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Increasing anthropogenic impacts on restricted-range taxa of Libya from 2011 to 2015

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ABSTRACT

Since many years ago, the vegetation in EL-Gabal EL-Akhdar area in Libya exposed to pressure caused by different factors like physical and anthropogenic factors. During last four years the impact of human activities increased rapidly. This led to decreasing the vegetation and influenced the vegetation dynamics and vegetation composition. A number of plant species which described as restricted-range taxa, especially shrubs and trees, like Arbutus pavarii, Cupressussempervirens and others became more endangered. Increasing the human activities from 2011 to 2015 and their effects on vegetation was explained due to the absence of authorities.

Key words: Libya; Vegetation composition; Endemic; Human impacts; land abuse.

INTRODUCTION

Restricted-range taxa is a general term can be used to describe different plant species which distributed in very narrow range. Some of these species are exposed to threats caused by human activities or climatic factors, while these species are rare, threatened or endemic.

The Libyan Flora has around 1800 plant taxa; 4% of them are endemic [11]. Thus, rare, threatened and endemicplants in this country are often restricted to anthropogenically disturbed sites including fire, overgrazing, agricultural expansion, urbanization...etc. [8]and/or climatic changes.

Libya lies in north Africa along the southern coast of the Mediterranean between latitude 18° and 33° North and 9° and 25° East with around 2000 Kilometer of coastal strip and it covers an area of about 1,759,540 km². The human population is about 5.8 million inhabitants (Figure 1). The Sahara characteristics form the large area of this country (more than 90% are desert), but some regions reflect the characteristics of the Mediterranean basin in the coastal regions. The climate characterized by distinctive rainfall in winter with high temperature patterns in summer and long drought period. This type of climate is the limitation factor which responsible about the vegetation cover and composition in the area(Figure 2). Even though this area expose to climatic changes, but, currently, there is no enough published data of impacts of climate change on regional floras. On the other hand, increasing the effect of human impacts was clear noticed. These effects were according to increasing anthropogenic activities in different ecoregions.

In the east part of Libya, especially El-Gabal El-Akhdar area, where the most plant species of Libyan flora are occurred, the effect is increased by a number of times compared to years before 2010. The main threats to this ecoregion are all associated with the removal of vegetation. Thus, different scenarios must take in account to avoid more disturbed and to find suit programs to protect thevegetation and flora from like these factors whichcould severely damage the native communities, and endanger many of the restricted-range taxa of the area. In this paper, we tried to shade some light and focus on some human factors and there effects during 2011-2015.



Figure 1: The study areawhichis located in the eastern part of Libya and surrounding by Mediterranean from three directions and appears as isolated area





Figure 2; The vegetation of EL-Gabal EL-Akhdar area which consists of the maquisvegetation that extends across theupper terrace. The interior areas are characterized with annual vegetation. Upper photo reveals the vegetation in rainy season(winter), while the lower photo reflects the effect of drought period on vegetation during summer season. Note the interior areas with arrows

MATERIALS AND METHODS

The study area is located in the north eastern part of Libya. The Climate of the area characterized by a long dry season and a short wet season. The highest rain falls are mostly during December and January with a total between 200 to up 600 ml/year depending on the elevation above the sea level. Therefore, the area was classified as arid and semi-arid region.

The study area expanded between El-Bakor rode(which far around 65 km from eastern borders of Benghazi city) to the end of Rassalhilal village. The notes and observations of human activities were noticed among the road side vegetation and recorded. The previous studies were used to draw enough picture about the situation of vegetation damage in the area during last four years.

RESULTS AND DISCUSSION

Presently, from field observations of the known populations which occurred along roadsides, it appears that the plant communities are being severely affected. This reveals direct correlation between exposing the area to human impacts and the vegetation composition. This agreed with previous studies those have also shown that the impacts were increased [4,5,6,8,9]. The relationbetween vegetation cover or composition and its dynamics is defined as the change in vegetation with time according to an appropriate scale of abundance of species[1].

El-Gabal El-Akhder is one of important ecological regions in Libya. Floristically, and according to its climatic factors especially rain falls, it is therichest region of all the phytogeographical regions of Libya. The plant species recorded in Libya were approximately 1800 plantsdistributed in 744 genera and 118 plant families. Around 50% of this total are occurred in El-Gabal El-Akhder region[11].

About 84 endemic species are recorded in the Libyan flora, approximately a bulk of 70 % of them are found in El-Gabal El-Akhderregion(about 59 endemic species) [11].El-Darier and El-Mogaspi[4]mentionedthat the total number of endemic species surveyed in the region was 44 species, belonging to 28 families. Some of these plants have economic importance such as honey production [6], or folk medicinal use [5,8].Thus, the number of plant collectors using illegal methods was increased and subsequently, rare and endemic species like *Arbutus pavarii*, *Arumcyrenaicum, Centaureacyrenaica, Crocus boullosii, Cupressussempervirens, Cyclamen rohlfsianum*, and *Cynara Cyrenaica*were become more threated.

The study reveals that the type of land use is one of the main factorswhich could be used as an indication to identify the vegetation damage. Clearly, as shown in figure 3, using the land for agricultural production was expanded. Even though trees and shrubs of some species were not completely affected, but annuals which form the huge bulk of the

flora influenced largely. The vegetation composition can be determined from the seed bank [3]. Seed bank of the soil might come from the plant of previous season or dispersal from outside the area. While production of cereals like wheat, which is depending on rainfalls, products damage of annual seedlings of natural vegetation, in addition, loss seed bank of these plant species during earth preparing processes.



Figure 3; Removing the natural vegetation and replace it by cereal crops like wheat. The influence of agricultural expansion and land abuse by cultivation

Upon some visits and field observation, it was noticed that a combination of fires in 2013 burned a huge number of hectares of land inRaasalhelal, where the eastern part of the study area, and in other parts ofEl-Gabal EL-Akhdar(Figure4). In Raasalhelal, the fire damaged around 2100 Hectares in 1993 and this led to disappearing wild forests which consist of large number of wild taxa like *Oleaeuropea, Juniperusphoenica, Pestacialentiscus, Rhus tripartite, Ceratoniasiliqua* Arbutus pavarii. [8].



Figure 4; The effect of fire factor on vegetation of RassElhilal. Note the regeneration of new pods of Arbutus pavarii

Officially, the reasons behind the present fires are not clear enough because of lack of information and investigations about. But some localities think this caused by some "owners", in the absence of authorities and abundance of weapons, to find out more free area of plants for buildings, farms, and other financial projects. The

communities of *Arbutus pavarii, Oleaeuropea, Juniperusphoenica* (which form the climax community of plants of El-Gabal EL-Akhdar) were found more influenced(Figure4 and 5).

Due to heavy pressure caused by overgrazing, woodcutting, agricultural expansion, plant collection and the effect of fire, a number of plants such as *Arbutus pavarii*, *Quercuscoccifera*, *Rosmarinusofficinalis* and others are not only endangered; but alsounder threat of extinction.

Because understanding the factors behind the changes of vegetation and its dynamics is very important to get any outcomes from conservationprograms [10]. And also species composition regarded as an indicator ofecological and management process at a site, quick and fast methods to prevent or stop this tragedian damage must take seriously in account, and based on these results we supposed and recommended the following:

1. Developing of national and new policies to protect plants and forests from overgrazing, fire, land abuse, illegal plant collection, urbanization...etc.

2. Encourage researchers for more survey and studies about vegetation and flora in the area using advanced methods.

3. Establishment of seed bank for all plant species in Libya, replant the new seedlings in their natural habitat and focusing on conservation programs to protect endemic and rare plants.

4. Using sustainable development in future projects.



Figure 5; The influence of plant community by fire factor. Note the ability of some plants to regenerate their selves, while *Juniperusphoenica* plants affected more than other species and were completely damaged



Figure 6; Overgrazing on vegetation of EL-Gabal AL-Akhdar. The goats, which form the largest livestock in the area and its clear effect on plant communities

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