



## Conservation of Saudi Arabian flora for their medicinal uses

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### Abstract

Kingdom of Saudi Arabia (KSA) had vast diversity of medicinal plants in which many are endemic to the region. However, the conservation state of such important resources has been evaluated using different sources of information in which some medicinally important families were seen to be on a Red alert of the International Union of Conservation of Nature (IUCN). Some members of the family *Euphorbiaceae* has been marked as vulnerable while genus *Draceana* in the family *Asparagaceae* was marked endangered. Authorities have made significant efforts towards conservation medicinal plants, overgrazing of forest reserves affects the diversity of flora, as such there is need for an integrated effort to protect national reserves, rangelands and marine protected areas, which in many cases proven to be effective conservation tools. Also more proactive measures are needed to protect and manage forest reserves and mangrove ecosystems in the Kingdom.

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## Introduction

The link between natural resource dependence and internal conflict has been approached from a variety of angles in a large and growing interdisciplinary literature. There is a need for managing numerous natural resources in the Kingdom of Saudi Arabia (KSA) to assure their sustainability. Medicinal plants are very important parts of human Life. Every Society or nation depends largely on its own available natural resources. Climate change coupled with the world economic crises put more pressure on those resources and as such made medicinal plants the best option if fully utilized. Saudi Arabia is blessed with rich diversity of flora some of which are endemic to the region in the whole world; it is important to make effective utilization of this floral diversity by proper management practices through science and technology. Another merit of conservations of floral diversity in Saudi Arabia includes reducing the cost of budgeting in healthcare sector and boosting of revenue when properly utilized.

Medicinal plants are valuable to the sustainable healthcare system and ease of accessibility to the rural populace. Forest is the main reservoir of medicinal plants which is under intense pressure as a result of climate change mainly caused by human anthropogenic activities usually as a result of disturbances in an ecological balance like water, temperature, drought, desertification etc. Most diseases of man are known to be cured by traditional medicines for centuries as old as human civilization (Kumar *et al.*, 2016). Kingdom of Saudi Arabia is a region with rich in many medicinal plants which are under serious pressure of climate change and desertification due to fast growing population and economic development. These has causes a lot of harm to the plant diversity and the forest reserve in general. Increasing population pressure, over exploitation, introduction of exotic species, wild fire, development of roads network etc. are the main reasons for endangerment of medicinal plants which need to be protected and conserved. In Saudi Arabia about 51% of its total flora are said to be of medicinal importance and there is need for proper for their

economic values. This traditional knowledge need to be fully passed through many generations. Many of the important medicinal plant species have been threatened and some of them are nearly going to extinction due to wrong scientific collection by untrained personnel. Recently, medicinal plants have become famous not only in developing countries but also in developed countries due to health consequences of orthodox medicine such as side effects of synthetic drugs and potential carcinogen. In view of the aforementioned reasons, there is need to conserve and propagate medicinal plants specie in order to save and protect them from extinction in order to ensure there sustainability for future generations. Therefore in this review we evaluate the conservation status of Saudi Arabian flora of medicinal importance and some of the factors affecting their conservation and management.

### *Biodiversity of Saudi Arabian Flora*

Saudi Arabian floras are composing of wide varieties of plant species; their unique ecosystems also make its plants species very unique in morphology and genetically as well. Saudi Arabian flora constitutes about 2282 specie in 855 genera out of which are Pteridophyta (27) and Gymnosperms (9). There are 131 documented families in the Kingdom, with about 33 Families which are represented by a single species each. According to Collenete 1998 vast majority of medicinal plants are located in Asir and Hijaz Areas of the western mountainous area of Saudi Arabia near the Red sea; which is as a result of the ecosystem of the area that has high amount rainfall and altitude. An estimated 2250sp (in 142 families) has been documented in Saudi Arabian Flora.

In which 242 are endemic in the Kingdom and 600 as rare and endangered species; as such there is a need for conservation and harnessing such precious resources endowed by nature. Al-yahya 1984 also stated that the Arabian Peninsula is a den of medicinal plants and folk medicine which has been originated many years ago. Mossa *et al* 1987 also stated that the kingdom of Saudi Arabia constitute diverse flora which include many medicinal herbs, shrubs and trees.

Flora of Saudi Arabia consist two of the eight famous global terrestrial realms; Palaeartic (Europe and Asia) and Afro-tropical (Africa and South sahara) alongside indo-malayan terrestrial realm. Based on vegetation and climate, KSA has been categorized into 24 ecosystems (Ahmed and Ghazanfar, 1991).

#### *Conservation Status of Saudi Arabian Medicinal Plants*

Saudi Arabian Kingdom had made an effort to improve the use of traditional medicine with the emergence of strategic plan on how to harness and regulate traditional medicinal plants that may lead to in a possibility of having complementary or alternative medicine being incorporated in a national policy. This step followed by the implementation of committee on alternative medicine in 1995 by the Saudi Arabian Ministry of health which was stride by partnering with the National institute on herbal medicine in order to easily achieve its objectives successfully.

Although there is a need for more efforts, plants conservation in Saudi Arabian has been given much attention. According to National Commission for Wildlife Conservation and Development Saudi Arabia NCWCD, 2006, there are two major areas where plants of serious conservation thetasexist; basically in Riyadh small one with a parameter of 9km<sup>2</sup> at the south-western mountains with 22 sp and Farsan Islands with 17 sp; hence it's clear that 39 sp of Endemic flora are receiving good conservation policy in Saudi Arabia. Abundance and richness of plant species data had revealed currently 13 areas are protected by the authorities in the Kingdom. For example at the King Khalid Wildlife Research Centre, and moreover the protected areas constitute about 60% of the total Saudi Arabian Flora.

Floral diversity has been very important aspect of environment and mankind. Saudi Arabia Kingdom like any other nations had a long history of using plants for medicinal purpose leading to the knowledge being passed through generations since ancient time (Sher H *et al.*, 2012). This methods had continued even during the time of the prophet peace

be upon him 571-632 (Aati *et al.*, 2019). This is popularly known as prophetic medicine (*Al ibb al-Nabawi*), as coined by ibnQayyim Al-jawziyyah (3). However many progress have been made by the muslims of that time among which are the categorizing the knowledge based on different school of thoughts, despite being traditional system the system has helped a lot in solving medical issues and treatment of diseases on that time. Plants such as Garlic (*Allium Sativum*), Black seeds (*Nigella sativum*), henna (*Lawsoniainermis*), Ginger (*Zingiber Sp*) had been used for medicinal purposes in Saudi Arabian Kingdom. Saudi Arabian Kingdom is about 2250000 KM<sup>2</sup> in Arabian peninsula. Its characterized by mountains, lava, deserts forests and meadows. The climate of Saudi Arabia is Unique in between tropical and temperate. Annual Rainfall was about 59mm/ year, which isnot constant in terms of its quantity and distribution.

The unique nature of the Kindom's climate makes the flora very unique and diverse. This is discovered for the first time in 1974 (7), Mossa *et al* also in his write up contributed in the Saudi Arabian flora titled 'Medicinal plants of Saudi Arabia'. These plants are parts of the cultural heritage and economy and Agriculture of the Kingdom of Saudi Arabia. Conservation of Floral diversity in Saudi Arabia is very significant for National development. Rapid increase in human population in the Middle Eastern region in general had exerted a lot of pressure on the plant biodiversity. Factors such as demand for food causes over use of Land which may leads to poor productivity and water scarcity. Overgrazing of protected areas which affects the population of wild plant flora. Plant diversity is important tools to guide us on how to solve these problems, for sustainable environmental development and future decision making.

#### *Destruction of Habitat*

Changing natural habitats of an organism has devastating effects on the diversity and specie composition. Human activities is the main factor in this process through pollution, mining of natural resources or as a result of management techniques

which can alter recycling process. For example irrigation practices, addition of fertilizers, modern farming system, addition of pesticides and fertilizers which hinders biological process in soil microbes (Abdel Khalik *et al.*, 2013).

*Economic Growth*

Saudi Arabian Fastest Economic Growth has been a challenging issue of Plant Biodiversity and conservation

concern. An increasing rate of GDP results in an increase demand of natural resources and over exploitations.

This may be seen as threat to the forest conservation and sustainability. One of these activities include the development of infrastructures such as Industries, Roads, artificial cities, shopping malls, stadia and many recreational spots for social attractions which lead to the loss of biodiversity in the affected natural ecosystems.

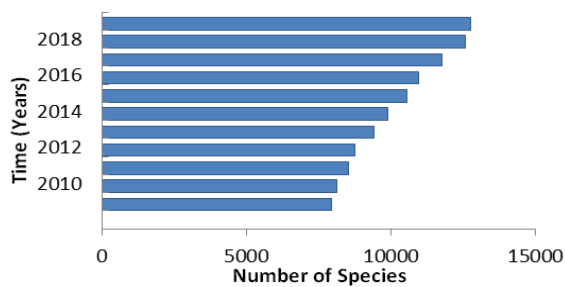
**Table 1.** Summary of Medicinal plants in Saudi Arabia and their conservation status.

Family	Total Number species	Known Medicinal speceis	Endemic to KSA	Conservation status(Rare and endangered)	Shrubs	Trees	Herbs
Apoceanaceae	8	5	1	4	-	1	2
Amarantheceae	21	7	-	4	2	-	7
Cappariceae	29	12	4	4	9	-	3
Euporbiaceae	65	20	2	11	5	-	15
Labiataeae	76	23	3	15	9	-	14
Solanaceae	33	12	-	7	3	-	9
Acantheceae	30	4	-	11	2	4	7
Polygonaceae	23	7	3	4	2	-	5
Total	255	86	13	49	30	1	55

**Table 2.** Threatened Plant Species Listed in the 2003 IUCN Red List of Threatened Species in KSA.

Species	IUCN Category
<i>Acacia</i>	LR/nt
<i>pachycerasvarnajdensis</i>	
<i>Dracaena ombet</i>	EN A1cd
<i>Dracaena serrulata</i>	EN A1abcd
<i>Euphorbia ammak</i>	VU A1c
<i>Juniperusprocera</i>	LR/nt

Source: IUCN 2003: IUCN Red List of Threatened Species.



**Fig. 1.** Number of threatened Floral Species According to IUCN red list 2009-2019.

Source: IUCN Red List 2019.

*Environmental Contamination*

An environmental contamination results in many adverse effects on habitat which may pose serious threats to plants species richness and survival.

Problems such as air pollution as a result of burning of fossils fuels in the Kingdom of Saudi Arabia, also due to industrialization which also releases many greenhouse gases which results in the drastic decline in forest productivity due to stress.

Carbon dioxide (CO<sub>2</sub>) emission mainly originated from utilization of coal was among the major sources of the pollutants (Greenhouse gases) which lead to global climate change. In Saudi Arabia, CO<sub>2</sub> amounts to 64.2% (World Bank, 2014).

*Introduction of exotic species*

KSA had a wide variety of non-native or exotic species in recent years. Most of which were brought in intentionally by humans as a result of their medicinal, ornamental, erosion control, landscaping purpose, or economic values or as a result of seed dispersal by animals, wind or water. About forty eight (48) species of exotic plants have been recorded in the Kingdom of Saudi Arabia most of which were traced from America .these has pose a serious threat to native species. For example, *Argementochroleluca*, *Nirotianaaglauca*, *opuliadellenii*, *O ficusindica*, *prospisjulifora* and *Trianthemaportulacastrum*were all exotic species.

## Conclusion

Competition for Land between man and other creatures had been a major problem in Plant biodiversity. Population of rural populace is spontaneously increasing overtime, as such more food, water and space competitions are highly intense which lead to increase in the infrastructural developments which means destruction of natural ecosystems, consumption of space and reduce the number of plant populations. Marine protected areas have proven in many cases to be effective conservation tools, as such there is a need for more proactive measures and policies to address the situation for better environmental sustainability. Also the need for public awareness by the groups and individuals about the importance of protecting natural ecosystem as a wealth endowed to them by the nature, as well as the mangrove ecosystem. A better conservation management strategy is needed that will address the current challenges to safeguard, restore and protect abundant natural habitat in the border landscape. Conservation planning should also consider addition of more national forest reserves and also a strategy that will require private contract with private land for ecosystem services. An effective national conservation plan also needed.

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## References

**AbdelKhalik K, El-Sheikh M, El-Aidarous A.** 2013. Floristic diversity and vegetation analysis of Wadi Al-Noman, Mecca, Saudi Arabia. *Turkish Journal of Botany* **37**, 894-907.

**Ahmad H, Ghazanfar SA.** 1991. Conservation of medicinal plants on the Arabian Peninsula two case studies (*Salvadora persica* and *Glycyrrhiza glabra* var. *glandulifera*). *Med. Plant Conserv* **3**, 15-16.

**Al-Yahya M.** 1984. Kuwait: Proc III. International Conference on Islamic Medicine. proceeding p.23.

**Collenette S.** 1998. Checklist of Botanical species in Saudi Arabia. West Sussex (UK) International Asclepiad Society 1998. p. 78.

**IUCN.** 2018. International Union for Conservation of Nature Red List of Threatened species. Version 2017-3. Available from <http://www.iucnredlist.org> [Accessed 28 April 2019].

**Jacob T.** 2019. Plant Diversity of Saudi Arabia. Retrieved from <http://www.plantdiversityofsaudi-arabia.info> accessed 28 April 2019

**Kumar A, Jnanesha AC.** 2016 Conservation of Rare and Endangered Plant species For Medicinal Use. *International Journal of Science and Research* **5**, 12-16.

**Lopez-puj L, Zhang F, Ge S.** 2006. Plant Biodiversity in China: richly varied, Endangered, and in need of conservation. *Biodiversity and Conservation* **5**, 3983-4026.

**Mossa J.** Al-Yahya M A, Al-Meshal I A. 1978 Medicinal plants of Saudi Arabia. Riyadh: King Saud University Press 234.

**National Commission for Wildlife Conservation and Development.** 2006. The Management plan for conservation of Juniper Woodland. Technical Report submitted to NCWC, pp. 1-141.

**Sher H, Alyemeni M, Khan A R, Sabir A.** 2011. Assessment of Local Management Practices on the population Ecology of Some Medicinal Plants in the Coniferous Forest of Northern Parts of Pakistan. *Scientific Research and Essays* **7(16)**, pp. 1639-1646.

**World Bank.** 2014 Reports on World Development Indicators, Retrieved at <https://databank.worldbank.org/data/reports.aspx?source=2&series=EGUSE.ELE.C.KH.PC&country=SAU>.