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Disturbance of flora and vegetation composition of Libya by human impacts: Costal Region of Al-Jabal Al-Akhdar area as model

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ABSTRACT

The human impacts and their effects on plant vegetation and biodiversity became a field of major interest in the last few years. many of human activities occurred in AL-jabal AL-akhdar area as result of increase of development activities and growth of population. The present investigation was carried out to study the flora and vegetation composition of coastal region of AL-jabal AL-akhdar area and the effects of human impacts on the vegetation composition. The results showed that 104 plant species belonging to 37 families were found. On the family level, both Fabaceae and Asteraceae were the major plant families in the area with 16 and 15 species, respectively. The annuals form the huge number of the plants(64.4%), while other life forms of the biological spectrum appeared in different percentages. Negative interactions between human activities (land abuse, charcoal burning, overgrazing…etc.) and vegetation were noticed among the study site. We discussed the relationship between flora and vegetation composition and the role of human activity which cause disturbance for the vegetation cover of the study area.

Key words: Human impacts; Vegetation composition; Life form; Libya.

INTRODUCTION

During last decades, the human activities and their impacts, which behind the disturbance on the flora and vegetation composition, were clearly observed and noticed. A number of studies showed that the human activities have greatly impacted the composition and diversity of terrestrial plants, in addition other factors like climatic conditions[4], [5], [8], [9] and[14]. The effects of environmental change on species composition, diversity and ecosystem functioning are poorly understood. Thus, further investigations are needed to understand how disturbance(natural and human)influences species diversity[12]. This might help to answer the questions addressed in this field.

Due to its flora, vegetation cover, biodiversity, climate and ecological importance, AL-Jabal AL_Akhdar area(North-eastern part of Libya)was studied in the early of 1900's by a number of Italian researchers. Recently, some surveys were done by local researchers. But the information and published data are still little. AL-Jabal AL_Akhdar is located in the north eastern part of Libya between latitude of (30° N) and (33° N), and extends for distance of about 250 km(Fig. 1). The vegetation and flora of AL-Jabal AL_Akhdar consists of a number of plant species which have different life forms with different strategies to avoid or escape from extreme climatic factors, especially the long drought period with high temperature in summer[2], [5].

In this present study, we aim to assess the flora and vegetation composition of the west part of AL-Jabal AL_Akhdar area. And to find out to what extent they impacted by human factors.

MATERIALS AND METHODS

The study site: Because of its variability, topography and diversity, the study site has been chosen to be in coastal region of the west part of AL-Jabal AL-Akhdar area, which far around 75 Km from the eastern borders of Benghazi city. Line transect method was used. The transect was divided into four sectors(A,B,C and D), where changes taking place along the line. It was started from the beach and ended by the mountain(Figure 2).

The climatic patterns are characterized by excessive heat in summer and variable precipitation in winter; however, the high temperature is recording between May and September(Figure3). Whereas, the rain fall occur between October and February(Figure4). In general, this contrasts the Mediterranean climatic conditions, which have the long period of drought in the study site, and that affect the flora and vegetation composition.

Plant sampling and collection: to collect the whole plant species occurred in the area at different stages, and according to its climatic conditions, many visits to the study site after rainfall were made in different times and seasons. This can make easy identification process, when samples compare to those of the herbarium. Plants were collected along the transect and observations about the vegetation, species and habitat, human activities and their impacts were noticed and recorded. The plant samples were identified using the Libyan flora and compared with samples in the Cyrenaica Herbarium, Faculty of Science, Department of Botany, University of Benghazi.

RESULTS

This study showed that(104) plant species related to(37)plant families were collected from the study area(Table1). The bulk number of collected and recorded species are herbs. The number of species was varied among the families. On family level, the floristic composition shows a high amount of the family Fabaceae(16 species) and Asteraceae (15 species), respectively. While other families appeared with different number varied from one to five species(Table1). The collections in sector(A) and(B) consists of a little number of plants. The huge number of collections(annuals), were appeared in sector (C) especially in the end of the sector, where the beginning of the mountain. The sector(D) showed that the most vegetation plant species were perennials those belong to maquis community which consists of *Jouneperous phoneciana, Pistacia lentiscus, Rhus tribirtata* and *Arbutus pavarii.* The species *Sarcopoterium spinosum* was widely observed in the cultivated parts of the study area and. Moreover, the parasitic species *Cuscuta campestris* was found in the study site .

Table 1: Number of species per each family at the study site. The number of families was 37 with 104 plant species. The results showed that both *Fabaceae* and *Asteraceae* are more distributed and had the huge number of species than other families, while others occurred with different numbers of species

Family	No. of species	Family	No. of species
Aizoaceae	1	*Iridaceae*	1
Alliaceae	4	*Lamiaceae*	5
Anacardiaceae	3	*Liliaceae*	5
Apiaceae	3	*Malvaceae*	2
Araceae	2	*Orobanchaceae*	1
Asteraceae	15	*Papaveraceae*	2
Boraginaceae	5	*Plantaginaceae*	3
Brassicaceae	4	*Plumbaginaceae*	2
Caryophllaceae	2	*Poaceae*	2
Chenopodiaceae	1	*Primulaceae*	2
Crassulaceae	1	*Ranunculaceae*	1
Cucurbitaceae	1	*Resedaceae*	1
Cupressaceae	1	*Rosaceae*	1
Cuscutaceae	1	*Ruppiaceae*	2
Dipsacaceae	1	*Scrophuloriaceae*	1
Ericaceae	1	*Valerianaceae*	2
Euphrbiaceae	2	*Violaceae*	1
Fabaceae	16	*Zygophyllaceae*	1
Geraniaceae	5		

The results showed also that the main life form of collected plants was annuals(Figure 5). The biological spectrum showed significant dominance of therophytes (64.4%) followed in percentage by chamephytes(15.38%), cryptophytes (14.4%), phanerophytes (4.8%). Finally, The hemicryptophytes reflected their occurrences only by one plant species(0.96%)(Figure 5).

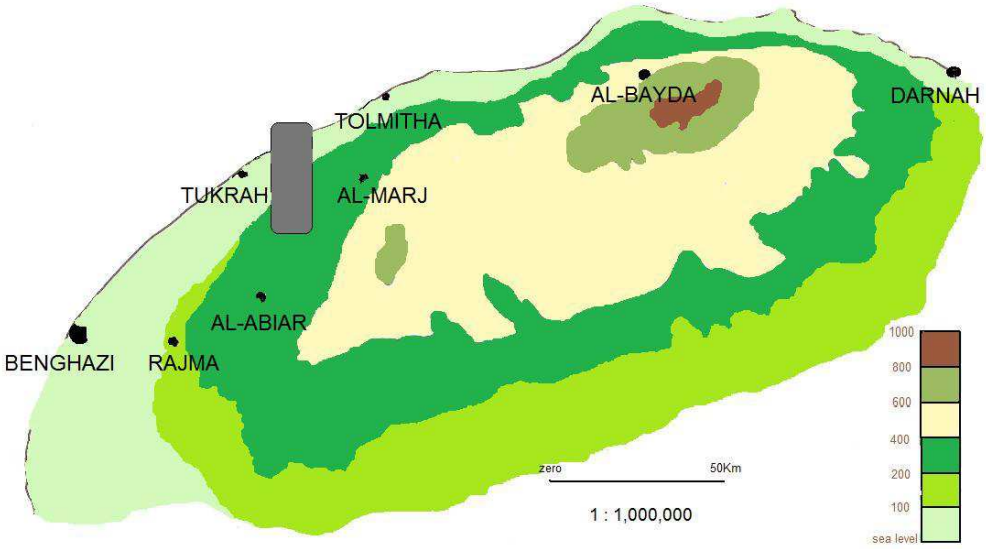

Figure 1: The location of study area(the gray) which far around 75 Km from the eastern borders from Benghazi city. The colors on the map reflect the altitude from the sea level

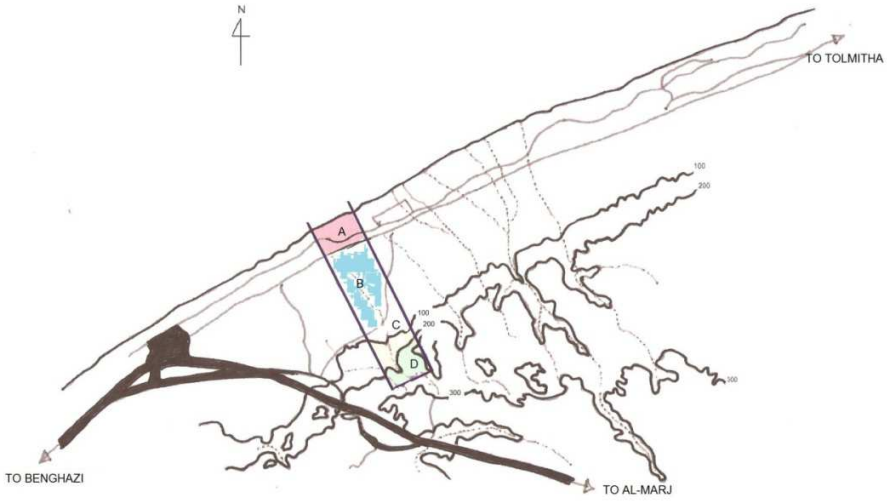

Figure 2: The transect line of the study site which divided into four sectors(A.B.C and D). the transect started from the beach until the road(A); the long sector that, contains a number of farms and appeared negative landuse was(B). while (C) was made on the first edge of the mountain. The last sector(D) was on the top of the mountain

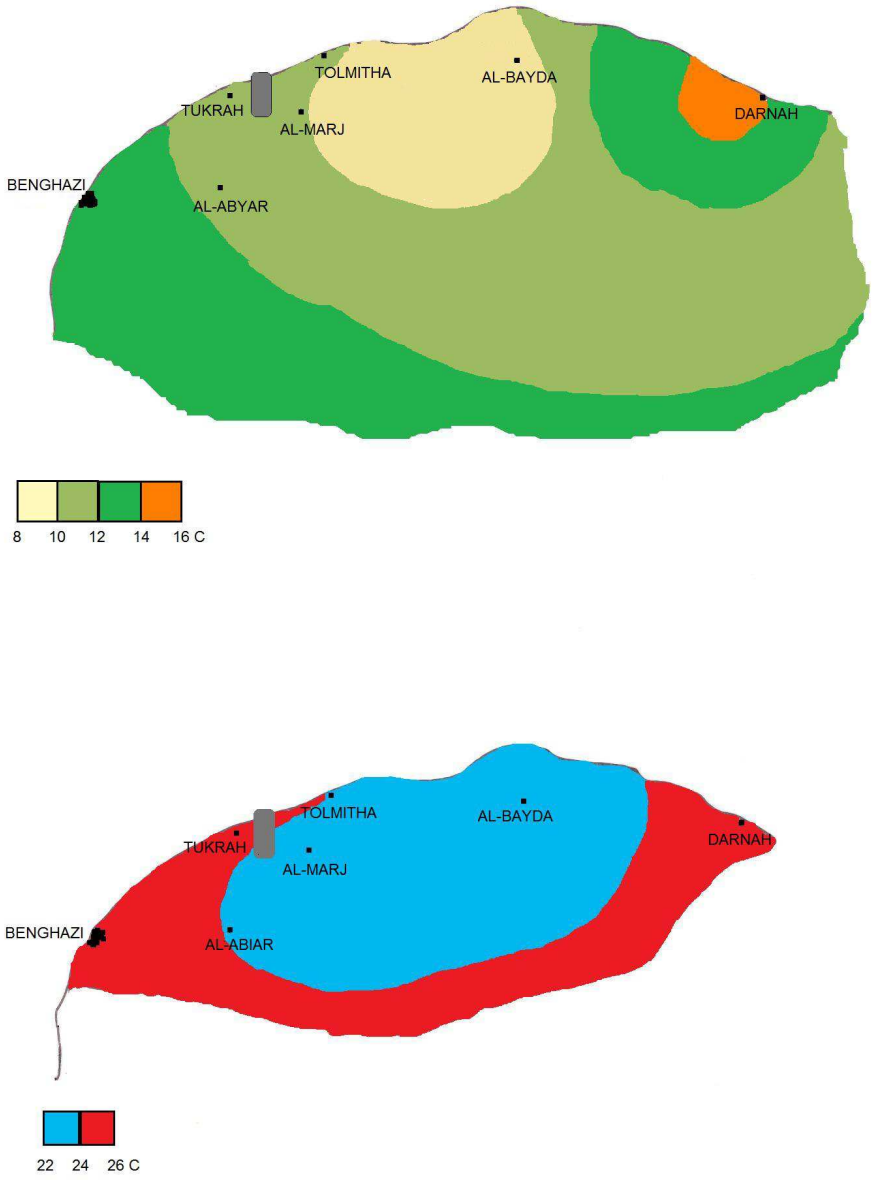

Figure 3: The temperature degrees of the study site in both winter(above) and summer(below). The temperature vary from 8 to 16 C in winter while it range from 22 to 26 C in summer depending on the altitude above the sea level. The high temperature recorded in August and the low degree was in January. The data are means of temperature and obtained from the Libyan Authority of Metrology during last years

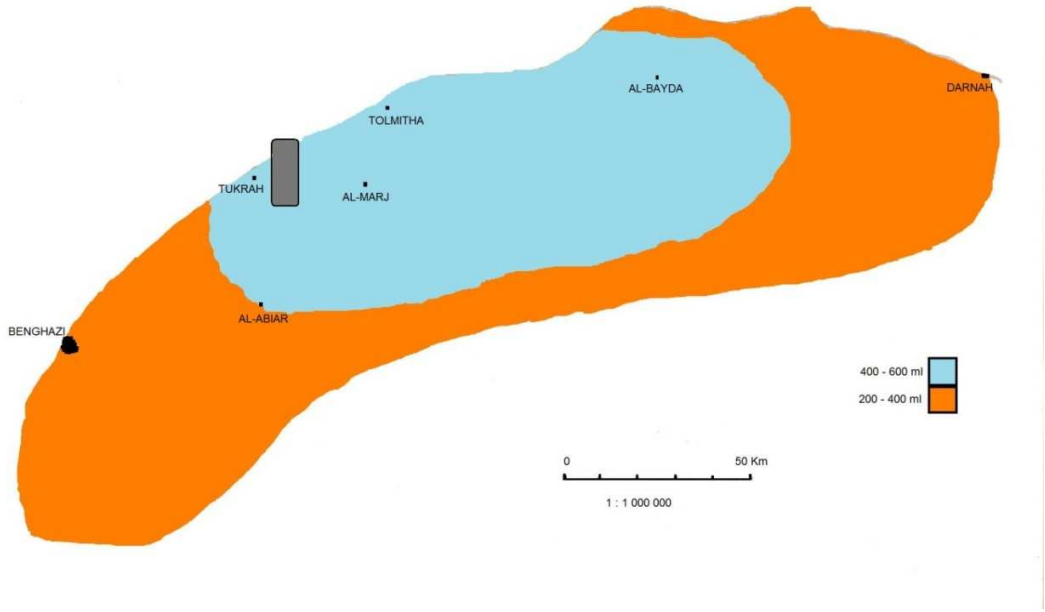

Figure 4: The precipitation rates of AL-Jabal AL-Akhdar area during winter seasons. The levels of rainfalls of area are ranged from 200 to 600 ml per year. The maximum levels are in December and January while the minimum are recorded in February and October. The long drought period is started from April to September when the rainfall stop. The data are obtained from the Libyan Authority of Metrology during last years

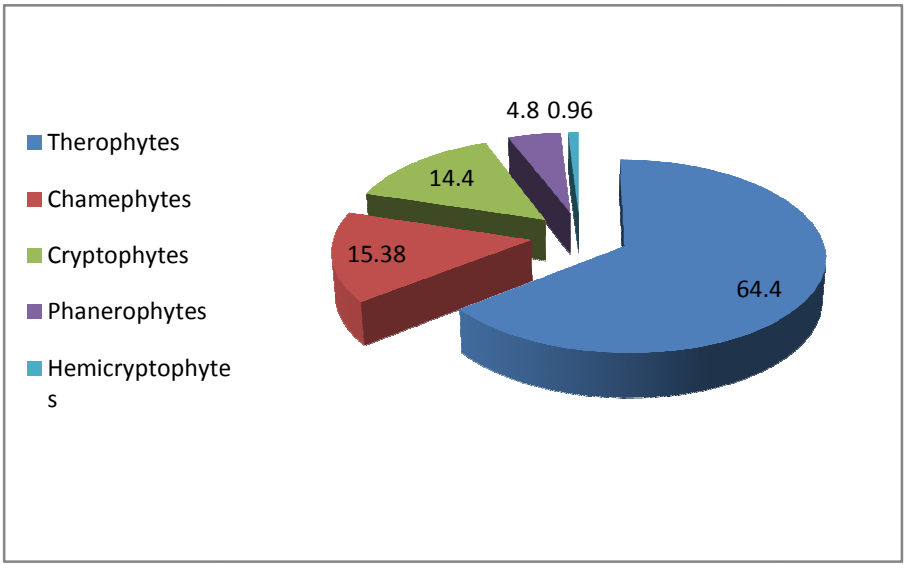

Figure 5. The biological spectrum of the study site. The annuals(Therophyte) form the huge bulk of the species(64.4%) while other life forms appeared in different percentages

DISCUSSION

A total of 37 families consisting of 104 taxa were found in the study site(Table 1). The plant family composition reflects the result of climatic conditions while the most plants are therophytes(Figure 5). This life form is common in arid and semi arid regions like Libya, and classified as one of important strategies plants use to escape from drought impacts.

The study area is utilized by small-scaled farms where the people grow food crops for their use and the local market. Furthermore, major cash crop in the area is wheat. While its production is rainfall depending, the human activities related to this process can be only noticed after the precipitations, which start from November to the end of April when the harvest season begins.

New succession of *Sarcopoterium spinosum* (Rosaceae) in the area reflected to what extent the land is abused. Strong negative impact on plants can be concluded, while this species with others were developed as a result of the damaged vegetation[1].

Despite the official rules, several illegal activities can still be observed in the area; e.g. illegal charcoal-burning, over grazing, collection of medicinal plants for commercial and folk medicine use, cutting the trees…etc. These activities beside of the intensive land abuse, can be classified as the most endangering nowadays.
Although charcoal burning and fuel wood cutting is forbidden, the local people are illegally collecting fire wood. The fire impact is initiated by charcoal-burning. Unfortunately, there is no official records about illegal fire and charcoal making in the study site. But, in general, a number of cases were recorded in different places of the total area of AL-Jabal AL-Akhdar. Thus, this and fire by weekenders might behind the amount of damage of the vegetation[7]. The fire partially or completely remove the vegetation layer and affect vegetation composition [6].

Because of grazing value of some plants, the locals graze their livestock(sheep and goats)using wild plants like *Pistacia lentiscus*, *Rhus tripartita* and *Arbutus pavarii*. The endemic species *A. pavarii* has grazing value of 45%. Because of its endemism, this rare plant is really endangering, and classified as one of the red list of IUCN[10]. In addition, trampling of animals might cause damage of ecosystem in the area[11]. Subsequently, the species composition of the vegetation could not get chance to tolerate disturbance and recover its self again[3].

Furthermore, the climatic changes with decreasing the amounts of precipitations during last four decades, led to complete damage of some plants in the area, and changing the vegetation composition. This phenomenon is clearly observed with the species *Jouneperous phoneciana* . which formed the climax community of the vegetation of AL-Jabal AL-Akhdar area. Nowadays, more than 90% of this plant is dead or appeared as woody dry branches. In addition, replacement of this wild plant using the invasive alien(exotic) *Eucalyptus*, have dramatic impacts on the natural vegetation. Because invasion by aliens is a global phenomenon, with negative impacts to the indigenous biological diversity and ecosystems [13].

One of the fundamental principles of this work is to provide some knowledge about the vegetation in coastal regions of Libya, especially AL-Jabal AL-Akhdar area. Because of its similarity in flora, vegetation composition and environmental factors, the data obtained from this study can be used and generalized on the whole coastal strip of AL-Jabal AL-Akhdar. And thus, rapidly steps in conservation programs can be take in account. Moreover, these results might have some benefits for the Mediterranean basin.

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