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ECOLOGICAL STUDIES OF SOME ACACIA SPECIES GROWN IN EGYPTIAN DESERTS

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ABSTRACT
Ecological analysis of vegetation in two different regions of Egyptian deserts were selected; Wadi Tekuila – Gabel Elba – Red Sea, and Gabel El-Halal –North Sinai area. The distance between study sites is 980 Km *has* disclosed some generalities in vegetation characters and species diversity. The tree plays an important role as a source for animals feeding, and for environmental enhancement by combating desertification and firewood specifically for Bedouin. The aim of this work is to study the ecological distribution of *Acacia tortilis spp. tortilis and Acacia tortilis spp. raddiana* using Relative Density, Relative frequency, Relative Cover and Importance Value Index**.** The results showed morphological of plants show that plants in Red Sea area (Wadi Tekuila, Gabel Elba) are bigger than the plants from Gabel El-Halal, North Sinai, and Acacia trees in Wadi Tekuila, Gabel Elba appeared as forests but in Sinai showed individual plant.

KEY WORDS: *Acacia tortilis, A. raddiana,* vegetation analysis and Egypt Flora.

INTRODUCTION

Food insecurity, poverty and malnutrition a Problem afflicting many countries of the world and the Egyptian society suffers from these problems and especially in arid desert areas. One of the reasons that have led to food insecurity, desertification, climate change, over grazing and environmental problems accumulated and growing which led to the shortage of human nutritional needs, as well as the inability to provide resources to feed the animals. Therefore it was necessary to study some important wild species which may suitable to reduce the shortfall in animal feed and acclimatized with harsh environments conditions) FAO, WFP and IFAD. 2012. Flora of Egypt consists of 2076 species, in addition to 151 infra-specific taxa from 725 genera representing 120 families. However, Egyptian flora has a special interest due to its unique mixture of native African and Asiatic species. Sinai Peninsula is the highest species diversity and plant cover in Egypt. However, the species richness is notable in north

Sinai decreased southward to be minimum in the middle sector of Sinai and increased again in the mountainous region of south Sinai. The numbers of species recorded in Sinai are 984 species El Hadidi, M. N, Hosni, H. A. 1996. Among of these species 171 in the Mediterranean sector, 203 in Gulf of Suez, 394 in south Sinai (Hegazy & Amer, 2001). The Egyptian sector of Elba mountain group containing 285 species, Elba sector occupies the second position in species diversity after Sinai. Species were recorded belonging to 52 families Hegazy & Amer, 2001. On the other hand, the Egyptian sector of Uweinate Mountain possesses low species diversity. The number of species recorded is 66 species (Boulos 1999). *Acacia* is the largest genus in the Leguminosae- Mimosoideae with approximately 1200 species distributed mainly in tropical and subtropical regions Mabberley, 1997. Species of *Acacia* have a ability to flourish under adverse conditions. Its value is a high quality of animal fodder, timber, fuel wood, charcoal, gums and other products as well as contributing to soil stabilization and improvement through nitrogen fixation, (Springuel &Mekki, 1993).

Acacia is represented in Egypt by ten species, of which two [*A. tortilis* (Forssk.) Hayne and (*A. nilotica* L.) Delile] are represented by two sub species each Boulos, 1999. They are widely distributed in various phytogeographical regions of Egypt, (Springuel & Mekki, 1993). *Acacia tortilis* sub species *raddiana* grows in desert wadis and sandy plains, usually in water catchments areas in the Sinai, Red Sea coast, Eastern Desert, and Gebel Elba (Boulos, 1999). *Acacia* mangium as a nitrogen fixing tree legume has become a major plantation tree species in the tropical humid and subhumid zones. The tree has a good potential to restore soil fertility as a follow species in agroforestry systems, and as a fuel species (Galiana *et al.,* 1998). The main aim of this study was too simplified over view framework on the identification, characterization and documentation the biodiversity of *Acacia tortilis* species in Egypt and Eco-geographical survey of the target *Acacia tortilis* sub species *tortilis and raddiana*.

MATERIALS & METHODS

1. Plant Genetic Resources (PGR)

Materials of *Acacia tortilis* (Forssk) Hayne sub species *raddiana* (Savi) Brenan photos (1 and 2) and *Acacia tortilis. (Forssk) Hayne sub species tortilis photos (3, 4 and 5)* were collected from the selected sites (Table 1).

2. Location of study areas

Four sites represent two different regions of Egyptian deserts were selected; Wadi Tekuila – Gabel Elba – Red

Sea, and Gabel El-Halal –North Sinai area (Table 1). The distance between study sites is 980 Km as a straight line (photo 6).

Sites data collected using GPS system (GARMIN GPSmap 62s), this data installed at map using Google Earth 7.0.3.8542.

Ecological Studies

For Ecological studies, five quadrates (20 M X 20 M) were designed in each site (photo 7 and 8)

The absolute and relative density and frequencies, of species in each stand was estimated. The coverage of a species was estimated by using the line-intercept methods along each stand. The relative values of density, frequency and cover for each species were summed up to give its Importance Value (IV) out of 300 (Curtis and McIntosh, 1950 and Ludwig and Reynolds, 1988).The taxonomical nomenclature of the plant species in the study area was after Täckholm (1974) and Boulos (1995, 1999, 2000, 2002 and 2005).The structure of vegetation of *Acacia tortilis* sub species tortilis and sub species raddiana, was analyzed sociologically according to procedures described Braun-Blanquet (1932). The component species in the community were listed and counted in a series of 5 quadrates, 20 × 20 m each quadrate. Density: Density denotes average number of individuals of a given species out of the total of samples examined in a study area however the species may or may not occur in all the quadrates. (Rastogi, 1999, Sharma, 2003).

$$\text{Density} = \frac{\text{Total number of plants of individual species in all quadrates}}{\text{Total number of quadrates studied}}$$

$$\textbf{B: Relative Density (RD) (\%)} = \frac{\text{Density of individual species}}{\text{Total density of all species}} \times 100$$

C: Frequency: indicates the number of sampling units in which a given species occurs. In this no counting is involved, just a record of species presence or absence is made (Rastogi, 1999, Sharma, 2003).

$$\text{Frequency (\%)} = \frac{\text{Number of quadrats with the individual species}}{\text{Total number of quadrats}} \times 100$$

$$\textbf{D:}\ \text{Relative frequency (RF) (\%)} = \frac{\text{Frequency of any species}}{\text{Total frequency of all species}} \times 100$$

E: Measurement of Cover

Usually cover is defined as the vertical projection of the crown or shoots area of a species to the ground surface, expressed as a fraction or percentage of a species to the ground surface expressed as a fraction or percentage of a reference area.

$$\textbf{F:}\ \text{Relative Cover (RC) (\%)} = \frac{\text{Cover of species A}}{\text{Total cover of all species}} \times 100$$

E: Importance Value Index (IVI)

IVI = RD + RF + RC (Rastogi, 1999 and Sharma, 2003),

PHOTO 1: *Acacia tortilis* sub species. *raddiana*

PHOTO 2: Seeds *Acacia tortilis* sub species. *Raddiana*

PHOTO 3: *Acacia tortilis* sub species.*tortilis*

PHOTO 4: Seeds *Acacia tortilis* sub species *tortilis* Elba

PHOTO 5: Seeds *Acacia tortilis* sub species *tortilis* Sinai

TABLE 1: The scientific names, family, sites and the location of species

No.	Scientific Name	Place	Latitude	Longitude	Altitude
1	*Acacia tortilis. (Forssk.) Hayne ssp. tortilis*	Wadi Tekuila, Gabel Elba, Red Sea	N 22°15'3.51"	E 036°22'15.04"	223 M
2	*Acacia tortilis. (Forssk.) Hayne ssp. tortilis*	Gabel El-Halal, North Sinai	N 30°48'45.63"	E 034°9'6.72"	185 M
3	*Acacia tortilis ssp. raddiana (Savi) Brenan*	Wadi Tekuila, Gabel Elba, Red Sea	N 22°15'3.51"	E 036°22'15.04"	223 M
4	*Acacia tortilis ssp. raddiana (Savi) Brenan*	Gabel El-Halal, North Sinai	N 30°48'45.63"	E 034°9'6.72"	185 M

PHOTO 6: Map Distance between study sites

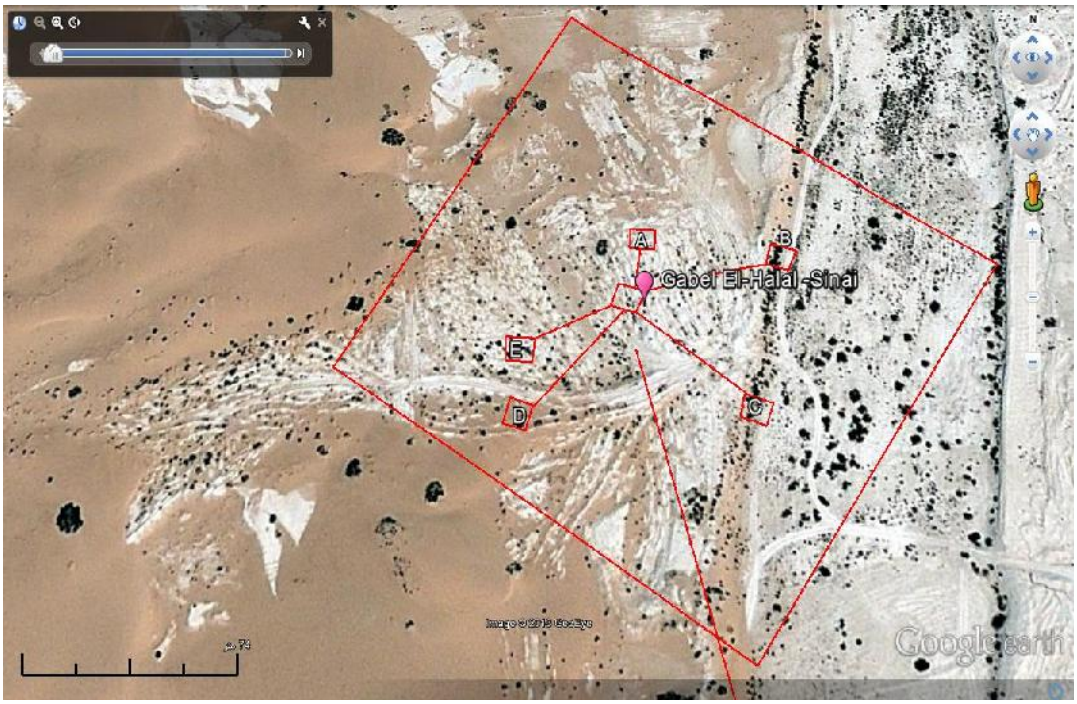

PHOTO 7: Map of Gabel El-Halal –North Sinai area

PHOTO 8: Map of Wadi Tekuila – Gabel Elba – Red Sea

RESULTS & DISCUSSION

1. Vegetation analysis

1.1. **Wadi Tekuila Gabel Elba, Red Sea:**

Data in Table (2) showed that the vegetation analysis of the community dominated by *Acacia tortilis ssp. raddiana, Acacia tortilis ssp. tortilis and Balanites aegyptiaca* based on Important Values (I.V) *shows that h*ighest Relative Frequency (R.F) showed with *Acacia tortilis ssp. tortilis* 38%, *and Acacia tortilis ssp. raddiana* 32%. The very common species is *Acacia tortilis ssp. tortilis, Acacia tortilis ssp. raddiana, Balanites aegyptiaca* and *Cassia italic.* It contained nine species and inhabited the small rocky hills. The leading dominant species of this group was *Acacia tortilis ssp. tortilis* dumosum (I.V. = 103.0), and *Acacia tortilis ssp. raddiana* dumosum (I.V. = 82.00). While the co-dominant species were *Solenostemma argel* (I.V. =32.00), *Balanites aegyptiaca* (I.V. =28.00), *Euphorbia chemperi* (I.V. =22.00), *Panicum turgedum* (I.V. =16.00). *Cassia italic* (I.V. =3.00), *Loronths Acacia* (I.V. =4.00) and *Zygophyllum simplex* (I.V. =10.00).

PHOTO 9: *Acacia tortilis* sub species raddiana *population*

TABLE 2: Characterization of the vegetation in Wadi Tekuila Gabel Elba, Red Sea

Species	Relative Coverage R.C (%)	Relative Density R.D (%)	Relative Frequency (R.F %)	Important Values (I.V)
Acacia tortilis ssp. tortilis	40	25	38	103
Acacia tortilis ssp. raddiana	20	30	32	82
Balanites aegyptiaca	5	13	10	28
Euphorbia chemperi	10	8	4	22
Solenostemma argel	15	10	7	32
Panicum turgedum	5	6	5	16
Cassia italic	1	1	1	3
Loronths Acacia	1	2	1	4
Zygophyllum simplex	3	5	2	10
Total	100	100	100	300

1.1. Gabel El- Halal, North Sinai

Data in Table (3) showed that the vegetation analysis of the community dominated by *Acacia tortilis ssp. raddiana, Acacia tortilis ssp. tortilis and Achillea fragrantisma* based On Important Values (I.V) *shows that dominant was Acacia tortilis ssp. raddiana, Acacia tortilis ssp. tortilis, Achillea fragrantisma, Zygophyllum simplex, Panicum turgedum, Capparis sinaica and with highest* important values (I.V) 99.3, *83.5, 55, 25.7, 19.6 and 16.9 respectively, the highest* Relative Frequency (R.F) showed with *Acacia tortilis ssp. raddiana* 34.3*%, Acacia tortilis ssp. tortilis 28.5%*. Results showed in this area the *Acacia* shrub have a small coverage. These results agree with (Girgis and Ahmed, 1985).

From the point of technical notes and morphological of plants show that plants in Red Sea area (Wadi Tekuila, Gabel Elba) are bigger than the plants from Gabel El-Halal, North Sinai.

TABLE 3: Characterization of the vegetation in Gabel El- Halal, North Sinai

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Species	Relative Coverage (R.C %)	Relative Density (R.D %)	Relative Frequency (R.F %)	Important Values (I.V)
Acacia tortilis ssp. raddiana	30	35	34.3	99.3
Acacia tortilis ssp. tortilis	30	25	28.5	83.5
Achillea fragrantisma	15	20	20	55
Zygophyllum simplex	15	5	5.7	25.7
Panicum turgedum	6	5	8.6	19.6
Capparis sinaica	4	10	2.9	16.9
Total	100	100	100	300

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