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A Mini-review on Medicinal Plants Used for the Treatment of Jaundice in the Canon of Medicine

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Abstract

Context: Jaundice is a common gastrointestinal system disorder globally. Considering the potential of herbal remedies in traditional medical systems, this study was performed to explore medicinal plants used for the treatment of jaundice in the Canon of medicine.

Evidence Acquisition: This narrative review was done on one of the most important textbooks in traditional Persian medicine. Different keywords, like *Yáraghān* and *Zárdī*, were searched in the book, and a list of plants used was prepared. We searched for recent literature to find any supportive evidence to find the established mechanism of action, as well.

Results: At the end of the study, 32 plants were found in the Canon of medicine, which most of them had at least one experimental or clinical study clarifying their mechanism of action to treat jaundice or decrease bilirubin.

Conclusions: There are potential remedies in traditional Persian medicine resources, which may be useful in future trials to treat jaundice.

Keywords: Persian Medicine, Jaundice, Traditional, Choleretic, Cholagogue, Cholekinetic, Iran, Avicenna, Canon

1. Context

Jaundice is the commonest presentation of patients with liver and biliary disease (1). Jaundice is not a disease in itself, but rather a sign, which can be accompanied by various diseases. It is characterized by yellow skin, mucosa, and sclera resulting from the increased production of bilirubin, usually over 2.5 and 3.0 mg/dL. Jaundice may occur either from increased production or reduced excretion of bilirubin due to several diseases and conditions that affect the liver, such as different types of hepatitis, liver cirrhosis, Gilbert syndrome, cholestasis, alcohol or drugs abuse, autoimmune disorders, hemolytic anemia, liver cancer, etc. (2). Despite the emergence of new chemical medications in conventional medicine, there has been a growing interest in searching medicinal plants and their traditional usage worldwide (3). According to the World Health Organization (WHO), about 80% of the people in the world are dependent on traditional medicine for their preliminary healthcare needs (4).

Valuable data are available in traditional Persian medicine (TPM) manuscripts about medicinal plants, which have been used by TPM scientists for the treatment of jaundice. Avicenna (10th and 11th centuries CE) was one of the prominent TPM scholars who meaningfully influenced the progress of Iranian medical science (5, 6); and the Canon of medicine (Al-Qanoon fi al-Tibb) is the most famous medicinal book of him s (7). A review on the Canon of Medicine could provide valuable data in the field of medicinal plants effective in treating jaundice. Acceptability, availability, and cost-effectiveness are also important points for such a survey. In this paper, we investigated medicinal plants, which are mentioned in the Canon of medicine for the treatment of jaundice.

2. Evidence Acquisition

In this narrative review study, medicinal plants mentioned in the Canon of medicine for jaundice were investigated using keywords of "*Yáraghān*", "*Yáraghān -e-ásfár*", "*Zárdī*", and "*Yáraghān -e-zárd*" as the terms that indicated jaundice. Then, the collected medicinal plants

were matched with scientific names using descriptions of Iranian physicians about the morphological and characteristics of the plants. Then, the scientific names of the collected plants were confirmed using some textbooks, including popular medicinal plants of Iran (8) and dictionary of medicinal plants (9). Probable toxicity of these plants were searched in patient desk reference (PDR) (10). In order to make relationships between traditional date and current findings, the effects and biological mechanisms of the mentioned medicinal plants were searched using PubMed, ScienceDirect, and Google Scholar databases and keywords, such as jaundice and the scientific name of the plants.

3. Results

Data collected from this investigation are presented in Table 1. A total of 32 plant species were mentioned for the treatment of jaundice in the Canon of medicine, that most of them were confirmed with current studies. We did not find a clinical trial for only four plant species, including *Ajuga chamaepitys* L., *Laccifer lacca*, *Potentilla reptans*, and *Laricifomes officinalis* (Vill.). For each plant, species, scientific name, common English name and TPM names, family, and parts used were recorded. The most dominant families were Asteraceae and Lamiaceae, with three species, followed by Leguminosae, Paeoniaceae, Brassicaceae, and Asparagaceae, with two species each. Different plant parts had been used for the treatment of jaundice.

Several studies have been conducted on herbal medicine to treat jaundice (3, 11-13), such as a study by Bakhshi Jouybari et al. (3), which was done to find the effectiveness of materia medica for jaundice based on some important TPM manuscripts, such as the Canon of medicine. They identified 111 materia medica belonging to 51 families as herbal remedies for treating jaundice (3). We found six plant species, including *Laccifer lacca*, *Paeonia officinalis* L., *Cassia fistula* L., *Laricifomes officinalis* (Vill.), *Lactuca sativa* L., *Ecballium elaterium* L. had not been mentioned in their study; however, similar keywords were used in both studies. Also, they had not mentioned that how the medicinal plants had been used in the various liver or bile duct disorders, and for which type of jaundice they can be most effective. In a study by Amiri et al. (11), 37 ethnomedicinal plants belonging to 26 families were documented for their therapeutic use against jaundice. They introduced 9 medicinal plants, which were repeatedly mentioned by the traditional healers as the most extensively used herbs for the treatment of jaundice in Mashhad (one of the major cities of Iran). They reported the pharmaceutical form and ethnomedicinal uses of these medicinal plants (11).

In our study, the therapeutic effects of the medicinal herbs mentioned in the Canon of medicine for the treatment of jaundice were investigated while current investigations on these medicinal herbs were also considered. In previous studies, the morphology of plants, the parts used for the production of medicines, and medicinal forms of plants useful for pharmacists have been focused on; however, in the current survey, more attention has been given to the therapeutic effects of herbs and their temperament. Temperament, as the principle of TPM, is based on four qualities: hot, cold, dry, and wet; as well as four senses of humor, including phlegm, blood, yellow bile, and black bile (14). In accordance with the results of this study, most herbs had a hot temperament, and just four herbs had a cold temperament; however, the inner part of the Citron (*Citrus medica*) is cold and wet, as well (Table 1).

In TPM, jaundice has various etiologies, such as gastric disorders, liver disorders, anemia, etc., and its treatment is based on the treatment of its cause. For example, if hepatic disorder leads to increased yellow bile, treatment should include medications that reduce yellow bile, which are usually medicinal herbs with cold temperament. However, if jaundice is caused by a liver disorder, such as liver weakness and anemia, treatment should include liver augmentation and correction of the anemia, which is usually treated by medicinal herbs with hot temperament. Also, in TPM manuscripts the beneficial effects, such as Mofatteh, Molattef and, Mohallel for these herbs have been noted. Mohallel herb is a medicinal herb that functions as a dissolvent. Mofatteh herb is a medicinal herb that acts as a detergent and removes all kinds of visceral obstructions, especially those in the liver caused by humours. Molattef herb is a medicinal herb that acts as a diluent. As Table 1 showed, the most repeated effect was "Mohallel effect" (18 plant species), followed by the "Mofatteh effect" (11 plants) and "Molattef effect". This means that these herbs are effective to dissolve and remove the substances, which cause obstruction. Awareness about these effects as well as the temperament of herbs can help in choosing the best medicinal herbs for the treatment of jaundice. Table 1 also lists other beneficial effects, such as the effectiveness of *Laccifer lacca*, *Lactuca sativa* L., and *Ecballium elaterium* L. on reducing ascites, as well as the effects of *Artemisia absinthium* L., *Laccifer lacca* (Kerr.), *Raphanus sativus* L., *Cassia fistula* L., *Laricifomes officinalis* (Vill.), *Laricifom Matricaria chamomilla* L. and *Arnebia euchroma* (Royle) in reducing liver pain. Also, nine plant species were listed as liver, stomach, or both enhancers.

4. Conclusions

A historical approach may be helpful in the discovery of some viewpoints that cannot be paid attention to by a purely medical one. This study gives us an insight into the ideas of Avicenna and could be valuable in finding new data on the clinical use of the medicinal herbs, which can be used for the treatment of jaundice leading to future opportunities to investigate their potential medicinal use.

Footnotes

Authors' Contribution: Jamileh Mahdavi Jafari did conceptualization, data collection, writing the original draft, and final approval of the manuscript. Shahdis Barimani did conceptualization, methodology, writing the original draft, and final approval of the manuscript. Fatemeh Aliasl did drug preparation, data collection, writing the original draft, and final approval of the manuscript. Ghazaleh Heydarirad did formal analysis, methodology, writing the original draft, and final approval of the manuscript. Mehdi Pasalar did formal analysis, methodology, writing, review, and editing, and final approval of the manuscript.

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Table 1. Medicinal Plants Reported in the Canon of Medicine and Their Mechanism of Action

No	Scientific Name	Common Name	Persian Name	Part Used	Family	Temperament (Mizadj)	Useful Effects in TPM	Useful Effects in the Current Studies
1	*Artemisia absinthium* L.	Wormwood	*Afsantin*	Stem and leaves	Asteraceae	Hot in the first and dry in the second degree	Mofatteh[a], Molattef[b], Moshel-e Safra[c], stomach strengthening, removing hepatic obstructions, useful in hepatalgia, and useful in jaundice	Reducing serum levels of total bilirubin (in vivo) (15)
2	*Asarum europaeum* L.	European wild ginger	*Asaroon*	Rhizome	Aristolochiaceae	Hot and dry in the third degree	Mofatteh, Mohallel[d], Monaghi[e] of stomach and liver, liver strengthening, useful in liver swelling, removing hepatic obstructions, useful in jaundice Useful in swelling	Reversing the altered levels of bilirubin (in vivo) (16)
3	*Asparagus officinalis* L.	Asparagus	*Helyoun*	Seed	Asparagaceae	Hot and dry in the first degree	Mofatteh, Useful in jaundice, removing hepatic obstructions	Anti-inflammatory effects, hepatoprotective effects (3), decreasing the level of serum bilirubin and the liver enzymes (in vivo) (17)
4	*Cicer arietinum* L.	Chickpea	*Hemmas*	Seed	Leguminosae	Hot and dry in the first degree	Mofatteh, useful in jaundice, useful in swelling	
5	*Ajuga chamaepitys* (L.) Schreb.	Yellow bugle	*Komafeytous*	Flower, leave, and seed	Lamiaceae	Hot in the second, dry in the third degree	Mofatteh, useful in black Jaundice removes hepatic obstructions useful in some hepatic and splenic diseases, removing splenic obstructions	None
6	*Laccifer lacca*	Lak	*Lac*	Scarlet resinous secretion of a lac insects	Lacciferidae	Hot in the second, dry in the third degree	Mohallel, Mofatteh, useful in jaundice useful in ascites, liver strengthening, useful in hepatalgia	None
7	*Nardostachys jatamansi* (D.Don) DC	Indian Nard	*Sumbul*	Rhizome	Valerianaceae	Hot in the first and dry in the second degree	Mohallel, Mofatteh, removing hepatic obstructions, liver and stomach strengthening, useful in jaundice	Reducing the increased serum levels of ALT, AST, and ALP induced by CCl4 in rats (18)
8	*Paeonia officinalis* L.	European peony	*Favania*	Root	Paeoniaceae	Moderately hot	Molattef, Mohallel, stomach strengthening Removing gastric irritation, useful in jaundice, removing hepatic obstructions	Reducing serum levels of total bilirubin (in vivo) (19, 20)
9	*Raphanus sativus* L.	Radish	*Fujl*	Leave and steam	Brassicaceae	Hot and dry in the first degree	Molattef, Mohallel, removing hepatic obstructions, useful in jaundice, useful in hepatalgia	Effective in decreasing total bilirubin level (21)
10	*Aloe vera* (L.) *Burm.f.*	Yellow aloe	*Cabr-e-zard*	Dried juice of leaves	Liliacea	Hot and dry in the second degree	Mofatteh, Mohallel, Moshel-e-Safra, removing hepatic obstructions, useful in jaundice	Reducing serum bilirubin concentration (in vivo) (22, 23)

11	*Cassia fistula* L.	Golden shower	*Khiar Shambar*	Fruit seed	Leguminosae	Moderate in hotness and coldness, wet in the first degree	Mohallel, Molayyen[f], cleaning the liver, useful in jaundice, useful in hepatalgia	Reducing the elevated levels of serum bilirubin (in vivo) (24)
12	*Salix alba* L.	White willow	*Khilaf (Khelaph)*	Leave	Salicaceae	Cold and dry	Removing hepatic obstructions, useful in jaundice	Reducing serum bilirubin concentration (in vivo) (25)
13	*Potentilla reptans* L.	Creeping cinquefoil	*Khamse uraq (Bentaphalon)*	Leave	Rosaceae	Moderate in hotness and coldness, dry in the third degree	Mohallel, useful in hepatalgia useful in jaundice	None
14	*Laricifomes officinalis (Vill.)*	Agaric White	*Ghariqun*	Whole herb	Fomitopsidaceae	Hot in the first and dry in the second degree	Molattef, Mohallel, useful in jaundice,useful in gastralgia, useful in hepatalgia	None
15	*Mentha longifolia* (L.) L.	Wild mint	*Fudenaj*	Leave	Lamiaceae	Hot and dry in the third degree	Molattef, Mohallel, useful in jaundice, useful in ascites	Protecting liver from injuries (4)
16	*Lactuca sativa* L.	Lettuce	*Khas*	Leave	Asteraceae	Cold and wet in the second degree	Useful in jaundice,useful in swelling	Preventing lipid peroxidation, antioxidant activities (5)
17	*Caesalpinia bonduc* L. Roxb.	Nickernut	*Retteh*	Leave	Caesalpiniaceae	Hot and dry in the second degree	Mohallel, stomach strengthening, useful in jaundice	Hepatoprotective activity, decreasing the enhanced level of serum bilirubin (26)
18	*Ecballium elaterium* (L.) A.Rich.	Squirting cucumber	*Qsa Alhmar*	Fruit	Cucurbitaceae	Hot and dry in the second degree	Mofatteh, Molattef, Mohallel, removes hepatic obstructions, useful in ascites, useful in jaundice	Hepatoprotective activity, decreasing the levels of total bilirubin (27)
19	*Rubia tinctorum* L.	Madder	*Runas*	Root	Rubiaceae	Hot and dry in the second degree	Mofatteh, useful in jaundice	Hepatoprotective activity, decreasing the level of bilirubin (in vivo) (7)
20	*Mentha spicata* L.	Spearmint	*Nana*	Leave	Lamiaceae	Hot and dry in the second degree	Molattef, Mohallel, useful in hepatic and splenic disease, removing obstructions of the liver and spleen, useful in jaundice	Reducing total bilirubin levels (in vivo) (28)
21	*Chelidonium majus* L.	Celandine	*Mamiran*	Root	Papaveraceae	Hot and dry in the third degree	Molattef, Mohallel, useful in jaundice	Hepatoprotective activity, decreasing the level of serum bilirubin and cholesterol (in vivo) (29)
22	*Brassica oleracea* L.	Cabbage	*Kurunb*	Leave and root	Brassicaceae	Hot in the first and dry in the second degree	Monzedj[g], Molayyen, useful in splenic disease, useful in jaundice	Hepatoprotective activity, decreasing the level of serum bilirubin (in vivo) (30)
23	*Physalis alkekengi* L.	Winter cherry	*Kakanj*	Fruit and seed	Solanaceae	Cold and dry in the second degree	liver strengthening, useful in jaundice	Hepatoprotective activity, antioxidant effect (in vivo) (8)
24	*Allium cepa* L.	Onion	*Basal*	Root	Alliaceae	Hot and dry in the third degree	Mofatteh, useful in jaundice, useful in splenic disease	Decreasing the level of serum bilirubin (in vivo) (31)
25	*Matricaria chamomilla* L.	Chamomile	*Babunaj*	Flower	Asteraceae	Hot in the second and dry in the first degree	Molattef, Mohallel, Mofatteh, useful in jaundice, useful in hepatalgia, useful in swelling	Hepatoprotective activity, antioxidant effect, and decreasing the liver enzymes (in vivo) (9)

26	*Arnebia euchroma* (Royle) I.M.Johnst	Arnebia	*Abukhalsa(shanjar)*	Root	Boraginaceae	Hot in the first and dry in the second degree	Mohallel, useful in hepatalgia, useful in jaundice, useful in splenic diseases	Decreasing serum total bilirubin level (in vivo) (32)
27	*Citrus medica* L.	Citron	*Otroj*	Fruit	Rutaceae	The outer part of the fruit is hot in the first and dry in the second degree and the inner part of the fruit is cold and wet in the second degree	Molattef, Monaghi, cleaning the blood from bile, useful in jaundice, liver, and stomach strengthening	Anti-helminthic, anti cytotoxic, antidiabetic, hypolipidemic, antifungal, antimutagenic and antiulcer effects (in vivo) (3)
28	*Ferula assa-foetida* L.	Asafoetida	*Heltit.*	Oleogum resin	Apiaceae	Hot in the beginning of fourth and dry in the second degree	Mohallel, useful in jaundice	Antihyperglycemic and anti hyper lipidemic effects (in vivo) (10)
29	*Cuscuta monogyna* Vahl	Dodder	*Koshouth*	Seed	Convolvulaceae	Hot in the first and dry in the third degree	Monaghi, Mofatteh, useful in jaundice, stomach and liver strengthening, removing hepatic and gastric obstructions	Hepatoprotective activity (in vivo) (33)
30	*Lycium barbarum* L.	Goji berries	*Fealzahraj (hozoz)*	Fruit and leave	Solanaceae	Moderate in hotness and coldness and dry in the second degree	Mohallel, useful in jaundice	Hepatoprotective activity, decreasing the level of serum bilirubin and the liver enzymes (in vivo) (34)
31	*Adiantum capillus-veneris* L.	Maidenhair	*Pare-siavashan*	Whole part	Pteridaceae	Moderate in hotness and coldness (hot and dry in the first degree)	Molattef, Mofatteh, Mohallel, useful in jaundice, useful in splenic disease	Hepatoprotective activity, decreasing the level of serum bilirubin and the liver enzymes (in vivo) (35)
32	*Rumex acetosa* L.	Sorrel	*Hummaz*	Aerial parts	Polygonaceae	Cold and dry in the second degree	Ghame[h] Safra, useful in jaundice	Hepatoprotective activity (in vivo) (36)

Abbreviation: TPM, traditional Persian medicine.
[a]Mofatteh: It is a detergent agent, which removes all kinds of visceral obstructions, especially those in the liver. Eliminating liver obstructions caused by humours.
[b]Molattef: It is a diluent agent, which dilutes all kinds of humours in the body.
[c]Moshel-e Safra: Bile purgative.
[d]Mohallel: It is an agent, which dissolves thick humours.
[e]Monaghi: It is a purifying agent, which removes excess humours.
[f]Molayyen: It is an agent, which helps to soften thick humous in the body.
[g]Monzedj: It is an agent, which ripens premature humours to reach its perfect state.
[h]Ghame: It is a quenching agent, which calms erupting humours.