RESULTS AND DISCUSSION

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This study was conducted in Halazien (HA) in Marsa-Matruh and Al-Aziziyya (AZ) in Sidi-Barrani locations, at the North Western Coast (NWC) of Egypt in order to identify, classify, analyze evaluate and select for native vegetation characteristics of the existing plant species. This study was conducted during the 4 seasons of 3 consecutive from years winter, 2000 up to autumn

Studied parameters were the botanical composition, frequency, abundance, coverage and density. Fresh and dry foliage potentialities, and its chemical composition. Biological evolution the acceptable palatable vegetation for materials were analysed, recorded and discussed to evaluation dry matter, organic matter and crude protein disappearance.

Results will be presented and discussed in the following chronological order as follows:

I. Vegetative growth behaviour:

I.1. Botanical composition:

The botanical composition was studied in each of the two assigned locations individually for each 3-subsequent sites. Comparing the obtained data were in great concern for better evaluation of the locations and the sites as well as the seasonal variations in respect of the studied botanical composition as follows:

First Location : Halazien (HA):

This location is about 45 km west of Marsa Matruh. Results for the studied botanical composition of Halazien (HA) location are presented in Table (5). The recorded survey and classification included the individual scientific names of species, vernacular name, life duration (An vrs Pr) and palatability situation (P vrs UP) for each family. Moreover, the relevant number after each of the recorded plant species represent the page number in the **Vivi-Täckholm (1974)** identification reference book for facilitating and confirming the morphological description for each of the listed plant species.

Such survey indicated that the natural vegetation components of (HA) location which was 58 plant species belongs to 20 families. Most of the existing plant species in this area were from the annual type, which forms 34 species. Whereas, the perennial species were 24. Out of the existing and identified 58 plants species, 36 were palatable and 22 were unpalatable.

The obtained number of species were 9 for *Legumenosae*, (Fabaceae), 11 for *Gramineae* (Poaceae), 10 for *Compositae* (Asteraceae), 3 for *Chenopodiaceae*, 5 for *Cruciferae*, 1 for *Alliaceae,* 1 of *Araceae,* 2 for *Caryophyllaceae,* 1 for *Convolvulaceae, Cyperaceae* and *Geraniaceae,* 3 for *Labiatae*, 2 for *Liliaceae,* 1 for *Malvaceae*, 2 for *Plantagonaceae*, 1 for *Primulaceae,* 1 for *Solanaceae, Thymelaceae, Umbelliferae* (*Apiaceae*) and *Zygophyllaceae*.

This result was noticed under the studied 3 sites of (HA) location and during the various seasonal variations. Results were

Table (5): Botanical composition survey in Halazien (HA) location at Marsa-Matruh for 3 studied sites from Winter 2000 up to Autumn 2002.

Family name	No.	Scientific name	Vernacular name	Pala-tability	Life duration	IR *
Fabaceae (Leguminosae)	1	- *Astragalus boeticus*	Mahallaq	P	An.	266
	2	- *Astragalus eremophilus*	Om-El-Qorien	P	An	264
	3	- *Lotus edulis*	Qarn El-Ghazal	P	An	244
	4	- *Medicago polymorpha*	Kert	P	An	236
	5	- *Medicago sativa*	Berseem	P	Pr	237
	6	- *Melilotus elegans*	Nafal	P	An	238
	7	- *Trifolium resupinatum*	Qart	P	An	240
	8	- *Trigonella hamosa*	Oshb	P	An	232
	9	- *Vicia monantha*	Khareeg	P	An	274
Poaceae (Gramineae)	10	- *Aegilops kotschyi*	Shaer El Faar	Up	An	701
	11	- *Aegilops ventricosa*	Shaer El Faar	Up	An	701
	12	- *Avena fatua*	Zommer	P	An	712
	13	- *Bromus rubens*	Deil El-Talab	P	An	680
	14	- *Cutandia dichotoma*	Khafoor	Up	An	685
	15	- *Hordeum leporinum*	Sheera	P	An	704
	16	- *Lolium multiflorum*	Simbil	P	An	706
	17	- *Lygeum spartum*	Halfa	P	Pr	739
	18	- *Phalaris minor*	Shaer	P	An	739
	19	- *Setaria glauca*	Thay El-qott	Up	An	752
	20	- *Stipa capensis*	Sebl El-Hussein	P	An	720
Asteraceae (Compositae)	21	- *Anacyclus alexandrinus*	Soret El-Kabsh	P	An	576
	22	- *Artemisia herba-alba*	Sheeh	P	Pr	580
	23	- *Calendula aegyptiaca*	Ain El-Baqar	Up	An	583
	24	- *Carduus getulus*	Hoshroof	P	An	533
	25	- *Centaurea calcitrapa*	Shoak	P	An	540
	26	- *Chrysanthemum coronarium*	Oqhowaan	Up	An	579
	27	- *Picris radicata*	Hozain	P	An	595
	28	- *Reichardia tingitana*	Galawein	Up	An	603
	29	- *Scorzonera alexandrina*	Dabbah	P	Pr	600
	30	- *Silybum marianum*	Shok El-Gamal	P	Pr	537

Cont. of Table (5).

Family name	No.	Scientific name	Vernacular name	Pala-tability	Life duration	IR *
Chenopodiaceae	*31*	- *Atriplex halimus*	Qutaf	P	Pr	114
	32	- *Hammada elegans*	Rimth	Up	Pr	126
	33	- *Suaeda pruinosa*	Suaeda	Up	Pr	121
Cruciferae	*34*	- *Brassica tournefortii*	Shiltaam	P	An	191
	35	- *Cardaria draba*	Lislis	P	An	202
	36	- *Maresia pygmaea*	Shigara	P	An	173
	37	- *Zilla biparmata*	Zilla	Up	Pr	196
	38	- *Zilla spinosa*	Sill	Up	Pr	196
Alliaceae	*39*	- *Allium roseum*	Basal	P	Pr	652
Araceae	*40*	- *Arisarum vulgare*	Reinish	Up	Pr	765
Caryophyllaceae	*41*	- *Gymnocarpos decandrum*	Garad	P	Pr	77
	42	- *Paronychia argentea*	Farsh-El-Ard	P	An	77
Convolvulaceae	*43*	- *Convolvulus lanatus*	Rakhaam	Up	Pr	427
Cyperaceae	*44*	- *Cyperus rotundus*	Se'd	Up	Pr	787
Geraniceae	*45*	- *Erodium hirtum*	Timmeir	P	Pr	298
Labiatae	*46*	- *Origanum syriacum*	Zater	Up	Pr	458
	47	- *Salvia aegyptiaca*	Zaeta	Up	Pr	460
	48	-*Salvia spinosa*	Thalaba	Up	Pr	463
Liliaceae	*49*	-*Asphodelus microcarpus*	Basal El Onsal	Up	An	630
	50	-*Ornithogalum trichophyllum*	Basal El-Hanash	Up	Pr	631
Malvaceae	*51*	- *Malva parviflora*	Khobbeiza	P	An	350
Plantaginaceae	*52*	- *Plantago cylindrica*	Dages	P	An	516
	53	- *Plantago notata*	Yanam	P	An	515
Primulaceae	*54*	- *Anagallis arvensis*	Ain El Gamal	Up	An	398
Solanaceae	*55*	- *Lycium shawii*	Awsage	P	Pr	477
Thymelaceae	*56*	- *Tymelaea hirsuta*	Methanan	Up	Pr	360
Apiaceae (Umbelliferae)	*57*	*Devera tortuosa (Pituranthos tortuosus)*	Qozzah	P	Pr	388
Zygophyllaceae	*58*	- *Peganum harmala*	Harmal	Up	Pr	300

*IR = Identification reference: Page No. in viv Täckholm reference book.

recorded during each of the 3 studied years from winter 2000 up to autumn 2002 as previously mentioned.

It could be generally noticed that the most of the dominance species of abundant proliferated growth and vigority in HA location were *Astragalus boeticus, Trigonella hamosa, Anacyclus alexandrinus, Hammada elegans, Cardaria draba, Paronychia argentea, Asphodelus microcarpus, Plantago cylindrica, Lycium shawii, Thymelaea hirsuta* and *Pituranthos tortuosus*. This result was true over the 3 studied sites of such location (HA) and during the subsequent 3 studied years.

Such obtained results may be attributed to the wide adaptability and capability for growth of the previously mentioned plant species under the prevailing stressed environmental conditions of (HA) location. Such strong adapted capability was more likely expressed in the persistance, growth and regeneration of its vegetative portion of reasonable palatability and nutritive value.

The favourability of such of the mentioned plant species was true under the very harsh environmental conditions of (HA) location in respect of the lack of water, high evaporation, wind erosion, and poor soil structure with its limitation.

Second Location: Al-Aziziyya (AZ) :

This location is about 12 km west of Sidi-Barrani. The recorded families and plant species in Al-Aziziyya (AZ) location at Sidi-Barrani from winter 2000 up to autumn 2002 are presented in Table (6). Results indicated a great difference between HA and AZ locations in their botanical composition. These 43 species in AZ location were belong to 17 families which is still less by 3 families

Table (6): Botanical composition survey in Al-Aziziyya (AZ) location at Sidi-Barrani over the 3 studied sites from Winter 2000 up to Autumn 2002.

Family name	No.	Scientific name	Vernacular name	Pala-tability	Life duration	IR*
Fabaceae (Leguminosae)	*1*	- *Astragalus eremophilus*	Om-El-Qorien	P	An	264
	2	- *Astraglus spinosus*	Kadaab	P	An	266
	3	- *Lotus arabicus*	Qatb	P	An	244
	4	- *Medicago sativa*	Berseem	P	Pr	237
	5	- *Trigonella stellata*	Gargas	P	An	232
Poaceae (Gramineae)	*6*	- *Aegilops ventricosa*	Shaer El-Faar	Up	An	701
	7	- *Bromus rubens*	Deil-El-Talab	P	An	680
	8	- *Hordeum leporinum*	Sheera	P	An	704
	9	- *Lygeum spartum*	Halfa	P	Pr	739
Asteraceae (Compositae)	*10*	- *Achillea fragrantissima*	Beithraan	Up	An	577
	11	- *Anacyclus alexandrinus*	Sorret-El-Kabsh	P	An	576
	12	- *Artemisia herba-alba*	Sheeh	P	Pr	580
	13	- *Calendula aegyptiaca*	Ain-El-Baqer	Up	An	583
	14	- *Carduus getulus*	Hoshroof	P	An	533
	15	- *Centaurea calcitrapa*	Shook	P	An	540
	16	- *Chrysanthemum coronarium*	Oqhowaan	Up	An	579
	17	- *Picris radicata*	Hazain	P	An	595
	18	- *Scorzonera alexandrina*	Dabbah	P	Pr	600
	19	- *Silybum marianum*	Shook El-Gamal	P	Pr	537
	20	- *Sphaeranthus suaveolens*	Qatefa	Up	Pr	553
Chenopodiaceae	*21*	- *Halocnemon strobilaceum*	Hatab ahmar	Up	Pr	117
	22	- *Hammada elegans*	Rimth	Up	Pr	126
	23	- *Traganum nudatum*	Oad/Hamd	Up	Pr	123
Cruciferae	*24*	- *Brassica tournefortii*	Shiltaam	P	An	191
	25	- *Cardaria draba*	Lislis	P	An	202
	26	- *Maresia pygmaea*	Shigara	P	An	173
	27	- *Zilla biparmata*	Zilla	Up	Pr	196
	28	- *Zilla spinosa*	Sill	Up	Pr	196
Araceae	*29*	- *Arisarum vulgare*	Reinish	Up	Pr	765

Cont. of Table (6).

Family name	No.	Scientific name	Vernacular name	Pala-tability	Life duration	IR*
Coryophyllaceae	*30*	*- Gymnocarpos decandrum*	Garad	P	Pr	77
	31	*- Paronychia argentea*	Farsh El-Ard	P	An	77
Convolvulaceae	*32*	*- Convolvulus lanatus*	Rakhaam	Up	Pr	427
Geraniaceae	*33*	*- Erodium hirtum*	Timmeir	P	Pr	298
Labiatae	*34*	*- Salvia aegyptiaca*	Zaeta	Up	Pr	460
	35	*- Salvia spinosa*	Thalaba	Up	Pr	463
Liliaceae	*36*	*-Asphodelus microcarpus*	Basal-El-Onsal	P	An	630
	37	*- Ornithogalum trichophllum*	Basal El-Hansh	Up	Pr	631
Malvaceae	*38*	*- Malva parviflora*	Khobbeiza	P	An	350
Plantagonaceae	*39*	*- Plantago cylindrica*	Dages	P	An	516
Polygonaceae	*40*	*- Polygonum equisetiforme*	Qordab	P	Pr	63
Solanaceae	*41*	*- Lycium shawii*	Awsage	P	Pr	477
Thymelaceae	*42*	*- Thymelaea hirsuta*	Methanan	Up	Pr	360
Apiaceae (Umbelliferae)	*43*	*Devera tortuosa (Pituranthos tortuosus)*	Qozzah	P	Pr	388

*IR = Identification reference: Page No. in viv Täckholm reference book.

compared to HA, location. Out of the surveyed 43 species, 22 were of perennial growth plus 21 species of annual type. In such location (AZ) there was 27 species of palatable nature and 16 of unpalatable ones.

The obtained number of families in (AZ) location were 5 for *Leguminosae* (Fabaceae), 4 for *Gramineae* (Poaceae), 11 for *Compositae* (*Asteraceae*), 3 for *Chenopodiaceae*, 5 for Cruciferae, 1 for *Araceae*, 2 for *Caryophyllaceae*, 1 for *Convolvulaceae* and *Geraniaceae*, 2 for *Labiatae* and *Liliaceae*, 1 for *Malvaceae*, *Plantagonaceae*, *Polygonaceae*, *Solanaceae*, *Thymelaceae* and *Umbelliferae* (*Apiaceae*).

Whereas, the most tolerated species of high environmental stress adaptability under AZ location were *Lotus arabicus*, *Trigonella stellata*, *Lygeum spartum*, *Artemisia herba-alba*, *Hammada elegans*, *Zilla biparmata*, *Paronychia argentea*, *Asphodelus microcarpus*, *Thymelaea hirsuta* and *Pituranthos tortuosus*.

The greatest number of species in HA compared to AZ locations could be due to the relatively better mechanical and chemical condition of the occupied soils which varied in the two location. Also, the more availability of some of the required minerals to plants in HA than AZ locations **(Tag-El-Din, 1969)**. Meanwhile, the higher precipitation in HA than AZ locations is of great beneficial effect for plant growth in general.

Relatively, more precipitation with relatively better distribution and more favourable climatic and edaphic factors were prevailing in HA compared to AZ location. Similar results were reported by other researcher as **Ayyad (1969); Osman (1969); Zahran & Girgis (1971); El-Ghonemy (1976); Abou-Deya & Salem (1990b); Ibrahim (1995); Riead *et al.* (1996c); Noureldin *et al.* (2000) and El-Morsy (2002)** regarding the botanical composition of plant vegetation under the North-Western Coast conditions.

It could be noticed from the following comparative set of data generated from Table (5 & 6) that HA location is the most promising location in grazing activity if managed HA as well as compared with the other studied location of AZ. This results could be due to the relatively less environmental stress on plant growth, adaptability and persistance in HA compared to AZ location.

The comparative set of data clarify the differences in the two studied locations of HA and AZ in the number of families, species, platabilities and their life span during 3 years of study are summarized as follows:

Number #	Halazien (HA) location	Al-Aziziyya (AZ) Location
Families	20	17
Species	58	43
Palatable	36	27
Unpalatable	22	16
Annuals	34	21
Perennials	24	22

It should be pointed out that HA location was relatively better in its prevailing harsh environmental conditions as compared with the other studied location of AZ. This was true due to the more limited environmental conditions for plant growth and development in the later location as compared with HA area.

I.2. Frequency :

A- Effect of locations, sites and their interaction on the frequency of the naturally grown plant species:

Results in Table (7 and A1 & A2) represent the effect of locations and sites on the frequency of the naturally growing plants species.

It is obviously clear that the HA location was of the highest frequency 44.36% compared to the AZ location where the its frequency of species was 41.27%. In other words HA location was 7.5% higher in frequency than the other location of AZ.

Selected sites were of slight fluctuated effect in the frequencies of the plant species. The highest frequency was noticed in the deepest site to south (9 km down the sea-shore). Whereas, the lowest frequency percentage was obtained in the middle site (6 km South). The closed site to the seas (3 km south) was of medium frequency percentage of plant species.

Such obtained results in frequency variations of plant species as affected by the studied sites clarify the effect of the studied location with its native edaphic and environmental conditions on this particular studied parameters.

In conclusion, site 3 (9 km down the sea) was the best regarding the frequency of the grown plant species in both locations (HA and/or AZ) with respectively higher value in HA than AZ location. This results could be attributed to the higher precipitation in HA than of AZ location as shown in Table (1 & 2). Similar

Table (7) : Effect of locations, sites and their interaction on the average frequency of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
		(%)		
HA	44.48	37.66	50.93	**44.36**
AZ	39.04	38.21	46.55	**41.27**
Mean	**41.76**	**37.94**	**48.74**	**42.82**

Table (8) : Seasonal effect and its interaction with location on the average frequency of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(%)		
HA	44.25	41.12	41.79	50.26
AZ	41.24	33.96	48.75	41.11
Mean	**42.75**	**37.54**	**45.27**	**45.69**

Table (9) : Interaction effect of locations, sites and seasons on the average frequency of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(%)		
HA	S1	41.89	41.49	39.52	55.00
	S2	37.01	40.62	35.00	38.00
	S3	53.85	41.25	50.84	57.78
AZ	S1	38.80	35.68	41.67	40.00
	S2	42.70	33.33	39.58	37.22
	S3	42.22	32.86	65.00	46.11

HA = Halazien , AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

results were obtained by **Ayyad (1969); Ahmed and Shalaby (1985); Ibrahim (1995); Reiad *et al.* (1996 a,b) and El-Morsy (2002).**

B. Seasonal effect and its interaction with location on the frequency of the naturally grown plant species:

Frequency of the different species were varied among the growing seasons as it is clear from Table (8 and A1 & A2). Over the two studied seasons, autumn 45.69% and summer 45.27% were of almost similar values. Such values were decreased in winter season (42.75%) with a slight reduction of about 7%. However, in spring season, frequency percentage of species decreased to 37.54%.

In other words, frequency of plant species were the highest in autumn and summer (the two dry seasons), then decreased in winter and spring (the two wet season) to reach its minimum value in the spring seasons (37.54%). These results were acceptable due to the more presence of the perennial species in autumn and summer season while annuals used to be grown in winter and spring seasons after precipitation as presented in Table (1 & 2).

So, the permanent perennials and the absence of annuals vegetation are more or less the reason for increasing the frequency of plant species in summer and autumn than during winter and spring season. Similar results were reported by **Osman (1969).**

The interaction effect of locations and growing seasons on the frequency of plant species (Table 8) indicated that the highest frequency of plant species was in HA location during autumn season (50.26%). Whereas the lowest frequency of plant species was noticed in spring season of AZ location (33.96%). This trend was generally noticed where higher frequency of plant species was higher in HA than AZ location in all seasons with various magnitudes among seasons as previously discussed. These results are along the same line as reported by **Ibrahim (1995); Reiad *et al.* (1996a,b) and El-Morsy (2002).**

C. Interaction effect of locations, sites and seasons on the frequency of naturally grown plant species:

It generally noticed from Table (9 and A1 & A2) that the interaction effect of locations, sites and seasonal variations on the frequency percentage of the grown species was clear.

The HA location was of the highest frequency of plant species in almost all sites being the highest in the third site, followed by the first, then the second site of the lowest frequency values as compared with the AZ location. Moreover, highest frequencies were obtained in autumn and summer seasons, then winter followed by spring season of the minimal frequency percentage of plant species.

For more clarification, *Hammada elegans* and *Thymeleae hirsuta* species for frequency were grown well in summer. So, their frequency were higher during autumn and summer due to the present of the plenty of perennial plants.

The highest frequencies of plant species in HA location were for *Hammada elegans, Thymelaea hirsuta* and *Pituranthos tortuosus* were their highest frequency was noticed during all seasons. Whereas, in AZ location, the *Artemisia herba-alba, Hammada elegans, Thymelaea hirsuta* and *Pituranthos tortuosus* were of the highest frequency. Such obtained highest frequency indicates that the vegetative activity was completely dependable on the suitability of the prevailing environmental condition, since, it grow well under the adequate availability of water, less temperature, more dew.... etc. This may affect the rates of vegetations in the harsh stressed environmental conditions, between the two locations, as shown in Tables (1 & 2) various investigators reported similar results.

I.3. Abundance :

A. Effect of locations, sites and their interaction on the abundance of the naturally grown plant species:

Data presented in Table (10 and A3 & A4) showed the effect of locations, sites and their interaction on the abundance of the naturally grown plant species. Meanwhile, in both locations (HA, AZ), the highest abundance of plant species were noticed in HA location compared to AZ location. This may be due to both of the edaphic and climatic factors were soil conditions and due to precipitation and wind stress effect. These results confirmed what obtained by **Reiad *et al.* (1996a).**

Over the 3 sites, the first location of Halazien (HA) was of the highest abundance (20.03%) in plant species compared to the second location of Al-Aziziyya (AZ) 13.31%. The highest abundance value at HA location than AZ location. This may be due to the relatively higher precipitation in HA location than AZ location as recorded in Table (1 & 2).

Table (10) : Effect of locations, sites and their interaction on the abundance of the naturally grown plant species from winter 2000 up to autumn 2002.

Site (S) / Location (L)	S1	S2	S3	**Mean**
		(%)		
HA	19.72	21.38	18.98	**20.03**
AZ	16.62	13.09	10.22	**13.31**
Mean	**18.17**	**17.24**	**14.60**	**16.67**

Table (11): Seasonal effect and its interaction with location on the abundance of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(%)		
HA	20.25	23.57	19.46	16.82
AZ	13.08	9.76	13.87	16.52
Mean	**16.66**	**16.66**	**16.66**	**16.66**

Table (12): Interaction effect of locations, sites and seasons on the abundance of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(%)		
HA	S1	16.62	24.64	20.39	17.21
	S2	25.25	24.63	19.87	15.77
	S3	18.89	21.44	18.21	17.47
AZ	S1	26.19	8.23	16.54	15.53
	S2	8.79	13.41	12.76	17.35
	S3	4.26	7.64	12.29	16.67

HA = Halazien , AZ = Al-Aziziyya locations

S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

Over the two studied locations (HA, AZ), the abundance of the native plant species was the highest at site 1 (3 km down the sea), followed by site 2 (6 km down the sea), then site 3 (9 km down the sea). The respective abundance percentage for plant species were 18.19, 17.24 and 14.60%. Such result generally indicated that better abundance was whenever the site was closer to the sea-shore. These results were true over the two studied locations.

Data for the interaction effect between locations (HA, AZ) and sites on the abundance percentage of plant species is presented in Table (10). Highest abundance was recorded in HA location (21.38%) for site 2, whereas, the lowest percentage were noticed in AZ location (10.22%) at site 3 with about double difference. It is generally noticed that HA location was much better in the abundance percentage of plant species compared to AZ location and abundance percentage of plant species slightly varied according to the studied sites, with a general decrease from site 1 to 2 then 3. This decrease was noticed as we go further south from the sea-shore (3, 6 and 9km).

This results could be mainly due to the differences between the two locations in the prevailing climatic and environmental conditions as precipitation, relative humidity, temperature and sunshine and radiation periodicity (Table 1 & 2). The edaphic differences in physical and chemical properties of the soil in both location played an essential role in such studied abundance parameter (Table 3 & 4). Along the same line, **Daniel and Naphtali (1962); Ayyad (1969); El-Ghonemy and Tadros (1970); Ibrahim (1995); Reiad *et al.* (1996) and El-Morsy (2002)** reported similar results.

B. Seasonal effect and its interaction with location on the abundance of the naturally grown plant species:

Results in Table (11 and A3 & A4) presented the effect of seasonal variation which was very much clear within the two studied locations regarding the abundance of the naturally grown plant species.

At HA location, maximum value of abundance was obtained (23.57%) in spring season, whereas the minimum value (9.76%) was noticed in the same season at AZ location. This result indicates the super abundance of the plant species in the first rather than the later location. Such result proved the much better environmental and soil conditions of HA location compared to AZ location especially in spring season.

The obtained results may prove that HA location was of the highest abundance in plant species. This was noticed in wet seasons compared to dry ones. Such result could be due to the highest precipitation as well as to the better environmental conditions in spring, winter and summer seasons in a descending order. **Abou-Deya and Salem (1990b); Ibrahim (1995); El-Morsy (2002) and Hendawy (2002)** found that the highest abundance was obtained in wet season compared to dry season.

In winter and summer seasons, abundance of plant species were 20.25 and 19.46%, respectively in HA location being 13.08 and 13.87% in AZ location. Such results still indicate the superiority of HA than AZ locations in this studied parameter during winter and spring seasons with relatively lower magnitude compared to summer season as previously discussed.

Also, the highest presence of perennials plants and the absence of annual plants in summer and autumn could be in great consideration for the obtained results. Such results confirm what was recorded **Reiad *et al.* (1996a).**

However, it is well noticed that no much detectable differences were recorded in the studied abundance parameters of plant species in both of HA and AZ location in autumn season, where the respective abundance values were 16.82 and 16.52%. This result showed an equal opportunity for the studied abundance character of plant species for either of the studied locations.

C. Interaction effect of locations, sites and seasons on the abundance of the naturally grown plant species:

Concerning the interaction effect of locations, sites and seasonal variations on the abundance percentage of the grown plant species, it is clear from Table (12 and A3 & A4) that the recorded abundance of plant species was 26.19% at AZ location in winter season at site 1 (3 km South). Whereas, lowest abundance were noticed (4.26%) at AZ location in winter season at site 3 (9km South). This results could be mainly due to the effect of edaphic conditions which act as an important parameter for tolerating and adaptive the stressed dominant environment conditions.

It could be generally noticed that abundance values of the grown plant species was strongly affected by each of the 3 studied factors and their interaction (Table 12). Abundance of plant species was extremely higher at HA than AZ location during spring and summer seasons in each of the three studied sites.

During winter season, the highest abundance were obtained in site 2 (25.25%), followed by site 3 (18.89%), then site 1 (16.62%) in HA location. Whereas, in AZ location, the highest abundance was obtained in the site 1 (26.19%), followed by the site 2 (8.79%), then the site 3 (4.26%). However, during autumn season, abundance was not varied much with the two studied locations and sites.

In general, the greatest abundance of the grown plant species in HA location were *Anacyclus alexandrinus, Paronychia argentea, Asphodelus microcarpus, Plantago cylindrica, Hammada elegans, Lycium shawii, Thymelaea hirsuta* and *Pituranthos tortuosus*.

Whereas, in AZ location the highest abundance of plant species were *Astragalus spinosus, Lotus arabicus, Trigonella stellata, Anacyclus alexandrinus, Asphodelus microcarpus, Plantago cylindrica, Hammada elegans, Thymelaea hirsuta* and *Pituranthos tortuosus*.

I.4. Coverage:

A. Effect of locations, sites and their interaction on the coverage of the naturally grown plant species:

Data in Table (13 and A5 & A6) represent plant coverage percentage per square meter (sq meter) in the two studied locations. Coverage of plant species in HA location (48.67%) was superior than for AZ location (37.97%) where the difference was significant. The highest value of coverage in HA compared to AZ location may be attributed to the highest precipitation and environmental effects

Table (13): Effect of locations, sites and their interaction on the average plant coverage of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
		(%)		
HA	47.85	58.33	39.83	**48.67[A]**
AZ	39.58	40.64	33.70	**37.97[B]**
Mean	**43.72[B]**	**49.49[A]**	**36.77[C]**	**43.32**

Table (14) : Seasonal effect and its interaction with locations on the average plant coverage of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(%)		
HA	49.93	46.15	49.02	49.57
AZ	41.01	37.32	37.76	35.78
Mean	**45.47**	**41.75**	**43.39**	**42.68**

Table (15) : Interaction effect of locations, sites and seasons on the average plant coverage of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(%)		
HA	S1	41.01	51.76	54.75	43.89
	S2	64.37	51.07	54.99	62.87
	S3	44.43	35.61	37.33	41.94
AZ	S1	30.69	43.74	49.33	34.59
	S2	44.97	38.01	39.82	39.67
	S3	47.36	30.21	24.14	33.09

HA = Halazien , AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

of HA location. Also, the higher precipitation rate and the relatively appropriate soil (Table 1, 2, 3 & 4) in HA location could be another reason. Similar results were reported by **Osman (1969); Ibrahim (1995); Reiad *et al.* (1996 a,b) and El-Morsy (2002).**

Coverage of plant species was significantly affected by the growing site (Table 13). Site 2 (6 km south of the sea-shore) was of the highest coverage percentage of 49.49%, followed by site 1 (3 km south) of 43.72%, then site 3 (9 km south) which had the lowest coverage 36.77%. This result may be attributed to the relatively better edaphic factors in site 2 (6 km south) compared to the other sites (1 and 3) in producing the highest coverage percentage. Similar effect was noticed when comparing the coverage % between site 1, 2 and 3 with significant differences and various magnitudes.

The interaction between locations and sites was not significant (Table 13). However, the highest value of coverage 58.33% was obtained in HA location at site 2 (6 km south), however, the lowest coverage percentage 33.70% was recorded in AZ location at site 3 (9 km south).

B. Seasonal effect and its interaction with location on the coverage of the naturally grown plant species:

Data in Table (14 and A5 & A6) showed the effects of location and the growing seasons of grown plant species. Results did not show significant differences in coverage percentage of the grown species under the circumstances of this study. However the coverage percentage was the highest for winter 45.47%, followed by summer 43.39%, then autumn 42.68% followed by spring 41.75%.

Such presented descending sequence in coverage percentage may be attributed mostly to the precipitation in winter season and to the less degree of drying for the subsequent seasons. In fact coverage percentage depends mainly upon the canopy structure of the growing plants, its nature growth and the exposed adverse conditions, and life cycle (annual vrs perennials) as well, where annual plants usually have less size compared to the perennial ones. **El-Monayeri *et al.* (1986)** showed that percentage plant coverage was maximum during hot dry season due to the shedding of the green foliage of the deciduous perennials.

Data in Table (14) did not show interaction effect between location and season on the coverage percentage of plant species. However, the highest coverage percentage was 49.93% in HA location during winter season, whereas, the lowest percentage was 35.78% at AZ location in autumn. These results are very well acceptable due to the adequate precipitation and the presence of the perennial species during winter season compared to the other seasons (spring, summer and autumn). Similar results were reported by **Abou-Deya and Salem (1990b), Ibrahim (1995); Reiad *et al.* (1996a); El-Morsy (2002) and Hendawy (2002).**

C. Interaction effect of locations, sites and seasons on the coverage of that naturally grown plant species:

It is generally noticed from data in Table (15 and A5 & A6) that the interaction effect of locations, sites and seasonal variation on the coverage percentage of the grown species were fluctuating of no significant specific trend. However, in HA location, the highest coverage % was recorded in winter (64.37%) at site 2, then in spring (51.76%) at site 1, in summer (54.99 and 54.75% in S2 and S1, respectively) which were almost similar and in autumn (62.87%) in site 2.

But in AZ location, the greatest coverage was noticed in winter 47.36% at site 3, in spring 43.74%, at site 1, in summer 49.33% at site 1 and in autumn 39.67% at site 2 as presented in Table (15).

It is worth noting that the greatest records of coverage (64.37%) was found at HA location in site 2 (6km south) in winter season as previously mentioned. This result is very well accepted due to the fact that cover measurements mainly depend upon the structure of plant canopy where most of annual plants had small limited canopy compared to the perennials which used to be responsible for increasing and magnifying the magnitude of such studied parameter. This is not the case for the annual species especially during winter season. Hence, appreciable cover enhancement was not related to the higher plant density, particularly in winter and spring. Results support what was recorded by **Abou-Deya and Salem (1990a), Ibrahim (1995) and Reiad *et al.* (1996 a,b).**

However, the obtained lowest coverage was 24.14% at AZ location in site 3 (9 km South) during summer season. As it is generally noticed in most cases that lower coverage percentage was usually in AZ location in all seasons at site 3 (9 km South).

Plant species of the highest coverage percentage at HA location were *Hammada elegans, Thymelaea hirsuta, pituranthos tortuosus* and *Asphodelus microcarpus.* But in AZ location showed that *Hammada elegans, Thymelaea hirsuta, Asphodelus microcarpus* and *Artemisia herba-alba.*

Perennials plant species exerted higher response in coverage percentage. This is because of the limited role of annuals in increasing plant coverage, but perennials plant species had the majority of reasons increasing coverage percentage. In this respect **Ibrahim (1995)** found that the greatest coverage was recorded for *Thymelaea hirsuta* in spring, followed by, autumn then winter at Sidi-Barrani.

Generally, coverage percentage at HA location seemed to be higher compared to AZ location in most of the studied growing seasons and sites. These results may be due to the relatively moderate environmental factors, reasonable precipitation and less stressed edaphic conditions in respect of sand and less gravel contents in the soil of HA location (Table 1,2,3 & 4) which can retain more water around the root rhizosphere zone of the native plants without permitting the run-off of such water towards the sea as it is used to be in AZ location.

I.5. Plant density (plant/ m^2):

A. Effect of locations, sites and their interaction on the plant density (plant/m^2) of the naturally grown plant species:

Data of density of plant species as affected by locations, sites and their interaction are presented in Table (16 and A7 & A8). Locations exerted significant effect of the density of grown plant species. Density of plant species in HA location (36.90) exceeded that of AZ location (17.83) by more than doubled with significant difference.

This result prove that HA location is much better than AZ location regarding the density of plant species. It should be noted

Table (16) : Effect of locations, sites and their interaction on the average density of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
		(Plant/m²)		
HA	31.33^{BC}	38.33^{AB}	41.03^{A}	$\mathbf{36.90^{A}}$
AZ	27.23^{C}	18.70^{D}	7.54^{E}	$\mathbf{17.83^{B}}$
Mean	**29.28**	**28.52**	**24.29**	**27.36**

Table (17) : Seasonal effect and its interaction with locations on the average density of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(Plant/m²)		
HA	65.40^{B}	76.27^{A}	3.47^{D}	2.47^{D}
AZ	37.12^{C}	29.29^{C}	2.47^{D}	2.42^{D}
Mean	$\mathbf{51.26^{A}}$	$\mathbf{52.78^{A}}$	$\mathbf{2.97^{B}}$	$\mathbf{2.45^{B}}$

Table (18) : Interaction effect of locations, sites and seasons on the average density of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(Plant/m²)		
HA	S1	43.67^{D}	75.53^{ABC}	3.60^{F}	2.53^{F}
	S2	64.13^{C}	83.33^{AB}	3.53^{F}	2.33^{F}
	S3	88.40^{A}	69.93^{BC}	3.27^{F}	2.53^{F}
AZ	S1	73.00^{ABC}	30.73^{DE}	2.87^{F}	2.33^{F}
	S2	30.87^{DE}	39.07^{D}	2.33^{F}	2.53^{F}
	S3	7.50^{F}	18.07^{EF}	2.20^{F}	2.40^{F}

HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

that vegetative growth activities are much dependable on the suitability and convenience of the prevailing of the environmental conditions, since it grow well under the adequacy of the available water, moderate temp and dew.... etc as presented in Table (1 & 2). Similar results were obtained and recorded previously by **Tag El-Din (1969); Girgis (1971); Ibrahim (1995); Reiad *et al.* (1996a); El-Morsy (2002) and El-Toukhy *et al.* (2002).** This is in addition to the better edaphic conditions in HA location as compared with AZ location (Table 3,4).

Results in Table (16) showed no significant difference in the density of plant species according to the sites. However, native plants showed slightly higher density at site 1 (3 km south) and the lowest value were in site 3 (9 km south), inspite of the very narrow range of differences.

The interaction effect between locations and sites on the density of plant species were significant. Results showed that at HA, density of plant species increased gradually from site 1 (31.33) to site 2 (38.33) up to site 3 (41.03). Whereas, there was no significant differences in density of plants between site 1 and 2 or between site 2 and 3. This trend was not true in AZ location, where density of plant species decreased gradually from site 1 (27.23) to site 2 (18.70) and down to site 3 (7.54) were the differences in between were significant as it is clear from Table (16).

It should be also noted that density of plant species were extremely higher in HA than that of AZ location at all sites (31.33 vrs 27.23 at site 1, 38.33 vrs 18.70 at site 2, and 41.03 vrs 7.54 plant/m^2 at site 3).

noticed in AZ location with no significant difference as shown in Table (17).

However, during summer and autumn (the dry seasons), density of plants extremely decreased compared to winter and spring (wet season). This results were true within each of the dry and/or, wet duration periods (Table 17). Such results could be attributed to the disappearance of annual plants species during such dry hot seasons. Similar results were reported by **Abou-Deya and Salem (1990b); Ibrahim, (1995); Reiad *et al.* (1996a); El-Morsy (2002); El-Toukhy *et al.* (2002) and Hendawy (2002).**

C. Interaction effect of locations, sites and seasons on the plant density (plant/m^2) of the naturally grown plant species:

The interaction effect of locations, sites and seasons on the density of plant species was significant Table (18 and A7 & A8). Higher densities of plants were recorded in winter (88.40 plant/m^2) in site 3 of HA location and in spring (83.33 plant/m^2) in site 2 at the same location. However, at AZ location, highest density of plant species were recorded in winter (73.00 plant/m^2) in the first site, and in spring (39.07 plant/m^2) for the second site.

Meanwhile, in summer and autumn (the dry seasons) plant densities dropped to the minimum levels (ranged from 2.20 to 3.53 plants/m^2) with no significant differences for either locations, sites or seasons (Table 18).

The recorded heaviest plant density at HA location were *Hordeum leporinum, Anacyclus alexandrinus, Hammada elegans Paronychia argentea, Asphodelus microcarpus* and *Plantago cylindrica.*

Whereas, at AZ location the greatest plant density were recorded for *Aegilops ventricosa, Anacyclus alexandrinus, Paronychia argentea, Asphodelus microcarpus, Plantago cylindrica* and *Thymelaea hirsuta.*

Also, it was obviously clear that density reached the minimum in dry season (summer and autumn) due to the absence of annuals. Many investigators found similar results such **Abou-Deya and Salem (1990b), Ibrahim (1995), Abou-Deya (1996), Reiad *et al.* (1996a), El-Morsy (2002) and El-Toukhy *et al.* (2002).**

In conclusion, the obtained results in addition to some other ideas which could be generated and implemented from research and development studies could be used successfully in establishment and renovating the NWC ranges of Egypt.

II. Foliage productivity :

II.1. Fresh foliage yield:

A. Effect of locations, sites and their interaction on the fresh foliage yield of the naturally grown plant species:

Fresh foliage yields data of the native plants for the two studied locations and the 3 sites are presented in Table (19 and A9 & A10). Results indicated significant effects on the total fresh foliage yield between the two locations of Halazien (HA) and Al-Aziziyya (AZ).

Fresh foliage yield of HA location was of the highest value (0.738 kg/m^2) compared to AZ location (0.560 kg/m^2). This difference may be attributed to such superiority of HA location than AZ in the prevailing more convenient environment conditions as

Table (19) : Effect of locations, sites and their interaction on the fresh foliage yield of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
		(kg/m^2)		
HA	0.693	1.017	0.504	**0.738^A**
AZ	0.524	0.714	0.443	**0.560^B**
Mean	**0.609^B**	**0.866^A**	**0.474^C**	**0.649**

Table (20) : Seasonal effect and its interaction with location on the fresh foliage yield of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(kg/m^2)		
HA	0.859	0.840	0.510	0.742
AZ	0.705	0.739	0.370	0.427
Mean	**0.782^A**	**0.790^A**	**0.440^C**	**0.585^B**

Table (21) : Interaction effect of locations, sites and seasons on the fresh foliage yield of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(kg/m^2)		
HA	S1	0.685	0.960	0.460	0.665
	S2	1.225	1.031	0.735	1.078
	S3	0.666	0.530	0.335	0.483
AZ	S1	0.581	0.717	0.393	0.403
	S2	0.887	0.938	0.479	0.553
	S3	0.648	0.562	0.237	0.325

HA = Halazien , AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

Table(22):Partitioning of total fresh foliage production from the perennial and annual plants species in response to locations, sites and their interaction during winter 2000 up to autumn 2002..

Location (L) \ Site (S)	S1		S2		S3		**Mean**	
	An	Pr	An	Pr	An	Pr	**An**	**Pr**
	(Kg/m²)							
HA	0.140	0.553	0.310	0.706	0.133	0.371	**0.194**	**0.543**
AZ	0.106	0.416	0.136	0.578	0.182	0.261	**0.141**	**0.418**
Mean	**0.123**	**0.484**	**0.223**	**0.642**	**0.158**	**0.316**	**0.168**	**0.481**

Table(23):Partitioning of total fresh foliage production into from perennial and annual plant species in response to seasonal variations and its interaction with locations during winter 2000 up to autumn 2002.

Location	Season							
	Winter		Spring		Summer		Autumn	
	An	Pr	An	Pr	An	Pr	An	Pr
	(Kg/m²)							
WH	0.428	0.432	0.349	0.491	-	0.510	-	0.742
AZ	0.337	0.368	0.226	0.511	-	0.370	-	0.427
Mean	**0.383**	**0.400**	**0.288**	**0.501**	-	**0.440**	-	**0.585**

Table (24): Total fresh foliage production from perennial and annual plant species as affected by the interaction of locations, sites and seasonal variation during winter 2000 up to autumn 2002.

Location	Sites	Season							
		Winter		Spring		Summer		Autumn	
		An	Pr	An	Pr	An	Pr	An	Pr
		(Kg/m²)							
WH	S1	0.228	0.459	0.331	0.629	-	0.460	-	0.665
	S2	0.746	0.479	0.494	0.537	-	0.735	-	1.077
	S3	0.310	0.357	0.221	0.308	-	0.333	-	0.483
AZ	S1	0.253	0.327	0.169	0.546	-	0.393	-	0.403
	S2	0.374	0.513	0.169	0.766	-	0.479	-	0.553
	S3	0.385	0.263	0.341	0.221	-	0.237	-	0.325

An = Annual plants, Pr = Perennial plants.
HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

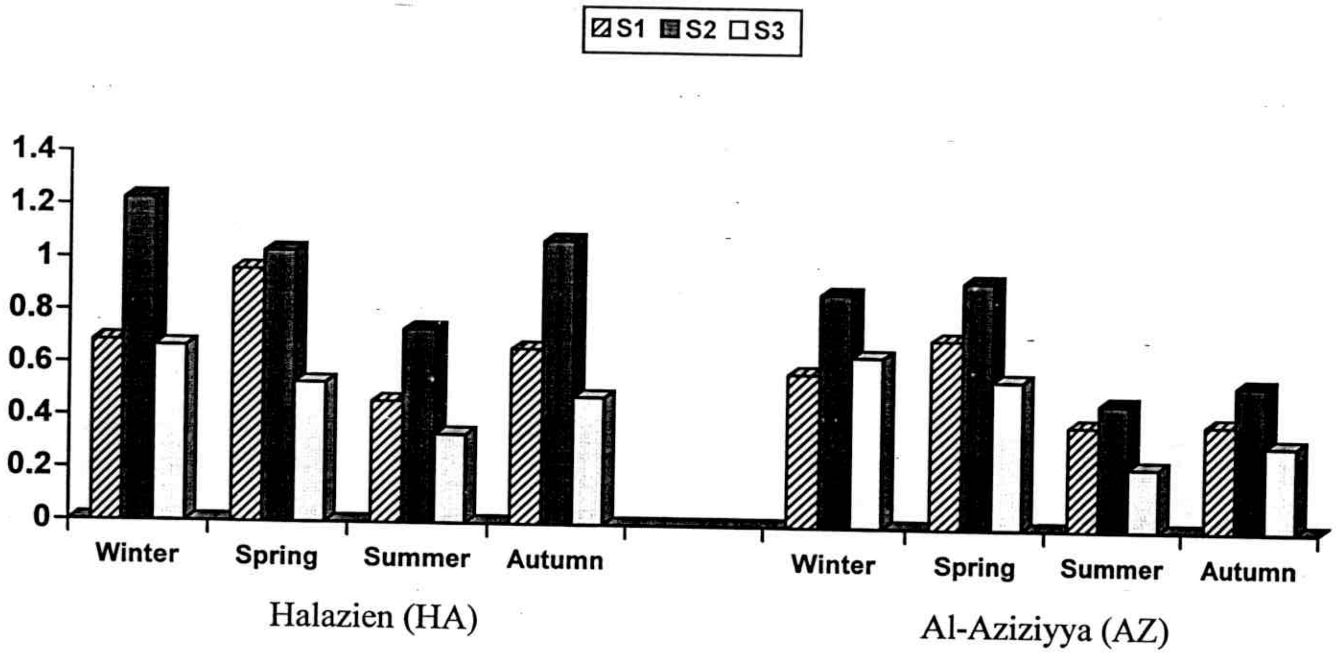

Fig. (3) : Effect of locations, sites and seasons on fresh foliage yield (kg/m^2) of the naturally grown plant species during winter 2000 up autumn 2002.

shown in Table (1 & 2). It is more likely that precipitation amounts and its reasonable frequency temperature, relative humidity, wind velocity as well as the more favourable edaphic condition (Table 3 & 4) plays an important role in stimulating and promoting appropriate vegetative growth under the circumstance of this research. Such obtained results support what was previously reported by **Ibrahim (1995) and Reiad *et al.* (1996b).**

Results in Table (19) also showed significant differences in the obtained foliage yield within the 3 studieds sites of 3, 6, 9 km south of sea-shore with the respective fresh foliage yield of 0.609, 0.866 and 0.474 kg/m^2. Such results proved that the highest fresh yield productivity was in site 2 (0.866 kg/m^2). So, such result may indicate the better edaphic conditions in site 2 compared to site 1 and/or 3.

The interaction effect of locations and sites on the fresh foliage productivity was not significant (Table 19). However fresh foliage productivity in both HA and AZ locations were the highest in site 2 than 1 and/or 3. Also, it is clear that the obtained foliage yield of plant species was higher in HA than AZ locations in all of the three studies sites.

In conclusion, site 2 (6 km down the sea) was of the highest potentiality for the fresh foliage production of the grown plant species in either of HA or AZ with higher value in HA than AZ location. This results could be attributed to the relatively higher amounts of precipitation with better distribution in HA (Table 1) compared to AZ location (Table 2) as previously reported by **Ibrahim (1995); Reiad *et al.* (1996b,c) and El-Morsy (2002).**

Such obtained results could be also due to the more perennial plant species compared to the annuals plant species in HA compared to AZ location as it is clear in Table (22). There perennial plant species contributed more in HA in respect of the proliferation of fresh foliage yield than in AZ location.

B. Seasonal effect and its interaction with location on the fresh foliage yield of the naturally grown plant species:

The studied fresh foliage yield of the different native species varied significantly among the growing seasons as it is clear from Table (20 and A9 & A10). Highest fresh yield of the grown plant species was obtained during spring and winter seasons, which was 0.790, 0.782 kg/m^2 respectively with no significant difference in between for those two wet seasons.

Whereas, the lowest fresh foliage yield in two dry seasons of summer and autumn were 0.440, 0.585 kg/m^2, respectively with significantly higher fresh yield in autumn than during summer season.

Such result confirm the relatively more convenient environmental conditions during the wet seasons compared to the dry seasons in promoting and stimulation all of the essential plant physiochemical operations resulted in increasing the growth and development of foliage production.

Also, it should be pointed out that the highest foliage productivity of wet seasons during winter and spring as compared to dry seasons of summer and autumn is more likely due to the association of the existence perennial plant species with the growing annual herbaceous plants. Meanwhile, the significant lower foliage production in the two dry seasons (summer and autumn) as compared to either of the two wet seasons (winter and spring) could be due to the existence of perennial plants and the complete disappearance of the annual herbaceous plants.

The interaction effect of locations and seasons was not significant on fresh foliage yield productivity of plant species. However, the highest fresh foliage yield in HA than AZ location was noticed in all seasons and all of the studied locations with much higher magnitudes in wet rather than the dry seasons. These results could be due to the moderate amounts of precipitation with better distribution in wet seasons in HA than in AZ location.

In other words, the contribution of the grown annual plant species to the already grown perennial plants is a reasonable cause for the abundance of higher fresh foliage production in (wet seasons) of winter and spring compared to (dry seasons) of summer and autumn as recorded in Table (23). Similar results were obtained by **Ibrahim (1995), Reiad *et al.* (1996b); El-Marsy (2002) and El-Toukhy *et al.* (2002).**

C. Interaction effect of locations, sites and seasons on the fresh foliage yield of the naturally grown plant species:

Data in Table (21 and A9 & A10) did not show significant interaction effect of locations, sites and seasons on fresh foliage yield of the grown native plant species. Whereas, results clarified that the highest fresh foliage yield of plant species were obtained in wet seasons (winter and spring) than the dry seasons (summer and autumn) in both locations (HA, AZ) at site 2 (6 km down the sea-shore) . The respective fresh foliage yield of plant species was 1.225, 1.031 and 1.078 kg/m^2 in winter, spring and autumn seasons, respectively at HA location corresponding to 0.887, 0.938 and 0.553 kg/m^2 at AZ location in winter, spring and autumn seasons (Table 21).

Such obtained variation in fresh foliage yield of plant species could be explained by the extreme variations in the prevailing climatic and edaphic conditions within the studied locations and sites as it is presented previously in Tables (1, 2, 3 & 4).

It is important to denote that under HA location the highest potentialities of the studied plant species in fresh foliage yield productivity were *Anacyclus alexandrinus, Asphodelus microcarpus, Plantago cylindrica, Gymnocarpus decandrum, Artemisia herba-alba, Hammada elegans, Zilla biparmata, Lycium shawii, Thymelaea hirsuta,* and *Pituranthos tortuosus.*

Whereas, in AZ location, the highest foliage yield was recorded for *Silybum marianum, Convolvulus lanatus, Asphodelus microcarpus, Lygeum spartum, Artemisia herba-alba, Hammada elegans, Zilla biparmata, Polygonum equisetiforme, Lycium shawii, Thymelaea hirsuta* and *Pituranthos tortuosus.*

It could be generally concluded that during wet seasons of winter and spring the higher fresh foliage yield were obtained as compared with the dry seasons of summer and autumn in both of the studied locations. This result was true with higher magnitude in HA than AZ location. Such results could be related to the relatively adequate and more even distribution of precipitation, relatively lighter sunshine radiation of moderate temperature in heat and periodicity, mild wind speed and more humidity in HA compared to AZ location as well as the relatively more convenient edaphic condition for growth and development of the native plant species in site 2 than site 1 and/or 3. The obtain results are in agreement with those of **Ibrahim (1995), Reiad *et al.* (1996b,c) and El-Morsy (2002).**

II.2. Dry foliage yield:

A. Effect of locations, sites and their interaction on the dry foliage yield of the naturally grown plant species:

Results of the obtained dry foliage yield as affected by the studied factors and its interaction were more or less similar to what was presented and discussed previously in fresh foliage yield with slight variations and different magnitudes. Dry foliage yield of the native plant species as affected by locations, sites and their interaction is presented in Table (25 and A11 & A12). Dry foliage yield was significantly affected by the studied locations. Its production of HA (0.392 kg/m^2) was significantly higher than those obtained from AZ location (0.286 kg/m^2). This result could be due to the relatively more moderate and less stressed environmental conditions with reasonable amounts and distribution of precipitation (Table 1 & 2).

Studied sites affected foliage yield of plant species significantly (Table 25). Results showed that the greatest dry yield was obtained at site 2 followed by site 1, then 3 (3, 6, 9 km down south of sea-shore, respectively) where the respective dry foliage

Table (25) : Effect of locations, sites and their interaction on the dry foliage yield of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
		(Kg/m²)		
HA	0.375	0.526	0.276	**0.392[A]**
AZ	0.264	0.392	0.203	**0.286[B]**
Mean	**0.320[B]**	**0.459[A]**	**0.240[C]**	**0.339**

Table (26) : Seasonal effect and its interaction with location on the dry foliage yield of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(Kg/m²)		
HA	0.363	0.400	0.331	0.476
AZ	0.303	0.332	0.244	0.266
Mean	**0.333[AB]**	**0.366[A]**	**0.288[B]**	**0.371[A]**

Table (27) : Interaction effect of locations, sites and seasons on the dry foliage yield of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(Kg/m²)		
HA	S1	0.286	0.453	0.327	0.434
	S2	0.476	0.516	0.434	0.680
	S3	0.327	0.231	0.233	0.313
AZ	S1	0.239	0.322	0.245	0.249
	S2	0.429	0.471	0.319	0.349
	S3	0.240	0.204	0.168	0.199

HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

Table (28): Partitioning of total dry foliage production from the perennial and annual plants species in response to locations, sites and their interaction during winter 2000 up to autumn 2002..

Site (S) / Location (L)	S1		S2		S3		**Mean**	
	An	Pr	An	Pr	An	Pr	**An**	**Pr**
	(Kg/m²)							
HA	0.084	0.289	0.110	0.416	0.052	0.226	**0.082**	**0.310**
AZ	0.034	0.229	0.047	0.346	0.046	0.157	**0.042**	**0.244**
Mean	**0.059**	**0.259**	**0.079**	**0.381**	**0.049**	**0.192**	**0.062**	**0.277**

Table (29): Partitioning of total dry foliage production into from perennial and annual plant species in response to seasonal variations and its interaction with locations during winter 2000 up to autumn 2002.

Location	Season							
	Winter		Spring		Summer		Autumn	
	An	Pr	An	Pr	An	Pr	An	Pr
	(Kg/m²)							
HA	0.174	0.189	0.153	0.249	-	0.331	-	0.476
AZ	0.085	0.219	0.085	0.248	-	0.244	-	0.266
Mean	**0.130**	**0.204**	**0.119**	**0.249**	-	**0.288**	-	**0.370**

Table(30): Total dry foliage production into from perennial and annual plant species as affected by the interaction of locations sites and seasonal variation during winter 2000 up to autumn 2002.

Location	Sites	Season							
		Winter		Spring		Summer		Autumn	
		An	Pr	An	Pr	An	Pr	An	Pr
		(Kg/m²)							
HA	S1	0.173	0.119	0.162	0.284	-	0.327	-	0.434
	S2	0.229	0.239	0.212	0.310	-	0.434	-	0.680
	S3	0.122	0.208	0.086	0.154	-	0.233	-	0.313
AZ	S1	0.080	0.159	0.056	0.266	-	0.245	-	0.249
	S2	0.105	0.327	0.083	0.388	-	0.319	-	0.349
	S3	0.069	0.170	0.116	0.090	-	0.168	-	0.199

An = Annual plants, Pr = Perennial plants.
HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

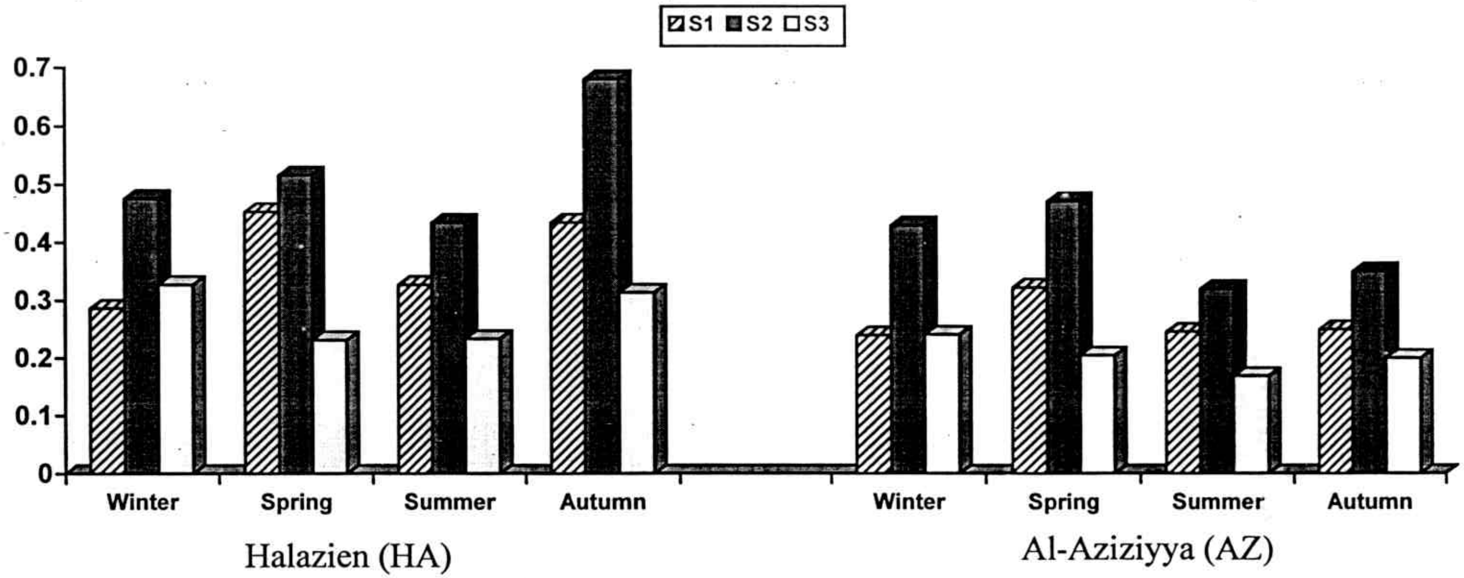

Fig. (2): Effect of locations, sites and seasons on the dry foliage yield (kg/m^2) of the naturally grown plant species during winter 2000 up to autumn 2002.

yield was 0.459, 0.320 and 0.240 kg/m^2. This result indicated that the highest production of site 2 was almost doubled than site 3 which was much correlated by the availability of reasonable precipitation as well as the other convenient climatic factors as moderate temperature which considered suitable for most of the grown native plant species. Also, the convenient edaphic factors may provide more privilege for growth and production of site 2 than site 1 and site 3 (Table 3 & 4). Similar results was noticed in fresh foliage yield (19) previously discussed .

A long the same line, interaction effect of locations and sites were not significant on the dry foliage yield of plant species. However, site 2 was of the highest value in dry foliage yield in both locations (HA, AZ). Whilst, the lowest value were in site 3 at both locations with higher magnitude in HA than AZ location in all of the studied 3 sites.

Such obtained lower values of dry matter yield in site 3 may be due to the severe lack of moisture and the worth edaphic conditions which depressed the biological and physiological functions of plants which limited its growth and development. Similar results were obtained by **Ibrahim (1995), Reiad *et al.* (1996b) and El-Toukhy *et al.* (2002)**. It is worth noting that the highest values of dry foliage yield of plant species in HA than AZ location and in site 2 than site 1 and 3 which was due to the abundance of perennial plants species on the expense of the annual ones as it is clear in Table (28).

B. Seasonal effect and its interaction with location on the dry foliage yield of the naturally grown plant species:

Seasonal variations significantly affected dry foliage yield of plant species in a slight different trend as for the fresh foliage yield previously discussed (Table 26 and A11 & A12).

Results indicated that almost similar dry foliage yield of plant species was obtained during spring (0.366 kg/m^2) and autumn (0.371 kg/m^2) with no significant difference. Also, no significant difference in dry foliage yield was noticed during winter (0.333 kg/m^2) and spring (0.366 kg/m^2) and autumn (0.371 kg/m^2) or between autumn and winter season. Such fluctuation in dry foliage yield among wet and dry seasons was not true in fresh foliage yield previously presented and discussed (Table 20). This could be hardly explained under the circumstances of this experiment, however, further research in this point is rarely needed, it may involve other different factors that need to be studied in further research.

Meanwhile, the response of fresh and dry foliage yield due to the seasonal variations was more or less similar with slight flucuated as recorded in Tables (20 & 26). Either fresh or dry foliage yield of the studied plant species were not significantly varied neither during winter nor in spring season, where the dry or fresh foliage yield were more or less similar. So, it could be concluded that either of the two wet seasons did not exert noticeable effect on neither fresh or dry foliage yield of the studied species.

However, this was not the situation during the two dry seasons (summer and autumn). During such two seasons, fresh and dry foliage yield were significantly higher in autumn than summer season.

So, it could be concluded that the seasonal varies during the two wet seasons did not significantly affect either fresh or dry foliage yield. Whereas, during the two dry seasons, autumn produced significantly higher fresh and dry foliage yield of the studied plant species than during summer season.

Such results could be acceptable due to one or more of the following seasons: 1) The increase in fresh and dry foliage yield during either of the two wet seasons with no detectable differences as compared with either of the two dry seasons confirm the abundant producing of the associated perennial and annual plant species with their beneficial effect in growth and production, 2) the relatively semifavourable environmental and edaphic conditions during such wet seasons participated in stimulating and enhancing the ecophysiochemical operations of the grown associated plant communities of annual and perennial plant species, 3) in addition the absence of the annual herbal plant species and the existence of the more tolerant perennial species could be the reason during the late autumn, 4) the significant reduction in fresh and dry foliage yield of the studied plant species in either summer and autumn compared to winter and spring may due to the absence of the annual plants as well as to the unfavourable prevailing environmental and edaphic conditions during the two dry seasons.

In other words, the presence of perennial plant species in more populations densities during dry seasons and the absence of annual herbaceous plants as well could be the reason for producing the minimum dry matter production during such dry seasons. These results are in agreement with those of **Ibrahim (1995) and Reiad *et al.* (1996b).**

Also, less dry matter during summer (dry season) is very well expected due to the less moisture, more drought stress and severe high temperature which increase the evapotranspiration that cause the increase in dry matter production during such two dry seasons.

Data in Table (26) did not show any significant interaction effect of locations and seasons on the dry yield of the native plant species. Similar trend was noticed in fresh yield previously presented and discussed with different magnitudes. However, the highest value of dry yield was in HA than AZ location in all seasons (Table 26). Meanwhile, the lowest dry foliage yield was obtained in summer season. Similar results previously reported by **Abou-Deya and Salem (1990a) and El-Toukhy *et al.* (2002).**

C. Interaction effect of locations, sites and seasons on the dry foliage yield of the naturally grown plant species:

Data of locations, sites and seasonal variations interaction on dry foliage yield of plant species are presented in Table (27 and A11 & A12), indicated no significant effect of such studied trait. Similar trend was noticed in fresh foliage yield previously presented and discussed (Table 21). However, it appears to be true that the highest dry yield was produced in HA location in all sites and all seasons compared to AZ location. Moreover, the highest value was noticed in site 2 (6 km down) in both locations compared to the other sites as already noticed and recorded in fresh foliage yield previously discussed Table (21).

Also, wet seasons produced higher dry yield values than during dry seasons. These results were true in the two locations of HA and AZ. This, could be due to the relatively moderate prevailing environmental and edaphic conditions during such seasons and among location and sites of the native plant species as previously mentioned.

At HA location, the obtained plant species of highest dry foliage yield were *Hordeum leporinum, Anacyclus alexandrinus, Silybum marianum, Gymnocarpus decandrum, Paronychia argentea, Asphodelus microcarpus, Hammada elegans, Zilla biparmata, Lycium shawii, Thymelaea hirsuta* and *Pituranthos tortuosus.*

Whereas, at AZ location plant species of higher dry foliage yield were *Asphodelus microcarpus, Artemisia herba-alba, Hammada elegans, Lycium shawii, Thymelaea hirsuta* and *Pituranthos tortuosus*.

It could be generally concluded that foliage yield (either fresh and/or dry) were markedly affected by the variation in either locations, sites and seasons and/or their interaction as well.

Maximum foliage yield were obtained in wet seasons than dry ones. It may be due to the adequate amounts and even distribution of precipitation during the such seasons, in addition to the contribution of the annual plants species associated with the already grown perennial plant species. Meanwhile, the superiority of HA location than AZ location mainly due to the moderate climatic conditions especially rainfall amounts and distribution, reasonable sunshine radiation, moderate heat of semiconvenient predicate and the reasonable relative humidity in HA compared to AZ locations. In addition, convenient edaphic conditions as the physical and chemical characters of soil which exerted its effect in site 2 in both locations which ended up by producing the highest foliage fresh and dry yield. Such obtained results are along the same line with what was reported by **Ibrahim (1995), Reiad *et al.* (1996b) and El-Morsy (2002).**

III. Chemical composition:

Chemical composition of the studied plant species were determined. The analyzed components were crude protein (CP), total carbohydrates, crude fiber (CF), ash content, ether extract (EE), sodium and potassium contents in the HA, AZ locations for the 3 sites at each of the four growing seasons. This was done during the three years of the study from winter 2000 up to autumn 2002. Results will be presented and discussed according to the following chronological order :

III.1. Crude protein :

A. Effect of locations, sites and their interaction on the crude protein percentage of the naturally grown plant species:

Data in Table (31 and A13 & A14) present the locations, sites and their interaction effect on the crude protein of the grown plant species. Results evidentiated that protein percentage of plant species at HA location significantly exceeded that of AZ location. The average CP in plants at HA location was 8.47% on dry matter basis which surpassed that obtained from AZ location (7.35%). Superiority of CP content at HA location may be attributed to the

Table (31): Effect of locations, sites and their interaction on the crude protein of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
		(%)		
HA	9.06^{B}	10.29^{A}	6.07^{D}	**8.47^{A}**
AZ	7.96^{C}	8.67^{B}	5.42^{E}	**7.35^{B}**
Mean	**8.51^{B}**	**9.48^{A}**	**5.75^{C}**	**7.91**

Table (32) : Seasonal effect and its interaction with location on the crude protein of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(%)		
HA	9.06	8.77	8.03	8.03
AZ	8.01	7.56	6.93	6.88
Mean	**8.54^{A}**	**8.17^{A}**	**7.48^{B}**	**7.46^{B}**

Table (33) : Interaction effect of locations, sites and seasons on the crude protein of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(%)		
HA	S1	10.88^{A}	8.73^{DE}	9.06^{CDE}	7.55^{FG}
	S2	10.92^{A}	10.00^{ABC}	9.90^{ABC}	10.35^{AB}
	S3	5.38^{IJ}	7.58^{FG}	5.13^{J}	6.18^{HI}
AZ	S1	9.39^{BCD}	8.08^{EF}	7.54^{FG}	6.81^{GH}
	S2	9.55^{BCD}	8.76^{DE}	8.15^{EF}	8.20^{EF}
	S3	5.10^{J}	5.84^{HIJ}	5.11^{J}	5.64^{IJ}

HA = Halazien, AZ = Al-Aziziyya locations

S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

vigorous growth of plants and to the increase number of legumes species (Table A13 & A14) in such location (Table 31) as compared with that of AZ location. **Osman (1969); Ibrahim (1995) and Reiad *et al.* (1996c)** achieved similar results.

Results also indicated that the CP content of plant species significantly varied according to the growing site. In site 2 the high values of crude protein percentage was obtained 9.48% followed by site 1 (8.51%), then site 3 (5.75%). Almost doubling of CP content of plant species was noticed in site 2 compared to site 3. This could be due to the closest of site 2 (6 km down to the sea-shore) compared to site 3 (9 km down). Meanwhile, this result could be possibly due to vigorous growth of associated annual plant species results in wet season under site 2 (6 km down) condition. Also, the edaphic condition of site 2 could be relatively better. **Noureldein *et al.* (1999a,b,) and El-Toukhy *et al.* (2002)** reported similar results.

The interaction effect between locations and sites on crude protein content of plant species was significant (Table 31). The significant interaction effect of locations and sites on the CP content of the plant species, indicated that HA location produced plant species of significantly higher CP content as compared with AZ location.

This result was true at any of the studied sites with different magnitudes of significant differences. Higher CP contents was noticed in site 2 at HA (10.29%) and AZ (8.67%) locations. In site 1, CP contents significantly decreased according to the location (9.06% for HA and 7.96% for AZ location).

However, site 3 produced the lowest CP content in plant species at HA (6.07%) and AZ (5.42%). Again, the longest distance of site 3 from the sea-shore (9 km down south) could exert more stressed environmental and edaphic conditions that affected the growth and the assimilation rates of plant species which induce low synthesis and accumulation of protein contents in the grown plant species.

Moreover, increasing the population number and growth of the annual legumes in the associated plant in site 2 (Table 31 and A13 & A14) could be another reason for increasing CP content of plants in site 2 compared to site 3.

The obtained differences in the chemical components of plant species in the different sites and locations could be a function of the prevailing environmental and edaphic factors as soil type, acidity, moisture structure, texture, organic matter content, soil microorganism, soil temperature, chemical and physical composition of soil solution. In addition to the relatively less stressed environmental conditions. Along this line, **Ibrahim (1995), and Reiad *et al.* (1996b)** found similar results.

B. Seasonal effect and its interaction with location on the crude protein percentage of the naturally grown plant species:

Results in Table (32 and A13 & A14) presented the effect of location and seasons on CP content of plant species. Crude protein percentage were significantly affected by the prevailing seasonal variation. Lowest CP content of plant species was obtained in summer (7.48%) and autumn (7.46%) with no differences in between. Whereas, the highest CP content was obtained in plant species during winter (8.54%) and spring seasons (8.17%).

In other words, CP content of plant species was lower in summer and autumn seasons then in winter and spring seasons with significant difference. Whereas, there was no significant differences CP content of plant species between summer and autumn or between winter and spring seasons.

Also, crude protein content of plant species tended to decrease in dry seasons compared to wet rainy seasons. During the dry seasons of summer and autumn, annual legumes started to disappearance from the plant associations which cause lower CP content of the grown plants as it is clear from Table (32 and A13 & A14). And it is more likely that perennial type of plants are almost relatively lower in CP contents **Ibrahim (1995) and Reiad *et al.* (1996b,c).**

Such presented trend of CP reduction in dry seasons could be also attributed either to the direct effect of drought or salinity on plants structure and or to the indirect effect via an inhibition of the nitrifying bacteria which could be inhibited during hot summer season when soil is dry, saline and hot, which in turn decrease crude protein content of plant. Meanwhile, the degradation of protein into aminoacids and such stressed conditions could be another reason for decreasing CP content of the growing plants. **Ebad *et al.* (1991)** reported similar results.

Results in Table (32) did no show any significant interaction effect of locations and seasonal variations on the CP content of plant species. However, crude protein percentage from plants of the different location and growing seasons reached its highest level in winter and spring in both locations.

Also, the highest CP contents of plant species were noticed at HA location compared to AZ location in all season with no significant differences. Similar results were reported by **Ibrahim (1995) and Reiad *et al.* (1996b).**

C. Interaction effect of locations, sites and seasons on the crude protein percentage of the naturally grown plant species.

Data in Table (33 and A13 & A14) showed significant interaction effect of locations, sites and seasonal variations on the CP content of the native plant species. It is generally noticed that in either locations (HA, AZ), CP content of plants increased from site 1 to site 2, then decreased in site 3. This result was true in all seasons with various magnitudes. Also, the amounts of CP accumulation in plants were relatively higher in HA as compared with AZ locations in all sites and seasons.

The highest crude protein percentage of plant species at HA location were detected in *Astragalus boeticus, Medicago sativa, Trigonella hamosa, Anacyclus alexandrinus, Maresia pygmaea, Paronychia argentea, Plantago cylindrica, Hammada elegans, Lycium shawii. Thymelaea hirsuta* and *Pituranthos tortuosus*.

Whereas at AZ location, plants species of the highest CP content were *Lotus arabicus, Trigonella stellata, Anacyclus alexandrinus, Brassica tournefortii, Maresia Pygmaea, Plantago* *cylindrica, Artemisia herba-alba, Hammada elegans, Thymelaea hirsuta* and *Pituranthos tortuosus.*

III.2. Total carbohydrates:

A. Effect of locations, sites and their interaction on the total carbohydrate percentage of the naturally grown plant species:

Results in Table (34 and A15 & A16) showed slightly significant higher carbohydrates content of plants at HA location (11.43%) compared to AZ location (10.48%). Also, site 2 produced significantly highest carbohydrates content (11.78%) of the grown plant species that in site 3 (9.54%). Whereas, no significant difference was noticed in carbohydrate contents of plants in site 2 and site 1.

The superiority of HA location in site 1 and 2 in producing plant species of highest carbohydrate contents than AZ location of the same sites could be attributed to the greater proliferation of growth in HA location which caused more net PHS assimilation rates and active carbohydrates accumulation in plant species. This is mainly due to the more moderate environmental conditions and satisfactory mineral assimilates.

Results in Table (34) did not show any significant interaction effect of sites and locations on the carbohydrate contents of the native plant species.

However, it is very well noticed that highest carbohydrates accumulation was reported in site 2 (12.32%) and site 1 (12.14%) at HA location. The corresponding lowest carbohydrate contents were 11.24% and 10.97% in site 2 and 1 at AZ location.

Table (34) : Effect of locations, sites and their interaction on the total carbohydrates of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
		(%)		
HA	12.14	12.32	9.84	**11.43^{A}**
AZ	10.97	11.24	9.24	**10.48^{B}**
Mean	**11.56^{A}**	**11.78^{A}**	**9.54^{B}**	**10.96**

Table (35) : Seasonal effect and its interaction with location on the total carbohydrates of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(%)		
HA	11.79^{A}	11.27^{BC}	11.61^{AB}	11.05^{CD}
AZ	10.04^{E}	10.88^{CD}	10.74^{D}	10.27^{E}
Mean	**10.92^{AB}**	**11.08^{A}**	**11.18^{A}**	**10.66^{B}**

Table (36) : Interaction effect of locations, sites and seasons on the total carbohydrates of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(%)		
HA	S1	13.14	11.62	12.34	11.52
	S2	13.21	12.16	12.15	11.75
	S3	9.03	10.03	10.33	9.88
AZ	S1	10.62	11.55	11.15	10.56
	S2	11.25	11.49	11.38	10.83
	S3	8.24	9.61	9.69	9.43

HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

The highest carbohydrate contents at site 2 followed site 1 indicated that site 2 (6 km down) and site 1 (3 km down) was of much reasonable precipitation in amount and distributed as well as the other relatively satisfactory climatic factors which are suitable for the appropriate ecophysiochemical activities for most the studied native plant species grown in this area as compared with site 2 and site 1.

It is also noticed that the lowest value of carbohydrate contents in plant species was at AZ location in site 3 (9.24%) such site than other two sites. Furthermore, site 3 was far from sea-shore zone with its stressed environmental and edaphic conditions. Similar results were recorded previously by **Abd El-Aziz (1983), Ibrahim (1995), Reiad *et al.* (1996b,c) and El-Toukhy *et al.* (2002).**

B. Seasonal effect and its interaction with location on the total carbohydrates of the naturally grown plant species:

There was significant effect on the carbohydrate content of plant species for the seasonal variations and its interaction with locations as it is clear from Table (35 and A15 & A16). Carbohydrate contents of plant species was fluctuated within a very narrow range. Higher carbohydrate contents were obtained in summer (11.18%) and spring (11.08%) with no significant difference in between. Whereas, the lowest carbohydrate content was in winter (10.92%) and autumn (10.66%) with no detectable difference.

So, in generally, slight insignificant decrease in carbohydrate content from summer to spring and down to winter and autumn season was noticed. It looks to be true that such differences were not appreciated in spite of the slight significant differences.

Results also, indicated that carbohydrate contents of plant species at HA location was higher than that what was in AZ location with significant differences during summer, winter and autumn, but not in spring. Higher carbohydrate contents of plant species were in summer (11.61%), winter (11.79%), spring (11.27%) and autumn (11.05%) at HA location as compared with AZ location where the corresponding seasonal carbohydrate contents were 10.74%, 10.04%, 10.88% and 10.27%.

It should be noted that carbohydrate percentage attained its peak in summer and exceeded in spring season. Such trend was opposite to what was noticed with protein content of plants (Table 32). It may be due to the higher amount of associated annual legumes species which appear and grow in spring season. Such plants contained greater percentage of protein and less percentage of carbohydrate. Disappearance of such annual legumes in summer caused excess of carbohydrate contents on the expense of protein percent. Similar results were previously reported by **Ibrahim (1995), Reiad *et al.* (1996b,c) and Noureldin *et al.* (1999b).**

C. Interaction effect of locations, sites and seasons on the total carbohydrates percentage of the naturally grown plant species:

The interaction effect of locations, sites and seasonal variations on carbohydrate percent of plant species were not significant (Table 36 and A15 & A16). However, it is generally noticed that HA locations was responsible for producing plants of higher carbohydrate percentage than AZ location. This trend was true under all sites and all seasons.

Meanwhile, carbohydrate contents slightly decrease as the site get a down south from the sea-shore. Whereas, carbohydrate contents of plant species were fluctuated within a very narrow range as explained earlier according to the prevailing interrelated environmental and edaphic conditions. Also, increasing carbohydrate percent was positively corresponded with availability of water and its function in growth development and its constituent.

At HA location the plant species of highest carbohydrate content were *Medicago sativa*, *Trigonella hamosa, Anacyclus alexandrinus, Carduus getulus, Picris radicata, Maresia pygmaea, Gymnocarpus decandrum, Asphodelus microcarpus, Plantago cylindrica, Hammada elegans, Lycium shawii, Thymelaea hirsuta* and *Piturathos tortuosus.*

However, at AZ location the highest carbohydrate contents of the studied plant species were *Lotus arabicus, Asphodelus microcorpus, Plantago cylindrica, Artemisia herba-alba, Hammada elegans, Zilla biparmata, Lycium shawii, Thymelaea hirsuta* and *Pituranthos tortuosus.*

In conclusion, maximum carbohydrate percentage was obtained at HA location in all sites and seasons. This may be due to higher variability among sites which were expected particularly under the various adequate plant requirements for growth and constituents. Such results are agreement with those found by **Osman (1969)**, who reported that the total carbohydrate contents of plant species was varied according to the grown location.

It should be noted that the higher carbohydrate contents of plants were more likely due to the growing of the existing perennial plant species of higher carbohydrate contents during hot dry summer seasons. This is compared to the annual plants of shallow root systems and poor water and carbohydrate reserve in their storage organs.

Also, it is important to clarify that in most cases the content of carbohydrates and crude protein in plants is mostly related to each other into amount which all when added together the total will almost in similar amount. If one of these component increased will be on the expense of the other and vice versa. These depends on the nature of plants, the prevailing environmental and edaphic condition for increasing or decreasing any of such mentioned components (carbohydrate or crude protein content), which affect the quality of the foliage of the plant species according to the purpose of feeding.

III.3. Crude fiber percentage :

A. Effect of locations, sites and their interaction on the crude fiber percentage of the naturally grown plant species:

Data for the effect of locations, sites and their interaction on the crude fiber (CF) content, of the native plant species are presented in Table (37 and A17 & A18). Results indicated no significant difference in CF contents of plant species in response to locations, where CF contents of plants was almost similar. So, locations did not exert any appreciable effect on the CF content of plant species.

Unlikely, sites significantly affected CF content of plant species (Table 37). Site 2 (6 km down south the sea-shore) produced plant species of the highest CF content (31.77%) compared to site 1 (29.25%) and site 3(28.08%) with significant differences in between. This could be due to the expected higher growth rate in

Table (37) : Effect of locations, sites and their interaction on the crude fiber of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
			(%)	
HA	30.20	31.91	27.76	**29.96**
AZ	28.29	31.63	28.40	**29.44**
Mean	**29.25^{B}**	**31.77^{A}**	**28.08^{C}**	**29.70**

Table (38) : Seasonal effect and its interaction with location on the crude fiber of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(%)		
HA	24.61^{D}	26.10^{CD}	34.39^{A}	34.73^{A}
AZ	26.50^{C}	25.40^{CD}	31.69^{B}	34.16^{A}
Mean	**25.56^{C}**	**25.75^{C}**	**33.04^{B}**	**34.45^{A}**

Table (39) : Interaction effect of locations, sites and seasons on the crude fiber of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(%)		
HA	S1	26.67^{IJK}	25.01^{JKL}	33.20^{CDE}	35.93^{ABC}
	S2	24.25^{KL}	28.05^{GHIJ}	38.79^{A}	36.52^{AB}
	S3	22.90^{L}	25.24^{JKL}	31.17^{EFG}	31.74^{EF}
AZ	S1	25.04^{JKL}	26.31^{IJKL}	29.32^{FGHI}	32.49^{DEF}
	S2	27.68^{HIJK}	26.71^{IJK}	35.21^{BCD}	36.92^{AB}
	S3	26.79^{IJK}	23.19^{L}	30.55^{EFGH}	33.08^{CDE}

HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

site 2 due to the reasonable edaphic conditions in such site and the prevailing moderate temperature during the whole year except for the hot summer season. Also, this in turn could increase the assimilation rate of plants which produce higher rates of CF formation. Similar results were obtained by **Ibrahim (1995), Reiad *et al.* (1996b) and Noureldin *et al.* (1999b).**

Moreover, results proved that site 2 (6 km down) was responsible for producing plants of higher crude fiber percentage. This may be attributed to the more presence of perennial type of plants (Table 37 and A17 & A18) which have more woody and fibrous branches **(El-Toukhy *et al.*, 2002).**

Results did not show significant interaction effect of sites and locations on the CF content of the plant species (Table 37). However, site 2 produced the highest CF content of plants in HA (31.91%) and AZ location (31.63%) within the same magnitude. Meanwhile, CF contents of plant species in HA was slightly higher than at AZ location in site 1 and site 2 with no significant interaction effect.

Generally, at both locations, site 2 produced higher CF percentage in plant species. This may be also due to the relatively shallow soil sector (Table 3 & 4) in this site which resulted in insufficient moisture supplies to plant roots **(El-Morsy, 2002).**

B. Seasonal effect and its interaction with location on the crude fiber percentage of the naturally grown plant species:

Data in Table (38 and A17 & A18) represent seasonal effect and its interaction with locations on the CF contents of the studied native plant species. Results evedintiated slight highest CF contents of plants during the two dry seasons of autumn (34.45%) and summer (33.04%) with significant differences in between. Whereas, significantly lowest CF content of plant species were noticed during wet seasons of winter (25.56%) and spring (25.75%) with no detectable significant difference in CF content.

In other words, summer and autumn seasons were significantly higher in CF content of plant species than in winter and spring seasons. But no significant differences in CF content between each of the two dry or the two wet seasons (Table 38).

Such obtained results could be explained by the assimilation of other essential components of plants on the expense of CF in the two wet seasons. The opposite trend were true in forming more CF contents in the two dry seasons.

The interaction effect of seasons and locations on the CF contents of plant species was significant (Table 38). At HA, CF content of plants was significantly higher (34.39%) as compared with AZ location (31.69%) in summer season. In autumn season, CF content of plant species did not vary at HA (34.73%) compared to AZ (34.16%) location.

However, in winter season, CF content of plants was significantly higher in AZ (26.50%) compared to HA location (24.61%). Whereas, in spring, CF content of plants did not significantly vary in HA (26.10%) than in AZ (25.40%) location.

It should be noted that CF contents were always higher in summer and autumn (dry season) as compared with winter and spring (wet seasons) with significant differences as it is clear from Table (38).

The obtained higher CF content of plants during dry seasons (summer and autumn) could be due to the water stressed plants because of precipitation lack which stimulate the assimilation towards CF formation rather than the other essential plant components. Also, perennial woody fibrous plants participated more in CF accumulation in dry seasons where annual plant species started to disappearance in dry seasons (Table A17 & A18) as explained and recorded earlier in this respect. Similar results were reported by **Ibrahim (1995), El-Morsy (2002) and El-Toukhy *et al.* (2002).**

C. Interaction effect of locations, sites and seasons on the crude fiber percentage of the naturally grown plant species:

The interaction effect of seasonal variations, locations and sites on the CF content of plant species was significant (Table 39 and A17 & A18). It is generally noticed that during the dry seasons of summer and autumn, site 2 produced plants of higher CF content than of site 1 or 3 in either HA or AZ locations. In other words, site 2 (6km down south of sea-shore) was responsible for producing plants of higher CF content. This trend was true at HA and AZ locations as well for summer and autumn seasons with relatively higher magnitudes at HA than AZ location.

Almost, similar trend was noticed in spring and winter seasons in both location with significant noticeable reduction in CF content and slightly ignorable differences as compared during the two dry seasons (summer and/or autumn).

Whereas, in winter season, CF content slightly decreased in plants as we go down far from the sea-shore (site 1, 2 and 3) at HA location. But in the same winter season at AZ location, site 2 was responsible for slightly ignorable higher CF contents of plants as compared with site 1 and site 2 as previously mentioned. **Osman (1969)** obtained similar results at Sidi-Barrani location. Also, in this respect **Tag-El-Din (1969)** concluded that chemical analysis of eight plant communities in different locations in Sidi-Barrani region varied widely according to the different studied communities.

Moreover, it could be concluded that the more perennial shrubby plants of higher CF contents at HA location were, *Anacyclus alexandrinus, Paronychia argentea, Asphodelus microcarpus, Plantago cylindrica, Pituranthos tortuosus, Hammada elegans* and *Thymelaea hirsuta.*

But at AZ location, plants of highest CF content were *Pituranthos tortuosus, Thymelaea hirsuta, Lycium shawii, Hammada elegans* and *Zilla biparmata.* Generally, annuals plant species had the least value of fiber content than the perennials ones.

III.4. Total ash content:

A. Effect of locations, sites and their interaction on the total ash percentage of the naturally grown plant species:-

Data represented in Table (40 and A19 & A20) showed that the total ash percentage of the studied native plant species was significantly affected by locations, sites and their interaction. Slightly higher ash contents was recorded in HA location (13.54%) compared to AZ location (12.80%) with significant difference. This results could be attributed to some the general factors as the soil

Table (40) : Effect of locations, sites and their interaction on the ash content of the naturally grown plant species from winter 2000 up to autumn 2002.

Site (S) / Location (L)	S1	S2	S3	Mean
	(%)			
HA	14.15^A	14.25^A	12.23^B	**13.54^A**
AZ	12.07^B	13.99^A	12.35^B	**12.80^B**
Mean	**13.11^B**	**14.12^A**	**12.29^C**	**13.17**

Table (41) : Seasonal effect and its interaction with location on the ash content of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
	(%)			
HA	13.87	12.99	13.21	14.10
AZ	12.98	12.89	12.01	13.36
Mean	**13.43^A**	**12.93^B**	**12.61^B**	**13.73^A**

Table (42) : Interaction effect of locations, sites and seasons on the ash content of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
		(%)			
HA	S1	14.11	12.94	14.46	15.07
	S2	14.78	13.86	13.86	14.51
	S3	12.72	12.16	11.32	12.71
AZ	S1	11.62	12.60	11.24	12.88
	S2	14.63	13.78	12.80	14.75
	S3	12.69	12.29	11.98	12.44

HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

type, and available moisture which promote the root growth for better mineral absorption and accumulation as reported by **Noureldin *et al.* (1996 b,c).**

The effect of sites on the ash content of the native plant species was significant as it is clear from Table (40). Maximum ash content of plants was noticed in site 2 (14.12%) followed by site 1 (13.11%), then site 3 (12.29%).

Moreover, sites and locations interaction exerted its significant effect on the ash content of the plant species (Table 40). Higher ash content of plant species was reported in site 2 for both location with no significant differences in between.

It was also clear that at HA location, the highest ash contents of plants in site 2 (14.25%) did not significantly vary than what was noticed in site 1 (14.15%), but was significantly higher than site 3 (12.23%).

This is not the case in AZ location, where ash contents of plant species in site 2 was significantly higher than in site 1 and 3 with no significant differences in between in the two later sites as it is clear from Table (40).

In addition previously mentioned locations and sites of highest ash contents of the grown native plant species was much correlated by the availability of rains as well as other favourable climatic and edaphic conditions (Table 1,2,3 & 4) as temperature, humidity and moisture status which are considered the most stimulus factors which promote root growth of plant species for more absorption and accumulation of soil minerals especially from the harsh condition of the sites of salty areas.

In conclusion, the greatest total ash % was noticed at HA location in site 2 (6 km down) and site 1 (3 km down). This result indicates much positive correlation between soil water availability and mineral absorption and higher temperature as well. There presented results are in accordance with those obtained previously by **Osman (1969); Ibrahim (1995); Reiad *et al.* (1996 b); Noureldin *et al.* (1999b) and El-Morsy (2002)** previously recorded.

B. Seasonal effect and its interaction with location on the total ash percentage of the naturally grown plant species:

Seasonal effect and its interaction with locations on the total ash contents of the native plant species are presented in Table (41 and A19 & A20). Data revealed that plants grown under the seasonal variation were significantly affected in its total ash percentage. Highest ash contents were noticed in autumn (13.73%) followed by winter (13.43%) with no detectable significant difference. Whereas, the lowest ash content were reported in spring (12.93%) and summer (12.61%) which also did not significantly vary.

The obtained highest ash content of plants in wet seasons (late autumn and winter) indicated that ash content of plants were much positively correlated with the available moisture in the soil as well as the surrounding favourable atmosphere for mineral absorption and accumulation in the grown plant species. Also, the stimulation of root growth and activities which are usually matches with the vegetative growth. These results are in harmony with what was reported earlier in this respect by **Ibrahim (1995), Reiad *et al.* (1996 b) and Noureldin *et al.* (1999b).**

Results also indicated that the interaction between locations and seasonal variations did not significantly affect the total ash percentage of plant species. However, the highest value were at autumn season in HA location (14.01%) and the lowest one was recorded in summer at AZ location (12.01%) as shown in Table (41).

C. Interaction effect of locations, sites and seasons on the total ash percentage of the naturally grown plant species:

Data in Table (42 and A19 & A20) represent the interactions effect of locations, sites and seasons on total ash percentage of plant species. No significant interaction effect was noticed on the total ash content of plant species. However, the highest ash content was (15.07%) in HA location at site 1 (3km down) in autumn season. Whereas, the lowest ash content was (11.24%) at AZ location in site 1 (3 km down) during summer season. In it is generally noticed that in both location of HA and AZ that the highest ash content were obtained in site 2 and 1 in winter and autumn seasons respectively.

It could be generally concluded that at HA location, during summer and winter season, ash content of plant species were slightly decreased as we go down south from the sea, site 1 (3 km down), site 2 (6 km down) and site 3 (9 km down). This was not the case in winter and spring seasons, where site 2 had the highest ash content (14.78, 13.86%) of plant species compared to site 1 (14.11, 12.94%) and site 3 (12.72, 12.16%). However, in AZ location, the previously mentioned trend was noticed in all seasons, where site 2 produced the following ash contents of 14.63, 13.78, 12.80 and 14.75% during the respective season of winter, spring, summer and autumn for the highest ash content of plants compared to the other sites (1 or 3).

But could be generally noticed that highest ash content of plant species was in HA than in AZ location, and in site 2 than site 1 and site 3 and during autumn and winter seasons, then during summer then spring season with different variable magnitudes. This trend was more or less noticed with sodium and potassium accumulation in plant species previously discussed.

The prevailing environmental and edaphic conditions permits the plants to keep and retain water supply strongly enough and accordingly become succulent during such season. Ash allowing plants for better ability to continue in better assimilation rates and growth with satisfactory status more than the other unadapted native plants.

Moreover, the increase in ash percentage of plant species during autumn which followed by winter and spring comparable with that of summer may be due to the occurrence of reasonable precipitation beside the other sources of moisture such as dew and fog, in addition to the relative decrease in temperature. This moderate environmental changes in turn could result in enhancing more growth rate of foliage and roots and more absorption rate of minerals. Presented results are more or less similar to what was reported by **Osman (1969); Ibrahim (1995); Reiad *et al.* (1996b,c) and Noureldin *et al.* (1999b)**. In addition **Abd- El-Aziz (1982)** found that ash content as a percentage of DM were significantly affected with range plant species weather annuals or perennials in nature.

The highest total ash percentage of plant species that was recorded in HA location were *Anacyclus alexandrinus, Hammada elegans, Maresia pygmaea, Paronychia argentea, Asphodelus microcarpus, Plantago cylinderica, Thymelaea hirsuta* and *Pituranthos tortuosus.*

However, AZ location, plant species of the highest total ash percentage were *Anacyclus alexandrinus, Artemisia herba-alba, Hammada elegans, Brassica tournefortii, Zilla biparmata, Asphodelus microcarpus, Plantago cylindrica, Thymelaea hirsuta* and *Pituranthos tortuosus.*

III.5. Ether extract (EE) percentage:-

A. Effect of locations, sites and their interaction on the ether extract percentage of naturally grown plant species:

The effect of locations, sites and their interaction on the ether extract (EE) of the studied native plant species is presented in Table (43 and A21 & A22). Locations did not exert any significant effect of the EE of plant species. However, the EE content of plants was significantly affected by the sites. Site 2 (6 km down) produced the highest EE content (2.78%) with significant differences compared to site 1 (2.51%) or site 3 (2.39%) inspite of the slight differences. This is due to the very narrow ranges of EE content in the native plant species.

The interaction effect of locations and sites on the EE content of plants species was significant (Table 43). Results indicated that site 2 produced the highest EE content of plants at HA (2.88%) which was slightly higher than plants of AZ location (2.67%) with significant difference inspite of the very small differences.

Table (43) : Effect of locations, sites and their interaction on the ether extract of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
		(%)		
HA	2.59^{BC}	2.88^{A}	2.30^{D}	**2.59**
AZ	2.43^{CD}	2.67^{B}	2.47^{CD}	**2.52**
Mean	**2.51^{B}**	**2.78^{A}**	**2.39^{C}**	**2.56**

Table (44) : Seasonal effect and its interaction with location on the ether extract of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(%)		
HA	2.91^{AB}	3.02^{AB}	2.18^{C}	2.24^{C}
AZ	2.89^{B}	3.11^{A}	1.81^{D}	2.29^{C}
Mean	**2.90^{B}**	**3.07^{A}**	**2.00^{D}**	**2.29^{C}**

Table (45) : Interaction effect of locations, sites and seasons on the ether extract of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(%)		
HA	S1	3.03^{ABCD}	3.16^{ABCD}	2.20^{HIJK}	1.95^{JKL}
	S2	3.40^{A}	3.27^{ABC}	2.50^{FGH}	2.35^{GHI}
	S3	2.32^{GHIJ}	2.62^{EFG}	1.83^{KL}	2.43^{FGH}
AZ	S1	2.97^{BCDE}	3.09^{ABCD}	2.00^{IJKL}	1.66^{L}
	S2	2.77^{DEF}	3.34^{AB}	1.77^{L}	2.81^{DEF}
	S3	2.92^{CDE}	2.91^{CDE}	1.66^{L}	2.39^{GH}

HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

Either site 1 or 3 produced plant species of significantly but slightly lower in EE content than of site 2. These results were true at HA and AZ locations with relatively lower but not significant at the later location (Table 43).

Average EE% of native plants in HA location was higher than AZ location at site 1 and 2 and vice-versa in site 3. This might be due to the favorable growth conditions in HA location than AZ location as reported by **El-Morsy (2002).**

Favourable growth conditions in HA locations was responsible for raising ether extract percentage. It is obviously, clear that dry yield and ether extract percentage in HA location were better than AZ location.

B. Seasonal effect and its interaction with location on the ether extract percentage of the naturally grown plant species:

Seasonal effect and its interaction with locations on the EE content of plant species is presented in Table (44 and A21 & A22). Highest EE content of plants (3.07%) was obtained during spring season, followed by winter (2.90%), then autumn (2.29%), followed by summer 2.0%. So, it could be noticed that wet seasons of spring and winter are responsible for the peak of assimilation rates and storing the extra energy source in form of EE in plants.

However, the lowest EE contents in plant species was noticed during the dry seasons of summer and autumn could be due to the poor assimilations rates under the harsh dry hot condition and expenditure of the stored energy in the required biological and physiological aspects which end up by consuming EE contents of plant species to the minimum during such dry seasons of summer and autumn.

Results also indicated significant interaction effect of seasons and locations on the EE content of plants (Table 44). Highest EE content of plants was recorded during spring season (in both locations (3.02% for HA and 3.11% for AZ) with no significant difference in between. Similar trend was noticed during winter season (2.91% for HA and 2.89% for AZ). Whereas, lower EE content of plants were noticed in autumn season with no significant differences due to locations (2.24% for HA and 2.29% for AZ). But in summer season EE content of plants was slightly but significantly higher in HA. (2.18%) than in AZ (1.81%) location as presented in Table (44). Such results are in harmony with those obtained by **Abd- El-Aziz (1982) and El-Morsy (2002).**

C. Interaction effect of locations, sites and seasons on ether extract percentage of the naturally grown plant species:

The interaction effect of locations, sites and seasonal variations on EE content of plant species was significant as presented in (Table 45 and A21 & A22).

It is generally noticed that winter and spring seasons are of the highest EE in plant species at site 2 in HA location (3.40% in winter and 3.27% in spring), and at AZ location (2.77% in winter and 3.34% in spring) with slightly lower magnitudes in AZ compared to HA locations.

Meanwhile, summer and autumn seasons produced plant species of lower EE content at the two locations compared to spring and winter seasons. Meanwhile, such results were true in site 3 during summer season at HA and AZ locations and at site 1 during autumn at both locations as well.

Favorable growth conditions in HA location was behind the increasing in EE percentage than that of AZ location. This may be due to increasing of water availability which led to expanding variations among species in respect of ether extract percentage in winter and spring seasons. It is well known that most of plant species formed their seeds in winter and spring where highest EE content was expected to be increased into seeds hence the highest EE content increased in spring season.

In generally EE content increased from winter to spring and then decreased in summer and autumn. This results may be due to the increase in leaf ratio and the begin of plants to get into seed stage formation during spring and summer. These results are in harmony with those obtained by **Abd-Al-Aziz (1982); Ibrahim (1995); Reiad *et al.* (1996b,c); Noureldin *et al.* (1999b,c) and El-Morsy (2002).**

Highest value of EE content of plant species at HA location were *Anacyclus alexandrinus, Carduus getulus, Maresia pygmaea, Asphodelus microcarpus, Plantago cylindrica, Lycium shawii, Thymelaea hirsuta* and *Pituranthos tortuosus*.

Whereas, at AZ location, the highest EE content of plant species were *Brassica tournefortii, Maresia pygmaea, Asphodelus microcarpus, Plantago cylindrica, Thymelaea hirsuta* and *Pituranthos tortuosus*.

III.6. Sodium content:

A. Effect of locations, sites and their interaction on the sodium percentage of the naturally grown plant species:

Result in Table (46 and A23 & A24) clarified that sodium contents on dry matter basis of the native plant species was not significantly affected by the grown location (HA or AZ). Sodium content was almost similar for plant species grown in the two location (HA or AZ).

Results showed plants grown under different sites conditions were significantly different in sodium percentage of plant species (Table 46). Sodium content in plant species was significantly higher in site 2 (0.72%) compared to site 1 (0.66%) or site 3 (0.64%).

The interaction effect of locations and sites on sodium content of the grown native plant species was significant (Table 46). Highest sodium percentage of plant species was noticed in site 2 for HA (0.74%) and for AZ location (0.70%) with no significant differences within the two locations.

Meanwhile, salt accumulation of plant species in site 3 (0.59%) was significantly lower than in site 1 (0.70%) at HA location. Slight opposite trend was noticed in AZ location. This may be due to the effect of early and more even precipitation in HA than in AZ locations Table (1 & 2). This permit the plants to absorb sodium more efficiently with more rates in HA location than AZ location. A long the same line **Ibrahim (1995) and Reiad *et al.* (1996b)** reported similar results.

Table (46) : Effect of locations, sites and their interaction on the sodium of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	**Mean**
		(%)		
HA	0.70^{AB}	0.74^{A}	0.59^{C}	**0.68**
AZ	0.62^{C}	0.70^{AB}	0.68^{B}	**0.67**
Mean	**0.66^{B}**	**0.72^{A}**	**0.64^{B}**	**0.67**

Table (47) : Seasonal effect and its interaction with location on the sodium of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(%)		
HA	0.54^{D}	0.54^{D}	0.77^{B}	0.85^{A}
AZ	0.64^{C}	0.58^{D}	0.80^{B}	0.64^{C}
Mean	**0.59^{C}**	**0.56^{D}**	**0.79^{A}**	**0.75^{B}**

Table (48) : Interaction effect of locations, sites and seasons on the sodium of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(%)		
HA	S1	0.53^{JK}	0.55^{IJK}	0.85^{C}	0.88^{BC}
	S2	0.59^{HIJ}	0.60^{HIJ}	0.82^{CD}	0.96^{AB}
	S3	0.51^{JK}	0.47^{K}	0.65^{GHI}	0.72^{EFG}
AZ	S1	0.67^{FGH}	0.60^{HIJ}	0.59^{HIJ}	0.61^{HIJ}
	S2	0.66^{FGH}	0.59^{HIJ}	0.80^{CDE}	0.75^{DEF}
	S3	0.60^{HIJ}	0.55^{IJK}	1.01^{A}	0.55^{IJK}

HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

B. Seasonal effect and its interaction with location on the sodium percentage of the naturally grown plant species:

Data in Table (47 and A23 & A24) showed that seasonal response of sodium percentage in plant species and its interaction with location. Results evedentiated that over the two locations, summer season was of the highest salt concentration (0.79%) in the studied plant species followed by autumn (0.75%). Whereas, winter (0.59%) and spring (0.56%) were of the lower salt percentage, with significant differences between each of the four seasons.

The highest salt concentrations were in dry than wet seasons in both of the studied locations. The highest salt percentage of plant species was in summer season being (0.77%) in HA and (0.80%) in AZ location. These two value were significant higher than what was recorded in spring for HA (0.54) and AZ (0.58%). It is also noticed that significantly higher salt percentage was noticed in plants during autumn compared to winter in HA location. This was not the case in AZ location where salt percentage in plant species were almost similar as presented in Table (47).

These results are more likely acceptable due to limitation of moisture supply and the higher evaporation and transpiration percentage in hot season which lead to the expected increase in salt contents in the grown plant species.

Also, the highest values in dry than wet seasons was due to the disappearance of annual plants (Table 47 and A23 & A24) that are characterized with low sodium content, whereas, perennial plant usually maintain relatively higher salt concentration and tolerance. Similar results were recorded by **Ebad *et al.* (1991)** where they found that under wet and dry saline habitats, halophytes, tended to increase their Na^+ content during the dry season compared to the rainy ones. Along the same line similar result was reported earlier by **El-Morsy (2002).**

C. Interaction effect of locations, sites and seasons on the sodium percentage of the naturally grown plant species:

Results in (Table 48 and A23 & A24) indicated significant interaction effect of locations, sites and seasons on the sodium percentage of the native plant species. It is clear from such data that sodium percentage in plant species did not significantly varied during winter or spring seasons. This result was true within the two locations (HA or AZ) or within the 3 studied sites.

It is also clear that sodium percentage in plant species during summer season was significantly higher than during winter or spring seasons under the two locations and the 3 sites. But in autumn season, the highest sodium percentage accumulated in the native plant species as compared with summer season with significant differences in the second (0.96%) and third site (0.72%) of HA location.

Whereas, at AZ location, no much differences was detected in sodium concentrations during summer and autumn season in the first and second sites. But, in the third site, salt concentration decreased to almost 50% from summer to autumn season with significant difference. This was not the case in HA location.

So, it could be concluded that during winter and summer seasons, no much appreciated differences was noticed in sodium concentrations of the native plants among locations and sites.

However, autumn season was of the highest sodium concentrations in plant species as compared with summer season in HA location at the 3 sites. This was not the case in AZ location, where sodium content was almost similar for summer and autumn in site 1, slightly lower in site 2 and much lower in site 3 (Table 48).

The higher absorption rate of sodium is characterized by the drought and salt tolerance of plants species that have higher rate of absorption of sodium than at the other sites. These results could be due to the ability and higher capacity of absorbing sodium as a unique behavior for these plant to tolerate the salt stress through raising up its osmotic potential. This is through the salt accumulation or organic acid formation the osmotic pressure of the root cells for better moisture and salt absorption of the salt tolerant plants.

Also, the superiority of sodium accumulation in plant species during summer and autumn may be due to the efficient absorption of sodium in order to tolerate both salt and drought stresses.

It could be concluded that the accumulation of sodium was dependable much on the soil location as well as the plant association. Similar results were obtained by **Ibrahim (1995); Reiad *et al.* (1996b) and El-Morsy (2002)**. Whereas, **Osman (1969)** found that location had no significant effect on sodium content in tissues of *Anabasis*, but *Plantago albicans* absorped more sodium when their plants gorwn in typical association compared with that grown in different ecotones.

In HA location plant species which contained the higher sodium percentage were *Gymnocarpus decandrum*, *Asphodelus* *microcarpus, Plantago cylindrica, Hammada elegans, Thymelaea hirsuta* and *Pituranthos turtuosus*.

Meanwhile, AZ location plant species that have the highest of sodium percentage were *Trigonella stellata, Brassica tournefortii, Asphodelus microcarpus, Hammada elegans* and *Thymelaea hirsuta*.

III.7. Potassium Content:

A. Effect of locations, sites and their interaction on the potassium percentage of the naturally grown plant species:

Data in Table (49 and A25 & A26) showed that the effect of locations, sites and their interaction on potassium percentage of plant species were of significant effect. At HA location, potassium percentage in plant species significantly exceeded ash surpassed that of AZ location which was 1.70 and 1.64%, respectively. This mean that potassium absorption rates were relatively higher under the adequate water availability which was higher in HA than AZ location.

Results also indicates significant effect of sites on the potassium percentage of the native plants species. Site 2 was of the heaviest potassium accumulation in plant species (1.86%) followed by site 1 (1.65%), then site 3 (1.51%) of the lowest potassium percentage in its plant species. This results proved that potassium absorption was much more efficient in site 2 compared to site 1 and 3, which may indicate relatively more available and adequate water and salt absorption in site 2 than the other sites.

Table (49) : Effect of locations, sites and their interaction on the potassium of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L) \ Site (S)	S1	S2	S3	Mean
		(%)		
HA	1.74^{B}	1.93^{A}	1.43^{D}	**1.70^{A}**
AZ	1.55^{C}	1.78^{B}	1.58^{C}	**1.64^{B}**
Mean	**1.65^{B}**	**1.86^{A}**	**1.51^{C}**	**1.67**

Table (50): Seasonal effect and its interaction with location on the potassium of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Seasons			
	Winter	Spring	Summer	Autumn
		(%)		
HA	1.57^{CD}	1.49^{D}	1.99^{A}	1.74^{B}
AZ	1.76^{B}	1.48^{D}	1.65^{BC}	1.65^{BC}
Mean	**1.67^{B}**	**1.49^{C}**	**1.82^{A}**	**1.70^{B}**

Table (51): Interaction effect of locations, sites and seasons on the potassium of the naturally grown plant species from winter 2000 up to autumn 2002.

Location (L)	Site (S)	Seasons			
		Winter	Spring	Summer	Autumn
			(%)		
HA	S1	1.69^{BC}	1.52^{CDEFG}	2.19^{A}	1.54^{CDEF}
	S2	1.61^{BCDE}	1.66^{BCD}	2.27^{A}	2.16^{A}
	S3	1.40^{EFG}	1.30^{G}	1.52^{CDEFG}	1.51^{CDEFG}
AZ	S1	1.44^{DEFG}	1.54^{CDEF}	1.64^{BCD}	1.59^{BCDE}
	S2	2.06^{A}	1.55^{CDEF}	1.81^{B}	1.70^{BC}
	S3	1.78^{B}	1.35^{FG}	1.51^{CDEFG}	1.67^{BC}

HA = Halazien, AZ = Al-Aziziyya locations
S1, 2 and 3 = 3, 6 and 9 km South of the sea-shore, respectively.

Results in Table (49) evedentiated significant interaction effect of potassium accumulation in plant species as affected by locations and sites. At HA and AZ locations, site 2 was of the highest potassium accumulation in their plant species with significant higher magnitudes in the first (1.93%) rather than the second (1.78%) location. These results were true in site 1 and site 3 of the lowest potassium percentage in its grown plant species.

So, it could be concluded that the highest potentialities of potassium absorption and accumulation was noticed in both locations with relatively higher magnitudes in HA compared to AZ location. Similar trend was noticed in site 1 then site 3 (Table 49). These findings confirm what was reported previously by **Ibrahim (1995); Reiad *et al.* (1996b,c) and Noureldin *et al.* (1999b,c).**

B. Seasonal effect and its interaction with location on the potassium percentage of the naturally grown plant species:

Results in Table (50 and A25 & A26) showed significant effect on potassium percentage of plant species as affected by the growing seasons and their interaction with locations. The slightly higher potassium absorption was in summer season (1.82%) followed by autumn (1.70%) with significant difference. The obtained highest values of potassium in plant species during summer could be due to the high temperature of the hot summer seasons which strongly stimulate the evapotranspiration which leave a lot of salts in plants tissue and increase the salt concentration on the top layers of the soil. Also, the abundance of perennial species which used to have more salts than the annual species were the later plants used to be in great shortage or disappearance at that time of the year (Table 50 and A25 & A26).

The seasonal and its interaction effect with locations was significant on the potassium accumulation of the grown plant species (Table 50). Results showed that such effect was noticed during summer and winter seasons at the two locations. Potassium accumulation in plant species during summer was significantly higher in HA (1.99%) than AZ (1.65%) location. Slightly different trend was noticed in winter season where AZ produced plant species of slightly higher in potassium percentage (1.76%) than HA (1.57%). This difference in potassium accumulation percentage in plant species during such seasons (summer and winter) could be due to the effect of edaphic and environmental variations in the two studied locations and the varieties in the annual and perennial plant components.

It showed be also noticed that no significant difference in potassium percentage of plant species was obtained during autumn and spring for the two studied locations (Table 50).

C. Interaction effect of locations, sites and seasons on the potassium percentage of the naturally grown plants species:-

Data in Table (51 and A25 & A26) represent significant interaction effect of locations, sites, and seasonal variations on potassium percentage of plant species. Highest potassium percentage of plant species was obtained during summer season at both locations in site 2 which was 2.27% and 1.81% in HA and AZ location, respectively.

Whereas, the lowest potassium percentage was recorded in spring season for site 3 in HA (1.30%) and AZ (1.35%) locations. Similar trend with slightly lower magnitudes were noticed in autumn season at the second site which was 2.16% at HA and 1.70% at AZ location.

These results indicated that potassium absorption rates during drought season depend much on the behaviour of plants and of the particular nature of the plant associations as reported by **Osman (1969); Ibrahim (1995) and Reiad *et al.* (1996b,c).**

In conclusion, HA location produced plant species of higher potassium concentration than AZ location. Such result indicted that the relatively increase of water availability in the soil could enhance plants absorption of potassium which caused higher accumulation of potassium during such hot summer periods. Also, higher transpiration rates enhances the salt accumulation in the grown plant species. Meanwhile, this may be due to the unique plant association needs for the available specific edaphic condition for growth and minerals absorption. Similar results in this respect was reported by **Osman (1969); Ebad *et al.* (1991); Ibrahim (1995); Reiad *et al.* (1996b,c); Noureldin *et al.* (1999b,c) and El-Morsy (2002).**

It is also noticed that in HA location plant species of higher potassium percentage were *Anacyclus alexandrinus*, *Artemisia herba-alba, Hammada elegans, Maresia pygmaea, Asphodelus microcarpus, Thymelaea hirsuta* and *Pituranthos tortuosus*.

Whereas, at AZ location plant species of higher potassium content were *Lotus arabicus, Trigonella stellata, Anacyclus alexandrinus, Hammada elegans, Asphodelus microcarpus, Thymelaea hirsuta* and *Pituranthos tortuosus.*

The highest and lowest values of the studied vegetative parameters of the native plant species as affected by location, site and seasonal variations are summarized in the following Table (52).

Parameter	Location		Sites			Season			
	HA	AZ	S1	S2	S3	W	SP	S.	AU.
Vegetative growth									
Frequency (%) :									
H	44.36				48.74				45.69
L		41.27		37.94			37.54		
Abundance (%):									
H	20.03		18.19						
L		13.31			14.60				
Coverage (%):									
H	48.67			49.49		45.47			
L		37.97			36.77		41.75		
Density (plant/m^2):									
H	36.90		29.28				52.78		
L		17.83			24.29				2.45
Foliage productivity									
Fresh yield (kg/m^2):									
H	0.738			0.866			0.790		
L		0.560			0.474			0.440	
Dry yield (kg/m^2):									
H	0.392			0.459					0.371
L		0.286			0.240			0.288	
Chemical constituents									
Crude protein (%):									
H	8.47			9.48		8.54			
L		7.35			5.75				7.46
Carbohydrate (%):									
H	11.43			11.78				11.18	
L		10.48			9.54				10.66
Crude fiber (%):									
H	29.96			31.77					34.45
L		29.44			28.08	25.56			
Ash content :									
H	13.54			14.12					13.73
L		12.80			12.29			12.61	
Ether extract (%):									
H	2.59			2.78			3.07		
L		2.52			2.39			2.00	
Sodium content:									
H	0.68			0.72				0.79	
L		0.67			0.64		0.56		
Potassium content:									
H	1.70			1.86				1.82	
L		1.64			1.51		1.49		

IV. Biological Evaluation:

The present study could help in better selection of the promising nutritive drought- resistant and/or salt tolerant native plant species in order to be used for renovating improving and/ or establishing newly natural grazing areas. This is for achieving the ultimate target for increasing or obtaining and adequate nutritive feed and to increase animal productivity of better quality under the proposed grazing area in the North Western Coast (NWC) of Egypt.

Thereby, the dry matter, organic matter and crude protein analysis and digestibility of the such selected promising native plant species as follows:

IV.1. Chemical composition:

Data in Table (53) presented the chemical composition on dry matter basis for the grown plant species in details. The analysis included dry matter content (DM), organic matter content (OM) and crude protein content (CP).

Results indicated that most of the grown plants are considered as succulents. On other hand the analysed plants contain high percentage of dry matter which ranged from 31.53 to 69.7%, Organic matter was also ranged from 83.1 to 90.3% and crude protein which ranged from 5.3 to 16.6%.

The highest value of DM content was recorded for *Lygeum spartum* (69.7), *Picris radicata* (65.4), *Medicago sativa* (56.9%) and *Maresia Pygamaea* (56.5%).

Organic matter (OM) content showed variable differences within plant species. The highest OM value was recorded for

Table (53): Initial composition (DM, OM, and CP) of the digested plant species.

Plant species	Chemical composition		
	DM	OM	CP
1. Astragalus eremophilus	47.9	86.1	14.9
2. Lotus arabicus	53.3	86.5	16.6
3. Medicago sativa	56.9	87.6	12.5
4. Trigonella hamosa	50.8	87.1	14.4
5. Vicia monantha	50.6	88.6	16.2
6. Bromus rubens	37.3	87.9	8.1
7. Hordeum leporinum	31.5	88.3	5.3
8. Lygeum spartum	69.7	83.1	8.9
9. Anacyclus alexandrinus	40.2	85.8	14.2
10. Artemisia herba-alba	55.1	84.3	16.5
11. Carduus getulus	34.1	86.2	10.2
12. Centaurea calcitrapa	54.3	85.1	7.2
13. Picris radicata	65.4	86.8	12.2
14. Silybum marianum	28.9	87.5	7.9
15. Brassica tournefortii	34.2	86.9	10.2
16. Cardaria draba	46.6	87.3	10.9
17. Maresia pygmaea	56.5	86.3	12.9
18. Erodium hirtum	51.9	90.3	12.8
19. Malva parviflora	44.2	86.2	10.2
20. Plantago cylindrica	42.3	84.7	12.7
21. Lycium shawii	54.1	83.4	11.0
22. Pituranthos tortuosus.	36.5	85.7	10.8

Erodium hirtum (90.3%), *Hordeum leporinum* (88.3%) and *Medicago sativa* (87.6%) as presented in Table (53).

In the North-Western Coast of Egypt, many studies have been conducted to investigate the effect of plant species and varieties on in relation to its chemical composition and nutritive value. A long the same line **Ibrahim (1995) and Abd-El-Aziz (1978)** found that *Artemisia herba-alba* was superior in OM contents. **Abd-El-Aziz (1982)** reported that chemical composition of the native grown plants was significantly affected by the fodder species weather being annuals or perennials.

Crude protein (CP) content is also quite varied among the grown plant species. However, most of these plants had highest content of crude protein as *Lotus arabicus* (16.6%), *Artemisia herba-alba* (16.5%), *Astragalus eremophilus* (14.9%) and *Trigonella hamosa* (14.4%). Whereas the other plant species had low CP Content as *Lygeum spartum* (8.9%) *Silybum marianum* (7.9%) and *Hordeum leporinum* (5.3%) as recorded in Table (53).

-In Situ trials:

The conducted in-situ trials included DM, OM and CP disappearance through digestibilities periods of 6, 12 and 24 hrs on dry matter basis as an indicator for the nutritive value evaluation of the native plant species. Results will be presented and discussed as follows:

In-Situ dry matter, organic matter and crude protein disappearance of the native plant species as presented in Tables (54, 55, and 56). There are significant differences among the analysed species on dry matter basis. Each of these analysed components will be discussed according to its rate of digestibility and disappearance in 6, 12 and 24 hours as follows:

IV.2. Dry matter disappearance:

Results in Table (54) showed that many plants had good values in dry matter disappearance in situ such as *Malva parviflora* (77.18%), *Trigonella hamosa* (72.87%), *Lygeum spartum* (69.69%), *Anacyclus alexandrinus* (65.29%). Also, significant effect between such plant species was noticed. The remaining plants had low values as *Pituranthos tortuosus* (26.47%).

This experiment were conducted under three periods of time which were 6, 12 and 24 hrs. The respective, dry matter disappearance were 38.66, 50.45 and 65.40 with significant differences.

The interaction between species and digestibility duration of 6, 12 and 24 hours on the dry matter disappearance of the native plant species were significantly affected. The *lygeum spartum* (85.79%), *Malva parviflora* (85.62%) and *Trigonella hamosa* (81.78%) gave highest value of DMD under 24 hours digestibilities. Whereas, the lowest value was for *Pituranthos tortuosus* (18.31%).

Generally, results concerning in situ DMD of different plants species (Table 54) showed that such values ranged from 18.31% to 85.79% within the first 6 and 24 hours of digestibility. These values explain how these plants can be varied in its speed of digestibility with significant differences according to the amounts, quality and nature of its components. Similar results of good nutritive quality for some of the studied roughage were noticed by **Ibrahim (1995) and Abd-El-Aziz (1978, 1982).**

Table (54) : In situ digestibility of dry matter for the tested plant species during 6, 12 and 24 hrs.

Plant species	Digestibility duration			Mean
	6hrs.	12hrs.	24hrs.	
1. Astragalus ermophilus	rstuvwxyz 36.78	lmnopqrstu 46.74	cdefghi 70.58	**f 51.37**
2. Lotus arabicus	rstuvwxyz 36.06	jklmnopqrst 51.08	defghijklmn 64.03	**f 50.39**
3.Medicago sativa	rstuvwxyz 36.86	ghijklmnopq 56.95	bcdef 76.99	**def 56.93**
4. Trigonella hamosa	cdefghi 65.35	defghijklm 71.49	abcd 81.78	**ab 72.87**
5. Vicia monantha	tuvwxyz 32.28	nopqrstu 45.62	defghijklmn 64.81	**f 47.57**
6. Bromus rubens	wxyz 21.03	stuvwxyz 32.82	fghijklmnop 58.12	**g 37.32**
7.Hordeum leporinum	yz 19.17	uvwxyz 28.60	mnopqrstu 46.27	**gh 31.35**
8. Lygeum spartum	opqrstuv 53.45	cdefghij 69.83	a 85.79	**abc 69.69**
9. Anacyclus alexandrinus	opqrstu 44.29	bcdefgh 74.03	bcde 77.54	**bcd 65.29**
10. Artemisia herba-alba	uvwxyz 29.34	uvwxyz 29.45	opqrstuv 43.41	**gh 34.06**
11. Carduus getulus	efghijklmno 62.35	opqrstu 44.32	efghijklmno 60.47	**def 55.71**
12. Centaurea calcitrapa	pqrstuvw 40.01	nopqrstu 45.72	bcdef 77.21	**Ef 54.31**
13. Picris radicata	opqrstuv 43.51	defghijklmn 64.30	abcde 78.39	**Cde 62.07**
14.Silybum marianum	xyz 20.72	uvwxyz 30.95	stuvwxyz 35.09	**Gh 28.92**
15. Brassica tournefortii	qrstuvwxy 38.33	mnopqrstu 46.33	cdefghijkl 65.88	**f 50.18**
16. Cardaria draba	stuvwxyz 35.30	klmnopqrstu 47.10	ghijklmnopq 57.38	**f 46.59**
17. Maresia pygmaea	rstuvwxyz 37.53	ghijklmnopq 57.23	bcdefg 74.78	**def 56.51**
18. Erodium hirtum	pqrstuvwx 39.24	ijklmnopqrs 52.31	defghijklmn 64.06	**ef 51.87**
19. Malva parviflora	efghijklmno 61.34	abc 84.58	ab 85.62	**a 77.18**
20. Plantago cylindrica	rstuvwxyz 35.78	hijklmnopqr 54.95	cdefghijk 66.12	**ef 52.28**
21. Lycium shawii	opqrstuv 43.39	jklmnopqrst 50.94	cdefghij 67.82	**ef 54.05**
22. Pituranthos tortuosus	z 18.31	vwxyz 24.49	rstuvwxyz 36.63	**h 26.47**
Mean	**38.66^{C}**	**50.45^{B}**	**65.40^{A}**	**51.50**

The interaction effect of digestibility period and plant species was significant as presented in details in Table (54). Such results are reasonably accepted due to the various constituents of the analyzed plant species which are logically affected by its speed of digestibility, disappearance and nutritive value.

IV.3. Organic matter disappearance:-

Data in Table (55) clarified that organic matter disappearance (OMD) of plant species under the three duration periods of 6, 12 and 24 hours of digestibilities. Organic matter digestibility where of higher values for *Malva parviflora* (76.67%), *Trigonella hamosa* (70.55%), *Picris radicata* (62.33%) and *Anacyclus alexandrinus* (61.66%). Whereas, the lowest values of (OMD) were recorded for *Artemisia herba-alba* (25.01%), *Silybum marianum* (21.45%) and *pituranthos tortuosus* (17.62%). Such obtained variations in (OMD) of plants species were significant.

In addition OM disappearance of each of the analyzed plant species at 6, 12 and 24 hours and its significantly differences due to the elapsed digestibility period are listed in details in Table (55). On the average OMD significantly increased as the duration time of digestibility increase from 6, 12 and 24 hours with respective values of 33.39, 45.34 and 60.50%.

Moreover, data in the same Table (55) showed that the interaction effect between plant species and periodicity of digestibility on this studied parameter was not significant.

Table (55) : In Situ digestibility on organic matter for the tested plant species during 6, 12 and 24 hrs.

Plant species	Digestibility duration			Mean
	6 hrs	12 hrs	24 hrs	
1. Astragalus eremophilus	37.24	40.97	66.94	**48.38^{DE}**
2. Lotus arabicus	36.19	47.33	60.55	**48.02^{DE}**
3. Medicago sativa	32.84	53.91	75.20	**53.98^{CD}**
4. Trigonella hamosa	69.50	62.57	79.58	**70.55^{AB}**
5. Vicia monantha	27.36	41.86	62.08	**43.77^{DE}**
6. Bromus rubens	14.79	25.67	53.28	**31.25^{FG}**
7. Hordeum leporinum	10.96	20.96	40.87	**24.26^{GH}**
8. Lygeum spartum	35.66	65.13	53.19	**51.33^{CDE}**
9. Anacyclus alexandrinus	38.75	71.65	74.58	**61.66^{BC}**
10. Artemisia herba-alba	19.06	21.02	34.96	**25.01^{GH}**
11. Carduus getulus	60.44	39.78	56.07	**52.09^{CDE}**
12. Centaurea calcitrapa	33.38	39.38	73.86	**48.87^{DE}**
13. Picris radicata	38.93	60.99	87.06	**62.33^{BC}**
14. Silybum marianum	13.79	23.66	26.89	**21.45^{GH}**
15. Brassica tournefortii	33.18	40.68	59.89	**44.58^{DE}**
16. Cardaria draba	29.61	40.95	52.11	**40.89^{EF}**
17. Maresia pygmaea	31.77	53.08	71.79	**52.21^{CDE}**
18. Erodium hirtum	36.74	49.80	61.41	**49.32^{DE}**
19. Malva parviflora	56.88	82.63	90.52	**76.67^{A}**
20. Plantago cylindrica	31.02	50.53	61.38	**47.64^{DE}**
21. Lycium shawii	36.70	48.23	62.52	**49.15^{DE}**
22. Pituranthos tortuosus.	9.90	16.81	26.17	**17.62^{H}**
Mean	**33.39^{C}**	**45.34^{B}**	**60.50^{A}**	**46.41**

IV.4. Crude protein disappearance:

Digestibility coefficients of crude protein content on dry matter basis for the analyzed native plant species are presented in Table (56). Digestibility was significantly affected by the various plant species. The *Trigonella hamosa* (56.22%), *Malva parviflora* (52.45%), *Vicia monantha* (51.98%), *Medicago sativa* (51.95%), *Picris radicata* (50.77%) and *Carduus getulus* (50.97%) had the significantly highest values of CP disappearance. While, the lowest values were recorded for *Hordeum liporinum* (34.40%), *Silybum marianum* (39.86%) and *Bromus rubens* (39.70%) with significant differences as shown in Table (56).

Variation in digestibility coefficients among the tested plant species might be related to the overall chemical composition of such plants, which varied in its nature, quantity and quality.

Data in the same table (56) showed significant differences in CP digestibility of plant species at the time elapsed for digestibility (6, 12 and 24 hrs). Digestibility was significantly increased from 40.77% to 47.75% and up to 53.25% during 6, 12 and 24 hours digestibility duration, respectively.

Data also showed no significant interaction effect of CP digestibility of plant species and time elapsed for digestibility (6, 12 and 24 hours).

In conclusion, among the previously listed chemical composition (Table 53), dry matter disappearance (Table 54), Organic matter disappearance (Table 55), and CP disappearance (Table 56) on dry matter basis for the analyzed native plant species

Table (56): In Situ digestibility on crude protein for the tested plant species during 6, 12 and 24 hrs.

Plant species	Digestibility duration			Mean
	6 hrs	12 hrs	24 hrs	
1. Astragalus eremophilus	43.43	48.88	53.86	**48.72^{BCDE}**
2. Lotus arabicus	44.57	51.15	56.65	**50.79^{ABCD}**
3. Medicago sativa	45.96	52.78	57.10	**51.95^{ABC}**
4. Trigonella hamosa	53.17	57.14	58.36	**56.22^{A}**
5. Vicia monantha	43.74	52.13	60.06	**51.98^{ABC}**
6. Bromus rubens	32.84	37.68	48.56	**39.70^{GH}**
7. Hordeum leporinum	29.35	33.61	40.23	**34.40^{H}**
8. Lygeum spartum	42.61	52.66	55.49	**50.25^{ABCDE}**
9. Anacyclus alexandrinus	40.29	54.39	56.14	**50.27^{ABCDE}**
10. Artemisia herba-alba	41.41	43.61	50.68	**45.23^{DEFG}**
11. Carduus getulus	52.45	46.20	54.26	**50.97^{ABCD}**
12. Centaurea calcitrapa	37.04	44.89	55.63	**45.85^{CDEFG}**
13. Picris radicata	43.43	50.74	58.13	**50.77^{ABCD}**
14. Silybum marianum	38.54	39.54	41.52	**39.86^{GH}**
15. Brassica tournefortii	45.84	50.46	53.15	**49.82^{BCDE}**
16. Cardaria draba	36.87	46.84	51.43	**45.05^{DEFG}**
17. Maresia pygmaea	37.99	45.64	49.17	**44.27^{EFG}**
18. Erodium hirtum	40.43	50.34	54.66	**48.48^{BCDE}**
19. Malva parviflora	41.16	55.25	60.93	**52.45^{AB}**
20. Plantago cylindrica	29.15	44.58	51.64	**41.79^{FG}**
21. Lycium shawii	39.23	46.98	53.19	**46.47^{BCDEF}**
22. Pituranthos tortuosus.	37.35	45.01	50.64	**44.33^{EFG}**
Mean	**40.77^{C}**	**47.75^{B}**	**53.25^{A}**	**47.26**

during 6, 12 and 24 hours duration periods of digestions, it could be efficiently useful to select for the most promising plant species of the highest fresh and dry matter productivity, best nutritive components, and faster digestibility. Such selective native plants will be of higher pay- off for adequate and richest nutritive value in fulfilling the requirements of animal feeding in respect of quantity and quality. Selective plant species according to its quantitative and qualitative characteristics will be of great help in renovating and establishing new ranges of better management.