Shigellosis phytotherapy: A review of the most important native medicinal plants in Iran effective on Shigella

Article in Der Pharmacia Lettre · March 2016

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Shigellosis phytotherapy: A review of the most important native medicinal plants in Iran effective on Shigella

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ABSTRACT

Shigella is a gram-negative intracellular pathogen which causes bacillus diarrhea in humans. Besides clinical and gastrointestinal diseases, shigella causes food poisoning. In Iran, medicinal plants are used to treat infectious diseases. In this review article, the native medicinal plants to Iran that are effective on shigellosis were reported. For this purpose the key words Shigella, medicinal plants, essence, and extract were searched for in databases such as Scientific Information Database, Scopus, PubMed, Magiran, and Google Scholar and the related articles were retrieved and analyzed. Findings indicated that 18 medicinal plants native to Iran were effective on shigellosis, including Echinophora cinerea Boiss, Echinophora cinerea Boiss, Stachys lavandulifolia Vahl, Cuminum cyminum, Alliums stadium, Cymbopogon olivieri (Boiss), Salvia suffruticosa, Achillea wilhelmsii, Cleome iberica, Centaurea depressa, Teucrium polium L., Salvia mirzayanii, Haplophyllum canaliculatum, Geum coccineum, Mentha spicata L., Salvia aethiopis L., Salvia atropatana Bunge, Salvia oligophylla Auch. Ex Benth., Salvia macrosiphon Boiss. Identification of effective components of these plants could be a route to producing nature-based antibiotics for shigellosis.

Key words: Shigella, Medicinal plants, Iran

INTRODUCTION

Infectious and non-infectious diseases are day by day increasing in prevalence [1-10]. Epidemiological studies have highlighted detection of disease course and strategies of disease prevention and management [11-28]. Infectious diseases are an important issue of the twenty-first century and medicine [29]. Shigella is a gram-negative intracellular pathogen which causes bacillus diarrhea in humans. Different species of Shigella bacteria are transmitted through fecal-oral route and enter into human body via contaminated food and water. For shigella, about 10-100 organisms are sufficient to cause infection [30]. Colon biopsies from infected patients have shown extensive infiltration of inflammatory cells, tissue edema, and certain areas of epithelium which have been completely destroyed. Shigella is able to invade epithelial cells to gain entry to the epithelium of the colon and exploitation of the specialized epithelial cells in lymphoid follicles. Gastrointestinal disorders and diarrhea are also caused by this pathogenesis [31-34]. Besides clinical and gastrointestinal diseases, Shigella may cause food poisoning as the third leading reason for food poisoning after Salmonella and staphylococcus [35].
Table 1. Native medicinal plants native to Iran effective on Shigella

<table>
<thead>
<tr>
<th>Row</th>
<th>Scientific name</th>
<th>Family</th>
<th>Persian name</th>
<th>Main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EchinophoracneraeBoiss</td>
<td>Apiaceae</td>
<td>Khosharizeh</td>
<td>An experimental study indicated that Echinophora cineracea Boiss. essence on S. dysenteriae formed a growth inhibition zone of 15 mm [64].</td>
</tr>
<tr>
<td>2</td>
<td>StachyslavandulifoliaVahl</td>
<td>Lamiaceae</td>
<td>Chaye kouhi</td>
<td>An experimental study indicated that Stachys lavandulifolia Vahl. essence on S. dysenteriae formed a growth inhibition zone of 29.6±0.3 mm [64].</td>
</tr>
<tr>
<td>3</td>
<td>Cuminum cyminum</td>
<td>Apiaceae</td>
<td>Zireyeh sabz</td>
<td>A study indicated that Cuminum cyminum essence on Shigella flexneri formed a growth inhibition zone of 23 mm [64]. Also, MIC* and MBC** were obtained 1.48 and 1.24, respectively [65].</td>
</tr>
<tr>
<td>4</td>
<td>Alliums stadium</td>
<td>Liliaceae</td>
<td>Sir</td>
<td>A study indicated that MIC and MBC of Alliums stadium for S. dysenteriae was obtained 12.5 and 25 mg/dL, respectively [66].</td>
</tr>
<tr>
<td>5</td>
<td>Cymbopogonolivieri</td>
<td>Graminaceae</td>
<td>Poutar</td>
<td>A study indicated that Cymbopogon olivieri extract on S. flexneri formed a growth inhibition zone of 16 mm [67].</td>
</tr>
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<td>6</td>
<td>Salvia saffractisoca</td>
<td>Lamiaceae</td>
<td>Maryangoli maemoui</td>
<td>A study indicated that Salvia saffractisoca extract on S. flexneri formed a growth inhibition zone of 16 mm [67].</td>
</tr>
<tr>
<td>7</td>
<td>Achilleawilhelmsii</td>
<td>Asteraceae</td>
<td>Boumadaran</td>
<td>A study indicated that Achillea wilhelmsii extract on S. flexneri formed a growth inhibition zone of 19 mm [67].</td>
</tr>
<tr>
<td>8</td>
<td>Cleomeiberica</td>
<td>Cleomaceae</td>
<td>Golegandom</td>
<td>A study indicated that Cleome iberca extract on S. flexneri formed a growth inhibition zone of 10 mm [67].</td>
</tr>
<tr>
<td>9</td>
<td>Centaurea depressa</td>
<td>Lamiaceae</td>
<td>Gelegandom</td>
<td>A study indicated that Centaurea depressa extract on S. flexneri formed a growth inhibition zone of 15 mm [67].</td>
</tr>
<tr>
<td>10</td>
<td>Teucrium polium L.</td>
<td>Lamiaceae</td>
<td>Kalpoureh</td>
<td>An experimental study indicated that Teucrium polium L. essence on S. flexneri formed a growth inhibition zone of 23 mm [68].</td>
</tr>
<tr>
<td>11</td>
<td>Salvia mirzayami</td>
<td>Lamiaceae</td>
<td>Mourtalkh</td>
<td>An experimental study indicated that 20, 10, 5, 2.5, 1.25, and 0.625 mg Salvia mirzayami essence formed a growth inhibition zone of 17.67, 13.33, 12, 10, 9, and 8 mm, respectively [69].</td>
</tr>
<tr>
<td>12</td>
<td>Haplophyllum canaliculatum</td>
<td>Rutaceae</td>
<td>Sodabe tarkei</td>
<td>An experimental study indicated that 20, 10, 5, 2.5, 1.25, and 0.625 mg Haplophyllum canaliculatum essence formed a growth inhibition zone of 17.33, 17, 14.67, 12.67, 11.33, and 9.67 mm, respectively [69].</td>
</tr>
<tr>
<td>13</td>
<td>Geranium okanense</td>
<td>Rosaceae</td>
<td>Mikhake kouhi</td>
<td>An experimental study indicated that 10 mg Geranium okanense fraction disk on Shigella formed a growth inhibition zone of 20 mm [70].</td>
</tr>
<tr>
<td>14</td>
<td>Mentha spicataL.</td>
<td>Lamiaceae</td>
<td>Naamey sabz</td>
<td>A study indicated that MIC and MBC of Mentha spicata L. for S. flexneri was obtained 0.156 and 0.364±023, respectively [71].</td>
</tr>
<tr>
<td>15</td>
<td>Saliscutiapartana</td>
<td>Lamiaceae</td>
<td>A type of Gelegandom</td>
<td>An experimental study indicated that S. cutiapartana 3% extract on S. flexneri formed a growth inhibition zone of 1±0 mm [72].</td>
</tr>
<tr>
<td>16</td>
<td>Saliva atropurpurea Bunge</td>
<td>Lamiaceae</td>
<td>A type of Gelegandom</td>
<td>An experimental study indicated that S. atropurpurea 3% extract on S. flexneri formed a growth inhibition zone of 5±0 mm [72].</td>
</tr>
<tr>
<td>17</td>
<td>Salva oligiphylia Auch. exBenth</td>
<td>Lamiaceae</td>
<td>A type of Gelegandom</td>
<td>An experimental study indicated that S. oligiphylia 3% extract on S. flexneri formed a growth inhibition zone of 10±0.3 mm [72].</td>
</tr>
<tr>
<td>18</td>
<td>Saliva macrosiphon BOISS</td>
<td>Lamiaceae</td>
<td>A type of Gelegandom</td>
<td>An experimental study indicated that S. macrosiphon 3% extract on S. flexneri formed a growth inhibition zone of 15.3±0.3 mm [72].</td>
</tr>
</tbody>
</table>

* Minimum inhibitory concentration
** Minimum bactericide concentration
Medicinal plants are botanically considered important because of containing pharmaceutically and nutritionally active components. Excessive use of antibiotics has often led to growing bacterial resistance to these drugs. On the other hand, excessive use of antibiotics leads frequently to side effects in human body [36]. Irrespective of their main effective substance, the significance of medicinal plants is related to containing other substances with therapeutic effects that can prevent the side effects-related toxicity in addition to strengthening the plant's therapeutic effect [37]. Further, being nature-based and causing fewer side effects than chemical drugs have resulted in growing use of medicinal plants [37]. A recent concern in medicine and pharmacology is bacterial resistance, which has been reported over 90% to some chemical drugs [38]. The related problems have caused great interest in searching for and suggesting antimicrobial compositions particularly plant-based ones [39,40]. Plant-based compositions are traditionally used to treat a variety of infectious and non-infectious diseases in many regions worldwide [41-63]. Shigellosis is a significant infectious disease. In Iran, medicinal plants are used to treat infectious diseases. In this review article, the native medicinal plants to Iran that are effective on shigellosis are reported.

In this study, the key words Shigella, medicinal plants, essence, and extract were searched for in databases such as Scientific Information Database, Scopus, PubMed, Magiran, and Google Scholar and the related articles were retrieved and analyzed.

Analysis of various publications indicated that 18 medicinal plants native to Iran were effective on shigellosis, including Echinophora cinerea Boiss, Echinophora cinerea Boiss, Stachys lavandulifolia Vahl, Cuminum cyminum, Alliums studium, Cymbopogon olivieri (Boiss), Salvia suffruticosa, Achillea wilhelmsii, Cleome berica, Centaurea depressa, Teucrium polium L., Salvia mirzayanii, Haplophyllum canaliculatum, Geum coccineum, Mentha spicata L., Salvia aethiopis L., Salvia atropatana Bunge, Salvia oligophylla Auch. exBenth., Salvia macrosiphon Boiss (Table 1).

DISCUSSION

The findings of the present study indicated that E. cinerea, S. lavandulifolia, C. cyminum, A. studium, C. olivieri, S. suffruticosa, A. wilhelmsii, C. iberica, C. depressa, T. polium L., S. mirzayanii, H. canaliculatum, G. coccineum, M. spicata, S. aethiopis, S. atropatana, S. oligophylla, S. macrosiphon were anti-shigellosis.

Phytochemical analysis of anti-shigellosis plants has indicated that the above plants have effective components. In traditional medicine, S. lavandulifolia is used to relieve pain particularly joint and rheumatic pain, headache, dizziness, and neurological pains [73]. S. lavandulifolia contains mircin, digimarcin, beta-pinene, alpha-pinene. In traditional medicine, E. cinerea is used to strengthen stomach [74,75].

Alpha-phellandrene, carvacrol and alpha-pinene are the main components of E. cinerea [76]. C. cyminum is used to treat gastrointestinal tract diseases as carminative and digestion-facilitative and pulmonary diseases and cough [77]. The main components of C. cyminum include sabinene, flavonoids, polysaccharides, coumaraldehyde, pinene, and terpine [78]. In traditional medicine anti-convulsive, anti-inflammatory, analgesic, refrigerant, and wound-healing properties of T. polium have been confirmed [79]. Salvia is used to treat common cold, bronchitis, gastrointestinal disorders, and brucellosis [80].

Different species of Salvia genus contain flavonoids, diterpenoids, and sesterpenes [81-84]. H. canaliculatum components include 7-isopentenyloxy-γ-fagarine, perfamine, flindersins, skimmianine, and atanine [85]. In medicine G. coccineum is used to treat diarrhea, gastrointestinal disorders, and acid reflux as well as for dyeing [86].

Eugenol and mertenol are main effective substances of G. coccineum essence [87]. In traditional medicine, M. spicata has been abundantly used to digest foods further, increase gastrointestinal tract movements, treat common cold and cholera, and relieve bronchial inflammation [88-94].

Phenolic compounds including flavonoids and flavonols have strong antimicrobial activities [86]. Hence, the antimicrobial activity of this plant might be, at least in part through phenolic compounds. It should be noted that there are a lot of other plants which have phenolic compounds [95-112], which worth examining. These compounds have antioxidant properties [113-122] which reduce the infection side effects.

Currently in case a drug resistance is developed, the drug is changed to fight pathogenic bacteria and fungi. In light of traditional therapeutic effects and chemical analysis of the above plants, their effective substances could be examined in experimental and clinical investigations and if their positive effects are demonstrated, they can be used to produce nature-based antibiotics effective on Shigella.
REFERENCES


