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Effect of Habitat and Season on the Crude Protein Content of Some Mediterranean Desert Species, Egypt

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ABSTRACT. The study demonstrates spatial and temporal variations in the crude protein content in the organs of three desert species of different growth forms in five habitats in the northwestern desert of Egypt.

The crude protein content in the annual grass *Cutandia dichotoma* is higher than that in the perennial herb *Plantago albicans* and the perennial subshrub *Helianthemum lippii*. The ranges of variations in the crude protein content in the selected species are comparable to those of the important range species in other arid regions. The contents are higher than in some cultivated fodder crops and foodstuffs. The contents in the photosynthetic organs of the two perennial species are highest during the early vegetative stage and are lowest during the dormant stage.

The crude protein content in the selected species exhibits notable ranges of variation with habitat. In *Helianthemum lippii*, the content increases from 4.13% to 8.75% in old branches during summer as the total soluble salts increases from 0.36 mmhos/cm in the coastal dunes to 1 46 mmhos/cm in the transitional area between the ridge and the saline depression It also increases from 7.05% to 8.31% in leaves, and from 3.06% to 5.06% in roots as the total soluble salts increased from the first to the second habitat. An opposite trend is exhibited by the content of crude protein in *Plantago albicans* and *Cutandia dichotoma*.

The study of metabolic variability between plants occurring along environmental gradients gives valuable information on their response to stress (Turner and Kramer 1980). The importance of proteins to plants in terms of structure and use in metabolism is reviewed by Beevers (1976). Usually, palatability for sheep and cattle is indicated by high over low crude protein (Cook 1959, Thalen 1979, Le Houérou 1980).

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Spatial and temporal variations in the content of crude protein in various organs of vascular plants have been the subject of many studies in different types of ecosystems (Mooney and Billings 1961, Barnett and Naylor 1966, Louw *et al.* 1968, Barnes 1969, Uresk and Sims 1975, Bonsma 1976, Thalen 1979, Bate 1979, Le Houérou 1980). The western Mediterranean coast of Egypt is characterized by physiographic variations that lead to the differentiation of various habitats (Ayyad and Le Floc'h 1983). Relatively few studies have been conducted to establish the crude protein content of plant tissues in these habitats (El-Refai *et al.* 1975, Barakat *et al.* 1977). The present study aims at evaluating the variations in the crude protein content of the organs of three desert species of different growth forms in a variety of habitat in this region.

Study Area

The northern part of the Western Desert of Egypt, between Alexandria and Alamein, consists of a series of elongated ridges, alternating with depressions, running parallel to the Mediterranean coast in a NE-SW direction. The study area is a 12 km long transect perpendicular to the seashore, 80 km to the west of Alexandria (Fig. 1). It passes through both ridges and depressions, from sand dunes near the sea to a non saline depression south of the village of Omayed. A comprehensive description of the geology, geomorphology, climate, vegetation and land-use of the study area is given by Ayyad and Le Floc'h (1983). It is covered by sedimentary formations ranging from lower Miocene to Holocene (Selim 1969). The latter is formed of beach deposits, sand dune accumulations, wadi fillings, loamy deposits, lagoon deposits and limestone crusts.

The study area is included in Emberger's Mediterranean isoclimatic zone (Le Houérou 1981), the dry arid climatic zone (Bwh) of Köppens system (Trewartha 1954), and the mesothermal province of Thornthwaite (1948). The bioclimatic map of UNESCO (1977) designates its climate as arid with mild winter and warm summer. The monthly mean temperature varies between 13.2°C in January and 26°C in August. The monthly maxima and minima are again the lowest in January and the highest in August. The relative humidity is higher in summer than in winter. It attains a minimum average of 60.5% in October. As may be expected, the evaporation is greater during the summer than in winter months. It ranges between 5.8 mm/day in January and 9.0 mm/day in August. The study area is characterized by one rainy season. Most of the rain falls during the period between October and February, with a mean annual rainfall of 168.9 mm. However, the amount of rainfall varies considerably around this mean from one year to the other. In some years it reaches above 250 mm, while in others it hardly exceeds 50 mm.

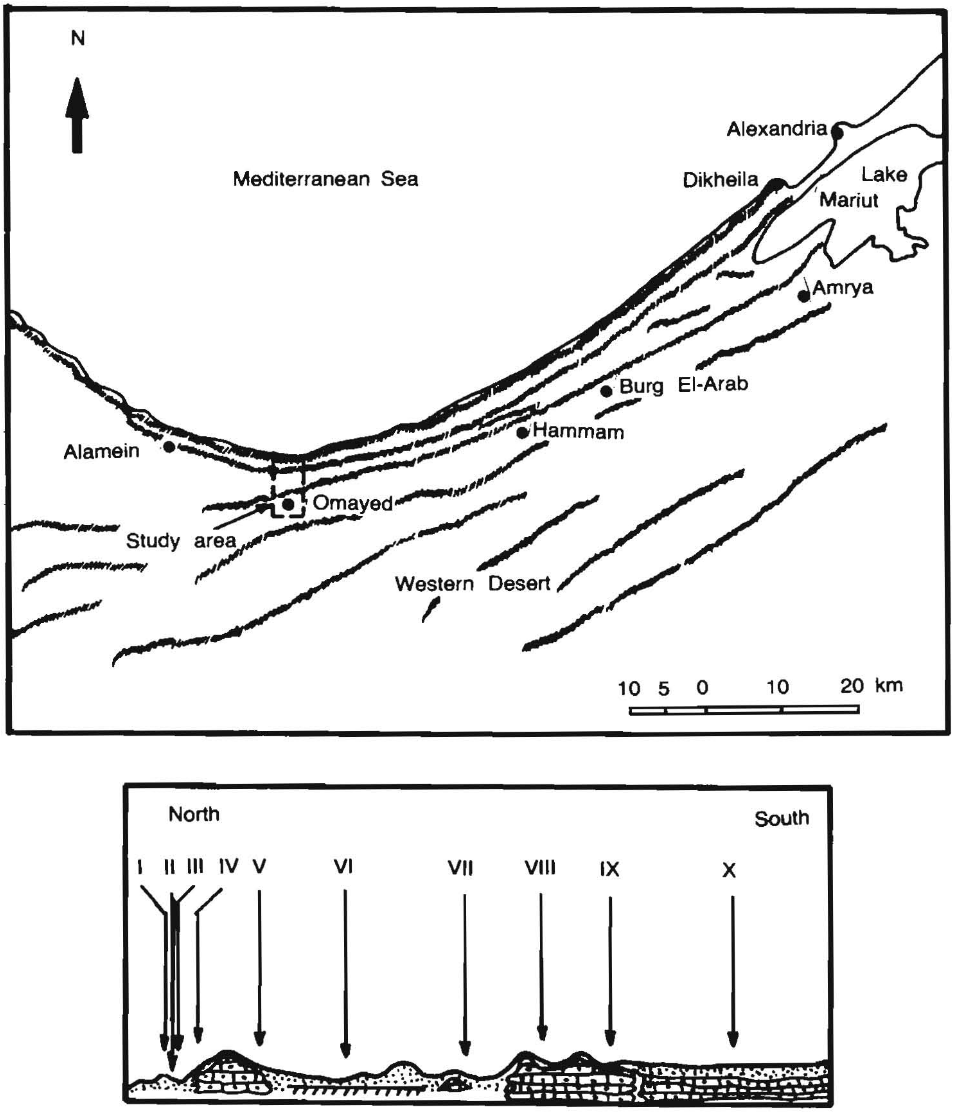

Fig. 1. Location map of the study area and the profile structure in a north-south direction along its main topographic features. I= sand dunes; II= transition between sand dunes and the salt marsh; III= the salt marsh; IV= transition between the salt marsh and ridges; V= transition between ridges and the saline depression; VI= the saline depression; VII= transition between the saline depression and the plain with skeletal soil; VIII= the plain with skeletal soil; IX= transition between the plain with skeletal soil and non-saline depression; X= the non-saline depression (Dotted areas are for calcareous sand, dotted boxes for oolitic limestones, and dashed horizontal line for water table).

The soils in the study area are Ermosols and include Haplic, Luvic, Calcic, Gypsic and Salic subunits (El-Gabaly *et al.* 1969). Soil characteristics of the selected habitats in this study were reported by Abdel-Razik *et al.* (1984) and are summarised in (Table 1). In all habitats the percentage of sand is higher than that of silt and clay. The soil is more sandy in the dunes and non-saline depressions, and contains less oxidizable organic carbon (OOC) and total soluble salts (TSS). The pH ranges from 7.10 in the non-saline depression to 7.77 in the transitional area between Abu-Sir ridge and the saline depression. Soils of the latter habitat contain more soluble salts than elsewhere. Water-holding capacity (WHC) varies with soil texture with the lower values in the more sandy soils (dunes). Total phosphorus is highest (11.97 ppm) in the northern slopes of Abu-Sir ridge, least (2.17 ppm) in the dunes. The average of total nitrogen attains a minimum (0.018%) in the non-saline depression and a maximum (0.080%) in the rocky plain.

The vegetation belongs to the *Thymelaeion hirsutae* alliance with two associations: (a) *Thymelaea hirsuta - Noaea mucronata,* with a wet varient dominated by *Asphodelus microcarpus,* and a dry varient dominated by *Achillea santolina,* and (b) *Anabasis articulata - Suaeda pruinosa* (El-Ghonemy and Tadros 1970).

The main land uses at present in the western Mediterranean desert of Egypt are grazing and rain-fed farming (or irrigated by underground and run-off water). The main annual crop is barley. Figs are successful on calcareous coastal dunes, and olives and almonds in inland alluvial depressions. Irrigated agriculture of

Table 1. Average values of the physical and chemical properties of the soil at the depth of 0-50 cm in various habitats of the study area (Abdel-Razik *et al.* 1984)

Soil factor	Habitat*				
	I	II	III	IV	V
Sand %	94.40	81.74	89.50	74.17	90.54
Silt %	0.70	12.22	7.05	17.10	6.38
Oxidizable organic carbon %	0.18	0.57	0.38	0.34	0.14
Water-holding capacity %	11.7	28.9	24.9	27.8	13.7
Total soluble salts (mmhos/cm)	0.36	0.44	1.64	1.26	0.31
pH	7.23	7.38	7.77	7.40	7.10
Total phosphorus (ppm)	2.17	11.97	7.75	7.52	8.11
Total nitrogen %	0.074	0.071	0.062	0.080	0.018

* I = stabilized dunes: II = northern slope of Abu Sir ridge; III = transitional area between the ridge and the saline depression; IV = rocky plain with skeletal soil; V = non-saline depression

pasture and grain crops and of fruit trees (mainly vine) is spreading after the extension of irrigation canals from the Nile up to 60 km west of Alexandria.

Materials and Methods

The three species selected for study (*Plantago albicans* L., *Helianthemum lippii* L. Pers. and *Cutandia dichotoma* (Forssk.) Trabut) represent three of the most common growth-forms in the western Mediterranean desert of Egypt: perennial herb, perennial subshrubs and annuals respectively. Sampling of the plant material of these three species started in November 1983, at different phenological phases till November 1984. During this period a number of individuals of each species (at least 10 of the two perennials and 50 of the annuals) were sampled randomly every 45 days from five different habitats: (1) stabilized sand dunes; (2) northern slope of Abu-Sir ridge; (3) transitional area between the ridge and the saline depression; (4) rocky plain; (5) non-saline depression. The samples of the two perennial species were collected from all these habitats, while those of the annual species were collected from habitats 1, 4 and 5 only where it was found. All samples were kept in paper bags and brought to the laboratory shortly after collection, where they were rinsed several times with tap water, and twice with distilled water, and air dried. The sampled individuals of *Helianthemum lippii* were separated into four parts: roots, leaves and young branches, old branches and reproductive organs, and those of *Plantago albicans* into below-ground organs (roots and perennating stem), vegetative organs and reproductive organs. The samples of *Cutandia dichotoma* represented the whole plant. All plant samples were oven-dried at 65°C to constant weight. The samples were then ground, powdered and kept in small paper bags ready for analysis. Total organic nitrogen was estimated according to the procedure described by Naguib (1969). Crude protein was calculated by multiplying the total organic nitrogen by 6.25.

Analysis of variance was applied to assess the significance of variation in the crude protein content with date and habitat for each organ of each of the selected species. The least significance range (LSR) test was then applied to evaluate the differences between the members of pairs of the mean content of crude protein in each organ at different seasons. All these statistical tests are according to Steel and Torrie (1960).

Results

Helianthemum lippii

Seasonal variations in the concentration of crude protein in *Helianthemum lippii* were significant as evaluated by the F-test. The probability that these variations were due to random sampling was lower than 0.01 (Table 2). The LSR-test indicated that the concentrations of crude protein in roots in early autumn and late winter were mostly significant from those in all other seasons (Table 3).

The maximum concentration of crude protein in roots (20.75%) was that recorded in the plants of the non-saline depression in early autumn of 1984, and the minimum concentration (2.94%) was that recorded in late spring in the plants of Abu-Sir ridge. In leaves and young branches, the maximum concentration (22.06%) was that recorded in the plants of the non-saline depression in late autumn of 1984 and the minimum concentration (3.0%) was that recorded in the plants of the non-saline depression in early winter. In old branches, the maximum concentration (13.69%) was that recorded in the plants of Abu-Sir ridge in late autumn of 1983, and the minimum (3.38%) was that recorded in the plants of the rocky plain habitat in early autumn of 1984. In the reproductive organs, the maximum concentration (38.38%) was that recorded in the plants of the transitional area between Abu-Sir ridge and the saline depression, and the minimum concentration (22.94%) was that recorded in the plants of the non-saline depression.

The variations in the concentration of crude protein in *Helianthemum lippii* exhibited two characteristic trends (Table 3). The first trend was that in young and old branches, and was distinguished by two peaks, one in late winter (vegetative activity) or spring (peak of reproductive activity), and the second in late autumn. Exceptions of this general trend were the earlier occurrence of the winter peak in the old branches, and also the occurrence of the second peak in spring or early summer instead of autumn in the leaves and young branches in the plants of the rocky plain and the transitional area between the ridge and the saline depression. The second trend of variation was exhibited by the concentration of crude protein in roots. This trend was characterized by three peaks, one in early winter, the second in spring, and the third (which was the highest) in late summer or early autumn.

Table 2. F-values (analysis of variance) for variations in the concentration of crude protein in different organs of *Helianthemum lippii,* with habitat and date and their interaction. The probability that any of these values is due to random variation is less than 0.01

Source of variations	Leaves and young branches	Old branches	Roots
Habitat	3.70	43.39	2.86
Date	73.88	193.21	131.32
Interaction	2.64	24.72	3.47

Table 3. Temporal variations in the mear concentration of crude protein (g/100 g oven-dry weight) in the organs of *Helianthemum lippii* in different habitats. Means with common letters are not significanty different (at the 0.05 probability level)

Habitat*	Month							
	Nov.	Jan.	Feb.	Apr.	May	Jul.	Sep.	Nov.
				Leaves and young branches				
C.D.	8.94	4.13	13.13	8.19	4.94	7.50	7.56	8.13
	ab	b	a	ab	b	b	b	ab
Ab.R.	8.69	3.88	8.56	9.06	9.56	6.00	4.69	6.69
	ab	b	ab	ab	a	ab	ab	ab
T.R.S.D.	15.19	4.94	10.75	8.63	8.83	8.31	5.31	6.19
	a	b	ab	b	b		b	b
R.P.	8.19	7.31	10.31	9.31	7.81	9.00	10.38	8.31
	a	a	a	a	a	a	a	a
N.S.D.	11.13	3.00	7.56	9.25	8.56	4.31	3.50	22.06
	a	c	abc	ab	ab	bc	c	
				Old branches				
C.D.	8.25	9.31	7.44	11.63	5.19	4.13	4.13	6.56
	abc	ab	abc	a	bc	c	c	bc
Ab.R.	13.69	4.69	8.13	9.00	5.81	6.63	4.63	9.31
	a	b	b	b	b	b	b	ab
T.R.S.D.	7.69	10.69	4.19	5.06	5.56	8.75	7.00	6.56
	ab	a	b	b	b	ab	ab	ab
R.P.	6.94	12.56	7.88	11.31	5.05	5.19	3.38	6.81
	ab		ab	b	b	b	b	ab
N.S.D.	5.69	12.50	10.56	8.25	5.44	6.19	8.31	7.44
	c	a	ab	abc	c	bc	abc	bc
				Roots				
C.D.	10.13	15.25	9.69	10.19	4.31	3.06	15.13	7.31
	bc	a	c	bc	d	d	ab	c
Ab.R.	11.50	9.56	8.00	10.44	2.94	7.25	18.44	8.00
	a	a	a	a		a		a
T.R.S.D.	11.50	11.63	6.13	8.06	3.75	5.06	19.31	5.75
	ab	a	c	abc	c	c		c
R.P.	16.50	11.44	6.81	8.19	4.13	5.94	19.31	6.56
		bc	d	cd	d	d	a	d
N.S.D.	10.56	11.94	7.69	8.44	6.13	9.13	20.75	6.81
	ab	a	ab	ab	b	ab		
				Reproductive organs				
C.D.				24.75				
Ab.R.				27.75				
T.R.S.D.				38.38				
R.P.				32.69				
N.S.D.				22.94				

* C.D. = Coastal dunes; Ab.R. = Northern slope of Abu-Sir ridge; T.R.S.D. = Transitional area between Abu-Sir ridge and the saline depression; R.P. = Rocky plain; N.S.D. = Non-saline depression.

The variations in the concentration of crude protein with habitat exhibited wide ranges of variation. For example, in the reproductive organs, it varied from 24.75% in the plants of the coastal dunes, to 38.38% in the plants of the transitional area between Abu-Sir ridge and the saline depression (Table 3). On the other hand, in early winter the concentration in roots varied from 9.56% in the plants of Abu-Sir ridge to 15.25% in the plants of the coastal dunes, and in summer, it varied from 5.94% in the plants of the rocky plain to 9.13% in the plants of the non-saline depression. In leaves and young branches, the concentration of crude protein in autumn (1983) varied from 8.19% in the plants of the rocky plain to 15.19% in the plants of the transitional area between the ridge and the saline depression.

Plantago albicans

Seasonal variations in the concentration of crude protein in the vegetative and the below-ground organs of *Plantago albicans*, were highly significant as evaluated by the F-test (Table 4). Differences in concentration between each season and all other seasons as evaluated by the LSR-test were in most cases also significant (Table 5). This was particularly obvious for early autumn and late winter in both the vegetative and the below-ground organs of the plant.

The seasonal variations exhibited characteristic trends for most habitats. In the vegetative organs, the general trend was a gradual increase in the concentration of crude protein from autumn (at the beginning of growing season) to maximum concentration in winter (peak of vegetative activity) or spring (peak of reproductive activity), a sharp decrease to minimum concentration in summer (dryness of vegetative organs), and then a gradual increase to medium concentration in autumn of the next season (Table 5). The decrease in the concentration of crude protein in vegetative organs was especially notable from mid-spring to mid-summer.

The concentration of crude protein exhibited notable ranges of variation with organ, season and habitat. In general, the highest value (41.44%) was that recorded for the reproductive organs of the plants in the non-saline depression in spring (peak of reproductive activity), while the lowest value (2.88%) was that recorded for the vegetative organs in summer (dormancy period) for the plants of the coastal dunes. An example of variations in the vegetative organs with habitat, is that between 13.75% in the plants of the non-saline depression and 24.38% in the plants of the transitional area between the ridge and the saline depression in early winter. In summer, the concentration in the vegetative varied from 2.88% in the plans of the coastal dunes to 9.25% in the plants of Abu-Sir ridge. In the below-ground organs, the concentration of the crude protein in summer varied from 5.75% in the plants of the coastal dunes to 10.25% in the plants of the rocky

Table 4. F-values (analysis of variance) for variations in the concentration of crude protein in different organs of *Plantago albicans,* with habitat and date and their interaction. The probability that any of these values is due to random variation is less than 0.01

Source of variations	Vegetative organs	Below-ground organs
Habitat	4.54	5.83
Date	41.69	72.82
Interaction	6.73	9.46

plain habitat. In the reproductive organs, it varied from the 21.5% in the plants of the coastal dunes to 41.44% in the plants of the non-saline depression (Table 5).

Cutandia dichotoma

The variations in the concentration of crude protein in *Cutandia dichotoma* were mostly significant as evaluated by the F-test (Table 6). In general, the highest concentration of crude protein (36.13%) was that recorded for the plants in the non-saline depression spring, while the lowest concentration (24.0%) was that recorded for the plants in the rocky plain in winter (Table 7).

The variations in the concentration of crude protein exhibited considerable variations with date of sampling. For example, it varied from 27.5% in winter to 36.13% in spring in the plants of the non-saline depression. In the rocky plain, the concentration varied from 24.0% in winter to 26.19% in spring (Table 7).

Discussion

Crude protein is usually calculated by multiplying the total organic nitrogen by 6.25. This conversion factor is derived from the observation that the average amino acid from which the proteins are synthesized contains approximately 16% nitrogen. Clearly protein determinations based on this method are an approximation since other non-nitrogenous compounds are converted to ammonia. However, the bulk of the nitrogen in plants is contained in protein. Such crude protein estimates in addition of providing useful data for comparative purposes, reflect to a great extent its true content in plants (Beevers 1976).

This study indicates that the crude protein content in the annual species *Cutandia dichotoma* is higher than its content in the perennial herb *Plantago* *albicans* and the perennial subshrub *Helianthemum lipii*. This supports the recommendation that true attention be given to the annual species as forage in desert ecosystems (Al-Khatib 1978; Kernick 1966).

Crude protein contents of over 20% were recorded in leaves and young shoots of *Anvillea garcini*, *Artemisia herba-alba*, *Calligonum comosum*, *Haloxylon*

Table 5. Temporal variations in the mean concentration of crude protein (g/100 g oven-dry weight) in the organs of *Plantago albicans* in different habitats. Means with common letters are not significantly different (at the 0.05 probability level)

Habitat*	Month							
	Nov.	Jan.	Feb.	Apr.	May	Jul.	Sep.	Nov.
				Vegetative organs				
C.D.	12.75	15.31	24.75	16.88	18.44	2.88	6.13	14.50
	a	bc	a	bc	b	c	c	bc
Ab.R.	16.50	15.31	14.50	18.13	13.75	9.25	7.25	16.56
		bcd	ab	ab	bc	a	cd	cd
T.R.S.D.	14.75	24.38	20.25	16.88	13.13	3.69	7.00	8.75
		a	a	b	bc	b	c	b
R.P.	9.50	21.56	17.75	19.06	14.06	5.00	9.13	9.50
		a	a	c	bc	a		ab
N.S.D.	10.38	13.75	23.00	18.13	14.69	3.56	4.25	12.38
	a	c		ab	bc	b	c	bc
				Below-ground organs				
C.D.	15.38	7.88	17.13	8.13	5.75	5.75	7.00	9.00
	a	bc	a	b	c	bc		
Ab.R.	14.38	15.25	14.75	7.50	7.63	8.13	7.63	10.38
	a	b	a	b	b	b	b	
T.R.S.D.	13.13	12.13	12.13	10.00	7.63	7.75	6.75	11.63
	a	cd	a	cd	bc	bc	b	b
R.P.	6.63	10.13	14.00	8.88	9.13	10.25	9.38	10.88
	de	ef	cd	abcd	abc	ab	f	a
N.S.D.	11.13	9.88	11.13	8.75	8.88	8.38	10.13	12.50
		ab	a	ab	c	c		
				Reproductive organs				
C.D.				21.50				
Ab.R.				37.25				
T.R.S.D.				36.25				
R.P.				31.19				
N.S.D.				41.44				

* Habitat names are given in Table 3.

articulatum, H. salicornicum, Nitraria retusa and *Rhanterium epapposum* of the Iraqi desert (Thalen 1979). In New Mexico, Klemmedson and Smith (1973) recorded the crude protein of leaves and fruits of mesquite (*Prosopis juliflora*) and palo verde (*Cercidium floridium*) as 5.0 - 24.6%. The crude protein contents of *Heliotropium ramosissimum* and *Emex spinosa* in Kuwait ranged from 21% to 24% (Kernick 1966). Khawaja *et al.* (Undated, quoted by Thalen 1979) reported that the crude protein content for alfalfa hay, barley grain, dried sugarbeet pulp, barley hay, dried date pulp and sorghum plant were 11.56%, 9.92%, 8.45%, 5.97%, 5.17% and 3.23% respectively. Thus, it is obvious that the range of variations in the crude protein in the selected species of the present study are comparable to those of the range species in other arid regions, and could be higher than in many cultivated foder crops and other foodstuffs.

Turkhin and Milkryakova (1969) reported that the relative rate of protein synthesis in plants decreases in extreme high temperature and light intensity. Furthermore, the reduced water contents in plants during summer may also reduce protein content by blocking glycolysis, krebs cycle and amination (Shah and Loomis 1965). This may explain the lower crude protein content in the photosynthetic organs of *Plantago albicans* and *Helianthemum lippii* in summer

Table 6. F-values (analysis of variance) for variations in the concentration of crude protein in *Cutandia dichotoma*, with habitat and date and their interaction

Source of variations	F
Habitat	169.03
Date	260.06
Interaction	194.06

Table 7. Means of the concentration of crude protein (g/100 g oven-dry weight) in *Cutandia dichotoma* in different habitats during winter and spring of the growing season

Habitat	Winter	Spring
Coastal dunes	27.88	30.19
Rocky plain	24.00	26.19
Non-saline depression	27.50	36.13

than in other season. In most habitats, the maximum content in the two species was recorded during the early vegetative stage, and the minimum was recorded during the dormant stage. The non-photosynthetic organs showed insignificant seasonal variations in crude protein content. This agrees with the findings of Kernick (1966), Rushworth (1975), Uresk and Sims (1975), Bonsma (1976) and Thalen (1979). The protein content of the annual forage species in Kuwait was found to decrease by a factor of 2.5 from the beginning to the end of the growing season (Kernick 1966). In the range lands of Iraq, Thalen (1979) indicated a decrease in crude protein content in current season's growth of *Rhanterium epapposum* from 29.5% at the beginning of growth to 4.7% in the dormant stage. In *Artemisia herba-alba* leaves, the content dropped from 18% and 23% during the early vegetative stage to 11% and 14% during the dormant stage.

The effect of salinity and water stresses on the protein content of cultivated plants has been a matter of dispute. Shimose (1957), Bernstein (1962), Chen *et al.* 1964, Kleinkopf *et al.* (1976) reported that salinization induced an increase in the total nitrogen content of plants. On the other hand, Barnett and Naylor (1966), Shimose (1973), El-Shourbagy and Missak (1975) and El-Shahaby (1981) reported that Na Cl treatment induced a decline of protein content of other plants. In the present study, the remarkable variations in the crude protein content of the selected species with habitat may be attributed to variation in soil salinity. Total soluble salts of the soil was considerably higher in the soil of the transitional area between Abu-Sir ridge and the saline depression, and in the soil of the rocky plain than elsewhere. In *Helianthemum lippii,* the concentration of crude protein increased from 4.13% to 8.75% in old branches during summer as the total soluble salts increased from 0.36 mmhos/cm in the coastaldunes to 1.46% mmhos/cm in the transitional area between Abu-Sir ridge and the saline depression. In leaves, it increased from 7.05% to 8.31%, and in roots it increased from 3.06% to 5.06% as the total soluble salts increased from the first to the second habitat. An opposite trend was exhibited by the concentration of crude protein in *Plantago albicans* and *Cutandia dichotoma.* As the total soluble salts increased, the concentration in the vegetative organs of *Plantago albicans* during the growing season decreased from 24.75% in the plants of the coastal dunes to 20.25% in the plants of the transitional area between Abu-Sir ridge and the saline depression. In the below-ground organs, it decreased from 17.13% to 12.13% as the total soluble salts decreased from the first to the second habitat during the same season. Also, in *Cutandia dichotoma,* the concentration decreased from 36.19% in the plants of the non-saline depression (total soluble salts = 0.31 mmhos/cm) to 26.19 in the plants of the rocky plain (total soluble salts = 1.26 mmhos/cm).

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تأثير البيئة والموسم على محتوى البروتين الخام في بعض النباتات الصحراوية بساحل البحر الأبيض المتوسط بمصر

*رفيق الغريب و نبيل صابر و ليلى بيدق

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تهدف الدراسة إلى تقدير التغيرات الفصلية في محتوى البروتين الخام في أعضاء ثلاثة أنواع من النباتات البرية في منطقة العميد بالساحل الشمالي الغربي لمصر، والإختلافات في هذا المحتوى في النباتات النامية في البيئات المختلفة في النطاق الممتد من الشاطيء إلى المنخفض غير الملحي. وقد تناولت الدراسة ثلاثة أنواع تمثل أنماطاً حياتية متباينة (طرز نمو متباينه): نوع تحت شجيري معمر (نبات قصيب الرعل)، نوع عشبي معمر (نبات الينم) ونوع حولي (نبات الخفور) وتابعت الدراسة التغيرات الفصلية في العينات التي جمعت من خمس بيئات ينظمها الخط الممتد من الساحل إلى الداخل.

وقد اتضح من هذه الدراسة أن محتوى البروتين الخام في النبات الحولي «الخفور» أعلى من محتوى البروتين الخام في العشب المعمر «الينم» ومن محتوى البروتين الخام في النوع تحت الشجيري المعمر «قصيب الرعل».

وقد تبين أن محتوى البروتين الخام في الأنواع التي أختيرت لهذه الدراسة يمكن مقارنته بمحتوى البروتين الخام في بعض الأنواع البرية ذات الأهمية الرعوية في البيئات الجافة في مناطق جغرافية أخرى. كما أن محتوى البروتين الخام بهذه الأنواع كان أعلى من محتوى البروتين الخام في بعض المحاصيل العلفية وأعلى من بعض المواد الغذائية التي تستخدم كعلف للماشية.

وقد أوضحت الدراسة كذلك أن محتوى البروتين الخام في الأوراق والأفرع الغضة يتناقص مع نهاية مرحلة النشاط الخضري.

وقد أظهرت الأنواع محل الدراسة تغيراً واضحاً في محتواها من البروتين الخام مع تغير البيئة التي تنمو فيها. وقد عزي ذلك إلى إختلاف الصفات الطبيعية والكيميائية للتربة في هذه البيئات، وبالذات في كمية الأملاح المذابة الكلية (ملوحة التربة). ففي النبات تحت الشجيري المعمر «قصيب الرعل» زاد محتوى البروتين الخام في الأفرع المسنة أثناء فصل الصيف من ٤,١٣ ٪ إلى ٨,٧٥ ٪ بزيادة ملوحة التربة من ٠,٣٦ ملليموز/ سم في بيئة الكثبان الرملية إلى ١,٤٦ ملليموز/ سم في البيئة الإنتقالية بين هضبة أبو صير والمنخفض الملحي.

أما في الأوراق والأفرع الغضة فقد زادت نسبة البروتين الخام من ٣,٠٦ ٪ إلى ٥,٠٦ ٪ بزيادة ملوحة التربة من البيئة الأولى إلى البيئة الثانية. وقد اتضح إتجاه معاكس للتغير في محتوى البروتين الخام مع ملوحة التربة بالنسبة لنبات الينم ونبات الخفور، حيث انخفضت كمية البروتين الخام في النباتات النامية في البيئات ذات الملوحة العالية نسبياً.

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