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Ethnopharmacological survey of medicinal plants in Jordan, Mujib Nature Reserve and surrounding area

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ABSTRACT

Aim of the study: Medicinal plants are an important element of indigenous systems in Jordan. These resources are usually regarded as part of a culture's traditional knowledge. Therefore, the aim of this study is to collect information from local population concerning the use of medicinal plants of the Mujib region; identify the most important medicinal plants used; determine the relative importance of the species surveyed and calculate the informant consensus factor (F_{ic}) in relation to medicinal plant use.
Materials and methods: Qualitative tools were used for data collection and to record the interviewee's personal information and topics related to the medicinal use of specific plants. The collected data were used to calculate the F_{ic} and the plant use values.
Results and conclusions: Fifty-eight plants were identified to be still in use in traditional practice in Mujib. Our results showed that the highest use values were recorded for the species *Artemisia sieberi* Bess. and *Silybum marianum* (L.) Gaertn., while the highest F_{ic} was cited for digestive problems. Anthropologically, women were the primary gatherers while healers were reported to be both females, predominantly, and males; yet, herbalists are deficient in this local community.

1. Introduction

Ethnopharmacology and drug discovery using natural products remain important issues in the current target-rich, lead-poor scenario. According to the world health organization (WHO), about three-quarters of the world population rely upon traditional remedies (mainly herbs) for their health care (WHO, 1991). In fact, herbs/plants are the oldest friends of mankind. They not only provided food and shelter but they also served the humanity to cure different ailments. Medicinal plants have provided the modern medicine with numerous plant-derived therapeutic agents (Evans, 2002). These drugs are either totally natural extractives, or semi-synthetic derived from natural precursors, or model (prototype)-derived agents. Aspirin, atropine, artimesinin, colchicine, digoxin, ephedrine, morphine, physostigmine, pilocarpine, quinine, quinidine, reserpine, taxol, tubocurarine, vincristine, and vinblastine are few examples of what medicinal plants have given us in the past. Most of these plant-derived drugs were originally discovered through the study of traditional cures and folk knowledge of native population. Some of these could not be substituted despite the enormous advancement in synthetic chemistry. Very few drugs from higher plants have attained any prominence in conventional medical practice in the last couple of decades even with the increasing interest in phytomedicine. Essentially, ethnopharmacology has already played important role in the development of conventional medicine and is likely to play more significant role in the years to come (Gilani and Rahman, 2005).

Jordan is a relatively small country but well- known for the great variation in wild plants due to the geographical diversity and climatic circumstances. Around 2500 plant species (of which 2.5% species are listed as endemic) were recorded (Al-Eisawi, 1996). The floral species in Jordan also include medicinal and herbal species as well as aromatic and spices species. From these plants, 485 species from 99 different families are categorized as medicinal plants. These species have a wide distribution in the country (Al-Eisawi, 1982; Oran, 1994; Oran and Al-Eisawi, 1998). Like other countries in the region, Jordan is composed of two different societies: one rural and another urban. Both of them depend upon the rich traditional heritage. Folk medicine is widely practiced by the inhabitants of the

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remote areas or the nomads who generally inhabit the desert and some areas of the steppe and the uplands. The reliance on herbal medicine and the uncontrolled collection of medicinal plants might cause the disappearance of some medicinal herbs growing in the area and will add more plants to the list of the endangered plant species (Afifi and Abu-Irmaileh, 2000). Moreover, users of herbal remedies need validated information on the safety and efficacy of medicinal plants (Tyler, 1994; Tyler et al., 1998). Adequate knowledge and correct handling of herbal medicine requires the licensing of professional herbalists, a regulatory control of handling, storage, and methods of use (Abu-Irmaileh and Afifi, 2003).

The information that is known and which was accumulated on the use of plants in health care systems around the world is of inestimable value. It must be sifted, correlated, investigated and potentiated (Cordell and Colvard, 2005). Thus, the relative importance of a medicinal plant within a culture and the homogeneity of information regarding its traditional medicinal uses are valuable and need to be evaluated using quantitative tools, such as use value (UV) and informants consensus factors (F_{ic}) (Heinrich et al., 1998; Gazzaneo et al., 2005).

This study will pursue our investigation on the current ethnopharmacological knowledge among the Jordanian societies (Aburjai et al., 2006). The survey inventoried medicinal plants used by locals of Mujib area reporting plant use values (UV). In addition, the fidelity of the cited uses for specific category of diseases was ranked using the informants consensus factors (F_{ic}).

2. Materials and methods

2.1. Study area

Mujib Nature Reserve is located in the central highlands and the southern part of Jordan valley within the coordinates 31°27′N–36°00′E (see Fig. 1). The name is derived from the major valley that crosses the central part of the reserve from east to west. The western perimeter of the reserve lies on the Dead Sea—the lowest depression on earth measuring about 400 m below sea level. The high altitudes reaching about 900 m above sea level confined in the eastern part. It covers an area of approximately 212 km^2. Mujib valley and Wala valley are the major valleys in the area; other important valleys are Sqara, Shqeiq, Attoun, Abo Rteima, and Zarka' Main.

According to the bio-geographical zones map of Jordan, the area lies within two different bio-geographical zones, the Irano-Turanian and the Sudanian. As for the Irano-Turanian bio-geographical zone, it is characterized by lower rainfalls, poor soils and higher temperatures and a vegetation that is "timber-less" with mostly shrubs and bushes. The Sudanian bio-geographical zone in the lower area along the Dead Sea is characterized by having a warm winter, a very hot summer and very low rainfall. It is called the Sudanian or tropical zone because it has some physical and biological characters similar to those in Sudan.

The study area is allocated by the government to the Royal Society for the Conservation of Nature (R.S.C.N.). As a result, the whole study area is a nature reserve in which human activities are limited depending on the reserve management plan. Grazing is allowed in small areas on the eastern parts of the study area. This grazing is limited for 4 months a year, 2 in winter and 2 in spring. There are no other human activities allowed in the study area. A standardized data collection sheet was used for the habitat description, which includes all necessary information about physical attributes of the local environment. Dominant species in the area were also listed, with an estimation of their coverage percentage.

2.2. Interviews and plant material collection

This survey was conducted throughout the year 2005. The interviewing team was composed of six members. Interviews took place in the interviewees' homes using the native language (Arabic). The 40 interviewees were aware of their right to refuse answering any question, to stop the interview at any time, or to simply decline the interview altogether. The survey team conducted 35 home visits during which interviews ranged from 30 to 120 min. During the conduct of the survey, the interviewing team relied chiefly on soliciting information via oral conversations held during social meetings, oriented discussions and explicit observations. Data collected through direct interviews were immediately documented on field notebooks. In addition to evaluating the current ethnopharmacological status of Mujib area, which is the material of the present report, the interviews also assessed some other aspects such as herbal sources of the medicinal plants, socio-conomic situation in the communities and the interviewees' personal education as well as the source and extent of interviewees' knowledge and willingness to associate to national unions.

The identity of each plant species mentioned by each informant was verified and confirmed by a professional taxonomist/botanist using live specimens and photographs. Voucher specimens of these herbs were collected and stored at the R.S.C.N. herbarium at the site. Some of the plant species used are known to be rare or endangered species, so they were not easy to find during the survey.

2.3. Data analysis

Plant use values (UV) and informants consensus factor (F_{ic}):

Relative importance of each plant species known locally to be used as herbal remedy was reported as use value (UV) (Gazzaneo et al., 2005). The use value (UV) is calculated as follows:

$$\mathrm{UV} = \frac{\Sigma U}{n}$$

where, UV the use value of a species; U the number of uses per species; n the number of informants.

The UV is helpful in determining the plants with the highest use (most frequently indicated) in the treatment of an ailment (or ailment category) with a given F_{ic} value (see below).

On the other hand, informant consensus factor (F_{ic}) was employed to deduce the homogeneity of the information about a specific plant use to treat a particular category of ailments. All citations were placed into ailment categories for which the plant was claimed to be used. The F_{ic} factor estimates the relationship between the "number of use-reports in each category (n_{ur}) minus the number of taxa used (n_t)" and the "number of use-reports in each category minus 1". F_{ic} is calculated as in the following formula (Heinrich et al., 1998):

$$F_{ic} = \frac{(n_{ur} - n_t)}{(n_{ur} - 1)}$$

where, n_{ur} the number of use-reports per each category; n_t the number of taxa used.

The product of this factor ranges from 0 to 1. A high value (close to 1) indicates that the taxa (usually species) are relatively, used by a large proportion of the informants indicating a more consistent use of the medical resources (i.e. culture-bound syndromes). While a low value indicates that informants disagree on the taxa to be used in treatment within a category of illness. In other words the F_{ic} is an indicative value of how much the informants are consistent and the extent they agree about the use of certain plant species for treatment of a given ailment or ailments category. This means that as the F_{ic} value of a given ailments category approximates 1.0 as the