PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

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OPEN ACCESS

Pakistan Journal of Nutrition

ISSN 1680-5194
DOI: 10.3923/pjn.2019.554.562

Research Article
Routine Usage of Medicinal Plants in Northern Jordan

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Abstract

Background and Objective: Jordan is rich in medicinal herbs. The present study examined the medicinal use of herbs commonly found in northern Jordan to determine their usage value and importance for treatment of routine ailments. **Materials and Methods:** Data regarding use of 13 herbs grown in Irbid and Zarqa, Jordan, was collected from 108 participants using a questionnaire and assessed according to usage value. **Results:** Survey results revealed all 13 herbs were utilized daily in food, drinks and as home remedies for different ailments, including digestive, respiratory, nervous, genitourinary, circulatory, liver, dental, diabetic, skin and menstrual cramp issues. Treatment of digestive ailments involved the most species (n = 7) followed by respiratory and nervous system problems (n = 6 each). *Salvia officinalis* had the highest usage value (0.88) followed by *Mentha piperita* (L.) *Huds* (0.8) and *Pimpinella anisum* (0.76), indicating their significance. **Conclusion:** The present study not only preserves local ethnopharmacological knowledge of plants grown in northern Jordan but also provides important information regarding their potential for treating mild to moderate ailments.

Key words: *Aloysia citriodora*, *Cinnamomum verum*, *Elettaria cardamomum*, ethnopharmacology, *Hibiscus sabdariffa*, *Matricaria aurea* (Loefl.), *Mentha piperita* (L.) Huds, northern Jordan, *Paronychia argentea* Lam., *Pimpinella anisum*, *Rosmarinus officinalis*, *Salvia officinalis*, *Syzygium aromaticum*, *Thymus vulgaris*, usage value, *Zingiber officinale*

Received: February 03, 2019 Accepted: April 07, 2019 Published: May 15, 2019

Citation: R.A. Almuhur, 2019. Routine usage of medicinal plants in Northern Jordan. Pak. J. Nutr., 18: 554-562.

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Folk medicine has been a significant source of alternative medicine worldwide for centuries, especially in countries with great variation in geography and climate due to the wide diversity of plant species available[1]. Use of herbal medicines also tends to be more common in rural and underdeveloped areas that lack access to modern medicine. In Jordan, about 2000 plant species are estimated to play a very important part in everyday life as traditional medicines [2]. Studies conducted in Wadi Mujib, Ajloun and Tafila regions of Jordan have begun to classify the importance of various medicinal plants using information consensus factor (ICF) and usage value (UV) as indicators[3-5]. ICF value links citations of several plant species groups based on ailment treatment, however UV represents recorded use per species. Previous studies showed the highest UV in Mujib for digestive disorders[3]. *Crocus hyemalis* (saffron) showed the highest UV in Mujib[3], while *Matricaria aurea (Loefl.)* and *Allium cepa L.* had the highest UV in Tafila[5]. Besides, kidney and digestive problems had the highest ICF in Ajloun and Tafila, respectively[4, 5].

Irbid and Zarqa have the second and third largest metropolitan populations in Jordan, with 1,819,600 and 1,403,000 inhabitants in 2016, respectively[6]. Irbid is located in northern Jordan, 70 km north of Amman, about 20 km away of the Syrian border and surrounded by Um Qais, Al koura, Mafraq and Al Ramtha. It is divided into 23 city districts, has an overall area of 1500 km^2 and its climate is hot in summer and cold, wet and snowy in winter, with a recorded rainfall range of 234-400 mm in 2015/2016[6]. Zarqa is also located in northern Jordan, 24 km northeast of the capital, Amman. It is divided into 5 districts and has an overall area of about 4761 km^2. Zarqa has a moderate climate, with an annual recorded temperature average of 17.4°C and annual rainfall ranging from 102-109 mm in 2015/2016[6].

In 2014, Oran reported that medicinal plants in Jordan are in danger of disappearing due to human activities, such as construction of buildings and trails, urbanization, random livestock grazing and continuous excessive use[5,7,8]. Uncontrolled use of Jordanian herbs as a source of food, fuel and traditional medicine creates a challenge for herbalists because it is very difficult to keep records of the enormous variation of plant species for coming generations[5]. Many herbs grown in Jordan are grown in other areas and countries; however, research evaluating local knowledge regarding their medicinal use and commercial potential is limited[9-11]. Therefore, the present study examined the medicinal applications of some of the most commonly used herbs found in northern Jordan, specifically Zarqa and Irbid, to determine their UV and perceived significance for the treatment of various ailments. Importantly, this study helps preserve local ethnopharmacological knowledge and provides foundational information on the medicinal-chemical potential of these plants, which may be useful for new drug development.

MATERIALS AND METHODS

Participants and questionnaires: The present study was conducted from March to June 2017 in northern Jordan. A survey questionnaire was administered to people residing in the cities of Zarqa and Irbid through face-to-face interviews. The questionnaire included both closed and open questions, covering demographic characteristics of participants and names of some local medicinal plants, their utilized parts, method of use and usage frequency. Surveys were conducted by 7 students enrolled in a biological sciences course who received prior instruction on their proper administration. Each student was asked to approach 15 participants. Data collection was systematized to reflect reality and truthfulness. Prior to participation, respondents were informed of how their answers would be used as part of the study and that any identifying information would remain private.

UV index: The utilization of 13 medicinal herbs grown in northern Jordan was assessed according to a UV index, which numerically evaluates the relative importance of each plant species as a home remedy based on respondent plant usage answers. The UV was calculated with the following formula:

$$UV = \frac{U}{N}$$

where, U represents the number of uses per species and N is the number of respondents.

RESULTS

Data regarding the utilization of 13 medicinal plants [*Aloysia citriodora*, *Cinnamomum verum*, *Elettaria cardamomum*, *Hibiscus sabdariffa*, *Matricaria aurea* (Loefl.), *Mentha piperita* (L.) *Huds*, *Paronychia argentea* Lam., *Pimpinella anisum*, *Rosmarinus officinalis*, *Salvia officinalis*, *Syzygium aromaticum*, *Thymus vulgaris* and *Zingiber officinale*] grown in Irbid and Zarqa was assessed according to a UV index.

A total of 108 participants were included in the present study, consisting of 38 males and 70 females. The medicinal plants used were either cultivated by the respondents,

Table 1: Comparison of respondent sex, education level and medicinal plant usage

	Males (n = 38)				Females (n = 70)			
	Users		Non-users		Users		Non-users	
	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
Medicinal plant usage	20	52.63	18	47.34	62	88.57	8	11.42
Education level								
Campus Graduate level	10	50.00	14	77.78	40	64.52	4	50.00
School	10	50.00	4	22.22	22	35.49	4	50.00

harvested from the wild and /or purchased from an herbalist (*E. cardamomum*, *Syzygium aromaticum*, *C. verum* and *Z. officinale*). About 76% of all respondents were interested in using medicinal plants on a daily basis; of them, the majority were female (88.57% versus 52.63% of males, Table 1). About 65% of highly educated females showed a tendency to use traditional herbs compared to 50% of highly educated males. Common medicinal uses for all 13 herbs surveyed are summarized in Table 2. Respondents used various herbs to prepare drinks frequently throughout the entire year. The leaves of the plants were used most often, along with flowers, flower buds, fruits and roots. Herbal treatments for several ailments were most often prepared as infusions or decoctions. Overall, plant species in the Lamiaceae family were most commonly used in Zarqa and Irbid. In particular, *Salvia officinalis* had the highest usage (UV = 0.88) followed by *Mentha piperita* (L.) *Huds* (UV = 0.8), *Pimpinella anisum* (UV = 0.76), *E. cardamomum* (UV = 0.68), *Matricaria aurea* (Loefl.) [UV = 0.63], *Z. officinale* (UV = 0.56), *T. vulgaris* (UV = 0.49) and *H. sabdariffa* (UV = 0.44). Usage of *Syzygium aromaticum*, *R. officinalis*, *A. citriodora* and *Paronychia argentea* Lam. was less common (UV = 0.29, 0.17, 0.1 and 0.07, respectively; Table 2). Medicinal plants reportedly used to treat various categories of ailments are summarized in Table 3.

DISCUSSION

People living in Zarqa and Irbid, Jordan, can be categorized into two distinct communities based on their residential location (rural versus urban) and both communities are aware of and use medicinal plants according to their shared traditional and cultural heritage. In the present study, a survey of 108 residents of Zarqa and Irbid was employed to obtain information on current usage of medicinal plants in northern Jordan in order to determine their perceived value for treating various ailments. Females reported greater reliance on herbal remedies than males, a higher level of education obviously tempered usage for both sexes. Nonetheless, usage of medicinal herbs for treatment of various ailments was still relatively prominent among the sampled respondents, reportedly due to their availability, pleasant tastes and smells, low cost and continued widespread belief that herbal remedies are safer than modern medications. Medicinal plants were grouped into different categories based on their home remedies usage, to treat ailments of the systems: Circulatory, digestive, respiratory, reproductive, nervous and urinary systems, besides to diabetes, skin, dental and liver problems

Digestive system problems: The present results revealed that 7 of the 13 herbs examined are still used in northern Jordan to treat gastrointestinal problems, including colic, diarrhea, stomach ulcers, infections and constipation. Of them, *Salvia officinalis*, *Mentha piperita* (L.) *Huds*, *Pimpinella anisum*, *E. cardamomum* and *Matricaria aurea (Loefl.)* were the most frequently used for digestive disorders according to UVs (range, 0.63-0.88), whereas *Paronychia argentea* Lam. and *R. officinalis* were less common (UV = 0.07 and 0.17, respectively). *Salvia officinalis* (sage) has been used for centuries in traditional medicines of Asia, Latin America and Europe as well as by the German Commission as a treatment for diarrhea, hyperglycemia, dyspepsia, ulcers and paralysis[12] and has also been reported to reduce throat pain in patients with pharyngitis[13]. Studies of *Mentha piperita* (L.) *Huds* (peppermint) oil suggest its efficacy in the treatment of functional dyspepsia and irritable bowel syndrome by facilitating the relaxation of gastrointestinal muscle via an antagonistic effect on calcium channels[14-16] and its *in vivo* application has been shown to induce a significant spasmolytic effect on the gastrointestinal tract[17]. Furthermore, menthol, a main chemical component of peppermint oil, was also shown to cause relaxation of the gastrointestinal tract during endoscopy by affecting calcium channels[18-20].

Use of *Pimpinella anisum* (anise) seeds reportedly has several beneficial effects, from teeth polishing to carminative and antidiarrheal[21,22]. In addition to its laxative effects[23], *Pimpinella anisum* has also been shown to act as an antiulcerative agent against chemically-induced gastric ulcer[24]. Similar to anise, *E. cardamomum* (cardamom) seeds were

Table 2: Plants used for treatment of various human health problems in Zarqa and Irbid, Jordan

Scientific name	*Syzygium aromaticum*	*Pimpinella anisum*	*Thymus vulgaris*	*Zingiber officinale*	*Aloysia citriodora*	*Mentha piperita* (L.) Huds	*Elettaria cardamomum*
Common name	Clove	Anise	Thyme	Ginger	Lemon verbena	Mint or Peppermint	Cardamom
Local name	Urunful	Yansoon	Zaatar	Zangabeil	Malleisah	Nana	Hail
Family name	Myrtaceae	Apiaceae	Lamiaceae	Zingiberaceae	Verbenaceae	Lamiaceae	Zingiberaceae
Part(s) used	Flower buds	Fruit	Leaves	Root	Leaves	Leaves	Fruit
Method(s) of use	Oil, infusion, or decoction (oral)	Infusion or decoction (oral), oil	Infusion or decoction (oral), oil	Infusion or decoction (oral)	Infusion or decoction (oral)	Infusion or decoction (oral), oil	Decoction (oral)
Recommended uses	Toothache, dental emergencies, fever reduction, colic, headache, sore throat, respiratory disorder	Gastrointestinal problems (carminative, diarrhea, constipation), menstrual cramps, sleep enhancement, stomach ulcer, nausea, epilepsy, calmative	Bronchitis, cough, asthma, toothache, urinary infection, liver problems, acne, insect stings/bites, depression, mood changes, memory problems	Rheumatism, toothache, respiratory disorder, blood pressure, heart problems	Anxiety, insomnia	Muscle relaxation, antispasmodic, calmative	Stress, obesity, digestive problems, prevent bad breath, cold, cough
Total users	24	62	40	46	8	66	56
Usage value	0.29	0.76	0.49	0.56	0.10	0.80	0.68

Scientific name	*Salvia officinalis*	*Rosmarinus officinalis*	*Cinnamomum verum*	*Paronychia argentea* Lam.	*Matricaria aurea* (Loefl.)	*Hibiscus sabdariffa*
Common name	Sage	Rosemary	Cinnamon	Silver nailroot or silvery whitlow wort	Golden chamomile	Roselle
Local name	Meirameih	Hasa elban	Qerfeh	Rejil el Hammame	Babonej	Karkadeih
Family name	Lamiaceae	Lamiaceae	Lauraceae	Caryophyllaceae	Compositae (Asteraceae)	Malvaceae
Part(s) used	Leaves	Leaves	Leaves	Leaves	Leaves	Flower
Method(s) of use	Infusion or decoction (oral)	Infusion	Decoction	Decoction	Infusion or decoction	Infusion or decoction
Recommended uses	Seizures, ulcers, rheumatism, inflammation, dizziness, diarrhea, hyperglycemia	Anxiety, depression, sleep problems, spasmodic, stomach ache, cold, influenza, kidney stones	Inflammation, diabetes	Diuretic, heart problems, kidney, urinary system problems	Colitis, ulcer, cough, inflammation, skin problems	Diabetes, blood circulation, pressure, anticancer, liver problems
Total users	72	14	54	6	52	36
Usage value	0.88	0.17	0.67	0.07	0.63	0.44

Table 3: Medicinal plants used to treat various ailments in Zarqa and Irbid, Jordan

Ailment category	Medicinal plant species used
Dental	*Elettaria cardamomum*, *Syzygium aromaticum*, *Thymus vulgaris*, *Zingiber officinale*
Digestive system	*E. cardamomum*, *Matricaria aurea* (Loefl.), *Mentha piperita* (L.) Huds, *Paronychia argentea* Lam., *Pimpinella anisum*, *Rosmarinus officinalis*, Salvia officinalis
Liver	*Hibiscus sabdariffa*, *T. vulgaris*
Respiratory system	*E. cardamomum*, *Matricaria aurea* (Loefl.), *Mentha piperita* (L.) Huds, *Syzygium aromaticum, T. vulgaris*, *Z. officinale*
Circulatory system	*H. sabdariffa*, *Z. officinale*
Genitourinary system	*Paronychia argentea* Lam., *R. officinalis*, *T. vulgaris*
Diabetes	*Cinnamomum verum*, *H. sabdariffa*, *Salvia officinalis*
Nervous system	*Aloysia citriodora*, *E. cardamomum*, *Mentha piperita* (L.) Huds, *Pimpinella anisum*, *R. officinalis*, *T. vulgaris*
Skin	*Matricaria aurea* (Loefl.), *T. vulgaris*
Menstrual cramps	*Pimpinella anisum*

chewed by ancient Egyptians to wash teeth and stimulate digestion, as well as for their antiemetic and antidyspeptic properties[25,26]. Mixing cardamom seeds with ginger, cloves and caraway has also been used for to alleviate digestive problems[27]. In Jordan, cardamom seeds are used in traditional Jordanian Arabic coffee, a welcoming daily hot drink that is consumed multiple times a day (morning and evening) throughout the whole year, typically before and after meals. They are also used as a seasoning for the famous Jordanian traditional lunch known as Mancef. *Matricaria aurea* (Loefl.) [golden chamomile] extract has been shown to effectively treat induced acute colitis in rats, suggesting its use for treatment of ulcerative colitis in humans[28]. Moreover, its usage as a daily food additive was reported to protect against ulcers[28]. Lastly, use of *R. officinalis* (rosemary) to treat gastrointestinal disturbances due to its ulcerogenic, carminative and antidyspeptic properties has also reported[29-31].

Respiratory system problems: The results of the present study demonstrated that 6 herbs are currently being used in northern Jordan to treat respiratory ailments, such as bronchitis, cough and asthma. *Mentha piperita* (L.) *Huds* was most frequently used for respiratory issues (UV = 0.80) followed by *E. cardamomum* (UV = 0.68), *Matricaria aurea* (Loefl.) [UV = 0.63], *Z. officinale* (UV = 0.56), *T. vulgaris* (UV = 0.49) and *Syzygium aromaticum* (UV = 0.29). Although *Mentha piperita* (L.) *Huds*, *Matricaria aurea* (Loefl.) and *Syzygium aromaticum* are widely used in Jordanian folk medicine for many purposes, published research evaluating their impact, if any, on the respiratory system remains unavailable. On the other hand, cardamom has been shown to have beneficial effects on cold and cough[32], while other have indicated the use of thyme for treatment of respiratory diseases, with a remarkable effect on bronchial asthma[33,34]. In traditional Chinese medicine, *Z. officinale* (ginger) is used as a treatment for respiratory conditions, bronchitis and rheumatism and has been shown to significantly reduce dry cough, flu symptoms and asthma[35].

Nervous system problems: The current results indicated a total of 6 plant species were cited as being used for treatment of nervous system issues, including depression, mood changes, memory problems, anxiety, insomnia, stress, sleep problems, epilepsy and headaches. In particular, *Mentha piperita* (L.) *Huds* was most frequently used (UV = 0.80) followed by *Pimpinella anisum*, *E. cardamomum* and *T. vulgaris* (UV range, 0.49-0.76), whereas *R. officinalis* and *A. citriodora* were less common (UV = 0.17 and 0.10, respectively). While peppermint is still used by many in Zarqa and Irbid to treat headaches, studies of its effects on headaches are still absent from the literature. In contrast, anise has been shown to elicit a sedative effect similar to aspirin and morphine[36] and ingestion of anise via capsule can significantly reduce pain intensity in dysmenorrhea cases compared to an mefenamic acid capsule[37]. Moreover, subcutaneous injection of anise essential oil reportedly has an anti-anxiety effect in mice[38]. Use of thyme is recommended for both physical and mental fatigue, exhibiting significantly positive effects on anxiety, insomnia, depression and mood changes[39]. Rosemary has been shown to have beneficial effects on memory via acetylcholinesterase inhibition in brain[40,41] and its calmative and antidepressant effects may be a consequence of its antioxidant capabilities and impact on gamma-aminobutyric acid receptors[41]. Interestingly, *A. citriodora palau* (lemon verbena) has been reported to play a role in treating Alzheimer's disease in addition to insomnia and anxiety[42-44], causing positive changes in mood and cognitive activity[43] possibly by affecting acetylcholine receptor activity in the central nervous system[45].

Dental problems: Herein, 4 species of medicinal plants were used by respondents for dental problems, such as toothaches, dental emergencies and bad breath. Of them, *E. cardamomum* was used the most (UV = 0.68) followed by *Z. officinale* (UV = 0.56), *T. vulgaris* (UV = 0.49) and *Syzygium aromaticum* (UV = 0.29). Cardamom is known to have been used by Egyptians as a tooth cleaner[25] and ginger and

Syzygium aromaticum (clove) are indicated as toothache remedies, especially due to their antibiotic, antimicrobial and anti-inflammatory effects[35,46]. The analgesic effects of clove have been attributed to its influence on Na^+/Cl^- channels and receptors in the ganglion cells[46]. However, there are currently no studies available on the use of thyme for dental care or problems.

Genitourinary system problems: The present results revealed that 3 of the 13 plant species assessed are still being used in northern Jordan to treat genitourinary problems. Though all are used to treat urinary infections and kidney stones, *T. vulgaris* is used the most (UV = 0.49), with *R. officinalis* (UV = 0.17) and *Paronychia argentea* Lam. (UV = 0.07) use being much less common. Thyme's role in relieving renal infections has been reviewed previously[47] and although rosemary and *Paronychia argentea* Lam. (silver nail root) are used in Zarqa and Irbid as home remedies, there are currently no documented studies available on their treatment of genitourinary system issues[48].

Diabetes: A total of 3 plant species were cited in the current study as being used to treat diabetes and related symptoms, such as hyperglycemia. Of them, *Salvia officinalis* (UV = 0.88) and *C. verum* (UV = 0.67) were used most frequently followed by *H. sabdariffa* (UV = 0.44). Use of clove has been shown to significantly reduce blood glucose, total cholesterol, triglycerides and low-density lipoprotein levels in type 2 diabetic patients but have no significant effect on fasting blood glucose levels in type 2 diabetic patients or healthy female volunteers[49-51]. Cinnamon has been shown to reduce insulin resistance[52,53] and lower fasting blood sugar levels from 10% to 29%[54-56] by slowing the enzymatic digestion of carbohydrates in the digestive tract[57]. Furthermore, a compound derived from cinnamon (hydroxychalcone) was found to mimic the role of insulin in glucose uptake[58]. The antidiabetic properties of *H. sabdariffa* (roselle) were also recently reported[59].

Circulatory system problems: In the present study, only 2 herbs, *Z. officinale* (UV = 0.56) and *H. sabdariffa* (UV = 0.44), were cited for the treatment of circulatory system issues, including blood pressure, circulation and heart problems. In traditional Chinese medicine, ginger is used to improve the flow of blood and other bodily fluids, stimulate heart muscle and reduces blood pressure[35,60,61]. Ginger contains many confirmed hypotensive and vasodilating compounds able to reduce blood pressure[62], some of which induce vasodilation when nitric oxide is released while calcium is blocked[62]. Ginger has also been reported to have antithrombotic activity[63,64], inhibit cholesterol increases by reducing its absorption in the blood and liver and prevent oxidation of low-density lipoproteins, which is necessary for cholesterol accumulation in arterial lumina[26]. Moreover, two studies have recently identified a role for roselle in blood pressure control[65,66]. Interestingly, daily administration of roselle was reported to effectively lower mild to moderate hypertension[66].

Skin problems: Herein, only 2 herb species, *Matricaria aurea* (Loefl.) [UV = 0.63] and *T. vulgaris* (UV = 0.49), were noted as being used for skins issues, including acne and insect stings/bites. Although, golden chamomile has been shown to have antimicrobial and anti-inflammatory activity[67], there are currently no reports on its use for treating skin problems. Thyme, on the other hand, has been shown to possess antiviral, antifungal and antibacterial activity[34,47] and its effect on skin issues, such as oily skin, sciatica, acne, dermatitis and bug bites/stings and other integumentary ailments, has been reviewed previously[38].

Liver problems: A total of 2 plant species, *T. vulgaris* (UV = 0.49) and *H. sabdariffa* (UV = 0.44), were cited herein as being used for general liver problems. Oral administration of aqueous sage and thyme extracts have been shown to increase resistance to oxidative stress[68] and thyme extracts were suggested to prevent the occurrence of liver diseases[68]. Roselle was previously reported to have a positive impact on liver disease via elimination of free radicals and conserving hepatic enzyme activity[69,70]. In addition, roselle extracts have been found to prevent fat deposition in the liver and abdomen[71].

Menstrual cramps: Pimpinella anisum (UV = 0.76) was the only herb used by respondents in the present study to treat menstrual cramps. The role of anise for treatment of menstrual cramping was reviewed previously[22]. Furthermore, daily consumption of anise by capsule for 1 month has been shown to attenuate the occurrence of hot flashes in postmenopausal women[72] and is highly effective for relieving pain, hence its recommended use for dysmenorrhea[37].

CONCLUSION

By examining the medicinal applications and UV of some commonly used herbs found in northern Jordan, the present study is helping to document local ethnopharmacological

knowledge that may provide important information related to the medicinal-chemical potential of these plants, which can be used for drug development. Further studies are needed to document other medicinal plants used in traditional Jordanian folk remedies and examine their regional usage and value.

REFERENCES

1. Lev, E. and Z. Amar, 2002. Ethnopharmacological survey of traditional drugs sold in the Kingdom of Jordan. J. Ethnopharmacol., 82: 131-145.
2. Atta, A.H. and A. Alkofahi, 1998. Anti-nociceptive and anti-inflammatory effects of some Jordanian medicinal plant extracts. J. Ethnopharmacol., 60: 117-124.
3. Hudaib, M., M. Mohammad, Y. Bustanji, R. Tayyem, M. Yousef, M. Abuirjeie and T. Aburjaie, 2008. Ethnopharmacological survey of medicinal plants in Jordan, Mujib nature reserve and surrounding area. J. Ethnopharmacol., 120: 63-71.
4. Aburjai, T., M. Hudaib, R. Tayyem, M. Yousef and M. Qishawi, 2007. Ethnopharmacological survey of medicinal herbs in Jordan, the Ajloun Heights region. J. Ethnopharmacol., 110: 294-304.
5. Abdelhalim, A., T. Aburjai, J. Hanrahan and H. Abdel-Halim, 2017. Medicinal plants used by traditional healers in Jordan, the Tafila region. Pharmacogn. Magaz., 13: S95-S101.
6. AlZoubi, Q., 2016. Jordan statistical yearbook 2016. Department of Statistics, Issue No. 67. http://dosweb.dos.gov.jo/DataBank/yearbook/YearBook2016_eng.pdf
7. Oran, S.A., 2014. The status of medicinal plants in Jordan. J. Agric. Sci. Technol., 4: 461-467.
8. Al-Khalil, S., 1995. A survey of plants used in Jordanian traditional medicine. Int. J. Pharmacogn., 33: 317-323.
9. Akgul, A., A. Akgul, S.G. Senol, H. Yildirim, O. Secmen and Y. Dogan, 2018. An ethnobotanical study in Midyat (Turkey), a city on the silk road where cultures meet. J. Ethnobiol. Ethnomed., Vol. 14. 10.1186/s13002-017-0201-8
10. Ahmed, S., M.M. Hasan and Z.A. Mahmood, 2016. Antiurolithiatic plants: Formulations used in different countries and cultures. Pak. J. Pharm. Sci., 29: 2129-2139.
11. Zyoud, S.H., S.W. Al-Jabi and W.M. Sweileh, 2015. Scientific publications from Arab world in leading journals of integrative and complementary medicine: A bibliometric analysis. BMC Complement. Altern. Med., Vol. 15. 10.1186/s12906-015-0840-z
12. Ghorbani, A. and M. Esmaeilizadeh, 2017. Pharmacological properties of *Salvia officinalis* and its components. J. Trad. Complement. Med., 7: 433-440.
13. Hubbert, M., H. Sievers, R. Lehnfeld and W. Kehrl, 2006. Efficacy and tolerability of a spray with *Salvia officinalis* in the treatment of acute pharyngitis-a randomised, double-blind, placebo-controlled study with adaptive design and interim analysis. Eur. J. Med. Res., 11: 20-26.
14. Coffin, B., F. Azpiroz, F. Guarner and J.R. Malagelada, 1994. Selective gastric hypersensitivity and reflex hyporeactivity in functional dyspepsia. Gastroenterology, 107: 1345-1351.
15. Shams, R., E. Oldfield, J. Copare and D. Johnson, 2015. Peppermint oil: Clinical uses in the treatment of gastrointestinal diseases. JSM Gastroenterol. Hepatol., Vol. 3.
16. Hills, J.M. and P.I. Aaronson, 1991. The mechanism of action of peppermint oil on gastrointestinal smooth muscle: An analysis using patch clamp electrophysiology and isolated tissue pharmacology in rabbit and guinea pig. Gastroenterology, 101: 55-65.
17. Mizuno, S., K. Kato, Y. Ono, K. Yano and H. Kurosaka *et al*., 2006. Oral peppermint oil is a useful antispasmodic for double contrast barium meal examination. J. Gastroenterol. Hepatol., 21: 1297-1301.
18. Hiki, N., M. Kaminishi, K. Yasuda, N. Uedo and M. Kobari *et al*., 2012. Multicenter phase II randomized study evaluating dose-response of antiperistaltic effect of l menthol sprayed onto the gastric mucosa for upper gastrointestinal endoscopy. Digest. Endoscopy, 24: 79-86.
19. Yamamoto, N., Y. Nakai, N. Sasahira, K. Hirano and T. Tsujino *et al*., 2006. Efficacy of peppermint oil as an antispasmodic during endoscopic retrograde cholangiopancreatography. J. Gastroenterol. Hepatol., 21: 1394-1398.
20. Asao, T., E. Mochiki, H. Suzuki, J. Nakamura and I. Hirayama *et al*., 2001. An easy method for the intraluminal administration of peppermint oil before colonoscopy and its effectiveness in reducing colonic spasm. Gastrointest. Endosc., 53: 172-177.
21. Shojaii, A. and M. Fard, 2012. Review of pharmacological properties and chemical constituents of *Pimpinella anisum*. ISRN Pharm., Vol. 2012. 10.5402/2012/510795
22. Anwar, I., 2017. Medicinal benefits of anise seeds (*Pimpinella anisum*) and *Thymus vulgaris* in a sample of healthy volunteers. Int. J. Res. Ayurveda Pharm., 8: 91-95.
23. Picon, P.D., R.V. Picon, A.F. Costa, G.B. Sander, K.M. Amaral, A.L. Aboy and A.T. Henriques, 2010. Randomized clinical trial of a phytotherapic compound containing *Pimpinella anisum*, *Foeniculum vulgare*, *Sambucus nigra* and *Cassia augustifolia* for chronic constipation. BMC Complement. Altern. Med., Vol. 10. 10.1186/1472-6882-10-17
24. Al Mofleh, I.A., A.A. Alhaider, J.S. Mossa, M.O. Al-Soohaibani and S. Rafatullah, 2007. Aqueous suspension of anise "*Pimpinella anisum*" protects rats against chemically induced gastric ulcers. World J. Gastroenterol., 13: 1112-1118.
25. Lwasa, S. and F. Bwowe, 2007. Exploring the economic potential of cardamom (*Elettaria cardamomum*) as an alternative and promising income source for Uganda's smallholder farmers. Proceedings of the 8th African Crop Science Society Conference, October 27-31, 2007, El-Minia, Egypt, pp: 1317-1321.

26. Savan, E.K. and F.Z. Kucukbay's, 2013. Essential oil composition of *Elettaria cardamomum* Maton. J. Applied Biol. Sci., 7: 42-45.
27. Korikanthimathm, V.S., D. Prasath and G. Rao, 2000. Medicinal properties of cardamom *Elettaria cardamomum*. J. Med. Arom. Crops, 22: 683-685.
28. Minaiyan, M., N. Dehkordi, P. Mahzouni and M. Roknabady, 2011. Effect of *Matricaria aurea* (Loefl.) Shultz-Bip. hydroalcoholic extract on acetic acid-induced acute colitis in rats. Iran. J. Basic Med. Sci., 14: 67-74.
29. Minaiyan, M., A.R. Ghannadi, M. Afsharipour and P. Mahzouni, 2011. Effects of extract and essential oil of *Rosmarinus officinalis* L. on TNBS-induced colitis in rats. Res. Pharm. Sci., 6: 13-21.
30. Dias, P.C., M.A. Foglio, A. Possenti and J.E. De-Carvalho, 2000. Antiulcerogenic activity of crude hydroalcoholic extract of *Rosmarinus officinalis* L. J. Ethnopharmacol., 69: 57-62.
31. Fernandez, L.F., O.M. Palomino and G. Frutos, 2014. Effectiveness of *Rosmarinus officinalis* essential oil as antihypotensive agent in primary hypotensive patients and its influence on health-related quality of life. J. Ethnopharmacol., 151: 509-516.
32. Dwy, A., 1994. Indian Medicinal Plants used Ayurvedic Preparations. Bishen Sing Mahendra Pal Publisher, Dehradun, India.
33. Inouye, S., T. Takizawa and H. Yamaguchi, 2001. Antibacterial activity of essential oils and their major constituents against respiratory tract pathogens by gaseous contact. J. Antimicrobiol. Chemother., 47: 565-573.
34. Javed, H., S. Erum, S. Tabassum and F. Ameen, 2013. An overview on medicinal importance of *Thymus vulgaris*. J. Asian Scient. Res., 3: 974-982.
35. Bhatt, N., M.I. Waly, M.M. Essa and A. Ali, 2013. Ginger: A Functional Herb. In: Food as Medicine. Essa, M.M. and M.A. Memon (Ed.). Nova Science Publishers, USA., pp: 51-72..
36. Tas, A., 2009. Analgesic effect of *Pimpinella anisum* L. essential oil extract in mice. Indian Vet. J., 86: 145-147.
37. Karami, N.K., F. Moattar and A. Ghahiri, 2008. Comparison of effectiveness of an herbal drug (celery, saffron, Anise) and mephnamic acid capsule on primary dismenorrhea. Ofoghe Danesh, 14: 11-19.
38. Sahraei, H., H. Ghoshooni, S.H. Salimi, A.M. Astani, B. Shafaghi, M. Falahi and M. Kamalnegad, 2002. The effects of fruit essential oil of the *Pimpinella anisum* on acquisition and expression of morphine induced conditioned place preference in mice. J. Ethnopharmacol., 80: 43-47.
39. Hoferl, M., S. Krist and G. Buchbauer, 2006. Chirality influences the effects of linalool on physiological parameters of stress. Planta Med., 72: 1188-1192.
40. Pengelly, A., J. Snow, S. Mills, A. Scholey, K. Wesnes and L. Butler, 2012. Short-term study on the effects of rosemary on cognitive function in an elderly population. J. Med. Food, 15: 10-17.
41. Nematolahi, P., M. Mehrabani, S. Karami-Mohajeri and F. Dabaghzadeh, 2018. Effects of *Rosmarinus officinalis* L. on memory performance, anxiety, depression and sleep quality in university students: A randomized clinical trial. Complement. Ther. Clin. Pract., 30: 24-28.
42. Kennedy, D.O., W. Little and A.B. Scholey, 2004. Attenuation of laboratory-induced stress in humans after acute administration of *Melissa officinalis* (Lemon Balm). Psychosomatic Med., 66: 607-613.
43. Kennedy, D.O., A.B. Scholey, N.T.J. Tildesley, E.K. Perry and K.A. Wesnes, 2002. Modulation of mood and cognitive performance following acute administration of *Melissa officinalis* (lemon balm). Pharmacol. Biochem. Behav., 72: 953-964.
44. Akhondzadeh, S., M. Noroozian, M. Mohammadi, S. Ohadinia, A.H. Jamshidi and M. Khani, 2003. *Melissa officinalis* extract in the treatment of patients with mild to moderate Alzheimer's disease: A double blind, randomised, placebo controlled trial. J. Neurol. Neurosurg. Psychiatry, 74: 863-866.
45. Wake, G., J. Court, A. Pickering, R. Lewis, R. Wilkins and E. Perry, 2000. CNS acetylcholine receptor activity in European medicinal plants traditionally used to improve failing memory. J. Ethnopharmacol., 69: 105-114.
46. Li, H.Y., B.K. Lee, J.S. Kim, S.J. Jung and S.B. Oh, 2008. Eugenol inhibits ATP-induced P2X currents in trigeminal ganglion neurons. Korean J. Physiol. Pharmacol., 12: 315-321.
47. Reddy, V.P., K.R. Vital, P.V. Varsha and S. Satyam, 2014. Review on *Thymus vulgaris* traditional uses and pharmacological properties. Med. Aromat Plants, Vol. 3. 10.4172/2167-0412.1000164
48. Abu-Irmaileh, B.E. and F.U. Afifi, 2003. Herbal medicine in Jordan with special emphasis on commonly used herbs. J. Ethnopharmacol., 89: 193-197.
49. Kianbakht, S. and F.H. Dabaghian, 2013. Improved glycemic control and lipid profile in hyperlipidemic type 2 diabetic patients consuming *Salvia officinalis* L. leaf extract: A randomized placebo. Controlled clinical trial. Complement. Ther. Med., 21: 441-446.
50. Behradmanesh, S., F. Derees and M. Rafieian-Kopaei, 2013. Effect of *Salvia officinalis* on diabetic patients. J. Renal Injury Prev., 2: 51-54.
51. Sa, C.M., A.A. Ramos, M.F. Azevedo, C.F. Lima, M. Fernandes-Ferreira and C. Pereira-Wilson, 2009. Sage tea drinking improves lipid profile and antioxidant defences in humans. Int. J. Mol. Sci., 10: 3937-3950.
52. Qin, B., K.S. Panickar and R.A. Anderson, 2010. Cinnamon: Potential role in the prevention of insulin resistance, metabolic syndrome and type 2 diabetes. J. Diabetes Sci. Technol., 4: 685-693.
53. Anderson, R.A., 2008. Chromium and polyphenols from cinnamon improve insulin sensitivity. Proc. Nutr. Soc., 67: 48-53.

54. Kirkham, S., R. Akilen, S. Sharma and A. Tsiami, 2009. The potential of cinnamon to reduce blood glucose levels in patients with type 2 diabetes and insulin resistance. Diabetes Obes. Metab., 11: 1100-1113.
55. Antony, Q., H. Kourlas and D.Q. Pham, 2007. Cinnamon supplementation in patients with type 2 diabetes mellitus. Pharmacotherapy, 27: 595-599.
56. Mang, B., M. Wolters, B. Schmitt, K. Kelb, R. Lichtinghagen, D.O. Stichtenoth and A. Hahn, 2006. Effects of a cinnamon extract on plasma glucose, HbA_{1c} and serum lipids in diabetes mellitus type 2. Enr. J. Clin. Invest., 36: 340-344.
57. Adisakwattana, S., O. Lerdsuwankij, U. Poputtachai, A. Minipun and C. Suparpprom, 2011. Inhibitory activity of cinnamon bark species and their combination effect with acarbose against intestinal α-glucosidase and pancreatic α-amylase. Plant Foods Hum. Nutr., 66: 143-148.
58. Jarvill-Taylor, K.J., R.A. Anderson and D.J. Graves, 2001. A hydroxychalcone derived from cinnamon functions as a mimetic for insulin in 3T3-L1 adipocytes. J. Am. Coll. Nutr., 20: 327-336.
59. Islam, A.K.M.A., T.S. Jamini, A.K.M.M. Islam and S. Yeasmin, 2016. Roselle: A functional food with high nutritional and medicinal values. Fundam. Applied Agric., 1: 44-49.
60. Mowrey, D.B. and D.E. Clayson, 1982. Motion sickness, ginger and psychophysics. Lancet, 319: 655-657.
61. Ghayur, M.N., A.H. Gilani, M.B. Afridi and P.J. Houghton, 2005. Cardiovascular effects of ginger aqueous extract and its phenolic constituents are mediated through multiple pathways. Vascular Pharmacol., 43: 234-241.
62. Ajay, M., A.H. Gilani and M.R. Mustafa, 2003. Effects of flavonoids on vascular smooth muscle of the isolated rat thoracic aorta. Life Sci., 74: 603-612.
63. Nurtjahja-Tjendraputra, E., A.J. Ammit, B.D. Roufogalis, V.H. Tran and C.C. Duke, 2003. Effective anti-platelet and COX-1 enzyme inhibitors from pungent constituents of ginger. Thrombosis Res., 111: 259-265.
64. Thomson, M., K.K. Al-Qattan, S.M. Al-Sawan, M.A. Alnaqeeb, I. Khan and M. Ali, 2002. The use of ginger (*Zingiber officinale* Rosc.) as a potential anti-inflammatory and antithrombotic agent. Prostaglandins Leukotrienes Essent. Fatty Acids, 67: 475-478.
65. Hajeebhoy, N., 2016. Why invest and what it will take to improve breastfeeding practices? The Lancet Breastfeeding Series: World Health Organization. https://www.who.int/nutrition/events/2016_bfhi_congress_presentation_latestscience_nemat.pdf
66. Ritonga, N.J., O. Setiani, U. Umaroh and F. Amri, 2017. Roselle flower (*Hibiscus sabdariffa*) in the treatment of hypertension in postpartum mothers. Belitung Nurs. J., 3: 229-237.
67. McKay, D.L. and J.B. Blumberg, 2006. A review of the bioactivity and potential health benefits of chamomile tea (*Matricaria recutita* L.). Phytother. Res., 20: 519-530.
68. Horvathova, E., A. Srancikova, E. Regendova-Sedlackova, M. Melusova and V. Melus *et al*., 2016. Enriching the drinking water of rats with extracts of *Salvia officinalis* and *Thymus vulgaris* increases their resistance to oxidative stress. Mutagenesis, 31: 51-59.
69. Duh, P.D. and G.C. Yen, 1997. Antioxidative activity of three herbal water extracts. Food Chem., 60: 639-645.
70. Furuta, S., I. Suda, Y. Nishiba and O. Yamakawa, 1998. High tert-butylperoxyl radical scavenging activities of sweet potato cultivars with purple flesh. Food Sci. Technol. Int. Tokyo, 4: 33-35.
71. Cid-Ortega, S. and J.A. Guerrero-Beltran, 2015. Roselle calyces (*Hibiscus sabdariffa*), an alternative to the food and beverages industries: A review. J. Food Sci. Technol., 52: 6859-6869.
72. Nahidi, F., M. Taherpoor, F. Mojab and H. Majd, 2008. Effect of anise extract on hot flush of menopause. Pajoohandeh, 13: 167-173.