Antioxidant Activity and Total Polyphenol Content of Aqueous Extracts from Three Selected Lamiaceae Members

Rupalee Shirsat, Subhash Suradkar and Deepak Koche
Department of Botany, Shri Shivaji College, Akola (MS) India

Abstract: Polyphenols, the natural antioxidants are present in plant extracts and they play a key role in antioxidative defence mechanisms in biological systems and they act as free radicals scavenging agents. Polyphenols might therefore inhibit development of coronary heart disease and cancers. Basil, oregano and sage are highly fragrant plants whose leaves are used as a seasoning herb for many different types of foods. Aqueous extracts were prepared from basil (Ocimum basilicum L.), Colebrookea oppositifolia Sm. and Salvia plebeia R. Br.. To check the presence of phenols, the UV-VIS spectrum was made. The amount of polyphenolic compounds from selected Lamiaceae species was determined by spectrophotometry method using the Folin - Ciocalteau reagent and gallic acid as standard. The range of polyphenols total was between 516,352 mg/100g dried species and 859,617 mg/100g dried species. Reducing power has been established by measuring the redox potential of aqueous extracts. Antioxidant activity was directly correlated with the total amount of polyphenols in the respective extracts.

Keywords: Ocimum basilicum, Colebrookea oppositifolia, Salvia plebeia, antioxidant activity, Folin-Ciocalteau reagent, redox potential

INTRODUCTION
Culinary herbs have been reported to possess antioxidant activities (Yanishlieva et al., 2006) suggesting that they might have potential human health benefits. Salvia plebeia is a popular plant belonging to the family of Lamiaceae and native to the Mediterranean region. The name “Salvia” comes from the Latin word meaning “the heal,” which sums up the folkloric belief of its therapeutic properties for almost all kinds of ailments and its popularity in traditional medicine (Kasimu, 1998). Ocimum basilicum L. (basil) is a popular herb world around. The importance of Basil as a culinary herb, its historic usage, essential oil composition and phenolics have been well reviewed by Kintzios (2004). Colebrookea oppositifolia Sm. is an important plant widely used in Indian folklore and is a very popular herb in the Asian countries. The leaves, dried herbs as well as the volatile oil of this aromatic perennial herb have been used for medicinal purposes for centuries. The positive effects of selected plants on human health have now been attributed to its antioxidant activity both in the essential oil and soluble phenolic fractions (Eguchi, 1996; Peak, 1991). The present study is focused on the total phenolic content and Antioxidant activity of above mentioned Lamiaceae members.

MATERIAL AND METHOD
Plant Materials
Ocimum basilicum L., was collected from the local residential area while Colebrookea oppositifolia Sm., and Salvia plebeia was collected from the forest ranges of Chikhaldara (MS) India.

Aqueous Extracts Preparation
The aerial parts of the selected plants, specially dried leaves (0.5 grams) were treated with doubledistilled water at 100 °C, for a period of 15 minutes. The
samples were filtered. The resultant filtrates were made off up to 50 ml with double-distilled water. Three samples for each selected plant were done.

Analysis of the Total Phenolic Compounds in Plant Aqueous Extracts
The amount of total phenolic content (TP) was determined as described by Waterhouse (2002). Sample extracts were prepared by diluting 1:10. To proceed with the Folin-Ciocalteu method, 0.5 mL of sample extract followed by the addition of 0.25 mL of Folin-Ciocalteu reagent (2.0 N) and 2.5 mL sodium carbonate solution 0.1 M. The blank was prepared using the same chemical reagents excluding the extract. The flasks were mixed well and left in the dark, at room temperature (25 °C) for 60 minutes, then the absorbance was read at \( \lambda = 750 \text{ nm} \) (Mahnaz, 2009). UV/VIS spectrophotometer and 1 cm quartz cells were used for all absorbance measurements.

Antioxidant Activity (Redox Potential)
In order to measure pH values and redox potential of samples the Multiparameter Consort C862 was used.

RESULTS AND DISCUSSION
Water extracts of all selected plants were analyzed in order to assess the amount of total polyphenols, redox potential and content in free reducing sugars of extracts.

The Total Content of Polyphenolic
The total amount of polyphenolic compounds (PT) in water extracts was analyzed by the Folin-Ciocalteu method. The amount of PT was expressed as mg gallic acid/100g dried plants using the linear equation of the standard calibration curve: \( Y = 0.153 \cdot X \). The gallic acid was selected as standard due to its presence in almost all plants.

The UV-VIS spectrum of gallic acid was shown in figure 1A. The absorbance range of gallic acid is 250-350 nm. UV-VIS spectra of the samples were recorded with Spectro UV-VIS Double Beam PC 8 Scanning auto cell Systronic Spectrophotometer. In figure 1B is shown UV-VIS spectrum of basil extract. In the range 280-340 nm was noticed a maximum of absorption as a shoulder which corresponds to gallic acid. The total amount of phenolic compounds in the selected plants ranged from 5.1635 to 8.596 mg gallic acid/g dried plant and they come in the following order Salvia>basil> Colebrookea (Figure 2). The results are comparable to those obtained by Miliauskas et al. (2003) and Ciorui and Dimataru (2009), who studied some culinary plants and obtained ranges of 4.30 to 37.90 mg gallic acid/g. Wagensteen et al. (2004) obtained 19 mg gallic acid/g total phenolic compounds in some coriander plants. Ismail et al. (2004) detected ranges of 11.07 to 71.67 mg gallic acid/g in selected vegetables. Capecka et al. (2003) detected between 11.07 and 14.06 mg gallic acid/g of the total phenolic compound contents in some herbs. Variation of phenolic compounds content arises due to several factors, which include the area of cultivation and other environmental stresses (Makkar, 1999). The results regarding the amount of total polyphenols obtained by Folin Ceocalteu method could be influenced also by interference of other compounds found in plants (Hussain, 2008; Olah, 2003).

Antioxidant Activity
A way of expression of the antioxidant capacity is to determine the reducing power of samples. The measurement of pH and redox potential, E, of extracts was done by multimeter Consort C862. With the values obtained for pH and E values of rH were calculated which are presented in Table 1. The reducing character of samples could be correlated to the rH parameter. As shown in Table 1, Salvia extracts achieve the more pronounced effect than the rest of spices followed by basil and Colebrookea extracts. Our results regarding the antioxidant activity of aqueous extracts are in agreement with the data provided by the scientific literature (Guveller, 1996). We found a good correlation between amount of total polyphenols and reducing character of assessed extracts, the correlation coefficient being 97.25%.

<table>
<thead>
<tr>
<th>Plants</th>
<th>PT (ppm)</th>
<th>E(mV)</th>
<th>pH</th>
<th>rH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salvia plebeia</td>
<td>859.6</td>
<td>10.26</td>
<td>6.83</td>
<td>14.01687</td>
</tr>
<tr>
<td>O. basillicum</td>
<td>580.8</td>
<td>18.5</td>
<td>6.21</td>
<td>13.06348</td>
</tr>
<tr>
<td>Colebrookea</td>
<td>520.3</td>
<td>22.5</td>
<td>5.91</td>
<td>12.58522</td>
</tr>
</tbody>
</table>

Table 1
The Values of PT, E(mV), pH and rH Parameters of Aqueous Extracts of Selected Plants
Antioxidant Activity and Total Polyphenol Content of Aqueous Extracts from three Selected...

CONCLUSIONS

The general objective of this study was to determine the content of the total amount of polyphenols and the antioxidant activity of selected plant extracts. From the experimental data obtained it can be concluded that the content of polyphenols is higher in Salvia extract rather than in basil and Colebrookea extracts. The antioxidant activity expressed as rH increases from Colebrookea, Ocimum to Salvia aqueous extracts. The analyzed plants show a real potential in providing the antioxidants for prevention of chronic diseases.

REFERENCES


