other hand, the observation of MDA levels, is very important for the determination of many diseases. So, we think that our study would be helpful in assessing the effects on public health. We hope that this original work is potentially a useful addition to the literature and can guide to similar works.

Taxa	Province /Locality
Salvia suffruticosa Montbret& Aucher ex Bentham	Elazig /Baskil, 1340 m
Salvia trichoclada Bentham	Elazig /Baskil, 1450m
Salvia multicaulis Vahl	Elazig /Baskil, 1490 m
Salvia candidissima Vahl subp. *candidissima*	Elazig /Baskil, 1750 m
Salvia russelli Bentham,	Elazig /Baskil, 1400m
Salvia verticillata L. subp. *verticillata*	Elazig /Baskil, 1490 m
Salvia virgata Jacq.	Elazig /Baskil, 1500 m
Salvia aethiopis L.	Elazig /Baskil, 1490 m
Salvia ceratophylla L.	Elazig /Baskil, 1350 m

Table 1: Salvia plants were collected habitats locality.

Taxa	MDA (mg/l)
S. suffruticosa	0.686
S. trichoclada	0.920
S. multicaulis	0.687
S. candidissima	0.852
S. russellii	0.632
S. verticillata	0.788
S. virgata	0.556
S. aethiopis	0.580
S. ceratophylla	0.620

Table 2: Determination of MDA levels in the plant (Some *Salvia* L. Taxa).

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