Identification of medicinal plants based on modern and indigenous knowledge (Case study: Ghasem Abad rangeland, west of Isfahan province, Iran)

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Abstract: The rural communities depend heavily on plant diversity for the fulfillment of their basic needs and conservation of other natural resources. They collect useful plant resources from various habitats and utilize them using indigenous knowledge and practices. Using medicinal plants has been considered by local people for a long time in different regions. Today, unfortunately, many of modern societies and even local communities do not have adequate knowledge about medicinal plants as well. Therefore, this study was designed to probe scientific identification and investigate culture of medicinal plants consumption based on scientific references, and indigenous knowledge in Ghasem Abad rangeland, situated in the west of Isfahan province. For this purpose, all plant species were investigated based on scientific references and medicinal plants were identified during 2008-09. Also indigenous knowledge of local people about medicinal plants' utilization was recorded by asking and observation way (in questionnaire). The results indicated that, more than 70% of total plants in this region belong to medicinal plants. Although, the local people recognize these kinds of plants; but they just consume only 35% of them. There are various medicinal plants in this area, and these medicinal plants belong to different families and life forms. Hemicryptophytes life forms cover more than 40% of total medicinal plants in this region. Moreover, the most consumption of medicinal plants among the local people belongs to Asteraceae, Papilionaceae, and Apiaceae with 21, 15 and 12 percent, respectively. Thus, combining the scientific and indigenous methods of identification and utilization of medicinal plants, not only could be effective on plants' health and preserve the indigenous knowledge, but also local economy will be improved and enhanced.

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1. Introduction

Medicinal plants are those plants that are used in treating and preventing specific ailments and diseases that affect human beings (Nwachukwu *et al.,* 2010). Human has been using herbs for generations around the world (Ates and Erdogrul, 2003), due to charm needed to cure the diseases, many people have come to the conclusion that, even chemical drugs answer their needs, but they may be harmful for their health and be sick of these medications in the future. Still, the use of plants as a source of medicine is very important for human beings (Kultur, 2007). Traditional herbal remedies provide health services even in highly industrialized setups because they are important pillars of culture and human socialization (Owuor *et al.,* 2005, Okello *et al.,* 2010). In many cases, plants used as herbal remedies are not only important as drugs, but also as food supplements with vitamins and minerals (Okello *et al.,* 2010).

The use of herbal medicine is increasingly finding more relevance today, especially with the recognition that we are facing more challenges in the treatment of some medical conditions such as diabetes and cancer (Kigen, *et al.,* 2013). Plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases (Nimri *et al.,*1999).

Several drugs have been derived directly and indirectly from plants including digoxin, taxol, vinblastine, nabilone and artemesin (Cragg *et al*., 2005; Kigen *et al.,* 2013). Medical plants have therefore become important source of research and development of new drugs (Kigen *et al.,* 2013).

Identifying medicinal plants and using them is so imperative. Use of medicinal plants is essential for people's health and protects the environment throughout the world (Anjaria, 1996). Any region has unique culture and knowledge about using plants and medicinal plants, for example in a village (in Pakistan) 114 plants were identified, which are used as food and medicine (Goodman and Ghafoor, 1992). In societies such as; African communities, many plant species are used to heal and cure diseases (Bussman *et al.,* 2006). However traditional usage of medicine and medicinal

plants in diverse developing countries as a normative basis for the maintenance of health is widely observed (UNESCO, 1998). The use of medical plants as a traditional medicine is well-known in the rural areas of many developing countries (Nimri, *et al*., 1999). Since time immemorial, people have gathered plant and animal resources for their needs. Examples include edible nuts, fruits, herbs, spices, gums, fodder and fibers used for construction of shelter and housing, clothing or utensils, and plant or animal products for medicinal, cosmetic or cultural uses. Even today, hundreds of millions of people, mostly in developing countries, derive a significant part of their subsistence needs and income from gathered plant and animal products. Gathering of high value products such as mushrooms (morels, matsutake and truffles), medicinal plants (ginseng, black cohosh and goldenseal) also are continued in developed countries for cultural and economic reasons (Yirga, 2010).

Traditional knowledge related to medicinal plants, plays an essential role in the use of these herbal medicines (IUCN, 2010) and traditional medicine remains an integral part of the health system in many areas (Joshi and Joshi, 2000). Medicinal plants may be defined as those plants that are commonly used in treating and preventing specific ailments, disorders and diseases, that are generally considered to be harmful for human (Anselem, 2004). Herbal medicine has been improved in developing countries as an alternative solution to health problems and costs pharmaceutical products (Nimri *et al*., 1999).

In the past, people were compelled to use any natural substance that, they came across to ease their suffering approaches to conserve the medicinal plants and traditional knowledge caused by different diseases (Khan *et al.,* 2005) also today local inhabitants in any area collect and utilize medicinal plants according to their availability in different seasons. The World Health Organization (WHO) estimates that, more than 80% of the healthcare needs in these countries are met through traditional healthcare practices (Dold and Cocks, 2002; Kigen *et al.,* 2013) that include traditional medicine and use of medical plants. It is necessary to understand physicochemical substance in plants' structure before using them, because some plants may store ingredients in their underground tubers (Kultur, 2007). There are many scientific and research centers in the most of the countries to test plants' chemical properties. Plants used in traditional medicine are mainly collected from the wild regions (Keirungi and Fabricius, 2005) and most of them are often harvested for trade (Rokaya *et al.,* 2010). Due to this content, identifying plants in natural areas is the first goal that needs to be discussed and understood and this is necessary to identify the medicinal plants, also how to use them. There are some plants that are served as food preservatives and antioxidants (Kumar *et al*., 1997) that they can be used instead of chemical preservatives. The Maltese Islands' people on a daily basis have quartiles sufficient knowledge of medicinal plants to apply (Lanfranco, 1992). Plants have traditionally been used as a source of medicine in India by indigenous people of different ethnic groups inhabiting various terrains for the control of various aliments afflicting human and their domestic animals (Panghal *et al.,* 2010). Local people have remarkable knowledge of species identity and their uses as crude drugs (Joshi AR and Joshi K, 2000) and (Joshi, k. etal, 2011). Like in many parts of the developing world, there is a growing upsurge in demand for herbal and other traditional remedies for various ailments among communities in Kenya (Otieno and Analo, 2012). Also, the rural communities of Nepal have a long tradition of using plant resources for their various basic needs such as food, medicine, firewood, timber, fodder and agricultural tools (Joshi and Joshi, 2000).

Undoubtedly, identifying is the first step to consume medicinal plants and one way to protect the perceived loss of cultural heritage is to document it (Sillitoe, 2000). Knowledge regarding the plant types and discussion over their recognition and preservation are the most important fundamentals in field, and they should be handed down to the next generations (Motaleb, 2010). There is an urgent need to document information on traditional Iranian herbal medicine because there are genuine concerns that this knowledge may be completely lost. Therefore the aim of this study was to identify medicinal plants' life form based on two modern and indigenous knowledge ways, scientific references and knowledge of local people about medicinal plants. This research was conducted in Ghasem Abad rangeland located in west of Isfahan province, Iran.

2. Material and Methods

2.1. Study Area

The region which has been studied is approximately 3000 hectares, and is located between 50° 59' to 50°52' east longitude and 32° 46' to 32° 41' north latitude at a distance of approximately 75 kilometers west of Isfahan province (Fig.1). The average height of the study region is 2350 meter and the highest and lowest altitudes are 2993 and 2040 above sea level, respectively. The average temperature of the region is 14.5 C° and the annual mean rainfall is 250 mm.

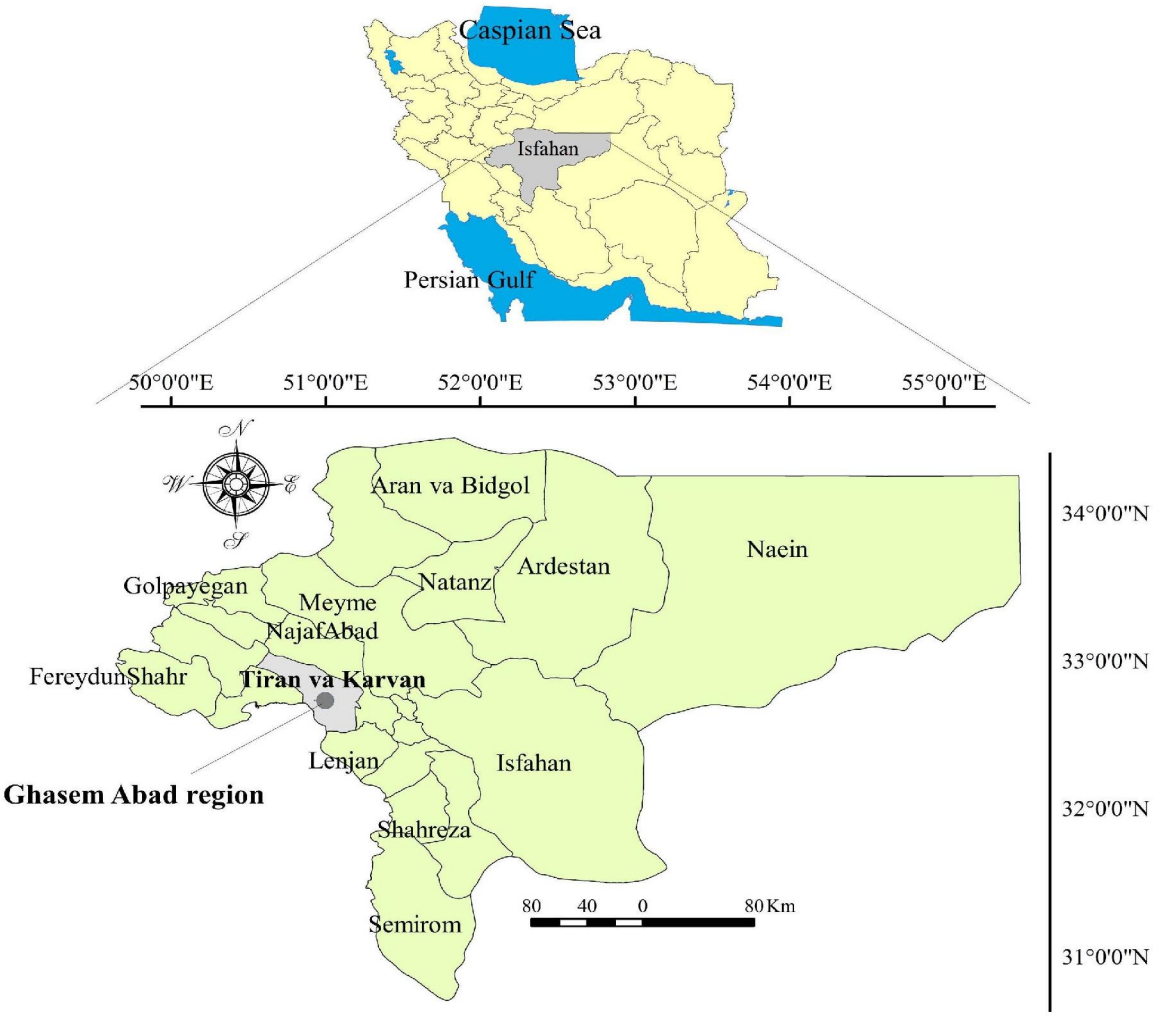

Fig1. Geographical location of the study area in Iran.

This area in the term of climate is the boarder of steppe and semi steppe zones, and it is entirely situated in ecoton zone. Its medicinal flora is very rich and consists different Chorotypes such as: Irano Turanian, Mediterranean, Europe and Siberian.

2.2. Methods

Because of the existence of accessible ways, field visiting was done favorably and just some laboratory works were left to identify the species. Different plant samples were gathered in their growing season during 2008-2009 and were identified. Identification was performed in two ways; using scientific references and local people's knowledge.

Along with the identification process, the information on traditional usage of plants was collected by direct field observations through a questionnaire-based field survey that, implemented to collect locals' folk knowledge. We use Indigenous knowledge of households and stockholders, which most of them are elderly and adult (between 40-60 years old – at advanced age). Actually, elderly people and healers have knowledge about the medical plants and their uses in healthcare. With their long experiences and practices, they have acquired rich knowledge about the utilization of plant resources in various ways (Gachhadar, 2006).

Also, those species which were not identified based on field works and local people's knowledge, were conveyed to herbarium of Isfahan University of Technology. During field sample gathering, photos were taken from the species, which were used for laboratory activities and identification. Sample recognition was done based on current ways and the identification clues and flora such as: Assadi *et al.* (1987), Mobayen (1973, 1984), Mozaffarian (1998), Rechinger (1963-2001). Also we were using other references in order to identify the medicinal plants such as; Zargari (1998), Zeinali *et al.* (2011) and Mozaffarian (2012).

3. Results

Results on the floristic diversity of the study area were categorized in family groups in table 1. Totally 129 species belonged to 84 genus and 34 families of medicinal plants were identified in the mentioned region. Except of few families which contain only one species and genus in this area, the majority of families have several species, but the local people are only using some of them. The percent of species in this area with plant family has been demonstrated in the below figure.

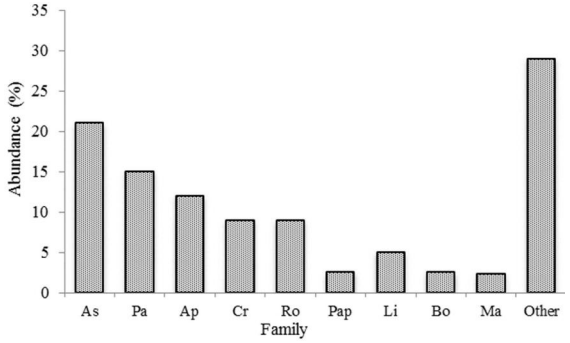

Fig 2. Medicinal plants Percentage in different families, which encompass the most consumption in the region. As= Astraceae, Pa= Papilionaceae, Ap= Apiaceae, Cr= Crucifereae, Ro=Rosaceae. Pap=Papaverceae, Li=Liliaceae, Bo=Boraginaceae. Ma= Malvaceae and Other including all other families.

Studies indicate that, there is a wide variety of medicinal plants in the region. Although the area is not huge, but medicinal plants have high percentage (more than 70 percent) of the total plants with diverse life forms, and one reason is the location of the zone (being echoton zoon). Actually study area is located on the border areas between steppe and semi-steppe. The total life forms of medicinal plants are revealed in fig.3 that, are classified based on Raunkiaer (1943).

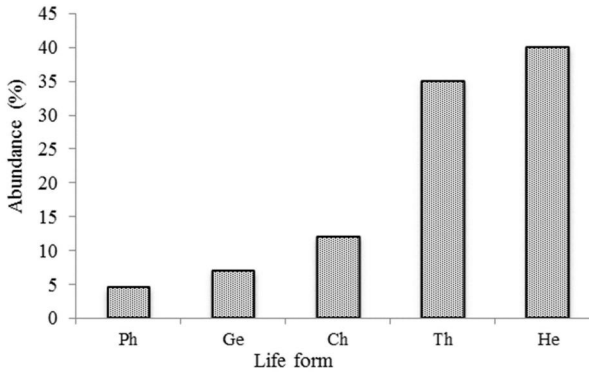

Fig 3. Percentage of different medicinal plants' life form in the region. Th= Therophytes, Ge= Geophytes, Ph= Phanerophytes, Ch= chamaephytes, He= hemicryptophytes.

Table1. List of medicinal plants species and some of their properties in the region

Scientific name	Family	Life form	Using by human (as medicinal plant)	Scientific name	Family	Life form	Using by human (as medicinal plant)
Acantholimon bracteatum	Plumbaginaceae	Ch	-	*Chenopodium album*	Chenopodiacea	Th	-
Acanthophyllum crassifolia	Caryophyllaceae	Ch	-	*Cirsium arvense*	Asteraceae	He	+
Achillea biebersteinii	Asteraceae	He	+	*Citrullus colocynthis*	Cucurbitaceae	He	-
Achillea filipendulina	Asteraceae	He	+	*Colchicum persicum*	Liliaceae	Ge	+
Acroptilon repens	Asteraceae	He	-	*Conringia orientalis*	Crucifereae	Th	-
Adonis aestivalis	Ranunculaceae	Th	-	*Consolida orientalis*	Ranunculaceae	Th	-
Aeluropus lagopoides	Gramineae	He	-	*Convolvulus arvensis*	Convolvulusaceae	Th	-
Agropyron intermedium	Gramineae	He	-	*Conyza canadensis*	Asteraceae	Th	-
Alhagi camelorum	Papilionaceae	He	+	*Cousinia bachtiarica*	Asteraceae	He	-
Allium heamanthoides	Liliaceae	Ge	-	*Cuscuta epithymum*	Cuscutaceae	Th	-
Allium tricoccum	Liliaceae	Ge	-	*Cynodon dactylon*	Gramineae	He	-
Alopecurus myosuroides	Gramineae	Ge	-	*Cyperus longus*	Cyperaceae	Ge	-
Alyssum desertorum	Crucifereae	Th	+	*Daphne mucronata*	Thymelaeaceae	Ph	-
Amygdalus orientalis	Rosaceae	Ph	+	*Datura inoxia*	Solanaceae	Th	-
Anabasis aphylla	Chenopodiacea	Ch	-	*Dianthus orientalis*	Caryophylaceae	Ch	-
Anthemia haussknechti	Asteraceae	Th	-	*Dittrichia graveolens*	Asteraceae	Th	-
Artemisia aucheri	Asteraceae	Ch	-	*Echinophora platyloba*	Apiaceae	He	+
Astragalus adscendens	Papilionaceae	Ch	+	*Echinops sp.*	Asteraceae	He	+
Astragalus gossypinus	Papilionaceae	Ch	+	*Ephedra strobilaceae*	Ephedraceae	Ph	-
Astragalus homosus	Papilionaceae	He	-	*Eremurus stenophyllus*	Liliaceae	He	-
Astragalus parrovianus	Papilionaceae	Ch	-	*Erodium cicutarium*	Geraniaceae	Ge	-
Astragalus scaphoides	Papilionaceae	He	-	*Eryngium bilardieri*	Apiaceae	He	+
Avena sativa	Gramineae	Th	-	*Euphorbia helioscopia*	Euphorbiaceae	He	-
Borago officinalis	Boraginaceae	Th	+	*Eurotia certoides*	Chenopodiacea	Ch	-
Capparis spinosa	Capparidaceae	He	+	*Ferula gumosa*	Apiaceae	He	-
Capsella bursa-pastoris	Crucifereae	Th	+	*Ferula ovina*	Apiaceae	He	+
Cardaria draba	Crucifereae	Th	+	*Glaucium flavum*	Papaveraceae	Th	+
Carthamus oxyacantha	Asteraceae	Th	+	*Glycyrrhiza glabra*	Papilionaceae	Th	+
Centaurea behen	Asteraceae	He	-	*Goldbachia laevigata*	Crucifereae	Th	+
Centaurea triumfettii	Asteraceae	He	-	*Grammosciadium platycarpum*	Apiaceae	He	-
Centaurea virgata	Asteraceae	He	-	*Gundelia tournefortii*	Asteraceae	He	+
Ceratocephalus falcatus	Ranunculaceae	Th	-	*Gypsophila bicolor*	Caryophylaceae	Th	-
Vulpia myuros	Gramineae	Th	-	*Helichrysum sp.*	Asteraceae	Th	-
Xanthium spinosum	Asteraceae	Th	-	*Ziziphora persica*	Labiateae	Th	+

Table 1. List of medicinal plants species in the region (continued)

Scientific name	Family	Life form	Using by human (as medicinal plant)	Family	Scientific name	Life form	Using by human (as medicinal plant)
Hertia angustifolia	Asteraceae	Ph	-	*Prangos ferulacea*	Apiaceae	He	-
Hymenocrater sp.	Labiateae	He	-	*Reseda luteouda*	Resedaceae	Ch	-
Hordeum leporinum	Gramineae	Th	-	*Rhamnus cathartica*	Rhamnaceae	Ph	+
Hyoscyamus niger	Solanaceae	Th	-	*Rheum ribes*	Polygonacea	He	+
Juncus inflexus	Juncaceae	Ch	-	*Rosa sp.*	Rosaceae	Ph	+
Lactuca serriola	Asteraceae	Ch	+	*Rosa persica*	Rosaceae	Ch	-
Lapsana apogonoides	Asteraceae	Th	-	*Rumex acetosa*	Polygonacea	He	+
Launaea spinosa	Asteraceae	He	-	*Sanguisorba minor*	Rosaceae	He	-
Iris aucheri	Iridaceae	Ge	-	*Sclerochloa durea*	Gramineae	He	-
Malva neglecta	Malvaceae	He	+	*Scorzonera sp.*	Asteraceae	Th	-
Marrubium vulgare	Labiateae	He	-	*Senecio vulgaris*	Asteraceae	Th	-
Medicago sativa	Papilionaceae	He	+	*Serratula latifolia*	Asteraceae	He	-
Melilotus albus	Papilionaceae	He	+	*Silene stenophylla*	Caryophylaceae	Th	-
Menta longifolia	Labiateae	He	+	*Silybum marianum*	Asteraceae	He	+
Muscari racemosum	Liliaceae	Ge	+	*Sisymbrium irio*	Crucifereae	Th	-
Noaea mucronata	Chenopodiacea	Ch	-	*Sisymbrium officinale*	Crucifereae	Th	-
Onobrychis cornuta	Papilionaceae	He	-	*Solanom luteum*	Solanaceae	Th	-
Onobrychis sativa	Papilionaceae	He	-	*Sonchus asper*	Asteraceae	Th	-
Onopordum acanthium	Asteraceae	He	-	*Sophora aleupecuroides*	Papilionaceae	Th	-
Ornitagalum umbllatum	Liliaceae	Ge	-	*Stachys byzantina*	Labiateae	He	+
Orobanch alba	Orobanchaceae	Ge	-	*Stachys inflata*	Labiateae	He	+
Papaver rhoeas	Papaveraceae	Th	+	*Stachys lavandulaefolia*	Labiateae	He	+
Parietaria judaica	Urticaceae	He	-	*Tamarix ramosisima*	Tamaricaceae	Ph	-
Peganum harmala	Zygophyllacea	He	+	*Taraxacum montanum*	Asteraceae	He	-
Phleum pratense	Gramineae	He	-	*Taraxacum officinale*	Asteraceae	He	-
Phlomis persica	Labiateae	He	-	*Thymus kotschyanus*	Labiateae	He	+
Phlomis rigida	Labiateae	He	-	*Tragopogon sp.*	Asteraceae	He	+
Pimpinella anisum	Apiaceae	Th	+	*Tragopogon pratensis*	Asteraceae	He	+
Plantago sp.	Plantaginaceae	Th	+	*Tribulus terrestris*	Zygophyllacea	Th	+
Plantago sp.	Plantaginaceae	Th	+	*Tulipa montana*	Liliaceae	Ge	-
Portulaca oleracea	Portulaceae	Th	+	*Verbascum spesiosum*	Scropholariaceae	He	-
Viola tricolor	Violaceae	Th	-	*Descuraina sophia*	Crucifereae	Th	+

*: These plants are used as medicinal plants by local people in order to cure some disease. **-:** These plants have not been used by local people as medicinal plants, because they don't know anything about them, and their knowledge is limited about them. Life form: Th= Therophytes, Ge= geophytes, Ph= phanerophytes, Ch= chamaephytes and He= hemicryptophytes.

4. Discussion and Conclusion

There are a large number of medicinal plant types and life forms in the study area and local people do not use their whole part, one of the interesting findings of the present study was that the people of the studied areas have remarkable detailed knowledge of species identification and use the plant resources to treat wide range of physical ailments, but some plants such as *Allium heamanthoides* and *Stachys lavandulaefolia* has been over used. Some species such as: *Gundelia tournefortii, Borago officinalis, Achillea biebersteinii, Descuraina Sophia* are the most known and acclaimed species belonging to Asteraceae family, which are used by local people (Table 1). Among all plant life forms, hemicryptophytes includes the most common species which are biennial, and covered by snow often in winter season, and Phanerophytes form has the less species (Fig 3). This is so important to their utilization and conservation time and practices. Considering the tendency of inclining global interest in medicinal plants, and global health (Franz, 1993), it is essential to identify medicinal plants and their characteristics in any region. Many of these plants were in various climates and tropical steppe areas, and have been used by human beings. This is very necessary to use and protect them properly (Dhar *et al*., 2000). Pasture utilization and conservation of medicinal plants should be done beside each other. Knowledge and identification is the initial step to use the medicinal plants in any region. Also indigenous knowledge must be combined with new knowledge to identify the compounds of medicinal plants and their advantages and disadvantages, because the efficacy of any plant as medicine cannot be determined through guessing (Nwachukwu *et al.,* 2010). In this area (Ghasem Abad rangeland), local people use few plants as medicine (34 percent of all existence medicinal plants) because

they do not have adequate and sufficient knowledge, and new instruments for exploitation and processing medicinal plants. Ajero and Mbagwu (2005) reported how traditional herbalists use medicinal plants instead of pills; they use powerful medication instead of injection and applying incision. Despite of the acknowledged importance of medicinal plants in Ezinihitte Mbaise Local Area, the application of medicinal plants to heal problems are still generally unknown, poorly organized and regulated while most of them are being exploited with little or no regarded to the future (Emereonye, 2007). Also in similar study, Leto *et al.* (2013) reported that only very few medicinal uses are widely known by all the informants, and on many occasions, a specific medicinal use was cited by only some people. Further studies is required in order to find out to what extent knowledge on the medicinal use of plants are still present in the younger generations in this area, and what methods might be adopted in order to halt this gradual loss in knowledge. Furthermore, agricultural and anthropogenic activities have resulted in loss of biodiversity and even extinction of some useful species in natural areas (Nwachukwu *et al.,* 2010).

However utilization and consumption should be done based on ecological principles to ensure sustainability and conservation of the resources, according to following tips (Emereonye, 2007): Non-destructive harvesting; Setting aside, reserved areas and cultivation of botanical gardens; Conservation and recovery of threatened medicinal plant species; Introduction of new species into cultivation to take the pressured off wild species population; Establishment of conservation stock and collection of seeds or other propagators for propagation; Proper management of the populations of endemic species to maintain their demographic integrity and genetic variability to make ethnic people aware of the importance of medicinal plant conservation and their usages. Some consultation meetings were conducted. Because some medicinal plants may be over used, in undesired and destructive conditions, this is vital to identify their ecological needs, and propagation. The feasibility of cultivating medicinal plants depends on local beliefs and capabilities, which may vary from one area to another, the ease of cultivating these species, and the economic potential of those that can be cultivated (Keirungi and Fabricius, 2005).

In the study area (Ghasem Abad rangeland), Medicinal plants are harvested and consumed only based on folk knowledge. Anthropogenic activity, however, imposes a negative impact on the natural habitats of many plant species (Panghal *et al.,* 2010). Thus, some species are heavily utilized, and some others are thoroughly out of use. Plants and especially medicinal plants should be utilized based on ecological principals. Therefore, scientific identification of medicinal plants could be helpful for people in local community for better and more sustainable utilization. Also Utilization of all medicinal plants according to their production potential and their various uses can be effective on economy of local people, also on plant health, and it had better be performed in similar communities.

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