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ECOLOGICAL AND CHEMICAL STUDIES ON WADI EL-RAMLA RANGE PLANTS IN THE NORTHWESTERN COAST OF EGYPT

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ABSTRACT

The present investigation was carried out on Wadi EL-Ramla in the Northwestern Coast of Egypt, during spring 2005 and 2006 to assess the relationship between common range plants and the environmental factors in terms of botanical structure, productivity, nutritive value and their ability to sustain and renew themselves in coping with their ecosystem. Fifty five plant species (thirty one annuals and twenty four perennials) belonging to twenty three families were surveyed and considered as common rangeland plants in Wadi El-Ramla. Among these species, thirty eight species were found palatable and seventeen species were found unpalatable which indicated the importance of Wadi El-Ramla as a rangeland ecosystem. Vegetation cover was analyzed and frequency, abundance, density, cover percentage, importance value and productivity were assessed. Nutritive values of the common range plants were evaluated by determining crude protein, crude fiber, ash, ether extract, and nitrogen free extract percentages. All characteristics showed differences among species in Wadi EL-Ramla habitat. Species *Trigonella stellata, Vicia sativa, Trigonella maritima, Astragalus hamosus, Lolium rigidum* and *Bromus rubens* are characterized by high productivity and high nutritional value and are recommended to be used in deteriorated pastures reclaimation on a short term basis. Perennials such as *Gymnocarpos decandrum, Periploca angustifolia, Deverra trotuosa, Lycium shawii* and *Atriplex halimus rubens* can be used for long term reclaimation due to their high productivity and high nutritional value.

Key Words: Frequency, Abundance, Density, Cover, Importance Value, Fresh Yield, Dry Yield, Crude Protein, Crude Fiber, Ash, Ether Extract, and Nitrogen Free Extract

INTRODUCTION

The Near East and North Africa region had witnessed a rapid socio-economic change in the last three decades **(Sidahmed, 1991).** This change greatly affected the rangeland ecosystems in the area where most of them were converted to cropland resulting in a 49% degradation of that land. Rangeland ecosystems are co-adapted and co-evolved to increase the land use efficiency in the Egyptian deserts which involved native palatable plants that can provide economic continuous forage supply for domestic grazing animals. Although the natural plant cover of the Egyptian deserts is low and scattered, the flora in the North West coast (NWC) is relatively rich and the diversity is high. The Western Mediterranean Coastal land is one of the richest phytogeograpical regions in Egypt because of its relatively high rainfall. It contains 50% of the total flora of Egypt **(UNESCO, 2003)** and considered as one of the richest grazing areas in the Egyptian costal region **(Heneidy, 2002).** Recently, this area received a lot of attention and the vegetation of different locations were surveyed by several authors **(El-Morsy, 2002; Bami, 2003; Heneidy, 2004; Abbas, 2006; Abbas et al., 2008; Abbas et al., 2009)**. Relative abundance of plant families in NWC region was assessed by several researchers **(Heneidy, 2004; El-Morsy, 2002; Baumi, 2003; Abbas, 2006)** and was found as following: *Asteraceae* (17%), *Fabaceae* (11.4 %), *Poaceae* (10.5 %), *Chenopodiaceae* (7.9 %) and other families were represented by less than 2 %, *e.g.*, *Aizoaceae*, *Apiaceae*, *Brassicaceae*, *Caryophyllaceae*, *Liliaceae*, *Plantaginaceae*, *Ranunculaceae*, *Solanaceae* and *Thymelaceae*. Also, **Täckholm (1974) and Boulos (1995)** indicated that *Fabaceae* and *Asteraceae* are the largest families in Egypt and had the greatest number of plant species. In the North West Coast region of Egypt, many workers have studied the effect of location and edaphic factors on vegetation characters. They concluded that there were great differences among locations for all investigated vegetative parameters such as abundance, frequency, plant density and plant coverage **(Reiad *et al*., 1996a in Sidi-Barani; Heneidy *et al.,* 2002 in El-Omayed area and Baumi,**

2003 in Halazien and Al-Aziziyya), they also added that considerable variability in vegetation structure was related to varying edaphic and/or climatic variation.

Rangelands in Egypt and North Africa comprise valuable resources providing pasture for grazing animals. In the past few decades' rangelands have been subjected to severe deterioration as farming activities intensified, removal of plants, overgrazing and plowing in different parts and in recent years reclamation and cultivation of desert. Thus the need for evaluating the relationship between rangelands and their surrounding ecological factors became vital for restoring their potential productivity. Therefore, this current work represents one of the contributions to the study the vegetation of this important, rich and diverse phytogeographical region in Egypt in order to (i) solve the problem of the deteriorated rangelands, (ii) restore its potential productivity and (iii) to better understand the relationship between some common range plants and environmental factors in terms of botanical structure, productivity, nutritional value and their ability to sustain and renew themselves under Wadi EL-Ramla habitat.

MATERIALS AND METHODS

This study was conducted at Wadi EL-Ramla in the North West Coast of Egypt. Floristic identifications are according to **Täckholm (1974)** and the scientific names of species were updated by **Boulos (1995).** All sampling and measurements were done during the spring of 2005 and 2006. fresh forage yield (g m^{-2}), dry forage yield (g m^{-2}), plant density (plant m^{-2}), relative density (R.D), coverage percentage, frequency percentage, relative coverage (R.C), relative frequency (R.F), importance value. Importance value is calculated as described by **Ludwig and Reynolds (1988)**. It is estimated as follows: Importance value (IV) = R.F + R.D + R.C. Abundance and palatability of all identified plant species were determined. Quadrates (5m x 5m) were used to determine fresh, dry foliage yields, cover percent and plant density. Ten replicates of 100 m length transects were used to determine plant abundance and frequency percentages. Shoot parts of annual plants were clipped and new growths of perennials were cut. Measurements were done according to **Hanson and Churchill (1961)** and **Mueller-Dombois and Ellenberg (1974).**

The chemical constituents for all plant species during growing seasons (spring 2005 and 2006) were determined. Samples of fresh matter (100g) were oven dried at 60 °C to a constant weight **(A.O.A.C, 1980)** and ground to fine powder for chemical analyses. Crude protein (CP %) was determined using the modified Micro–Kjeldahl method **(Peach and Tracey, 1956)**, Crude fiber (CF %), ash (Ash %) content, and ethere extract (EE %) were determined according to **A.O.A.C. (1980).** Nitrogen-free extract (NFE %) including carbohydrates and hemicellulose in feeds was calculated using the following equation: NEF % = 100 – (CP % + CF % + EE % + Ash %).

Study area: Wadi El-Ramla is located about 10 km South-Southwest of Mersa Matrouh, 31°17'396" N and 27°10'899" E, near a stone grinding mill about 300 m North of the highway by-pass road. Wadi El-Ramla is typical for agricultural use (rain-fed farming), in addition to its use as a rangeland system.

Climate: A monthly meteorological data for 2004, 2005 and 2006 has been collected from Mersa Matoruh meteorological station, 31^{O} 20' N and 27^{O} 13' E and the altitude is 25m (Table 1). Data was used to indicate the general climate features prevailing in the study area. The Mediterranean coastal region of Egypt is part of the warm coastal deserts according to Meigs's classification **(Meigs, 1973)** where the summer warmest month has a mean temperature less than 30^{O} C, and the winter coldest month has a mean temperature above 10^{o} C. Occasional short rainstorms occur in winter while most of the days are sunny and mild **(UNESCO, 1977)**. The Mediterranean Coastal Zone of Egypt receives noticeable amounts of rainfall, especially in winter. The rainy months are October, November, December, January and February. In summer, no or few rains are recorded, while in autumn, occasional heavy rain may occur. About 75% of the total amount of rain falls from November to February, and only about 10% falls during spring. December and January are the rainiest months. Monthly variation is great. Any month may be absolutely dry or abnormally wet **(Badly, 1965).**

Soil: Physical and chemical properties of soil were analyzed at two different depths (0-30 and 30-60 cm). Soil physical properties including soil texture assessment indicated the sandy loam nature of

the soil in Wadi El-Ramla. Soil pH varied from 7.47 to 7.95 in Wadi EL-Ramla which indicates that alkalinity is the common characteristic of Wadi El-Ramla soil (Table 2). Soil salinity measurements indicated that the soil of the Wadi is not saline (EC ranged from 0.81 to 1.65 mmhos cm^{-1}).

Table 1. Monthly and annual averages for climatic factors at Mersa Matrouh meteorological station during 2004, 2005 and 2006

Months	Mean (ºC)	WS (m/s)	RH %	P (mm)	Mean (ºC)	WS (m/s)	RH %	P (mm)	Mean (ºC)	WS (m/s)	RH %	P (mm)
	2004				2005				2006			
Jan.	13.30	4.8	62	39.60	14.27	4.4	62	44.00	13.45	3.2	69	46.80
Feb.	14.50	4.6	62	19.00	13.67	3.6	59	12.00	14.52	3.5	63	17.40
Mar.	16.32	3.9	62	2.00	16.17	3.6	56	6.00	16.17	4.67	59	5.50
Apr.	17.73	4.0	62	0.40	17.89	4.0	59	1.00	18.82	4.83	65	0.30
May	20.43	3.7	63	0.00	20.65	3.4	57	0.00	20.06	3.43	68	0.40
Jun.	23.25	3.1	67	0.00	23.05	3.8	66	0.00	23.50	4.50	63	0
Jul.	26.50	2.8	67	0.00	25.13	3.1	71	0.00	26.6	2.8	66	0.0
Aug.	26.15	2.5	67	0.00	26.62	3.6	69	0.00	26.4	2.6	67	0.0
Sep.	24.67	2.1	64	0.00	25.89	3.7	65	0.00	24.7	2.2	65	0.0
Oct.	22.98	2.5	59	0.00	22.18	3.7	61	5.00	22.6	3.1	60	0.0
Nov.	20.05	3.5	61	14.40	19.47	3.7	61	16.00	17.13	3.96	68.8	18.7
Dec.	15.28	2.9	63	22.10	15.47	3.8	67	21.00	13.94	4.84	67.1	31.6
Annual	20.10	3.4	63.3	97.50	20.04	3.7	63	105	19.82	3.64	65.08	120.70

RH: Relative Humidity, WS: Wind Speed, P: Precipitation, ºC: Air Temperature.
*Source: Meteorological Authority, Cairo.

Table 2. Physical and chemical properties of soil at study area

Wadi El-Ramla	Depth (cm)	pH	Texture	EC Mmhos /cm	Anions meq L^{-1}			Cations meq L^{-1}				Ca-CO_3 %
					SO_4	Cl	HCO_3	K	Na	Mg	Ca	
Top	0-30	7.47	Sandy loam	1.43	6.47	5.9	1.93	0.31	7.49	2.5	4	22.8
Bed	0-30	7.53	Sandy loam	0.81	2.9	3	2.2	0.72	3.98	1.4	2	16.90
	30-60	7.95	Sandy loam	1.65	56.19	120	3.03	0.22	129	20	30	21.90

RESULTS AND DISCUSSION

Botanical Composition, Palatability and Life Duration:

The floristic analysis of the recorded species in the range area of Wadi EL-Ramla indicates that fifty five plant species belonging to 23 families (Table 3). *Asteraceae* and *Fabaceae* families were found to be the most widespread families. These findings in the Wadi came in agreement with **Tackholm (1974)** and **Boulos (1995)** who indicated that *Fabaceae* and *Asteracae* are the largest families in the Egyptian flora, and had the greatest number of plant species. Among all recorded species, nine species were belonging to each of *Fabaceae* and *Asteraceae*, followed by the family *Poaceae* (eight species), *Brassicaceae* (five species), *Chenopodiaceae* (four species), *Caryophyllaceae* (three species) and one plant for the remaining seventeen families. The palatability assessment indicated that thirty eight species (69%) are palatable and seventeen species (31%) are unpalatable. This palatability assessment indicated that Wadi El-Ramla is rich as a rangeland ecosystem.

Life span of the recorded plant species in Wadi El-Ramla indicated that thirty one (56%) of these species are annuals and twenty four (44%) are perennials (Table 3). The annuals *Erucaria pinnata*, *Medicago littoralis*, *Picris radicata*, *Vicia sativa*, *Vicia monantha* and *Trifolium tomentosum* were recorded only in the first season of the study (spring 2005) while, *Avena sativa, Brassica tournefortii, Herniaria hirsute, Leontodon hispidulus, Lotus arabicus, Malva sylvestris, Matthiola longipetala, Papaver rhoeas, Paronychia argentea*, *Rumex dentatus*, *Trigonella stellata* and *Trigonella maritima* were recorded in the second season (spring 2006). However, *Achillea santolina*, *Anacyclus alexandrinus*, *Astragalus hamosus*, *Aegilops kotschyi*, *Bromus rubens*, *Phalaris minor*, *Lolium rigidum*, *Hordeum marinum*, *Reseda decursiva, Moricandia nitens*, *Mesembryanthemum nodiflorum, Plantago ovata, Adonis dentata* and *Carrichtera annua* were recorded in the both seasons of the study.

The difference in appearance of annuals between seasons could be related to grazing (palatable species) and/or the variation in the precipitation received in both seasons. Precipitation increased from 99.5 mm in the rainy period (November - April) of the first season to 112.4 mm in the same period of the second season. The results and conclusions came in harmony with the findings of these **Espigares and Peco (1995)** for the Mediterranean area.

Table 3. Botanical composition, palatability and life duration plant species recorded in Wadi El-Ramla during spring 2005 and 2006.

Family Name	Scientific Name	Vernacular Name	Palatability	Life Duration
Asteraceae	*Achillea santolina*	Bisherm	Un-Palatable	Annual
	Anacyclus alexandrinus	Sorrt el kabsh	Palatable	Annual
	Carduncellus erioceplalus	Kharshoof	Un-Palatable	Perennial
	Centaurea alexandrina	Moraar	Un-Palatable	Perennial
	Echinops spinosissimus	Qadaad	Un-Palatable	Perennial
	Leontodon hispidulus	Hoadaan	Palatable	Annual
	Picris radicata	Halaawa	Un-Palatable	Annual
	Scorzonera alexandrina	Dabaah	Palatable	Perennial
	Silybum marianum	Shoak el gamal	Un-Palatable	Perennial
Fabaceae	*Astragalus hamosus*	Qorein	Palatable	Annual
	Lotus arabicus	Gatb	Un-Palatable	Annual
	Lygos raetam	Retem	Palatable	Perennial
	Medicago littoralis	Nafal	Palatable	Annual
	Trifolium tomentosum	Qort	Palatable	Annual
	Trigonella maritima	Handaqooq	Palatable	Annual
	Trigonella stellata	Gargas	Palatable	Annual
	Vicia monantha	Gharanboush	Palatable	Annual
	Vicia sativa	Dohreig	Palatable	Annual
Poaceae	*Aegilops kotschyi*	Sha'eer el faar	Palatable	Annual
	Avena sativa	Zammer	Palatable	Annual
	Bromus rubens	Abu keneitla	Palatable	Annual
	Cynodon dactylon	Negeel	Palatable	Perennial
	Hordeum marinum	Shaeer barri	Palatable	Annual
	Lolium rigidum	Sahlah	Palatable	Annual
	Panicum coloratum	Shawash	Palatable	Perennial
	Phalaris minor	Ain el qott	Palatable	Annual
Brassicaceae	*Brassica tournefortii*	Shilltaam	Palatable	Annual
	Carrichtera annua	Gileglaag	Palatable	Annual
	Erucaria pinnata	Seleih	Palatable	Annual
	Matthiola longipetala	Mantoor	Palatable	Annual
	Moricandia nitens	Rakham	Un-Palatable	Perennial
Chenopodiaceae	*Atriplex halimus*	Qataaf	Palatable	Perennial
	Atriplex nummularia	Qataaf	Palatable	Perennial
	Haloxylon scoparium	Rimth	Un-Palatable	Perennial
	Salsola vermiculata	Salsola	Palatable	Perennial
Caryophyllaceae	*Gymnocarpos decandrum*	Garad	Palatable	Perennial
	Herniaria hirsuta	Omm lebbeid	Palatable	Annual
	Paronychia argentea	Farsh el-ared	Un-Palatable	Annual
Apiaceae	*Deverra trotuosa*	Quzaah	Palatable	Perennial
Asclepiaceae	*Periploca angustifolia*	Halaab	Palatable	Perennial
Aizoaceae	*Mesembryanthemum nodiflorum*	Ghasool	Un-Palatable	Annual
Boraginaceae	*Echium sericeum*	Saaq el-hamam	Palatable	Perennial
Cistaceae	*Helinthemum lippii*	Qoseib	Palatable	Perennial
Convolvulaceae	*Convolvulus arvensis*	Ollaiq	Palatable	Perennial
Geraniaceae	*Erodium hirtum*	Timmeir	Palatable	Perennial
Labiatae	*Marrubium vulgare*	Robeia	Un-Palatable	Perennial
Liliaceae	*Asparagus stipularis*	Aqool el gabal	Un-Palatable	Perennial
Malvaceae	*Malva sylvestris*	Khobaaza	Palatable	Annual
Papaveraceae	*Papaver rhoeas*	Deydahaan	Un-Palatable	Annual
Plantaginaceae	*Plantago ovata*	Yanam	Palatable	Annual
Polygonaceae	*Rumex dentatus*	Hommeid	Un-Palatable	Annual
Ranunculaceae	*Adonis dentata*	Na'ab al gamal	Un-Palatable	Annual
Resedaceae	*Reseda decursiva*	Rigl el ghraab	Palatable	Annual
Solanaceae	*Lycium shawii*	Awseeg	Palatable	Perennial
Thymelaceae	*Thymelaea hirsuta*	Mithnaan	Un-Palatable	Perennial

Coverage, Frequency, Plant Density and Abundance:

The cover percentage in spring 2005 was 12.3% and 14.22% in spring 2006 without a significant difference between the two seasons (Table 6). Generally, shrubs had greater coverage followed by forbs and grasses. *Lycium shawii* (1.40%) and *Periploca angustifolia* (1.03%) has the highest record of coverage. On the contrary, the lowest coverage was recorded for *Aegilops kotschyi* (0.01%), *Lolium rigidum* (0.01%) in the first season; *Bromus rubens* (0.01%) in the second season and *Scorzonera alexandrina* (0.01%) in both seasons. The difference in vegetation cover percentage in the first season compared to the second season in the same habitat could be reasoned to the variation between the canopy growth traits of individual species and different plant densities. These results are in accordance with those obtained by **Rogers and King (1972).** In addition, growth stage, grazing activities and precipitation average could affect coverage. While, **Abou-Deya (1984)** indicated that individual plant canopy, spacing between adjacent plants and grazing system caused the difference in coverage from one site to another.

The frequency percentage in Wadi El-Ramla was higher in the second season (spring 2006) than the first season (spring 2005), that may be attributed to increase of precipitation average (from 99.5 mm in the rainy period in first season to 112.4 mm in the same period in second season) and/or the appearance of a number of annuals in the second season. Plant species belonging to *Poaceae* family (i.e. *Bromus rubens*, *Hordeum marinum*, *Cynodon dactylon*, *Avena sativa, Aegilops kotschyi* and *Phalaris minor*) recorded high frequency percentage than other plant species (Table 4). The frequency of plant species in Wadi El-Ramla and indicates that the highest record of frequency between annuals was *Bromus rubens* (60%) and *Hordeum marinum* (60%) in the first season. However, that of perennials was for *Cynodon dactylon* (50%), *Gymnocarpos decandrum* (50%), *Helinthemum lippii* (50%) and *Lycium shawii* (50%) in the first season; and all of them are palatable. This indicate the importance of Wadis as a type of rangeland in North West Coast of Egypt that may be due to the protection of range plants around the cultivated fields from grazing animal and/or the program of improvement for range plants in this Wadi. On the other hand, the lowest frequency was recorded for *Scorzonera alexandrina* (10%), *Vicia monantha* (20%)

and *Astragalus hamosus* (20%) in the first season; that may be attributed to the overgrazing of palatable species.

Significant differences were noticed between seasons in plant density (Table 6). Average density in spring 2005 was 22.1 plant m^{-2} and 25.5 plant m^{-2} in spring 2006. This difference may be due to the increase of annuals in the second season (Table 6). Plant species belonging to *Poaceae* family attained higher plant density than other plant species (i.e. *Cynodon dactylon*, *Hordeum marinum, Avena sativa* and *Bromus rubens*). The highest plant density was recorded for *Cynodon dactylon* (1.5 plant m^{-2}) followed by *Hordeum marinum* and *Avena sativa* (1.1 and 1 plant m^{-2} respectively). In contrast, the lowest plant density was recorded for *Scorzonera alexandrina* (0.1 plant m^{-2}) followed by *Atriplex nummularia, Vicia monantha*, *Medicago littoralis* (0.2 plant m^{-2} for each) in the first season and *Astragalus hamosus* (also, 0.2 plant m^{-2} for each) in the second season (Table 4).

The highest abundance figure was attained from *Hordeum marinum* (11 plants) in both seasons followed by *Avena sativa* (10 plants) in the second season. While, the lowest abundance figure revealed in *Medicago Littoralis*, *Vicia monantha* in the first season and *Astragalus hamosus* in the second season from annual plant species. In contrast, for perennial species *Cynodon dactylon* and *Lycium shawii* exhibited the highest abundance figure. While, the lowest abundance species was detected in *Scorzonera alexandrina* and *Atriplex nummulariain* in the first season (Table 4).

Table 4. Coverage, frequency, plant density and abundance of palatable species recorded in Wadi El-Ramla during spring 2005 and 2006.

Scientific Name	Coverage %		Frequency %		Plant Density (plant m^{-2})		Abundance	
	2005	**2006**	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**
Aegilops kotschyi	0.01	0.02	50	40	0.7	0.7	7	7
Anacyclus alexandrinus	0.39	0.49	50	40	0.6	0.7	6	7
Astragalus hamosus	0.01	0.06	20	20	0.3	0.2	3	2
Atriplex halimus	0.46	0.47	30	40	0.4	0.5	4	5
Atriplex nummularia	0.48	0.49	20	30	0.2	0.3	2	3
Avena sativa	---	0.01	---	50	---	1	---	10
Brassica tournefortii	---	0.57	---	40	---	0.4	---	4
Bromus rubens	0.04	0.01	60	50	0.9	0.8	9	8
Carrichtera annua	---	0.30	---	40	---	0.4	---	4
Convolvulus arvensis	0.16	0.15	40	40	0.4	0.6	4	6
Cynodon dactylon	0.17	0.14	50	50	1.5	1.3	15	13
Deverra trotuosa	0.52	0.50	30	40	0.6	0.7	6	7
Echium sericeum	0.22	0.20	40	40	0.4	0.5	4	5
Erodium hirtum	0.19	0.21	40	40	0.5	0.5	5	5
Erucaria pinnata	0.29	---	30	---	0.3	---	3	---
Gymnocarpos decan-drum	0.48	0.52	50	40	0.7	0.7	7	7
Helinthemum lippii	0.41	0.32	50	30	0.5	0.3	5	3
Herniaria hirsuta	---	0.06	---	50	---	0.4	---	4
Hordeum marinum	0.03	0.02	60	40	1.1	1.1	11	11
Leontodon hispidulus	---	0.06	---	30	---	0.3	---	3
Lolium rigidum	0.01	0.02	40	50	0.8	0.8	8	8
Lycium shawii	1.32	1.40	50	40	0.6	0.8	6	8
Lygos raetam	0.42	0.35	30	30	0.4	0.4	4	4
Malva sylvestris	---	0.26	---	40	---	0.4	---	4
Matthiola longipetala	---	0.10	---	30	---	0.3	---	3
Medicago littoralis	0.09	---	20	---	0.2	---	2	---
Panicum coloratum	0.05	0.03	50	40	0.7	0.5	7	5
Periploca angustifolia	1.03	0.94	40	40	0.7	0.6	7	6
Phalaris minor	0.06	0.05	50	40	0.8	0.8	8	8
Plantago ovata	0.12	0.13	40	40	0.9	0.7	9	7
Reseda decursiva	0.33	0.27	40	20	0.5	0.3	5	3
Salsola vermiculata	0.18	0.19	30	30	0.3	0.3	3	3
Scorzonera alexandrina	0.01	0.01	10	20	0.1	0.2	1	2
Trifolium tomentosum	0.04	---	30	---	0.4	---	4	---
Trigonella maritima	---	0.03	--	30	---	0.3	---	3
Trigonella stellata	---	0.04	---	30	---	0.3	---	3
Vicia monantha	0.09	--	20	---	0.2	--	2	---
Vicia sativa	0.08	--	30	---	0.3	--	3	---

Importance Values, Fresh Weight, Dry Weight and Total Ash:

The importance value (IV) of plant species in Wadi El-Ramla varied from species to species (Table 5). The highest figure was contributed by perennials including *Lycium shawii* (16.60) followed by *Periploca angustifolia* (14.07), *Gymnocarpos decandrum* (10.23) and *Cynodon dactylon* (11.38). These perennials demonstrated higher adaptation to Wadi El-Ramla habitat conditions which include topography, low $CaCO_3$ content, low salinity and pH of 7 to lower levels of alkalinity. While, the lowest figure of IV was recorded for some other perennials too include *Scorzonera alexandrina* (1.14) followed by, *Helinthemum lippii* (5.05), *Lygos raetam* (5.68) and *Atriplex nummularia* (6.02). These perennials show low adaptation to the Wadi conditions. Annuals highest IV figure was recorded to *Anacyclus alexandrinus* (9.08) followed by *Hordeum marinum* (9.05) and *Bromus rubens* (8.19) while, the lowest IV figure was recorded to *Astragalus hamosus* (2.28) *Vicia monantha* (2.87) *Medicago littoralis* (2.87) and *Trigonella maritima* (3.02).

There was no significant difference between seasons in fresh weight (136.23 g m^{-2} in the first season and 145.72 g m^{-2} in the second season.in Wadi El-Ramla (Table 6). The fresh yield for each plant species during spring 2005 and 2006 (Table 5) indicated that the highest yield observed in *Lycium shawii* (9.80 g m^{-2}) in spring 2006, followed by *Deverra trotuosa* (6.66 g m^{-2}) and *Periploca angustifolia* (6.44 g m^{-2}) in spring 2006. In contrast, in the same season, the lowest yield was observed in *Hordeum marinum* (0.58 g m^{-2}), *Lolium rigidum* (0.83 g m^{-2}), *Astragalus hamosus* (0.89 g m^{-2}) and *Trifolium tomentosum* (0.95 g m^{-2}) in spring 2005. All of these species are palatable annuals. The productivity of perennials and annuals adds to the significance of Wadi El-Ramla as a rangeland ecosystem.

A non-significant difference in dry yield of plant species in Wadi El-Ramla between the season of spring 2005 and that of 2006 was detected (Table 6). Dry yield ranged from 49.90 g m^{-2} in spring 2005 to 50.50 g m^{-2} in spring 2006. The highest dry weight was achieved by *Lycium shawii* (3.47 g m^{-2}) in spring 2005. On the contrary, the lowest record of dry yield was detected in *Leontodon hispidulus* (0.15 g m^{-2}) in spring 2006.

The ash percentage in range plants of Wadi EL-Ramla varied between seasons and among species (Table 5). The maximum figure in ash percentage (or the minimum figure in organic matter) was recorded in *Atriplex nummularia* (35.23 %) in spring 2006. On the contrary**,** the

minimum figure in ash percentage (or the maximum figure in organic matter) was *Bromus rubens* (3.89 %) in spring 2005. In agreement with our findings, **El-Kerdawy (1992)** reported that in the Northwestern Coast of Egypt, mineral concentrations of range plants were greatly affected by plant species and stage of growth but not by plant location except for phosphorus and sodium in perennials on dry matter basis.

Table 5. Importance value, fresh weight, dry weight and total ash of palatable species recorded in Wadi El-Ramla during spring 2005 and 2006

Scientific Name	Importance Value		Fresh Weight (g/m^2)		Dry Weight (g/m^2)		Total Ash %	
	2005	**2006**	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**
Aegilops kotschyi	6.42	5.08	0.99	1.07	0.37	0.56	7.17	9.91
Anacyclus alexandrinus	9.08	8.37	3.45	3.58	1.24	1.23	20.27	21.70
Astragalus hamosus	2.74	2.28	0.89	0.95	0.24	0.23	22.82	26.82
Atriplex halimus	7.42	7.44	5.13	6.02	1.15	1.31	26.90	27.51
Atriplex nummularia	6.02	6.24	4.63	5.38	1.04	1.11	33.43	35.23
Avena sativa	---	6.75	---	1.02	---	0.32	---	10.55
Brassica tournefortii	---	7.78	---	4.83	---	0.89	---	34.73
Bromus rubens	8.19	5.98	1.05	1.22	0.61	0.73	3.89	11.01
Carrichtera annua	---	5.86	---	2.94	---	1.02	---	9.52
Convolvulus arvensis	5.65	5.62	1.26	1.59	0.23	0.25	11.30	12.50
Cynodon dactylon	11.38	8.86	1.61	1.03	0.43	0.29	9.95	10.85
Deverra trotuosa	8.81	8.44	6.20	6.66	3.05	2.97	6.70	6.26
Echium sericeum	6.13	5.59	2.45	1.92	1.11	0.89	21.57	23.57
Erodium hirtum	6.36	6.17	2.11	1.25	0.59	0.33	17.46	18.66
Erucaria pinnata	5.60	---	1.81	---	0.76	---	9.88	---
Gymnocarpos decan-drum	10.23	8.56	6.18	5.94	2.23	2.64	12.76	20.35
Helinthemum lippii	8.75	5.05	4.88	4.45	2.72	2.38	20.33	18.33
Herniaria hirsuta	---	4.75	---	1.14	---	0.40	---	10.70
Hordeum marinum	9.05	6.65	1.16	0.58	0.53	0.25	9.76	6.55
Leontodon hispidulus	---	3.25	---	0.66	---	0.15	---	15.83
Lolium rigidum	6.24	5.99	0.83	0.90	0.25	0.27	10.66	10.90
Lycium shawii	16.60	15.18	9.80	8.48	3.47	3.17	9.70	12.45
Lygos raetam	7.10	5.68	5.70	3.34	2.57	1.41	4.03	3.81
Malva sylvestris	---	5.62	---	2.75	---	0.77	---	21.35
Matthiola longipetala	---	3.53	---	1.59	---	0.36	---	33.50
Medicago littoralis	2.87	---	1.20	---	0.32	---	7.14	---
Panicum coloratum	6.72	4.39	1.25	1.24	0.42	0.47	9.19	8.79
Periploca angustifolia	14.07	11.12	6.24	6.44	2.60	2.64	16.45	15.85
Phalaris minor	7.27	5.69	1.31	1.49	0.70	0.78	7.47	6.87
Plantago ovata	8.24	5.86	1.32	1.64	0.56	0.61	9.53	12.56
Reseda decursiva	7.49	4.17	3.47	3.07	0.94	0.86	11.63	12.24
Salsola vermiculata	4.72	4.15	4.46	3.47	1.67	0.75	27.60	26.44
Scorzonera alexandrina	1.14	1.95	1.60	1.87	0.53	0.65	10.15	10.65
Trifolium tomentosum	4.03	---	0.95	---	0.36	---	8.68	---
Trigonella maritima	---	3.02	---	1.04	---	0.25	---	10.57
Trigonella stellata	---	3.11	---	1.27	---	0.41	---	17.79
Vicia monantha	2.87	---	1.16	---	0.45	---	7.10	---
Vicia sativa	3.92	---	1.24	---	0.38	---	7.24	---

Table 6. Analysis of variations between means of some plant characteristics in Wadi El-Ramla

Character / Year	Coverage	Plant density	Fresh weight	Dry weight
2005	12.371	22.1	136.230	49.90
2006	14.225	25.5	145.722	50.50
	NS	HS	NS	NS

S: Significant 5% HS: High Significant 1% NS: Non- Significant

Crude Protein, Crude Fiber, Ether Extract and Nitrogen Free Extracts:

Plant species belonging to *Fabaceae* family generally produce higher forage quality than other species because of the fact that legumes have high protein content and are favored by grazing animals. One of the most significant benefits of growing legumes with other plant species is improvement of forage quality in any range site. Actively growing plant parts have much higher protein levels than other plant parts. Leaves of forbs and shrubs are generally higher in protein than leaves of grass **(Holechek et al., 1995).** The crude protein percentage of plant species recorded in Wadi El- Ramla in spring 2005 and 2006 indicated differences between seasons and differences among species (Table 7). The maximum percentage of crude protein were attained in *Vicia sativa* and *Vicia monantha* (legumes) was (21.90%) and (21.50%) respectively, while the minimum percentage of crude protein was detected in *Deverra trotuosa* 6.26% in the second season. In agreement with the present findings, it was indicated that the amount of nitrogen compound in the plant depends mainly on the kind of tissue, the age of development and season **(Dietz, 1971). El-Shesheny (2007)** reported insignificant effect of plant growth seasons on crude protein content in the North West Coast region of Egypt, however, at the same region, there are many studies confirmed that there was a great influence of seasons on protein content such as **Abd El-Aziz (1984)** and **Reiad *et al*. (1996 b).** Seasonal differences between seasons were debated between authors. Some indicated seasonal differences and others not. We can conclude that differences are not a law but can be attributed to the prevailing environmental conditions that can be significantly different or not from year to year.

The crude fiber percentages in range plants from Wadi EL-Ramla varied significantly between seasons and among species. The maximum figure in crude fiber was *Deverra trotuosa* (44.70 %) in spring 2006, which is in agreement with **EL-Morsy, (2002)** findings**.** On the contrary**,** the minimum figure in crude fiber was *Erodium hirtum* (12.90 %) in spring 2006 (Table 7).

Baumi (2003) showed that the highest crude fiber contents were higher in dry seasons than wet seasons. In the same context, **Ibrahim (1995)** and **Reiad et al. (1996c)** reported that the highest percentage of crude fiber was recorded during summer followed by spring, autumn and winter in descending order. This indicated that higher temperature can affect crude protein content.

Ether extracts percentage of plant species from Wadi El- Ramla varied significantly between the seasons of spring 2005 and 2006 and among species (Table 7). The maximum value of ether extracts was attained in *Lycium shawii* (16.44 %) followed by *Phalaris minor* (14.78 %) in the first season. While, the minimum value of ether extracts was noticed in *Atriplex halimus* (5.79 %) followed by *Gymnocarpos decandrum* (7.56 %) in the second season (2006). **Ahmed and Nassar (1999)** found a variation in chemical composition of plant species as affected by habitats conditions after they studied different sites along the North West Coast region of Egypt. Generally, plant species belonging to the family *Poaceae* are higher in nitrogen free extracts in comparison with other plant species. NFE are one of the most important components of forage because it represents the basic source of energy for grazing animals **Holechek et al. (1995)**. Our results came in harmony with the findings of **Osman (1969)** who reported variation in the total carbohydrate contents among plant species as affected by location. Also, it is important to clarify that in most cases carbohydrate and crude protein contents are mostly related to each other in amounts when added together, the total percentage is almost constant. If one of these components increases it will be on the expense of the other and vice versa. This depends on the nature of plants, the prevailing environmental and edaphic conditions. The increase or decrease of any of the mentioned components (carbohydrate or crude protein contents), will affect the quality of the foliage of the plant species **(Baumi, 2003).**

Percentage of nitrogen free extracts from the studied plant species in Wadi El- Ramla in spring 2005 and 2006 are presented in

Table (7). The highest nitrogen free extracts concentration was attained in *Bromus rubens* (47.15%) in the season of spring 2005 (Table 7). The lowest concentration of nitrogen free extracts was noticed in *Atriplex nummularia* (13.63%) in the first season.

Table 7. Crude protein, crude fiber, ether extract and nitrogen free extracts of palatable species recorded in Wadi El-Ramla during spring 2005 and 2006

Scientific Name	Crude Protein %		Crude Fiber %		Ether Extract %		Nitrogen Free Extracts %	
	2005	**2006**	**2005**	**2006**	**2005**	**2006**	**2005**	**2006**
Aegilops kotschyi	10.95	11.57	31.60	30.70	10.41	9.00	39.88	38.82
Anacyclus alexandrinus	11.57	10.56	24.20	29.60	8.26	9.86	35.69	28.28
Astragalus hamosus	16.70	17.20	16.40	15.15	9.61	7.61	34.47	33.22
Atriplex halimus	15.64	15.20	27.23	25.40	11.00	5.79	19.23	26.10
Atriplex nummularia	18.13	17.12	25.60	24.56	9.21	8.81	13.63	14.28
Avena sativa	---	8.45	---	30.70	---	9.32	---	40.98
Brassica tournefortii	---	14.08	---	15.70	---	7.53	---	27.96
Bromus rubens	11.12	10.20	29.09	27.75	8.75	10.91	47.15	40.14
Carrichtera annua	---	15.62	---	35.10	---	16.47	---	23.29
Convolvulus arvensis	12.60	13.20	22.34	21.24	11.85	10.25	41.91	42.81
Cynodon dactylon	10.33	10.56	26.30	25.50	8.65	9.05	44.77	44.04
Deverra trotuosa	6.88	6.26	39.20	44.70	8.56	8.97	38.66	33.81
Echium sericeum	12.67	11.57	18.98	19.75	9.92	10.22	36.86	34.89
Erodium hirtum	15.92	16.10	13.40	12.90	10.41	11.21	42.81	41.12
Erucaria pinnata	14.31	---	40.05	---	11.04	---	24.72	---
Gymnocarpos decan-drum	9.38	7.82	38.90	28.70	7.56	7.36	31.39	35.77
Helinthemum lippii	10.79	11.22	19.95	22.32	10.05	9.13	38.88	39.00
Herniaria hirsuta	---	6.40	---	21.40	---	7.50	---	54.00
Hordeum marinum	8.45	9.07	29.85	32.70	11.91	7.85	40.03	43.83
Leontodon hispidulus	---	12.32	---	32.30	---	11.56	---	27.99
Lolium rigidum	10.23	11.20	25.75	32.10	11.82	9.19	41.54	36.61
Lycium shawii	14.39	14.89	36.95	30.20	16.44	11.75	22.52	30.71
Lygos raetam	15.95	14.39	38.95	35.00	8.39	5.66	32.68	41.15
Malva sylvestris	---	18.23	---	23.60	---	10.60	---	26.22
Matthiola longipetala	---	14.08	---	23.40	---	8.23	---	20.79
Medicago littoralis	18.50	---	38.20	---	14.02	---	22.14	---
Panicum coloratum	10.16	11.26	32.40	34.80	7.88	7.08	40.37	38.07
Periploca angustifolia	19.71	18.11	33.30	34.60	12.08	10.18	18.46	21.26
Phalaris minor	10.32	9.42	27.45	25.45	14.78	12.58	39.97	45.67
Plantago ovata	11.89	11.89	24.65	27.10	9.97	9.38	43.96	39.07
Reseda decursiva	19.98	18.14	23.85	20.10	11.59	8.81	32.95	40.70
Salsola vermiculata	9.89	8.76	17.40	16.80	7.87	8.98	37.24	39.02
Scorzonera alexandrina	15.28	14.08	27.05	26.85	9.30	8.50	38.23	39.93
Trifolium tomentosum	16.45	---	30.45	---	12.17	---	32.25	---
Trigonella maritima	---	18.93	---	35.35	--	11.20	--	23.95
Trigonella stellata	---	18.10	---	33.50	---	7.06	---	23.55
Vicia monantha	21.58	--	21.80	---	11.07	---	38.45	---
Vicia sativa	21.90	--	27.35	---	11.74	---	31.77	---

REFERENCES

A.O.A.C. (1980). Association of Official Analytical Chemists, Official Methods of Analysis. 13th ed., Washington, U.S.A, 832 pp.

Abbas, M. S. (2006). Ecological and Chemical Studies on Some Common Rangeland Plants in Egypt and Libya. M.Sc. Thesis, Institute of Africa Research and Studies, Cairo Univ., Egypt, 133 pp.

Abbas, M. S.; M. H. El-Mosry,; M. A. Shahba, and F. I. Moursy, (2008) Ecological Studies in Coastal Sand Dune Rangelands in North-West of Egypt. Option Mediterranéennes, Series A, No. 79: 389-393.

Abbas, M. S.; M. H. El-Mosry,; M. A. Shahba, and F. I. Moursy, (2009). Ecological and Nutritional Analyses of Rangeland Plants in the Western Mediterranean Coastal Sand Dunes in Egypt. The Second International Conference of Natural Resources in Africa on "Sustainable Development of Natural Resources in the Nile Basin Countries". Cairo, Egypt, 355-371 pp.

Abd El-Aziz, H. M. (1978). The Chemical Content and Nutritive Value of Some Forage Plants of North-Western Coast of U.A.R. M. Sc. Thesis, Fac. Agric., Ain Shams Univ., Egypt, 108 pp.

Abou Deya, I. B. (1984). Studies on distribution and adaptation of range plants in Sinai. Ph. D. Thesis. Faculty of Agriculture. Cairo Univ.

Ahmed, A. M. and Z. M. Nassar, (1999). Chemical composition of some natural range plants from the North Western Coast of Egypt. Proceedings of the VIth national conference for environmental studies and research, Institute of Environmental Studies and Research, Ain Shams Univ., Cairo, Egypt.

Badly, Ch. (1965). Climatologie de la Tunisie centrale. Project de planification rural integree de la Tunisie Centrale. FAO, UN, RO.

Baumi, N. H. (2003). Assessment of Some Range Plants under the North Western Coastal Condition. Ph.D. Thesis, Fac. Agric., Moshtohor, Zagazig Univ., (Benha branch), Egypt, 222 pp.

Boulos, L. (1995). Check List Flora of Egypt. Vol. 1, Al-Hadara Publishing, Cairo, Egypt, 286 pp.

Dietz, R. D. (1971). Nutritive value of shrubs: Wild land shrubs, their biology and utilization. International symposium, Utah State Univ., Logan Utah, USA, 289-318.

El-Kerdawy, D. M. (1992). Seasonal changes in mineral contents of some forage plants in the Egyptian North Western Coast. Al-Azhar J. Agric. Res., 16: 141–160.

El-Morsy, M. H. (2002). Studies on Range Plants in Wadi Magid and Wadi Mahgen in the North West Coast of Egypt. Ph.D. Thesis, Fac. Agric., Cairo Univ., Egypt, 206 pp.

El-Shesheny, M. A. (2007). Seasonal Variations of the Natural Vegetation and Range Development in the North Western Coast of Egypt. Ph.D. Thesis, Fac. Agric., Ain Shams Univ., Egypt, 198 pp.

Espigares, T. and B. Peco, (1995). Mediterranean annual pasture dynamics: impact of autumn drought. *Journal of Ecology*. 83, 1: 135-142.

Hanson, H.C. and E. D. Churchill. (1961). The plant community. Reinhold Publishing Corp., New York.

Heneidy, S. Z. (2002). Role of indicator range species as browsing forage and effective nutritive source, in Matruh area, a Mediterranean coastal region, NWC, Egypt. Journal of Biological Sciences, 2 (2): 136-142.

Heneidy, S. Z. (2004). Potential uses of plant species of the coastal Mediterranean region, Egypt. Pakistan Journal of Biological Sciences, 7 (6): 1010-1023.

Holechek, J. L.; R. D. Pieper, and C. H. Herbel, (1995). Range Management Principles and Practices. Prentice-Hall Inc., Englewood, New Jersey, 526 pp.

Ibrahim, K. A. (1995). Productivity and Nutritive Value of Some Range Plants of the North Western Coast. M.Sc. Thesis, Fac. Agric., Ain Shams Univ., Egypt, 183 pp.

Ludwig, J. A. and J. F. Reynolds, (1988). Statistical Ecology: a Primer on Methods and Computing. John Wiley & Sons Inc., New York, U.S.A, 337 pp.

Meigs, P. (1973). World Distribution of Coastal Deserts, their Natural and Human Environments. Eds. David, H. K. and Wiloon, A. W., Arizona Univ., Press: 3-13.

Mueller-Dombois, D. and H. Ellenberg, (1974). Aims and Methods of Vegetation Analysis. John Wiley & Sons Inc., New York, U.S.A., 547 pp.

Osman, A. F. (1969). Variation in the chemical content of native plants as influenced by different sites at Sidi-Barrani. M.Sc. Thesis. Fac. of Agric. Ain Shams univ.

Peach, K. and M. R. Tracey, (1956). Modern methods of plant analysis. Vol. I- Springer Verlage, Berlin, 4: 643.

Reiad, M. Sh.; M. A. Ashoub,; I. B. Abou-Deya,; M. S. El-Hakeem, and K. M. Ahmed, (1996 a). Effect of edaphic and climatic factors on soil and vegetation characters of different associations representative to the North Western Coast of Egypt. Egypt. J. Appl. Sci., 11 (1): 216-231.

Reiad, M. Sh.; M. A. Ashoub,; I. B. Abou-Deya,; M. S. El-Hakeem, and K. M. Ahmed, (1996 b). Productivity and nutritive value of some range communities at the North Western Coast of Egypt (*Thymelaea hirsuta* L.). Egypt J. Appl. Sci., 11 (3): 146-163.

Reiad, M. Sh.; M. A. Ashoub,; I. B. Abou-Deya,; M. S. El-Hakeem, and K. M. Ahmed, (1996 c). Environmental effect on yield and quality of five plant associations of the North Western Coast of Egypt. Annals of Agric. Sci., Moshtohor, 34 (1): 37-52.

Rogers, J. A. and J. King, (1972). The distribution and abundance of grass land species in hill pasture in relation to soil aeration and base status. *J. Ecol.* 60, 1: 18-20.

Sidahmed, A. E. (1991). Towards strengthening the range/livestock research and extension capabilities of national institutions in the Near East and North Africa. Proceedings, IV- International Rangeland Congress, Montpellier, France, 981-988.

Täckholm, V. (1974). Student's Flora of Egypt. Cairo Univ. Pub., Cairo, Egypt, 888 pp.

UNESCO, (2003). Site assessment methodology for El-Omayed biosphere reserve. Report issued by national UNESCO commission, Cairo, Egypt, 118 pp.

UNESCO, (1977). Map of the world distribution of arid regions. MAB Technical Notes, 7.

دراسات بيئية وكيميائية علي بعض نباتات المراعي في وادي الرملة بالساحل الشمالي الغربي لجمهورية مصر العربية

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قد اجريت الدراسة في وادي الرملة بالساحل الشمالي الغربي لمصر خلال ربيعي 2005 و 2006 لتقييم العلاقة بين نباتات المراعي والعوامل البيئية من حيث البنية النباتية والإنتاجية والقيمة الغذائية وقدرتها للحفاظ على وتجديد نفسها في تحت ظروف النظام الإيكولوجي لوادي الرملة. تم حصر خمسة وخمسون نوع نباتي منهم واحد وثلاثون نوع نباتي حولي واربعة وعشرون نوع نباتي معمر ينتمون الي ثلاثة وعشرون عائلة نباتية، ومن بين هذه الانواع ثمانية وثلاثون نوعاً مستساغ و سبعة عشر نوعاً غير مستساغ وهذا يشير لاهمية وادي الرملة كتظام بيئي رعوي، وقد تم تحليل الغطاء النباتي والتكرار والسيادة والكثافة النباتية والتغطية والاهمية النسبية للانواع والانتاجية كذلك تم تقييم القيمة الغذائية للانواع النباتي من خلال تحيدي نسب البروتين الخام والالياف الخام والرماد والمستخلص الاثيري والمواد الخالية من النتروجين، وقد اظهرت النتائج وجود اختلافات بين الانواع النباتية الموجودة في بيئة وادي الرملة وبناء علي هذه القياسات فانه يمكن استخدام الانواع النباتية التالية *Trigonella stellata, Vicia sativa, Trigonella maritima, Astragalus Bromus rubens hamosus, Lolium rigidum* ذات الانتاجية المرتفعة والقيمة الغذائية العالية لاستعادة واصلاح المراعي الطبيعية المتدهورة وذلك علي المدي القصير كما يمكن استخدام الانواع النباتية التالية *Gymnocarpos decandrum, Periploca angustifolia, Deverra trotuosa, Lycium shawii, Atriplex halimus rubens* ذات الانتاجية المرتفعة والقيمة الغذائية العالية لاستعادة واصلاح المراعي الطبيعية المتدهورة وذلك علي المدي الطويل.