

Trichomoniasis phytotherapy: An overview of the most important medicinal plants affecting *Trichomonas vaginalis*

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ABSTRACT

Trichomoniasis is the most common sexually transmitted parasitic disease which is commonly seen by gynecologists. This infection may lead to certain infections and complications multiple problems including a discharge, painful urination, genital irritation, discomfort after intercourse, premature rupture of membranes, preterm labor, low birth weight, and increased risk of HIV infection. Metronidazole is a trichomonacide metronidazole drug that may cause nausea, vomiting, bad taste, gastrointestinal disorders, rash, urticaria, angioedema, dizziness, peripheral neuropathy, and transient neutropenia. Regarding that trichomoniasis is one of the most important health issues in women, the aim of this review article is to report the medicinal plants that are effective on this parasite. *Taxus baccata*, *lavandula intermedia*, *Achillea millefolium*, *Artemisia absinthium*, *Juglans regia*, *Eucalyptus camaldulensis* Dehnh, *Stachys lavandulifolia*, *Artemisia aucheri*, *Zataria multiflora*, *Myrtus communis*, *Pelargonium roseum*, *Freula assafoetida*, *Allium sativum*, *Tanacetum parthenium*, *Mentha piperita*, and *Salvia officinalis* have been found to be used to control trichomoniasis. The main compounds of these plants can be investigated for potential efficacy on trichomoniasis in clinical trials.

KEY WORDS: *Trichomonas vaginalis*, Women, Herbal medicine, Traditional medicine, Iran.

1. INTRODUCTION

Vaginal infections are an important health problem in women in health care systems (Sobel, 1999). Trichomoniasis is the most common sexually transmitted parasitic infection which is commonly seen by gynecologists (Sobel, 1999). Infection with this parasite is associated with widely known symptoms and complications (Yasuda, 2009; Schmid, 2001). *Trichomonas vaginalis* is a flagellated parasite that is the cause of trichomonal vaginitis in women. This parasite can cause vaginitis, dysuria, and dyspareunia in women and urethritis in men (Cunningham, 2005; Robert, 2008; Janathan, 2007; Wolner-Hanssen, 1989). However, excessive urethral and vaginal discharge, dysuria, itching and severe irritation of the genital tract, and abdominal pain are the most important and most common symptoms of trichomoniasis. Trichomoniasis is asymptomatic in 10-50 of the patients (Patel, 2000). Human being is the only known source of this parasite (Johnston and Mabey, 2008). As well, figures indicate that each year, over 200 million people worldwide are infected with *T. vaginalis* (Petrin, 19998; Fiori, 1997). Metronidazole and tinidazole are two drugs of choice to treat trichomoniasis; however, these two drugs have been reported to cause teratogenicity, teratogenic effects on fetus, and drug resistance (Schwebke, 2006). Besides that, metronidazole is associated with certain complications including nausea, vomiting, bad taste, gastrointestinal disorders, rash, urticaria, angioedema, dizziness, peripheral neuropathy, and transient neutropenia. Metronidazole use is controversial during pregnancy, and is forbidden in the first trimester (Lance, 2006; Geralld, 2002). Therefore, more novel therapies with fewer side effects are being sought out.

Obviously, the use of medicinal plants is the oldest approach adopted by human beings to treat diseases, and throughout development in all human civilizations, there has been a very close relation between human beings and plants (Asadi-Samani, 2013; 2015; Bahmani, 2012; 2014; 2015; Saki, 2014; Parsaei, 2016; Nasri, 2015; Ahmadipour, 2016; Jivad, 2016; Mohsenzadeh, 2016). However, most of plant species have remained to be investigated adequately and even identified (Delfan, 2014; 2015; Ghasemi Pirbalouti, 2013; Bahmani, 2015; Rouhi-Boroujeni, 2016; Jivad, 2016; Asadbeigi, 2014; Parsaei, 2016). In the recent years, the use of medicinal plants and plant-based drugs has been on rise, such that medicinal plants are currently being used to treat many diseases (Moradi, 2012; 2013; Samarghandian, 2016; Kooti, 2014; Asadi-Samani, 2016; Rabiei, 2013; Bahmani, 2012; 2014; Nasri, 2014; Forouzan, 2012; Karamati, 2014). Medicinal plants can be used to treat diseases because of fewer side effects, patients better acceptance due to the recommendations of traditional medicine, past generations experiences, low cost, and agreeability to the body's physiological function (Bahmani, 2013; 2014; 2015; 2016; Shirani, 2011; Saki, 2014; Gholami-Ahangaran, 2012; Eftekhari, 2012; Beyrami-Miavagi, 2014).

Since trichomoniasis is one of the most important health problems in women and the drugs with fewer side effects and greater efficacy are being sought out, this study was conducted to report the medicinal plants that are effective on this parasite.

2. MATERIALS AND METHODS

In this review article, the key words consisting of *T. vaginalis*, medicinal plants, phytochemical compounds, extract, essential oil, and Iran were used to search for relevant articles in Google Scholar, Scientific Information Databases, and other databases. Only the articles that reported the works directly investigating the effects of medicinal plants and their derivatives on *T. vaginalis* were included.

3. RESULTS

Table.1. The medicinal plants with anti-*Trichomonas vaginalis* properties used in Iran

Scientific name	Family name	Persian name	Descriptions
<i>Taxus baccata</i>	Taxaceae	Sorkhdar	Crude extract and fraction 60% of dichlorometane-acetonic <i>T. baccata</i> extract (200, 300, 400, and 500 µg/mL) exerted greater anti- <i>T. vaginalis</i> effects compared to fraction 90%. 200 µg/mL of the extract 60% caused 100% inhibition of <i>T. vaginalis</i> growth, while the extract 90% caused a 60% inhibition (Zarea, 2013).
<i>Lavandula intermedia</i>	Lamiaceae	Ostokhodous	Essential oil of <i>Lavandula intermedia</i> (0.1% and 1% and 0.001%) caused removal of parasites (after 90 min, 120 min, and six hours, respectively) (Ezatpur, 2008).
<i>Achillea millefolium</i>	Asteraceae	Boumadaran	A study demonstrated that <i>A. millefolium</i> extract caused a significant decrease in the parasites number/time compared to metronidazole (Khalili, 2012).
<i>Artemisia absinthium</i>	Asteraceae	Afsantin	Different concentrations of <i>A. absinthium</i> extract caused a significant decrease in the parasites number/time compared to metronidazole (Kazemeian, 2012).
<i>Juglans regia</i>	Juglandaceae	Gerdo	Different concentrations of <i>J. regia</i> caused a significant decrease in the parasites number/time compared to metronidazole (Kazemeian, 2012).
<i>Eucalyptus camaldulensis</i> Dehnh	Myrtaceae	Okaliptous	An experimental study demonstrated that in 60 and 90 mg of hydroalcoholic <i>E. camaldulensis</i> extract, no <i>T. vaginalis</i> could grow (Kazemeian, 2012).
<i>Stachys lavandulifolia</i>	Lamiaceae	Chaye kouhi	A study demonstrated that 500 µg/mL of aqueous <i>S. lavandulifolia</i> extract and 50 µg/mL methanolic <i>S. lavandulifolia</i> extract caused the death of <i>T. vaginalis</i> (Kazemeian, 2012).
<i>Artemisia aucheri</i>	Asteraceae	Dermaneye kouhi	A study demonstrated that different concentrations of <i>A. aucheri</i> essential oil could cause the death of <i>T. vaginalis</i> (Azadbakht, 2000).
<i>Zataria multiflora</i>	Lamiaceae	Avishan shirazi	The studies concentrations of <i>Z. multiflora</i> extract caused the death of <i>T. vaginalis</i> at early culture (Azadbakht, 2000).
<i>Myrtus communis</i>	Myrtaceae	Mourd	<i>M. communis</i> with the studied concentrations at early culture caused the death of <i>T. vaginalis</i> (Azadbakht, 2000).
<i>Pelargonium roseum</i>	Geraniaceae	Zheranium	Methanolic and aqueous geranium extract exerted inhibitory effects on the growth of <i>T. vaginalis</i> trophozoites (Fakhrie-Kashan, 2014).
<i>Freula assafoetida</i>	Apiaceae	Anghouzeh	Two mg/mL of <i>F. assafoetida</i> extract caused destruction of 90% of <i>T. vaginalis</i> number in test tube after one-hour exposure with <i>T. vaginalis</i> (Sarkari, 2009).

<i>Allium sativum</i>	Amaryllidaceae	Sir	0.1 mg/mL of <i>A. sativum</i> extract caused destruction of 95% of <i>T. vaginalis</i> number in test tube after two-hours exposure with <i>T. vaginalis</i> (Sarkari, 2009).
<i>Tanacetum parthenium</i>	Asteraceae	Babouneye gavi	<i>Tanacetum Parthenium</i> extract (4, 5, 8, and 10 mg/mL) caused a complete destruction of all <i>T. vaginalis</i> parasites (Arefkhah, 2013).
<i>Mentha piperita</i>	Lamiaceae	Naena	The studied concentrations of <i>M. piperita</i> had very strong inhibitory effects on <i>T. vaginalis</i> (Yousefi, 2013).
<i>Salvia officinalis</i>	Lamiaceae	Maryam goli	The studied concentrations of <i>S. officinalis</i> extract had very strong inhibitory effects on <i>T. vaginalis</i> (Yousefi, 2013).

DISCUSSION

According to the findings, *Taxus baccata*, *lavandula intermedia*, *Achillea millefolium*, *Artemisia absinthium*, *Juglans regia*, *Eucalyptus camaldulensis* Dehnh, *Stachys lavandulifolia*, *Artemisia aucheri*, *Zataria multiflora*, *Myrtus communis*, *Pelargonium roseum*, *Freula assafoetida*, *Allium sativum*, *Tanacetum parthenium*, *Mentha piperita*, and *Salvia officinalis* are the native medicinal plants of Iran effective on *T. vaginalis*. According to traditional medicine, *L. officinalis* is reported to have antiparasitic, antimicrobial, antiviral, and anti-inflammatory effects (Gamez, 1990; Buchbauer, 1991). Furthermore, the antifungal and antioxidant properties of *A. millefolium* have been confirmed in some scientific investigations (Magiatis, 2000; Ayatollahi Mousavi, 1996; Sokmen, 2004). In some traditional medicine textbooks, *J. regia* is reported to treat ringworm, fungal, bacterial, and viral infections, and inflammatory diseases. Phytochemical investigations have demonstrated that 5-hydroxy 1,4-naphthoquinone is an effective compound of *J. regia* (Alkhawajah, 1997), which may explain the anti-*T. vaginalis* effects of this plant. *A. absinthium* has some properties such as insecticidal, appetizing, and antiparasitic (Ramezani, 2004). *E. camaldulensis* has disinfectant, refrigerant, antispasmodic, hypoglycemic, and antiparasitic (Ministry of health and medical education, 2003). Antibacterial and antimicrobial effects of *S. lavandulifolia* have been confirmed. As well, *S. lavandulifolia* is used to treat gynecological infections (Morteza Semnani, 2007; Azadbakht, 2004; Rabbani, 2005). *P. roseum* contains geranium, citronellol, phenil alcohol malic acid, ethylic acid, and mannitol has been found to exert anti-inflammatory, analgesic, disinfectant, hemostatic, and anti-dysentery properties in experimental works (Edris, 2007). In different studies, various effects of *Taxus baccata*, including antitumor, antibacterial, antifungal, and anti-inflammatory, have been reported (Jennewein, 2001; Paras, 2009; Erdemoglu, 2001; Kupeli, 2003). Diterpenoid and triterpenoid compounds are the main compounds of *Taxus baccata* (Mossadegh, 1971). According to traditional medicine, *A. sativum* and *F. assafoetida* are used as antiparasitic agents (Azadbakht, 2002; Ghazanfari, 2000; Lemar, 2002). Allicin is the effective compound of *A. sativum* (Zargari, 1994). *T. parthenium* contains parthenolide, camphor, and alpha-pinene (Tassorelli, 2005). *T. parthenium* can exert antiparasitic properties (Mahdi, 2006; Luize, 2005). *S. officinalis* is a plant with disinfectant effects (Samsam Shariat, 2000; Rojhan, 2001). *M. piperita* contains an effective compound called menthol with disinfectant properties (Ghasemi Pirbalouti, 2009).

4. CONCLUSION

Regarding the emphasis on the antiparasitic effects of these plants in the references of traditional medicine and phytotherapy, and the experimental works confirming the antiparasitic effects of these medicinal plants, we recommend to investigate potential anti-*T. vaginalis* effects of these plants in clinical trials to produce nature-based drugs effective on *T. vaginalis*.

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