RESULTS AND DISCUSSION

I. ECOLOGICAL STUDIES

As mentioned before, the aim of this work was to get some clue information about the vegetation distribution in a part of the Western Desert plateau ecosystem which occurs near Great Cairo. The chosen area was extended from km 30 to km 70 on the left side zone of Cairo-Alexandria Desert Road (from Giza).

We thought advisable to carry out this work in such chosen area for many reasons. The first was that the question about the natural and the population of vegetation distribution is still without clear answer in our chosen area, as very rare work was carried out on it.

The reclamation and the cultivation of some parts of this plateau area were began depending on the artesian water through the diggingg of deep wells which may be reached to more than 200 m depth. The activity of cultivation affected and controlled the natural distribution of vegetation. At the same time, many of the wild plants are considered as dangerous weeds in such new cultivated area and some time may be caused great problems for the progression of cultivation. Thus, the ecological and eco-physiological studies aid and provide us with the

good and proper method for controlling the undesirable wild plants in the cultivated area. In addition, many of the wild desert plants belong to the medical plants, and the protection and conservation of such plants seemed to be very important under the cultivation of new area. Thus, the ecological and eco-physiological studies on such medical plants provide us with the good information about the way of conservation of such important economic wild plants. Another reason for having chosen our study on this area, as the natural vegetation distribution may be considered as one of the most valuable biological monitors or indicators for the prevailing of climatic factors, and that provide us with a good indication about chosing of the most proper eco-system for cultivation of new area. In other words, the chosen of proper cultivated plants in a new area may be depended on indirectly the natural distribution of vegetations, as the last are the expression of the prevailing climatic factors.

According to the aforementioned information, our study was extended from 1986 till 1989 seasons to get some clue information about the distribution of different plant population in the communities of Cairo-Alexandria Desert Road extended from km 30 to km 70 on the left side from Cairo.

Location of the studied area:

The chosen area is located at the north-west of Great Cairo and is considered as a part of the western Egyptian Desert Tableland. The studied area was divided into five strips at kms 30,40, 50, 60 and 70. Every strip was 50 m at the road side with the depth of 1500 m foreward in the plateau. Because of the ecological features of this part, elevation, strong winds, high evaporation, deep water table exceeding 150 m and thin layer of soil, the balance under which natural plants live is precarious. This area may be considered as gravel-sand ecosystem interpreted with some calcium carbonate rocky elevation.

Topography_:

The general topography of the studied area is mostly seemed to be more or less flat to some gently undulating, as the monatory of the studied area is broken by sand gravel dunes, or calcium sand dunes. The extensive grazing of the wild plants by camels have a part in depleting the land of its natural vegetation and led to serious erosion of the soil and hindrance of the soil forming processes.

Climatic factors

Tables 1, 2, 3 and 4 presented the data of climatic factors prevailing in the studied areas during the seasons of 1986, 1987, 1988 and 1989 respectively. In addition, Table (5) represented the mean values of the four seasons.

It could be concluded from the data that there is no clear difference between the maximum and minimum temperature of the four studied seasons in the terms of total average. However, there some fluctuation between the values of every comparison corresponding month means values of the four seasons. It could be concluded that the maximum, minimum and mean of daily temperature increased gradually from January till it reached the maximum values during June, July and August, then decline gently during the successive remaining months till it reached the minimum values during December.

Dew point is the critical temperature under which the dew is formed. Dew may be considered as one of the main sources of water to the growing xerophytic plants especially in the arid zone and season. Thus, our study was extended to include the dew point. It could be concluded that dew point began at the lowest value during January and increased gradually after that to reach its maximum value during August and decline gently again after that to reach its lowest value during December. This fact is true in the four seasons (1986, 1987, 1988 and 1989). However, the dew point was allowed under either corresponding value of the minimum mean temperature value or the mean of night temperature value. This is true during the duration of the investigation (from 1986 till 1989). In other words, this means that the dew in the

studied area was out to take a functional role for the growth and the vegetation distribution in the tested area. This does not mean that some of air humidity could be absorbed directly either through aerial plant portion or with the sub-soil plant organs. It is interesting to mention that some of air humidity could be absorbed and be adsorbed by the fine and hygroscopic soil and plant particles.

With regard to the data of relative humidity, it could be concluded that the highest value at 600 O'Clock followed by 1800 O'Clock while it reached the lowest value at 1200 O'Clock. This means that a great fluctuation in daily relative humidity, and that take a part in the growth and development of the plants. It could be concluded that the seasonal variation of maximum and minimum average daily relative humidity was very great.

The maximum and minimum daily relative humidity were fluctuated from season to another and from month to another. This could affect the size of vegetation in the tested zone.

It could be concluded from the data of actual vapour pressure and the vapour pressure deficit indicate that the relative humidity did not reach the saturation level at any month of the different seasons. Moreover, many days

relative humidity reached the saturation levels during the different seasons of the detail original daily record data, but these saturation levels were not clear when the data were converted into the average of daily values per month.

With regard to the seasonal total rainfall per season, it could be concluded that season of 1987 having the largest total amount of rainfall followed by the season of 1988, while season of 1986 ranked the third, whereas season of 1989 ranked the fourth in this respect. Thus, it could be concluded that the most wetted season were, 1987 and 1988, while the most dried season was 1989, during which only 7.1 mm of rainfall was a gain. In addition, much data indicated that the rainfall in the studied area fluctuated greatly from season to another one and that takes a partial role in the distribution of the natural vegetation. In addition, the relative limited rainfall during the different seasons indicate that the studied area is considered as one of the most arid zone in Egypt when compared with that fall on the northern Egyptian zone.

Wind speed and maximum wind speed data indicate that this studied area is subjected to strong winds especially during March, April and May, while the lowest wind speed was occurred during January, November and December (the winter season).

It must be mentioned that the actual sunshine duration (hour/day) data were only available of 1988 and 1989 seasons while those of 1986 and 1987 were not available. This type of the climatic data play an important role on the vegetation distribution in the studied area as the cloud and Fog prevented the direct sunlight. Actual sunshine duration increased greatly during the summer season and decreased during winter, as the lowest values were gained during January, February, March and December. At the same time the highest values were gained during May, June, July, August and September. In addition the clouds and fog may be more during season of 1988 than those corresponding ones of season 1989, as the values of actual sunshine duration (hour per day) were higher during season of 1989 then those corresponding ones of season 1988.

It could be concluded from the previous different discussion of climatic factors data that such factors are very important governing the distribution and the growth of different natural wild plants in the studied area and the seasonal variation of such vegetation. As the winter season is characterized by the relative low temperature, higher relative humidity, rainfall and lower actual sunshine duration. Thus, it is expected that winter and spring seasons showed a heavy vegetation than summer or autumn.

Table (1) The average dialy values of climatic factors of the studied area (season, 1986)*

Month	Temperature (°C)					Dew point (°C)	Relative humidity (%)						Actual vapour pressure (m.bar)	Vapour pressure deficit (m.bar)	Total rain fall (mm.)	Wind speed (Nod./sec.)	Max. wind speed (Nod./sec.)	Day length (hour/day)
	Max.	Min.	Mean	Nite	Day		600	1200	1800	Max. value	Min. value	*** Mean						
January	20.1	8.3	14.2	12.5	16.0	7.0	75	46	62	85	44	65	8.1	4.9	0.0	3.8	8.2	10.4
February	21.5	9.8	15.7	14.1	18.7	9.0	73	42	58	83	38	61	10.7	8.2	4.9	4.3	9.6	11.3
March	23.5	12.6	18.1	15.5	20.4	9.8	75	41	57	85	37	61	12.2	9.7	4.1	5.5	11.4	12.0
April	29.9	14.5	22.2	19.2	24.2	11.3	68	33	51	83	28	56	14.0	14.8	5.4	5.3	10.9	12.8
May	29.1	16.4	22.8	19.9	23.8	11.5	66	32	45	79	29	54	13.8	14.8	2.0	5.0	11.2	13.2
June	34.4	21.5	28..0	25.2	29.2	15.1	60	31	42	76	29	53	18.1	21.4	0.0	5.3	10.5	14.0
July	34.5	22.5	28.5	25.6	30.5	18.6	71	37	54	82	35	59	21.7	17.4	0.0	5.3	9.7	13.9
August	34.6	22.4	28.5	25.8	30.6	19.4	75	39	54	88	36	62	22.7	16.5	0.0	4.3	9.3	13.9
September	33.8	21.5	27.7	25.0	30.3	18.6	73	38	53	86	37	62	23.3	16.4	0.0	4.9	9.5	12.3
October	29.0	17.3	23.2	20.6	25.6	15.4	74	44	61	87	42	65	17.7	11.1	0.0	4.4	9.0	11.4
November	23.2	12.7	18.0	16.5	20.0	10.6	76	46	64	87	43	65	12.9	7.8	0.4	3.6	8.3	10.7
December	19.8	8.4	14.1	11.6	16.0	6.4	72	43	63	81	41	61	9.8	6.4	2.7	3.9	8.7	10.2
Mean	27.8	15.7	21.8	19.3	23.8	12.7	72	39	55	84	37	60	15.4	12.5	19.5	4.6	9.7	-

* Calculated after daily records of Giza Meteorological Station (30.02 °N, Latitude, 19 m., Altitude).

** Total rain fall

*** Mean of the maximum and minimum values

- Note: Actual sun-shine duration data were not available in the station

Table (2) The average dialy values of climatic factors of the studied area (season, 1987)*

Month	Temperature (°C)					Dew point (°C)	Relative humidity (%)						Actual vapour pressure (m.bar)	Vapour pressure deficit (m.bar)	Total rain fall (mm.)	Wind speed (Mod./ sec.)	Max. wind speed (Mod./ sec.)	Day length (hour/ day)
	Max.	Min.	Mean	Nite	Day		600	1200	1800	Max. value	Min. value	*** Mean						
January	20.9	7.4	14.2	11.2	16.3	5.7	72	39	59	81	37	59	9.7	7.2	0.0	3.7	8.1	10.4
February	22.6	9.6	16.1	14.0	17.2	7.1	75	39	53	81	35	58	10.3	8.8	0.8	3.9	8.2	11.3
March	21.2	12.0	16.6	13.3	17.6	6.1	67	38	54	78	34	56	9.4	8.5	14.9	5.6	11.7	12.0
April	26.3	12.8	19.6	16.8	21.5	8.3	59	32	47	77	29	53	10.7	13.0	0.0	5.2	11.3	12.8
May	32.2	16.9	24.6	20.9	25.9	10.8	55	26	39	73	24	49	13.0	19.7	0.0	5.2	11.1	13.2
June	33.9	20.1	27.0	24.0	28.0	15.3	67	33	41	79	30	55	17.5	19.1	0.0	5.6	10.9	14.0
July	34.9	22.3	28.6	26.0	30.8	18.1	72	36	49	79	33	56	20.3	18.9	0.0	4.1	9.4	13.9
August	34.4	22.6	28.5	25.8	30.6	19.3	72	40	53	83	37	60	22.6	17.0	0.0	4.2	8.8	13.9
September	33.1	21.3	27.2	24.5	29.4	18.1	75	38	54	84	36	60	20.9	15.5	0.0	4.8	9.0	12.3
October	28.4	16.9	22.7	20.2	25.1	14.6	71	41	60	84	40	62	16.8	11.4	0.0	4.4	9.4	11.4
November	24.5	11.6	18.1	15.3	20.7	11.3	74	46	69	89	45	67	13.6	7.6	0.0	3.8	8.3	10.7
December	20.3	10.9	15.6	13.5	16.2	9.3	78	53	70	87	49	68	11.9	5.8	18.7	4.1	9.2	10.2
Mean	27.7	15.4	21.6	18.8	23.3	12.0	70	38	54	81	36	59	14.7	12.7	34.4**	4.6	9.6	

* Calculated after daily records of Giza Meteorological Station (30.02 °N, Latitude, 19 m., Altitude).

** Total rain fall

*** Mean of the maximum and minimum values

- Note: Actual sun-shine duration data were not available in the station

Table (3) The average dialy values of climatic factors of the studied area (season, 1988)*

Month	Temperature (°C)					Dew point (°C)	Relative humidity (%)						Actual vapour pressure (m.bar)	Vapour pressure deficit (m.bar)	Total rain fall (mm.)	Wind speed (Nod./sec.)	Max. wind speed (Nod./sec.)	Day length (hour/day)
	Max.	Min.	Mean	Nite	Day		600	1200	1800	Max. value	Min. value	*** Mean						
January	18.9	8.1	13.4	11.4	15.4	8.2	84	53	69	92	51	72	11.3	4.8	0.9	3.7	8.6	6.0
February	20.2	8.8	15.9	12.3	16.6	6.6	73	41	60	87	40	64	5.6	6.7	4.2	5.3	10.6	5.8
March	23.0	11.2	17.1	14.8	19.8	7.1	66	41	54	75	36	56	10.3	9.9	8.2	6.2	10.8	7.7
April	28.5	14.9	21.6	18.5	23.4	9.4	60	31	44	76	28	52	12.1	10.5	2.5	7.0	14.4	9.4
May	36.6	20.1	28.8	24.8	29.9	11.6	53	22	34	70	21	46	14.0	20.0	0.0	6.5	10.7	11.3
June	35.9	21.9	28.8	25.5	29.8	14.7	53	28	39	71	26	49	17.0	21.2	0.4	5.7	10.7	11.6
July	36.0	24.0	29.6	27.1	31.9	19.0	69	37	50	81	34	58	23.2	19.8	0.0	5.5	9.3	11.8
August	34.9	24.4	28.8	26.4	31.0	19.6	76	40	53	84	37	61	23.4	19.0	0.0	5.1	9.1	11.4
September	34.0	22.0	27.4	24.9	30.1	18.2	74	37	53	84	35	60	21.2	16.4	0.0	5.3	8.9	10.4
October	28.6	16.8	22.5	20.1	25.0	14.7	73	43	58	85	41	63	16.8	11.1	0.0	4.2	8.7	9.7
November	23.2	10.1	16.4	13.5	19.2	8.8	69	40	62	83	40	62	11.5	7.8	0.0	3.5	7.2	8.7
December	20.0	9.3	14.3	12.3	16.3	8.1	78	48	68	88	46	67	12.1	5.7	17.2	3.5	7.6	6.7
Mean	28.3	16.0	21.1	19.3	24.0	12.2	69	38	54	81	36	59	14.9	12.7	33.4**	2.1	9.7	9.2

* Calculated after daily records of Giza Meteorological Station (30.02 °N, Latitude, 19 m., Altitude).

** Total rain fall

*** Mean of the maximum and minimum values

- Note: Actual sun-shine duration data were not available in the station

Table (4) The average dialy values of climatic factors of the studied area (season, 1989)*

Month	Temperature (°C)					Dew point (°C)	Relative humidity (%)						Actual vapour pressure (m.bar)	Vapour pressure deficit (m.bar)	Total rain fall (mm.)	Wind speed (Nod./sec.)	Max. wind speed (Nod./sec.)	Day length (hour/day)
	Max.	Min.	Mean	Nite	Day		600	1200	1800	Max. value	Min. value	*** Mean						
January	16.8	6.8	11.8	10.0	13.4	6.4	84	53	68	91	51	71	9.7	4.3	4.7	4.3	9.6	6.8
February	20.0	7.7	13.9	8.0	16.0	6.0	75	43	59	87	40	64	9.6	6.8	0.2	4.7	9.5	8.1
March	23.8	10.9	17.4	14.8	19.8	8.0	70	34	52	84	34	59	10.9	9.6	0.2	5.2	10.3	9.3
April	32.0	15.6	23.8	20.1	25.1	10.4	61	26	44	79	25	52	13.6	16.0	0.0	6.1	10.2	10.2
May	33.1	18.6	25.9	22.2	26.8	12.1	58	27	39	75	25	50	14.4	19.9	0.0	7.3	11.7	10.2
June	34.6	20.6	27.6	24.2	28.7	14.8	56	30	41	78	28	53	17.0	21.0	0.0	6.1	9.9	12.2
July	34.4	22.2	28.3	25.1	30.2	19.0	73	41	54	85	62	74	22.1	16.1	0.0	2.3	8.9	12.0
August	35.0	22.7	28.9	25.6	30.5	19.7	75	39	54	87	37	62	23.1	16.1	0.0	4.7	8.9	11.3
September	33.7	21.0	27.4	23.8	29.6	18.0	70	39	56	87	37	62	20.6	15.1	1.8	5.7	9.1	10.6
October	29.5	17.5	23.5	20.6	25.9	14.6	70	39	58	85	37	61	17.0	12.6	0.2	5.6	8.7	9.6
November	24.9	13.0	19.0	16.1	21.3	11.9	74	45	66	88	44	66	14.1	8.1	0.0	5.7	7.7	8.3
December	21.1	9.7	15.4	12.7	17.3	8.9	77	48	67	89	45	67	10.9	6.0	0.0	3.4	8.0	7.4
Mean	28.2	15.5	21.9	18.6	23.7	12.5	70	39	55	85	39	62	15.3	12.6	7.1**	5.1	9.4	9.7

* Calculated after daily records of Giza Meteorological Station (30.02 °N, Latitude, 19 m., Altitude).

** Total rain fall

*** Mean of the maximum and minimum values

- Note: Actual sun-shine duration data were not available in the station

Table (5) The average dialy values of climatic factors of the studied area (in the terms of the means of the four seasons)*

Month	Temperature (°C)					Dew point (°C)	Relative humidity (%)						Actual vapour pressure (m.bar)	Vapour pressure deficit (m.bar)	Total rain fall (mm.)	Wind speed (Nod./sec.)	Max. wind speed (Nod./sec.)	Day**** length (hour/day)
	Max.	Min.	Mean	Nite	Day		600	1200	1800	Max. value	Min. value	*** Mean						
January	19.2	7.7	13.4	11.3	15.3	6.8	79	48	70	87	46	67	9.7	5.3	1.4	3.9	8.6	6.4
February	21.1	9.0	15.4	12.1	17.1	7.2	74	41	65	85	38	62	9.1	7.6	2.5	4.6	9.5	7.0
March	22.9	11.7	17.3	14.6	19.4	7.8	70	39	58	81	35	58	10.7	9.4	6.9	5.6	11.1	8.5
April	29.2	14.4	21.8	18.7	23.6	9.9	62	31	54	79	28	53	12.6	13.6	2.0	5.9	11.7	9.8
May	32.8	18.0	25.5	22.0	26.6	11.5	58	27	47	74	25	50	13.8	18.6	0.5	6.0	11.2	10.8
June	34.7	21.0	27.9	24.7	28.9	15.0	59	31	39	76	28	53	17.4	20.7	0.1	5.7	10.2	11.9
July	35.0	22.8	28.8	26.0	30.9	18.7	71	38	41	82	41	62	21.8	18.1	0.0	4.3	9.3	11.9
August	34.7	23.0	28.7	25.9	30.7	19.5	75	40	52	86	37	61	23.0	17.2	0.0	4.6	9.0	11.4
September	33.7	21.5	27.4	24.6	29.9	18.2	73	38	54	85	36	61	21.5	15.9	0.5	5.2	9.1	10.5
October	28.9	17.1	23.0	20.4	25.4	14.8	72	42	59	85	40	63	17.1	11.6	0.1	4.7	9.0	9.7
November	24.0	11.9	17.9	15.4	20.3	10.7	73	44	65	87	43	65	13.0	7.8	0.1	4.2	7.9	8.5
December	20.3	9.6	14.9	12.6	16.5	8.2	76	48	67	86	45	66	11.2	6.0	9.7	3.7	8.4	7.1
Mean	28.0	15.6	21.8	19.0	23.7	12.4	70	39	55	83	37	60	15.1	12.7	23.8**	4.9	9.6	9.5

* Calculated after daily records of Giza Meteorological Station (30.02 °N, Latitude, 19 m., Altitude).

** Total rain fall

*** Mean of the maximum and minimum values

**** Means of two seasons only, i.e., 1988 and 1989), as such data of 1986 & 1987 were not available.

II- **Edaphic factors :**

Data of different edaphic factors in the terms of mechanical (granulometric) analysis, mineral components (chemical), and soil moisture contents in different soil depths are tabulated in Tables 6, 7 and 8, respectively.

It must be mentioned that the collected samples for mechanical and chemical analysis was carried out during September of 1986 only, while soil moisture contents were carried out during the four studied seasons monthly. During 1986 season all of the studied area without any cultivated area, however, some strips were under cultivation especially at km 50 during the seasons of 1987, 1988 and 1989 from km 47 till km 50. The spots No. I, II, IV and V (kms 30, 40, 60 and 70, respectively, were still without cultivation until 1989). In this connection, the author got the permission of the farmer of km 50 to complete our study during the successive seasons. Thus, it is very important to compare the habitat under cultivation (Spot of km 50-No. III) with those uncultivated spots (kms 30, 40,60 and 70).

From our observation on the soil feature, it could be stated that: a) soil colour may be graduated from pail yellow into redish colour in the same area. In addition, the redish soil colour may appear after removal of the upper soil layer crush. b) The soil may be compacted

greatly after few cm from the upper surface, and seemed to appear as rocky or stony habitat (in the same zone of the same spot area). c) It must be mentioned here that, the studied area exposed to the strong winds many times of the year and that affected the soil depth through erosion. Thus it could be stated from our observation through the studied successive years, that the upper soil surface may be formed from a mixture of residual and eolian deposits, and may be changed from season to another.

Soil mechanical analysis :

It may be concluded from the data of table (6) that all the five tested spots are sandy soil with some limited gravel proportion, as the sand with its different diameters constituted the largest proportion.

It could be revealed also from the same data that the first upper soil layer (0.0-30 cm) mostly contains liner sand more than the two other layers (i.e., soil layer from 30 to 60 cm or from 60 to 90 cm), with some few exceptions. On the other hand, it could be revealed from the data of table (6) that there are some great fluctuation in the soil component from different particles of the different spots. For example, spots No. III, IV and V seemed to have more gravel and less sand properties than the spots of No. I and II. Accordingly spots No. III, IV and V may be considered as gravel sandy habitat.

Table (6) Granulometric analysis of soil at the different tested* spots area from km 30 to km 70 of Cairo-Alexandria Desert Road.

Spot No.	Soil Depth (cm)	Granulometric analysis of soil fraction (%)							Soil texture class
		2 > mm	2.0-1.0 mm	1.0-0.5 mm	0.5-0.25 mm	0.25-0.125 mm	0.125-0.063 mm	>0.063 mm	
I	0-30	2.01	2.01	17.25	38.46	37.45	1.64	1.18	Sand
Km 30	30-60	5.00	10.61	20.66	26.12	25.51	3.00	9.10	Sand
	60-90	5.45	20.31	19.28	24.31	26.05	3.21	1.39	Sand
Average		4.15	10.98	19.06	29.63	29.67	2.62	3.89	Sand
II	0-30	4.27	2.77	20.81	33.00	28.47	5.00	5.68	Sand
Km 40	30-60	4.87	8.17	24.13	30.25	26.10	5.00	1.48	Sand
	60-90	4.33	22.51	20.71	20.15	26.15	5.12	1.03	Sand
Average		4.49	11.15	21.88	27.80	26.91	5.04	2.73	Sand
III	0-30	7.06	11.40	19.60	23.05	31.86	3.86	3.17	Sand
Km 50	30-60	8.10	11.01	10.96	27.74	26.49	3.51	3.19	Sand
	60-90	8.34	19.00	19.23	20.82	26.83	4.47	1.31	Sand
Average		7.83	13.80	19.60	23.87	28.39	3.95	2.56	Sand
IV	0-30	5.53	17.20	20.49	16.11	34.33	2.44	3.36	Sand
Km 60	30-60	9.88	15.22	21.18	22.13	27.18	2.11	2.30	Sand
	60-90	16.44	22.51	16.36	18.17	20.19	5.33	1.00	Sand
Average		10.63	18.31	19.51	18.80	27.23	3.29	2.22	Sand
V	0-30	10.02	15.81	20.15	15.11	27.13	7.34	4.44	Sand
Km 70	30-60	9.92	17.72	18.70	20.44	26.31	3.00	3.91	Sand
	60-90	8.59	20.36	18.02	21.60	26.16	4.11	1.16	Sand
Average		9.51	17.96	18.96	19.05	26.53	4.82	3.17	Sand

* The samples were collected during September of 1986.

Table (7) Chemical analysis of soil at different tested spots area from km 30 to km 70 of Cairo-Alexandria Desert Road

Spot No.	Soil depth (cm)	pH	EC (m.mhos/cm)	Elements (mg/g dry weight)											Elements (ppm)		
				Ca^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO^{3-}	Cl^{-}	SO_4	N	Mg^{++}	Fe	Zn	Cu	Mn	Co	Se
I	0-30	7.9	0.73	5.63	2.0	0.11	0.09	0.77	0.61	4.74	0.01	46.01	22.35	2.13	41.21	1.17	0.27	2.16
km 30	30-60	7.9	0.80	5.48	2.0	0.11	0.04	1.55	0.71	5.66	0.11	44.85	24.67	2.16	44.63	2.77	0.30	1.87
	60-90	8.0	1.50	6.01	2.0	0.12	0.08	1.60	0.13	5.71	0.02	47.15	45.16	1.15	44.82	1.99	0.31	2.01
Average		7.9	1.01	5.71	2.0	0.11	0.07	1.31	0.48	5.37	0.05	46.00	30.73	1.81	43.55	1.98	0.29	2.01
II	0-30	7.9	1.31	4.11	0.91	0.09	0.00	0.90	0.41	4.66	0.02	48.16	30.11	1.78	36.17	1.08	0.25	2.25
km 40	30-60	7.9	1.22	4.31	0.91	0.13	0.00	1.20	0.32	5.46	0.13	46.17	35.12	1.89	44.10	1.98	0.33	1.99
	60-90	8.0	1.70	5.61	1.62	0.13	0.00	1.31	0.35	5.71	0.04	48.19	24.15	1.07	43.17	2.00	0.40	2.01
Average		7.9	1.41	4.68	1.15	0.12	0.00	1.14	0.36	5.27	0.02	47.51	29.79	1.58	41.15	1.69	0.33	2.08
III	0-30	7.3	0.70	4.30	1.70	0.10	0.00	0.50	0.81	4.82	0.16	47.45	20.83	1.97	37.72	1.80	0.32	1.82
km 50	30-60	7.4	1.12	5.53	1.37	0.11	0.00	1.32	0.48	5.68	0.13	44.41	36.23	1.88	42.77	1.93	0.33	1.60
	60-90	7.4	1.38	3.70	1.37	0.12	0.00	1.62	0.13	5.26	0.02	46.98	46.18	1.93	45.52	1.38	0.37	1.88
Average		7.4	1.07	4.51	1.48	0.11	0.00	1.15	0.47	5.25	0.10	46.28	34.41	1.93	42.00	1.70	0.34	1.77
IV	0-30	7.1	0.33	6.52	1.01	0.12	0.00	0.98	0.53	3.55	0.01	47.90	29.15	2.13	35.16	1.80	0.22	2.38
km 60	30-60	7.2	1.00	6.13	1.01	0.12	0.08	1.30	0.31	4.68	0.10	37.41	30.99	2.15	45.16	2.16	0.31	1.77
	60-90	7.8	1.00	6.61	1.52	0.13	0.06	1.32	0.41	5.71	0.03	46.15	35.16	1.16	46.17	1.98	0.42	2.34
Average		7.4	0.78	4.22	1.18	0.12	0.04	1.2	0.42	4.65	0.05	43.82	31.77	1.81	42.61	1.98	0.32	
II	0-30	7.3	0.44	4.31	1.03	0.11	0.00	1.16	0.53	4.96	0.01	39.66	28.13	2.29	37.2	2.75	0.21	2.95
km 70	30-60	7.5	0.90	4.93	2.00	0.11	0.09	1.17	0.64	4.99	0.11	45.77	38.16	2.56	45.28	2.66	0.35	1.16
	60-90	7.9	0.90	7.04	1.11	0.13	0.08	1.13	0.64	5.32	0.13	48.16	42.17	1.08	47.10	1.99	0.40	2.51
Average		7.6	0.75	5.43	1.38	0.12	0.06	1.15	0.60	5.09	0.08	44.53	36.15	1.98	43.19	2.47	0.32	2.15

Soil chemical analysis :

It could be revealed from the data of Table (7) that soil pH seemed to be more or less constant in different soil layers, without no clear differences between the various tested spots. In addition, the different soil layers which collected from various spots area are slightly alkaline in reaction. The same conclusions were observed with the electrical conductivity (E.C.).

It could be concluded, that Ca^{++} is the dominant cation, followed by Na^{+} and K^{+} rank's the third in this respects, as potassium is found in a trace amounts. I could be stated also that sulphate is the dominant salts, followed by bicarbonate while chloride ranks the third in this respect. In addition carbonate may be absent completely or may be found in some cases in very trace amounts.

Different studies on spots area seemed to have a very rare amount of fixed nitrogen either in the former of organic or inorganic salts. While, magnessium is found in the studied area with a satisfactory amounts. It must be mentioned here that, Ca, K, Mg and S are considered as ones of the most essential macro-elements in plant nutrition. Accordingly the dominance of Ca and the trace amounts of K indicate that the growing wild plants under such habitat could be considered as calciphile plants. The presence of

Mg in a relatively higher amounts indicates that such plants found easily their requirement from Mg.

The study of heavy essential micro-elements in the soil may gave a true picture. In spite of the essentiality of such elements for plant life, yet the excess of such elements in the soil may be sometimes toxic for many plants. However, many wild plants could survive under the relatively higher proportion amounts in the soil. It could be revealed from the data of Table (7) that Cu is found in higher proportion in the studied area. This finding is naturally expected as most of the calcareous soils seemed to have higher proportion of Cu. In other words, Cu is considered as the most dominant heavy nutrient micro element followed by Fe, Zn and Mn. Thus, the growing plants under this habitat must be adopted for soil mineral amounts. Cu may be considered sometime as one of the benifical element for plant, thus it was thought advisable to get some information about its presence in the soil. Such element was found mostly in the same proportion as in the case of zinc. However, sometimes Cu may exceed the proportion of Zn and mostly exceed the amounts of Mn.

Also dissolved so may be considered as one of the beneficial element especially for the good growth of graminea plants. The dissolved see is found in a sufficient amount in different studied area. The presence

of silicon in plant tissues give it a stiff and hard appearance. Such element with other ones (like Ca) and the conductive tissue elements supporting the plants under the arid conditions.

According to the various discussion of the climatic and edaphic factors one can conclude that the studied area seemed to be more or less a continuous sole habitat, in spite of the presence of some fluctuation in the elements of climatic and edaphic data.

Soil moisture content :

To determine the soil moisture content, samples of soils from every spot area were collected every month during the four successive seasons of 1986, 1987, 1988 and 1989. It is suggested that such data were suitable to discuss as the average of the four years. Such data are tabulated in Table (8). Before, discuss such data the following points must be mentioned: a) Soil moisture content is one of the very important edaphic factor for germination of the seeds, for supporting the plant vegetative stage, and for sexual reproduction stage as well. Every stage require a variable amounts of soil moisture. In other words, soil moisture content must be adequate for supporting the growing plants to complete their life cycle, and that may differ from plant to another and from stage to other stage in the same plant . b) under

our study work, seeds of annual plants may be mostly germinate under winter season, as the winter season is the wet and during which rain falls. The plants complete their life cycle during spring. However, perennial plants could be grown during all of the year depending on the available soil moisture after a modification in their organs to minimize their water requirements. Accordingly our data are present as the average of the four seasons, i.e., winter, spring, summer, and autumn.

It could be stated from the data, generally, that spring is the most wet season than other three season while autumn is the most dry one. In this connection it must be mentioned that the main source of soil moisture is either rainfall or dew or air humidity, as the soil water table exceeded 130 m. It must be mentioned that during the season of 1986 the rainfall occurred during February, March and April, however, most of the rainfall quantity occurred during February and March. During the season of 1988, most of the rainfall occurred during February, March and April, however during season of 1989 (is considered as the most dry season), most of the rainfall occurred during January, February and March (data of Tables, i, 2, 3 and 4). This indicated that most of rain quality was gained during spring, season of vegetative and reproductive growth stage of most of annual plants. During spring many of the seeds could germinate. Such plants seemed to be perennial or

have a short time for completing their life cycle.

As regard to the soil moisture percentage in different spots area, spot III at km 50 seemed to have the highest moisture percentage than the other four spots all over the seasons. This of course is due to that spot No. III is the cultivated area (cultivated with young fruit trees). However, many of the studied area in this spot was without cultivation, and soil samples was collected from cultivated and non-cultivated area as well.

It must be mentioned also that the first soil layer (0-30 cm) was always contain the lowest soil moisture than the other two layers, and the third layer (60-90) seemed to have the highest soil moisture percentage, while the second layer seemed to have a moderate amount between the upper and lower layer. In this respect it must be mentioned that evaporation from the upper layer occurred, but soil moisture in the lower layers could be moved into the upper layer.

Table (8) Average of soil moisture percentage during different seasons of various soil depths

	Spot No. I (km 30)				Spot No.II (km 40)				Spot No.III (km 50)				Spot No.IV (km 60)				Spot No. V (km 70)				Monthly average
	Soil Depth (cm)			Mean	Soil Depth (cm)			Mean	Soil Depth (cm)			Mean	Soil Depth (cm)			Mean	Soil Depth (cm)			Mean	
	0-30	30-60	60-90		0-30	30-60	60-90		0-30	30-60	60-90		0-30	30-60	60-90		0-30	30-60	60-90		
November	0.75	1.80	2.20	1.58	0.90	2.07	2.70	1.89	1.17	2.82	4.08	2.69	0.89	1.84	2.57	1.76	0.93	2.11	2.80	1.95	1.97
December	1.83	3.54	3.47	2.95	2.22	3.98	4.06	3.40	2.84	4.22	4.33	3.80	1.79	3.52	4.10	3.14	2.17	3.25	4.33	3.25	3.31
January	1.02	2.11	2.75	1.96	1.31	2.34	3.04	2.23	1.99	3.03	4.64	3.22	1.10	2.83	3.41	2.45	1.28	2.88	3.55	2.57	2.49
Average of winter season	1.20	2.45	2.81	2.16	1.48	2.78	3.27	2.51	2.00	3.36	4.35	3.24	1.26	2.72	3.36	2.45	1.46	2.75	3.56	2.59	2.59
February	1.57	3.43	4.31	3.10	1.74	3.59	4.45	7.26	2.52	4.02	5.28	3.94	1.74	3.56	3.96	3.09	2.08	3.45	3.83	3.12	3.30
March	2.13	4.20	4.60	3.64	2.82	4.58	5.02	4.14	3.51	4.83	5.47	4.60	2.16	4.33	4.54	3.68	2.83	4.31	4.50	3.88	3.99
April	2.00	4.06	4.47	3.51	2.22	3.96	4.99	3.72	2.76	5.20	5.28	4.41	2.10	3.79	4.14	3.34	2.32	4.22	4.32	3.62	3.72
Average of spring season	1.90	3.90	4.46	3.42	2.26	4.04	4.82	3.71	2.93	4.68	5.34	4.32	2.00	3.89	4.21	3.37	2.41	3.99	4.22	3.54	3.67
May	1.52	3.30	4.02	2.95	1.91	3.38	4.25	3.18	2.52	4.55	4.89	3.99	1.83	3.37	3.74	2.98	1.93	3.42	4.14	3.16	3.25
June	1.31	2.67	3.80	2.59	1.36	2.87	3.83	2.69	2.00	4.24	4.69	3.64	1.51	3.40	3.62	2.84	1.65	3.50	4.03	3.06	2.96
July	0.91	2.03	3.14	2.03	1.00	2.10	3.49	2.20	1.40	3.12	4.27	2.93	1.27	2.98	3.10	2.45	1.22	2.95	3.30	2.49	2.42
Average of summer season	1.25	2.67	3.65	2.52	1.42	2.78	3.86	2.69	1.97	3.97	4.62	3.52	1.54	3.25	3.49	2.76	1.60	3.29	3.82	2.90	2.88
August	0.87	1.95	2.90	1.91	0.92	1.99	3.12	2.01	0.92	2.94	3.99	2.62	1.09	2.50	2.87	2.15	1.14	2.47	2.97	2.19	2.18
September	0.86	1.85	2.69	1.80	1.23	2.11	2.74	2.03	1.18	2.65	4.73	2.85	1.02	1.82	2.43	1.76	1.01	1.75	2.53	1.76	2.04
October	1.01	1.64	2.45	1.70	1.16	2.00	2.76	1.97	1.16	2.73	3.85	2.58	0.96	1.67	2.64	1.76	1.00	1.72	2.45	1.72	1.95
Avrage of autumn season	0.91	1.81	2.68	1.80	1.10	2.03	2.88	2.00	1.09	2.77	4.19	2.68	1.02	2.00	2.65	1.89	1.05	1.98	2.65	1.89	2.05
Total Average	1.32	2.71	3.40	2.48	1.57	2.91	3.71	2.73	2.00	3.70	4.63	3.44	1.46	2.97	3.43	2.62	1.63	3.00	3.56	2.73	

III- Phyto-populations list in the study areas :

During the study seasons, i.e., 1986-1987, 1987-1988, ad 1988-1989, the collected plant samples were recognized and classified according to Taxholsu (1956 & 1974). It was found in the study areas 19 plant species as desert habitate plants. However, under the cultivated area of km 50 many other Delta - Nile and Nile Vale weeds were also recognized such as *Chenopodium murale* (L.) (= *C. tniagulare* Forssk.); *Medicago intertexa* (L.) Mill; *Melilotus indica* (L.) All.; *Capsella bursa = pastoris* (L.) Medicus; *Ammi majus* L. *Convolvulus arvensis* L.; *Cyperus rotundus* L. (=*Chlorocyperus rotundus* (L.) Palla., *Pycreus rotundus* Moyek); *Echinochloa colonum* L. Link (=*Panicum colonum* L.) *Cynodon dactylon* (L.) Pers. (=*Panicum daclylon* L., *Dactylon officinale* Vill.); *Sonchus oleraeus* L. and many other Nile Vale weeds. The above metntioned weeds seeds may be translocated to the cultivated area either through the Nile clay which are used by the farmers to improve the fertility of the sand soil or naturally by the winds.

Inspite of the presence of some Nile Valley weeds but we are intrested only with those having a sand habitat plants. The list of the 19 species which have a sand habitat plants which were found in the five spots could be summarized as follows in the form of their taxonomic position.

Division : Angiospermae

1) Class Dicotyledoneae

A Subclass Archichlamydeae

1) Order Polygoniales

Family Polygonaceae

* *Calligonum comosum* L'Mer

2) Order Centrospermae

a) Family Caryophyllaceae

* *Polycarpaea repens* (Forssk) Asch & Schweinf.

b) Family *Chenopodiacea*

* *Bassia muricata* (L.) Aschers.

* *Cornulaca monacantha* Del.

3) Order Papaverales

Family Cruciferae

* *Eremobium aegyptiacum* (spreng) Asch:

4) Order Rosales

Family Neuradaceae

* *Neurada Procumbens* L.; Boiss.

5) Order Geraniales

a) Family Zygophyllaceae

* *Zygophyllum album* L.F.

b) Family Geraniaceae

* *Monsonia nivea* (Decne) Decne

B) Subclass Sympetalae

6) Order Tubiflorae

Family Boraginaceae

* *Moltkiopsis ciliata* (Forssk) I.M. Johnst

7) Order Companulales

Family Compositae

Senocia desfontainei Druce

Ifoga specata (Forssk.) Sch.-Bip.

Cotula cinerea Del.

Reichardia tingitana (L.) Roth.

Launaea nudicaulis (L.) Hook.

Launaea mucronata (Forssk.) Muschler.

Launaea capitata (spreng.) Dandy.

II) Class Monocotyledoneae

8) Order Graminales

Family Gramineae

Stipagrostis plumosa (L.) Munro EX.T. Arders.

Pennisetum divisum (J.F. Gmel)

Chloris gayana Kunth.

IV- Macromorphology of Phyto-population Species in the studies Areas and Their Phenology :

The macromorphology of phyto-population species presented in the study spots area, i.e., at kms 30, 40, 50, 60 and 70 of Cairo-Alexandria - Desert Road during the years extended from 1986 till 1989 depends upon the author observations and examination of the collecting samples which were recorded in the form of many photographs and recorded data. The description of one or more of many workers in this field was in our consideration also in this respect (Tackholm, 1956 & 1974; Migahid, 1978; Daoud & Al-Rawi, 1985; and Al Rawi, 1987).

1) *Calligonum comosum* L'Her. (photos 1, 2 and 3)

Macromorphology

Glabrous shrub, divaricately much branched. Stems and branches ascending to erect; main branches rigid and articulate, the young branchlets fasciculate slender, weak, green and articulate. Leaves minute, inconspicous, subulate, adnate to the ochrea, sessile, soon decidous, ochrea short, bilobed, membranous. New young leaves appeared during March and April on the young developing new branches as the vegetative activity of such plant began during March and April, sometime the vegetative activity extended to May (1988 season). However, the forming

leaves, soon deciduous within one or two weeks, especially under hot winded days of April and May.

Flowers small, perfect, axillary, mostly single sometime a few clusters along the slender, green branchlets, pedicels jointed near the base (3.2 mm long). Petals lacking. Stamens 10. Carnate at base; anther oblong, red. Ovary superior, ovoid-oblong, 4-Carpelled, 4 angled, and grooved; style 4, free, incurved; stigmas capitate, fruit is bright, red-pink changed into dark brown after deciduous, tetragonous nutlet, beset with branched bristles in four rows, fruit is large covered by a tissue of branched soft spines, looking like hairtuft.

Such plant is perennial.

Local distribution : It is very common in many part of the Egyptian deserts, Gebel Elba, the Red Sea Coastal region and all the Egyptian deserts.

Habitate : sands and dunes, it is an excellent desert sand binder.

General distribution : Palestine, Jordan, Syria, Turkey, Iraq, Saudi Arabia, Bahrain, Oman, Aden, Iran, Pakistan, Afghanistan and Kuwait.

Phenology

Flowers of *Calligonum comosum* L'Her. wre observed, under the studied area, during March and fruits were observed during the end of April and the first of May the soon be deciduous after formation mostly under the mother plants.

The averages of root length, number of main branches, plant height, diameter per one plant and the average length of terminal and sub-lateral branches were tabulated in Table (9).

Root length : It could be concluded from the data of table (9) that root length was not changed from season to another as the average root length was 85 cm during the season of 1986 - 1988 was 84 cm and 83 cm during the season of 1988-1989. It could be concluded also that during the spring root length was higher than the other ones of Autumn, winter or summer. According to the abovementioned results it could concluded that the changes in seasonal environmental factors seemed to have more or less no effect on root growth.

We must mention her from our observations that *Calligonum comosum* depend partially on its deeper strong roots to tolerate water stress under arid desert

zone (Photo 2). It must be mentioned also that many strong later roots may be extended horizontaly under the soil surface, (Photo 1), to the direction of sample source of soil moisture (hydrotropesm). It could be concluded also that the water absorption root zone was found far from the soil surface (Photo 2), as most of the upper root portion was woody and legnified. It must be mentioned also that root length was longer than the shoot system, beside the leaves are absent to minimize the transpiration.

Plant height : It could be concluded from Table (9) that the plant height increased during spring, thus, it could be mentioned that the vegetative growth occurred during spring also flowering and fruiting was found during spring season. New lateral apical branches were grown during spring. There is no clear difference between plant height as related to the different spots area in this respect. It may be concluded also that plant height was in its lowest values during autumn increased slightly during winter and largest growth occurred during spring then decreased again during summer. The increase in plant height is mainly related to the growth of new flushing but the decrease in summer or autumn may be related to the flopping of the spring flushing portion. At the end of spring flowers were formed and plants became blooming and the fruits

formed at the beginning of summer season as mentioned before but quickly aborted from mother plants.

Plant diameter : Plant diameter is less than plant height to minimize the portion exposed to direct sunlight and hence less water losses occurred.

Number of main branches : Main branches seemed to be more or less about the average of 16 ones. It is extended from the basal vert short main stem near the soil surface . It must be mentioned here that the basal internode is shorter than the other intrnode is shorter than the other internode on the main stem and lateral branches.

Terminal branch length : Terminal branch length was about 26 cm containing about 6 to 15 internodes. The basal internode is very short but increased in the medium ones and be decreased again in lateral internode. The flowers were found on the spring flushing at the middle internodes.

According to the above mentioned information there is no question about the adoptation of *Calligonum comosum* L'Her to survive under arid desert zone. Thus, it is very common in many parts of Egyptian desert and many other Middle East arid countries. In fact it is an

excellent desert sand binder for many modifications in its plant organs as discussed before. This plant is mainly be used by Bedouin for fuel and that depleted the land of its natural distribution of *Colligonum comosum*. Also, this plant may be considered as one of the main excellent plant for fixing the sand dunes and that is useful for protection of desert farms from strong winds and also to minimizing the pollution with desert from especially Great Cairo. It is recommended to cultivate this plant in the desert around Great Cairo and many other countries in Egypt.

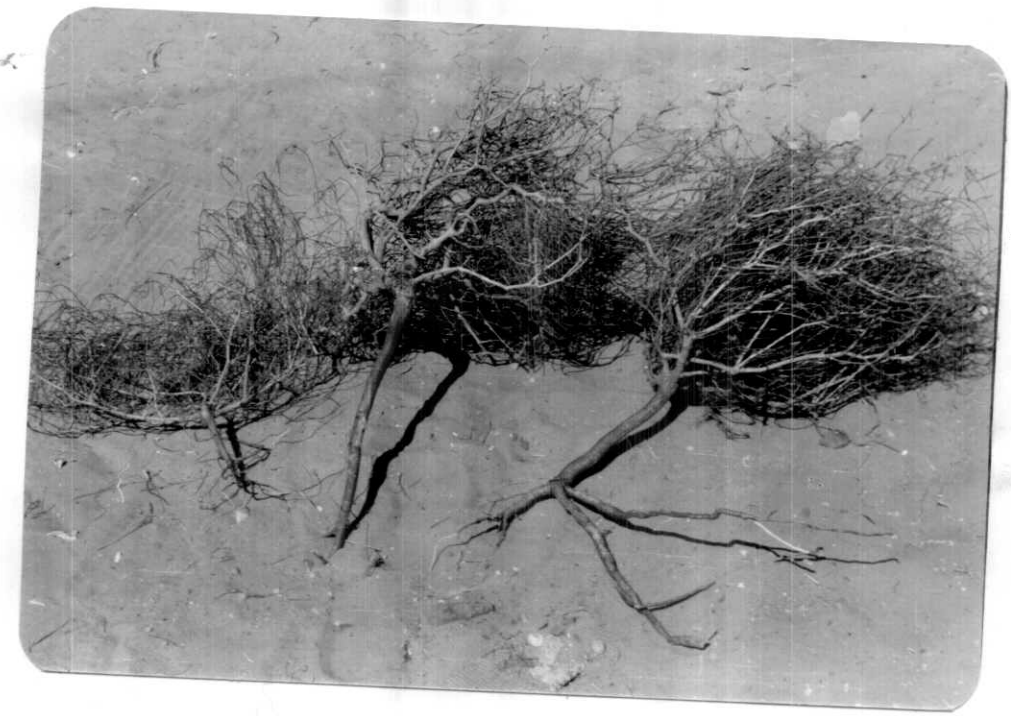


Photo (1) *Calligonum comosum* L'Her
Family, *Ploygonaceae*
Three tall glabrious shrubs showing a heavy condensing branches and a very woody strong roots (Photo during May 1987).

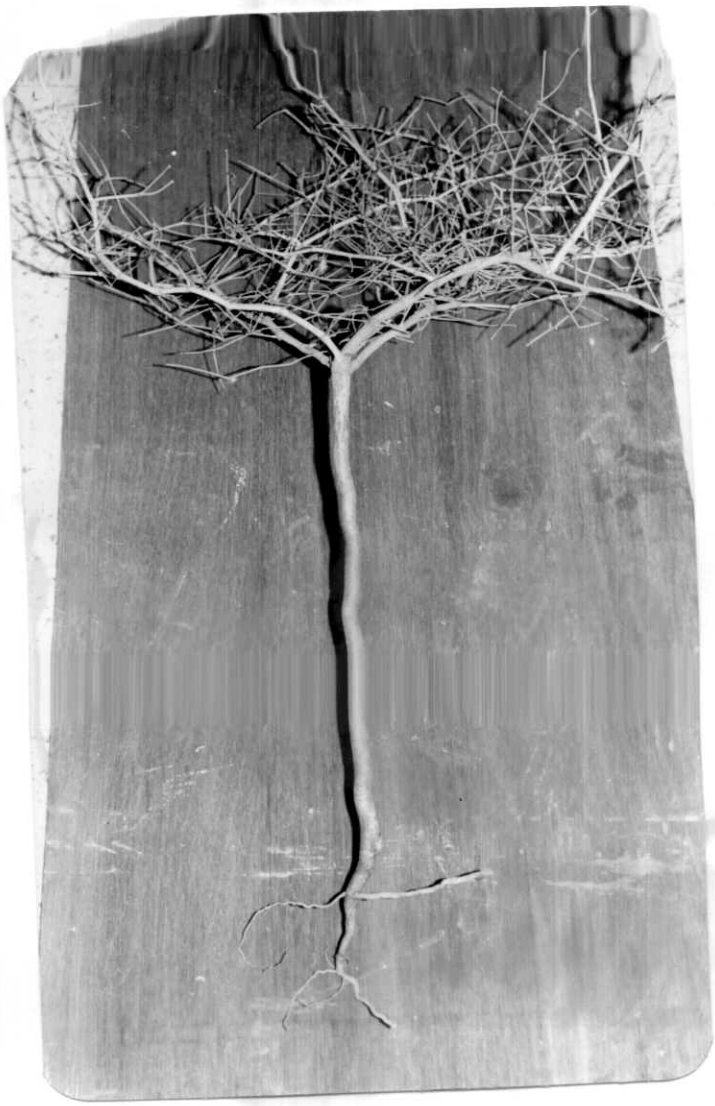


Photo (2) *Calligonum comosum* L'Her.
Family *Polygonaceae*
See the strong long roots and the heavy branched shoot system (April, 1988).

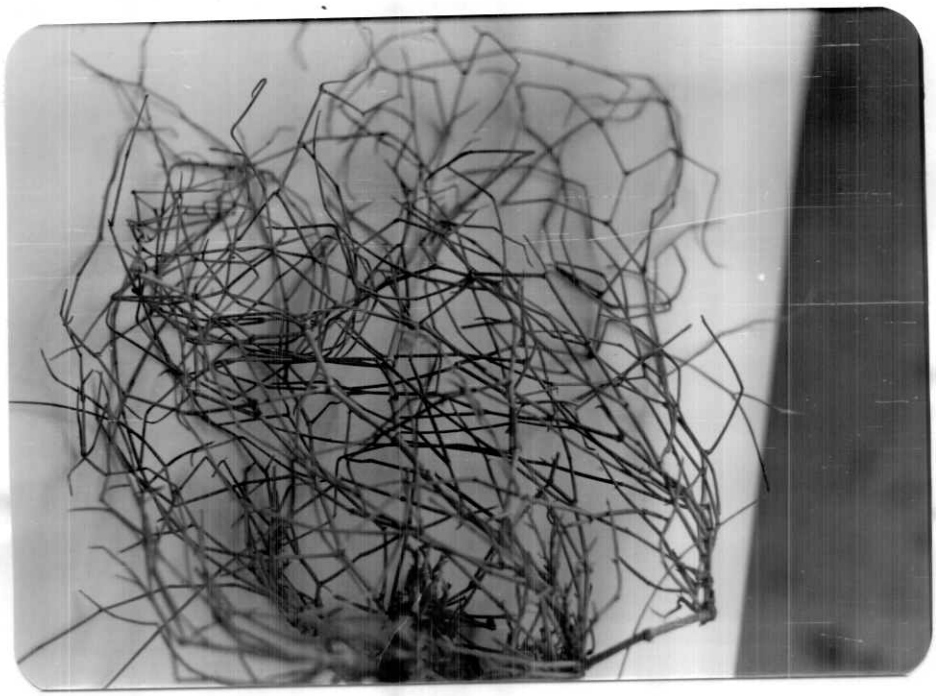


Photo (3) *Calligonum Comosum* L'Her.
Family *Polygonaceae*
Photos show the heavy conpact branching.
Photos May 1988,
A: Plant collected from km 40 while B was from Km 60.

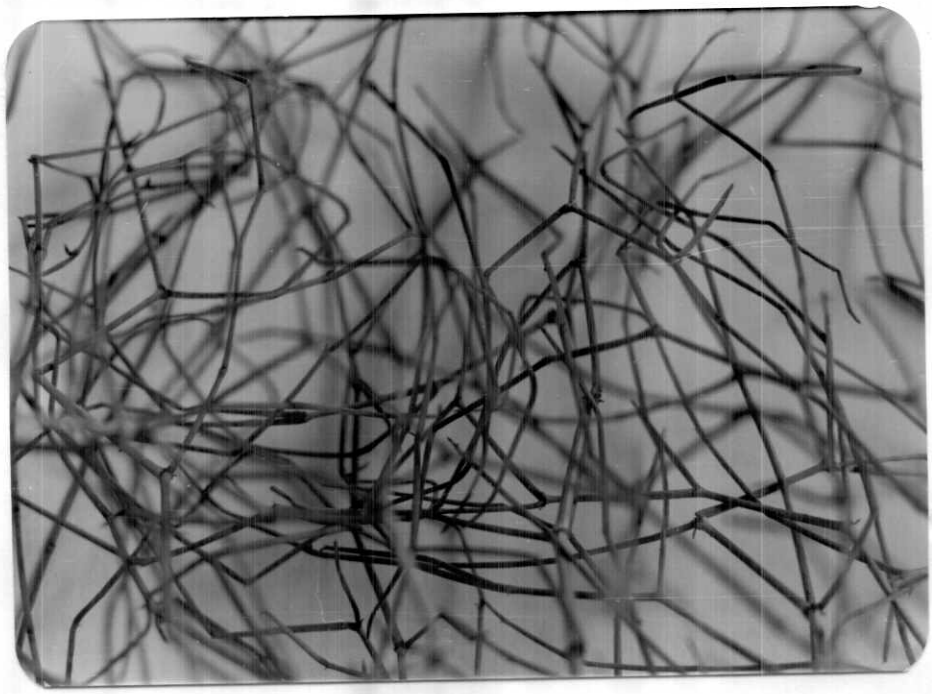


Table (9) Average of root length, plant hight, plant diameter number of main branches and terminal branch length of *Calligonum comosum* during different seasons at different studied spots area

Spot No.	Root length (cm)					Plant height (cm)					Plant diameter (cm)					No. of main branches					Terminal branch length (cm)				
	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average
Season 1986 - 1987																									
Spot I	81	83	82	81	82	70	73	84	81	77	64	64	73	72	68	17	16	17	17	17	25	23	30	28	27
Spot II	83	83	81	81	82	72	76	85	82	79	63	61	74	71	67	16	14	17	17	16	25	23	31	28	27
Spot III	80	84	89	83	84	80	76	89	82	82	67	69	81	79	74	16	16	16	14	16	24	21	33	31	27
Spot IV	85	84	91	83	86	82	87	87	83	85	61	62	74	71	67	15	15	14	17	15	23	20	33	31	27
Spot V	95	90	90	86	90	81	85	88	84	85	63	63	77	72	69	14	13	14	17	15	23	20	32	30	26
Average	85	85	87	83	85	77	79	87	82	82	64	64	76	73	69	16	15	16	16	16	24	21	32	30	27
Season 1987 - 1988																									
Spot I	86	84	83	85	85	76	77	86	81	80	66	61	75	72	69	14	14	17	16	15	25	23	29	26	26
Spot II	87	83	86	86	86	77	79	90	86	83	65	60	77	70	68	15	14	18	16	16	24	22	32	25	26
Spot III	80	82	84	86	83	80	81	95	86	86	68	65	82	78	73	15	16	19	15	16	24	25	35	29	28
Spot IV	86	82	82	84	84	81	83	89	86	85	66	61	75	73	69	16	14	16	14	15	23	23	33	24	26
Spot V	81	80	86	83	83	81	82	89	87	85	65	60	76	73	69	16	15	16	14	15	23	22	34	26	26
Average	84	82	84	85	84	79	80	90	85	84	66	61	77	73	69	15	15	17	15	15	24	23	33	26	26
season 1988 - 1989																									
Spot I	73	86	84	86	82	76	77	88	83	81	61	60	70	69	65	17	15	18	16	17	21	20	33	28	26
Spot II	76	86	83	85	83	75	78	92	83	82	61	59	74	71	66	18	15	19	13	16	20	21	29	28	25
Spot III	83	83	83	86	84	85	82	93	85	86	64	60	81	78	71	18	12	20	18	17	22	22	29	27	25
Spot IV	84	86	82	84	84	83	83	91	84	85	65	62	73	71	68	17	14	18	18	17	22	23	28	23	24
Spot V	85	85	81	86	84	81	83	91	83	85	66	61	74	71	68	17	15	17	15	16	23	23	27	23	24
Average	80	85	83	85	83	80	81	91	84	84	63	60	74	72	68	17	14	18	16	17	22	22	29	26	25
Total Average	83	84	85	84	84	79	80	89	84	83	64	62	67	73	69	16	15	17	16	16	23	22	31	27	26

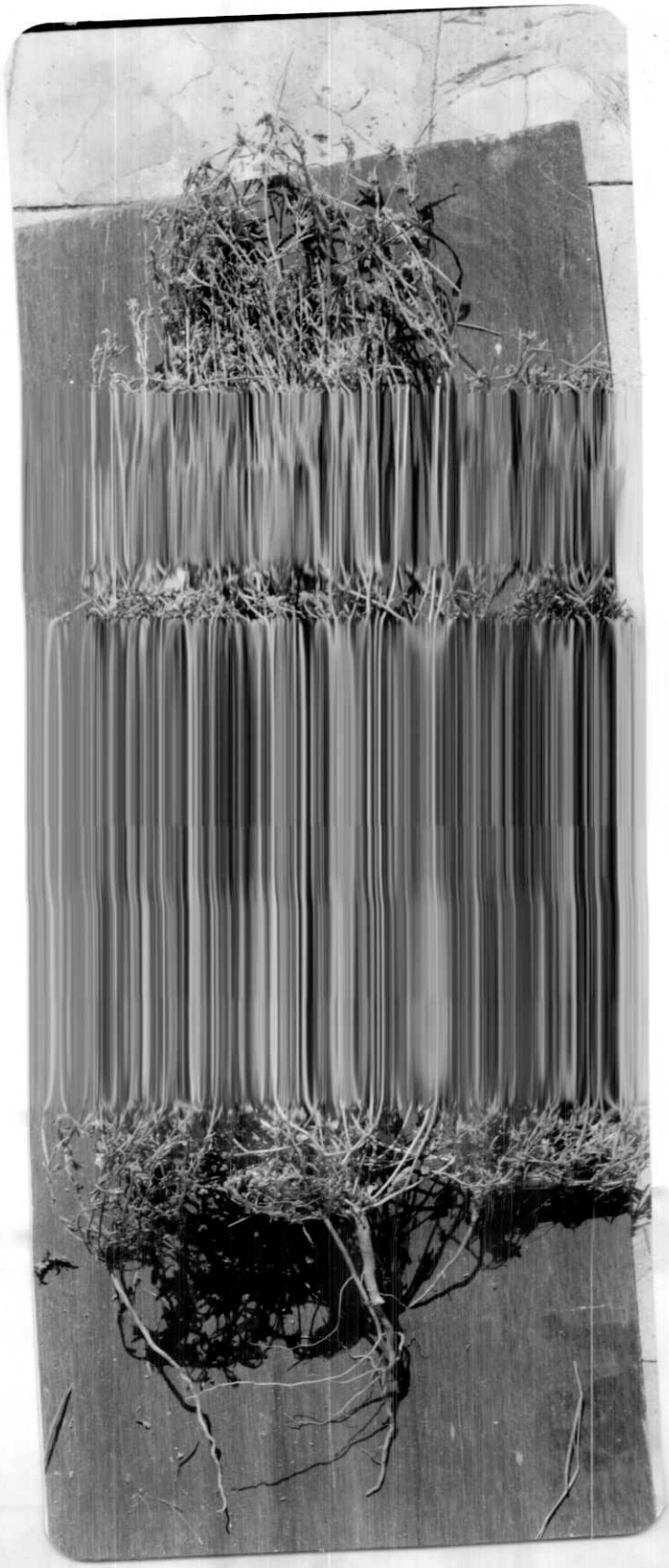
2. *Polycarpaea repens* (Forssk.) Aschers

Syns: Corrigiola repens, Forssk.

P. fragilis Delile.

Before discussing the macromorphology and phenology of *Polycarpaea repens*, it must be mentioned that some plants in the state of vegetative stage were translocated with the adhering natural soils into a plastic pots (20 x 20 cm) and irrigated with tap water twice weekly to clarify their behaviour under continuous source of water and to compare their growth naturally with those irrigated ones. Also, as many of the plant organs are fine and minute, thus their measurements were carried out by using a micro-scoler meter. Also, it must be mentioned that such plants grow under natural conditions in clusters and it is difficult to separate one plant from another without damage the branches or flowers, thus the number of branches per one plant and the number of flowers were out from our measurements and we suggest that complete detail studies must be carried out on such perennial herb began from seed germination until maturity if the question is to be fully answered about its complete behaviour.

Photo (4) *Polycarpaea repens* at flowring stage grown with *Stipagrostis plumosa* (see the poor growth of Stipogrostis) (grown at the farm of km 50 Cairo-Alex. Desrt Road).



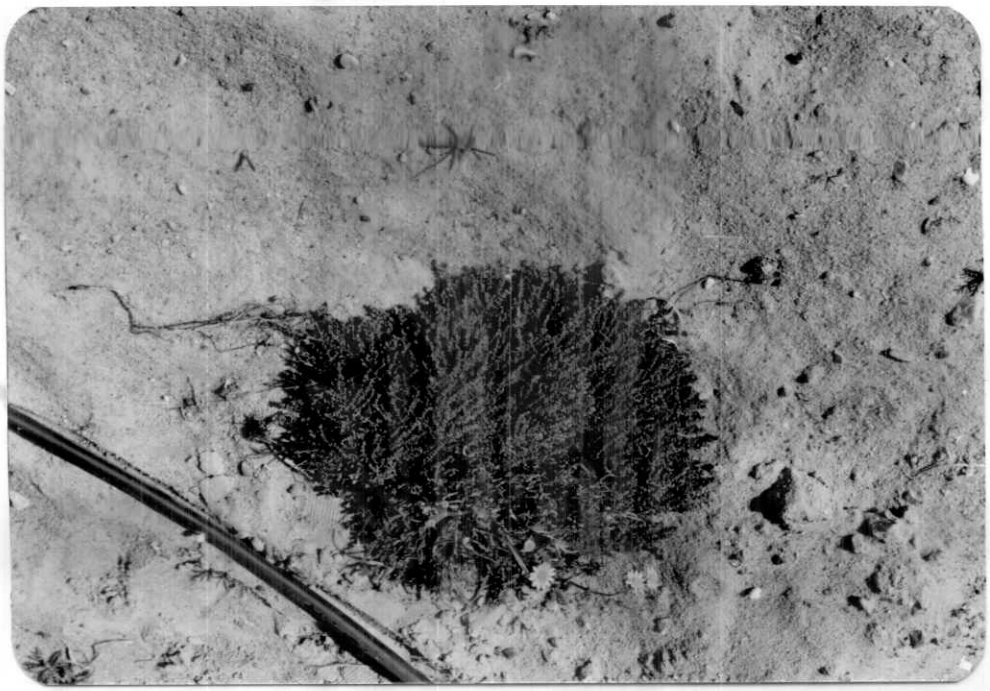


Photo (6) A cluster of *Polycarpaea repens* (before flowering with *Senecio disfontainei* near the irrigation pipe of the K 50 farm (Caio-Aelx. Desert Road)(February of 1988). Plants in vegetative growth stage. see the compacting heavy branches of the cluster.

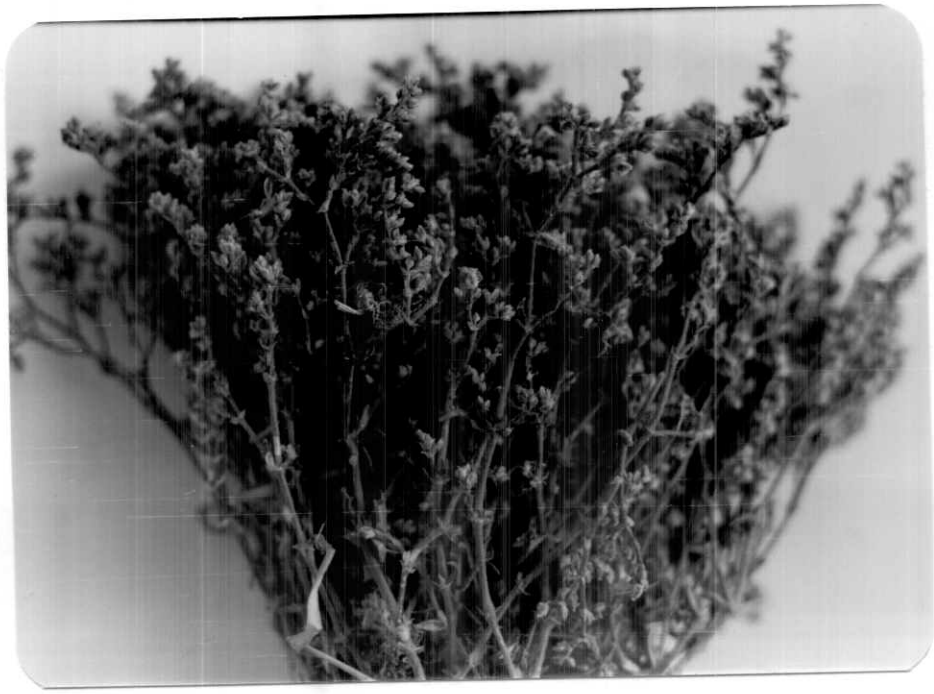


Photo (7) A condesing branches of *Polycarpaea repens* at flowering and fruiting stage (Apical plant portion). (This plant grown in plastic pot – it is more elongated than those grown under nature conditions). (April, 1989).

Table (10) Average of: Root length, plant hight, cluster diameter, leaf length and leaf width, during different seasons of *Polycarpaea repene* grown under nature conditions from km 30 to km 70 of Cairo Alexandria Desert Road.

Spot No.	Root length (cm)					Plant hight (cm)					Cluster diameter (cm)					Leaf length (mm)					Leaf wide (mm)				
	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average
Season 1986 - 1987																									
I	26	23	29	30	27	10	11	15	6	11	14	18	25	15	18	5.1	7.2	9.1	6.1	6.9	1.2	1.0	1.1	0.8	1.0
II	26	22	29	33	28	12	13	18	6	12	15	18	25	14	18	7.1	8.3	9.2	7.3	8.0	1.2	1.1	1.1	0.8	1.1
III	21	19	21	25	22	17	18	20	9	16	20	22	30	18	23	9.2	9.1	9.8	9.4	9.4	1.3	1.2	1.3	1.0	1.2
IV	22	20	24	23	22	13	14	16	7	13	16	18	23	16	18	6.2	7.1	9.1	6.4	7.2	1.2	1.0	1.0	0.9	1.0
V	21	21	24	23	22	13	14	17	7	13	17	18	24	16	19	6.2	7.2	9.1	6.4	7.2	1.2	1.0	1.0	0.9	1.0
Average	23	21	25	27	24	13	14	17	7	13	16	19	25	16	19	6.8	7.8	9.3	7.1	7.8	1.2	1.1	1.1	0.9	1.1
Season 1987 - 1988																									
I	23	25	32	34	29	9	13	17	5	11	13	20	22	13	17	6.1	8.2	7.2	6.1	6.9	1.3	1.1	1.1	1.0	1.1
II	22	25	32	35	29	10	14	17	4	11	14	20	23	12	17	6.1	8.1	7.2	6.1	6.9	1.3	1.2	1.2	1.0	1.2
III	19	20	25	30	24	15	18	22	6	15	18	23	28	18	22	8.1	9.4	9.4	9.0	9.0	1.4	1.2	1.4	1.2	1.3
IV	20	19	29	31	25	11	15	18	5	12	15	21	24	14	19	7.1	8.2	9.1	7.1	7.9	1.4	1.0	1.0	1.0	1.1
V	21	18	30	32	25	11	15	19	5	13	14	21	24	14	18	7.2	8.3	9.1	7.1	7.9	1.4	0.9	1.0	1.0	1.1
Average	21	21	30	32	26	11	15	19	5	13	15	21	24	14	19	6.9	8.4	8.4	7.1	7.7	1.4	1.1	1.1	1.0	1.2
Season 1988 - 1989																									
I	23	26	33	36	30	8	11	15	6	10	15	18	24	10	17	5.9	7.1	8.1	6.1	6.8	1.5	1.0	1.1	0.8	1.1
II	21	27	35	37	30	7	12	16	7	11	14	18	24	11	17	6.4	7.1	8.2	6.1	7.0	1.5	1.0	1.1	0.9	1.1
III	17	23	26	31	24	14	16	20	10	15	20	22	30	14	22	9.5	9.3	9.3	8.4	9.1	1.7	1.3	1.4	1.1	1.4
IV	19	20	29	30	25	11	12	15	8	12	14	19	25	12	18	7.1	8.2	9.1	6.4	7.7	1.4	1.1	1.0	1.0	1.1
V	20	20	30	33	26	11	12	15	8	12	14	18	25	12	17	6.2	8.2	9.1	7.0	7.6	1.5	1.1	1.0	0.9	1.1
Average	20	23	31	33	27	10	13	16	8	12	15	19	26	12	18	7.0	8.0	8.8	6.8	7.7	1.5	1.1	1.1	0.9	1.2
Total average	21	22	29	31	26	11	14	17	7	13	15	20	25	14	19	6.9	8.1	8.8	7.0	7.7	1.4	1.1	1.1	0.9	1.2

The following conclusions could be revealed from the data of Table (10)

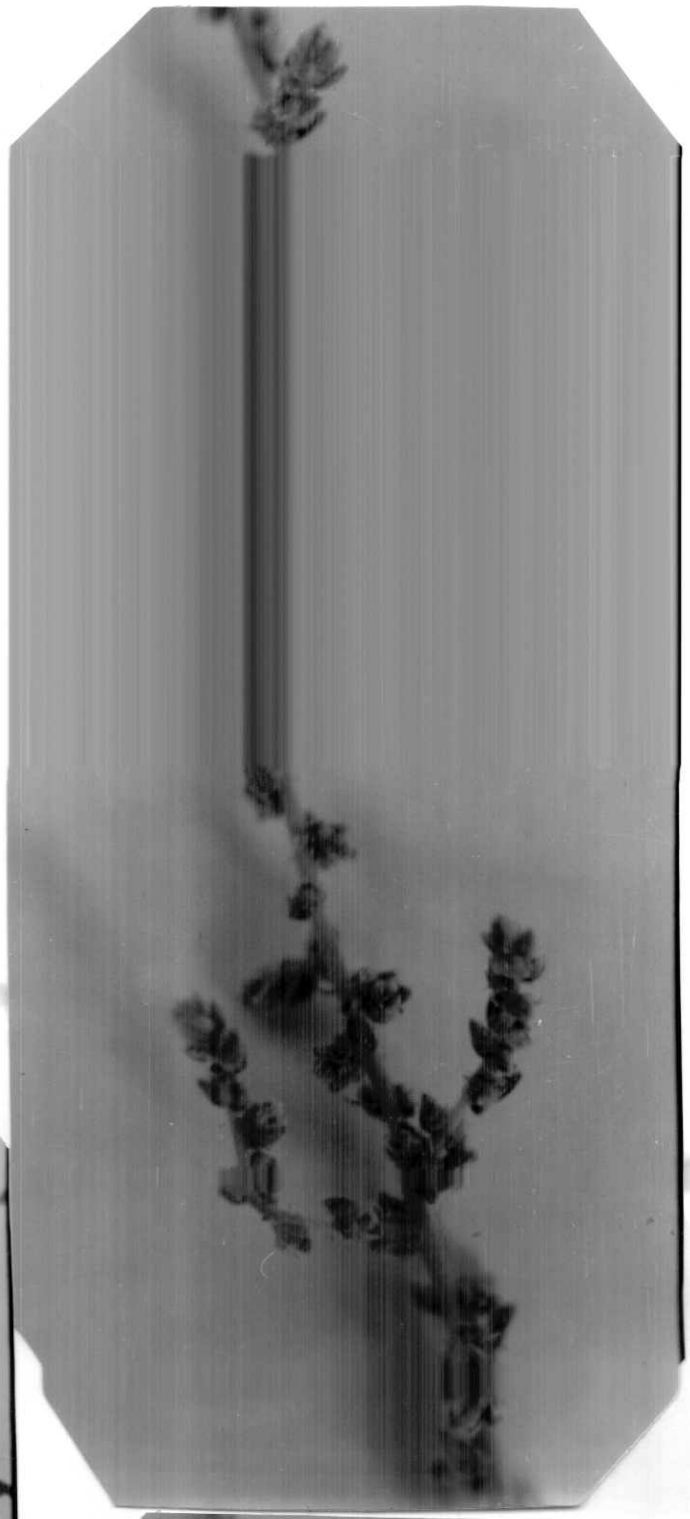
A) The length of root exceed the length of aerial plant portions, as under the arid desert zone the strong roots help the plant to absorb water and mineral. The roots extended deeply and some time extended horizontally for some distances and again returned to grow vertically. The type of root extension may depend on either the soil physical properties or extending into the direction of relative more soil moisture. At any way, the deep soil layer contain more relative moisture than the upper ones, thus the roots extended to the more soil moisture "hydrotropism". It must be mentioned that main root diameters may range from 3 to 4 cm of the first 10 cm. Then began to decrease continuously till it reached 1 to 3 mm at the root tips. Root branches were found at the depth of 10 to 20 cm from the soil surface. In addition, most of upper root portion was very elastic, but at the same time very strong, and can not be damaged by pulling it from the soil (except the lateral ones). This may indicate that the *Polycarpaea repens* seemed to be have a very strong elastic legnified root system that help the plant to be more tolerant to the soil moisture stress, especially during long dry season.

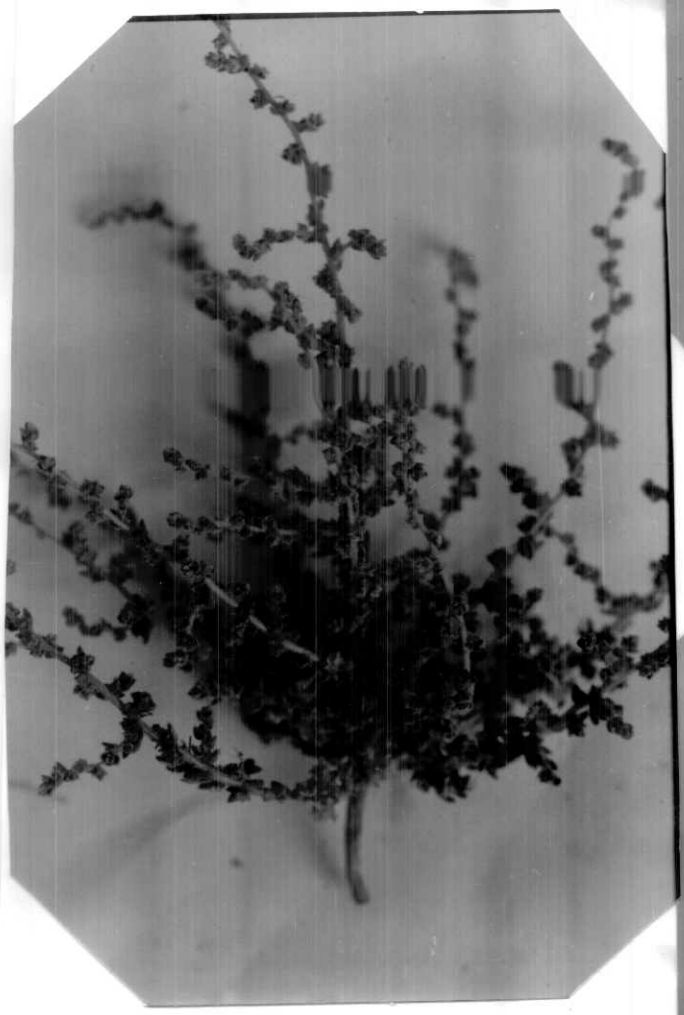
B) The data of aerial plant hight indicated that there are many changes with the changes of the season environmental conditions. The less plant height was gained during summer season, but the highest one was gained during spring. In this connection from our observations new sprouts began to appear during the first of September (the middle of Autumn), but this sprouts (Autumn sprouts) wwere very short. The new sprouts formation was extended till the end of February. The Autumn sprouts were shorter than the Winter ones (Winter sprouts). The sprouts emerged from the plant portions near the soil surface or from those portions under the first upper soil surface.

Plant height differed from spot to another, alenos the third spot (at km 50) possessed taller plants than the other four spots. This may be explained on the basis that under the cultivation area more soil moisture was available to the plants. In this connection plants grown under plastic irrigated pots reached into 30 cm height, while the maximum height was 20 cm during spring under the conditions of spot III of season 1986-1987 and 1988-1989, while during the season of 1987-1988 the average of plant height during spring was 22 cm. These results indicate that the prevailing environmental conditions affected plant height.

C) The study of cluster diameter is very important as the upper layer of the cluster is exposed to the direct bright sun light which affected the possibility of such perennial herb to surive under and the hot zone. Of course the silver or grey plant colour may help to reflect such of sun light. The very short aerial portion extention may take part in the protection from water depletion and the deeply extension of the root, also take a part in this connection. A possible adaptation to the water stress may be the presence of *Polycarpaea ripens* in compacting clusters which possessed more than one plant, some time this cluster contains ten plants, by measuring the main root numbers as aerial branches number does not indicate the plant numbers in every cluster. The growth in the form of compacting cluster minimize the penetration of direct sunlight into the inner surfaces of the clusters. This type of growth, also increase the surrounding inner air relative humidity and that minimize inner transpiration. It must be mentioned, that the young new sprouts were light green in colour and that changed into grey during flowering and fruiting stages. The presence of top flowers with their white petals take a part for the more adaptation of such herb to life under strong dry season. It must be mentioned also that many clusters have dry vegetative organs during summer, and begin to be green again during Autumn and Winter seasons.

Photo (8) *Bassia muricata* (L.) Marr.
A. Vegetative branch.
B. Basal plant portion showing a heavy basal branches.





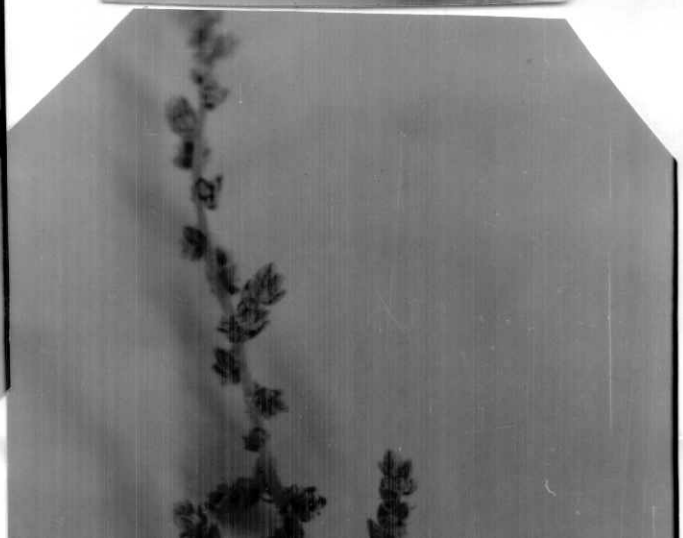


Photo (10) *Bassia muricata* (L.) Morr.
A: Entire plant collected from cultivated farm at km 50.
B: Apical branch portion (see the heavy latral branches).

Table (11) Averages of: Root length, plant hight, numbers of main branches, leaf length and leaf width of *Cassia muricata* grown under nature conditions from km 30 to km 70 of Cairo-Alexandria Desert Road.

Pot No.	Root length (cm)					Plant height (cm)					Number of main branches					Leaf length (mm)					leaf wide (mm)				
	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average
Season 1986 - 1987																									
I	5	40	41	40	32	3	55	49	41	37	4	9	8	6	7	14	13	10	10	12	3.1	2.8	2.1	1.4	2.4
II	5	45	44	41	34	2	59	52	44	39	4	10	9	5	7	14	12	11	10	12	3.2	2.6	2.2	1.3	2.3
III	8	50	49	47	39	4	65	61	55	46	5	9	8	7	7	14	13	10	11	12	3.3	2.6	2.1	1.2	2.3
IV	6	49	49	41	36	4	60	55	43	41	4	9	8	5	7	14	13	11	10	12	3.2	2.8	2.1	1.2	2.3
V	6	48	50	41	36	4	60	55	44	41	3	9	8	4	6	14	13	11	10	12	3.2	2.4	2.1	1.2	2.2
Average	6	46	47	42	35	3	60	54	45	41	4	9	8	5	7	14	13	11	10	12	3.2	2.6	2.1	1.3	2.3
Season 1987 - 1988																									
I	9	45	47	42	36	4	51	49	44	37	4	10	7	6	7	14	12	10	9	11	3.1	2.6	2.1	1.2	2.3
II	10	44	48	43	36	4	58	53	47	41	4	10	7	5	7	14	12	10	9	11	3.1	2.6	2.1	1.2	2.3
III	18	51	53	46	42	10	64	59	53	47	3	14	10	7	9	14	13	10	9	12	3.1	2.7	2.2	1.2	2.3
IV	10	48	51	42	38	10	60	55	48	43	4	9	7	7	7	14	12	10	8	11	2.4	2.7	2.2	1.3	2.2
V	14	47	52	44	39	5	60	57	48	43	4	9	8	6	7	14	12	11	9	12	2.6	2.6	2.3	1.4	2.2
Average	12	47	50	43	38	7	59	55	48	42	4	10	8	6	7	14	12	10	9	11	2.9	2.6	2.2	1.3	2.3
Season 1987 - 1988																									
I	8	43	44	40	34	3	49	41	38	33	4	9	7	5	6	13	12	10	9	11	2.3	2.9	2.4	1.3	2.2
II	14	44	47	40	36	7	50	45	39	35	4	10	7	6	7	13	11	10	9	11	2.3	2.9	2.3	1.3	2.2
III	20	50	54	49	43	13	67	61	49	48	3	13	10	9	9	12	11	10	8	10	2.4	2.8	2.3	1.2	2.2
IV	15	43	46	41	36	7	50	48	41	37	4	10	7	6	7	13	11	10	9	11	2.4	2.8	2.3	1.4	2.2
V	13	44	46	42	36	7	50	47	42	36	5	11	7	6	7	13	11	10	9	11	2.1	2.7	2.2	1.5	2.1
Average	14	45	47	42	37	7	53	48	42	38	4	11	8	6	7	13	11	10	9	11	2.3	2.8	2.3	1.3	2.2
Total average	11	46	48	42	37	6	57	52	45	40	4	10	8	6	7	14	12	10	9	12	2.8	2.7	2.2	1.3	2.3

becoming indurated, lobes furnished with 4 mm long spines, 2-3 times longer than fruit, spreading, straight, needle-shaped, yellow. Fruit utiricle included in spiny perianth. Seed 1-2 mm across, discoid, greenish-grey smooth.

Flowering : May (but fruiting extended from the end of May till the end of September, as the maturation of fruits having a long time)

Habitat: Sandy soil along the roadside.

General distribution. Plastine, Jordan, Syria, Iraq, Saudi Arabia and Kuwait.

Local distribution: very common in most Egyptian desert areas, as it was found in the oases of the Libyan desert, the Mediterranean coastal strip from El-Sallum to Rafah, all deserts of Egypt and Sinai (in sandy places).

Phenology:

It must be mentioned, according to our observations that the germination of such annual herb began during the winter season after the rainfall: and the seedlings were emerged during February, March and December of 1986 and 1988. But, the emergency of seedlings

occurred during March and December of 1987, as very little rainfall was gained during February. However, seedling emergency occurred during January of 1989. Thus, it must be mentioned here that seed germination of *Basica muricata* is connected with the rainfall, and as much of rain water aggregated beside the road, thus much of the seedling emerged along the roadside. As the seedling emergency occurred either during winter or early spring seasons of such annual plants and the vegetative growth extended from the seedling emergency for three to four weeks only and at the end of vegetative stage sexual, reproductive stage may be extended till the end of autumn, thus the collecting data of phenology were began after germination in the terms of root length, plant height, number of main basal branches, leaf length and leaf width. Such data are tabulated in Table (11).

It could be revealed from the available data that root length during the seedling stage (winter) was relatively small then increased sharply during the spring and declined slightly again during summer and autumn. Root length seemed to be more or less with slight variance during the study seasons, (i.e., the length of roots were slightly higher during the season of 1987-1988 than those corresponding ones presented during season of 1986-1987). Roots extended vertically

with heavy secondary branches after 15 cm from the soil surfaces.

Plant height take the same trend in its growth changes during the different studies seasons. It began very small during winter (seedling stage) then increased sharply during spring and then declined during summer and autumn (full mature stage). It must be mentioned here that many plants of *Bassia muricata* reached into mature stage during summer season, however, many others reached such stage during autumn. The decline in plant height is related to the dryness of many branches especially the main middle ones. It must be mentioned that plant height is related completely to the length of the middle main branch as the later branches are always less in their length than the middle main one. At full maturity plants seemed to have a shrubby form, as many may be reached into more than 75 cm length, especially those grown near the roadside (the data are the average of 20 plants grown in many parts).

It could be revealed also that location seemed to be without effect on plant height except the cultivated spot area (Spot III), as the plants grown under this condition are taller than the other studied spots. Thus, it may be concluded that the available soil moisture affected the plant height and plant growth

behaviour.

With regard to the data of number of basal main branches, it could be revealed that, these branches, emerged during the early period of seedling stage, and increase slightly during spring (flowering stage). The decline in the number of main branches during summer or autumn may be related to the dryness or the damage of such branches during full mature stage.

With regard to the leaf length, it could be concluded that plants grown under the variable environmental conditions of the various studied seasons (which extended from 1986 till 1989) seemed to have no effect on the leaf length. But it must be mentioned that leaf length was higher during the seedling stage and then decline continuously during the successive three seasons. In this connection, from our observation) leaves began fleshy and juicy during the seedling and the vegetative stage, then changed into juiceless during the mature stage: Accordingly leaf levels served as storage organ for water and other organic and inorganic nutrients which translocated into the developing reproductive organs during the long dry season. Thus, the continuous decrease in leaf length is related to the decline in its turgidity. Leaf width is also changed and decline continuously till it

with the staminodes and the disc on the lower half forming a tube surrounding the pistil. Ovary 2-carpelled, styles 2, filiform.

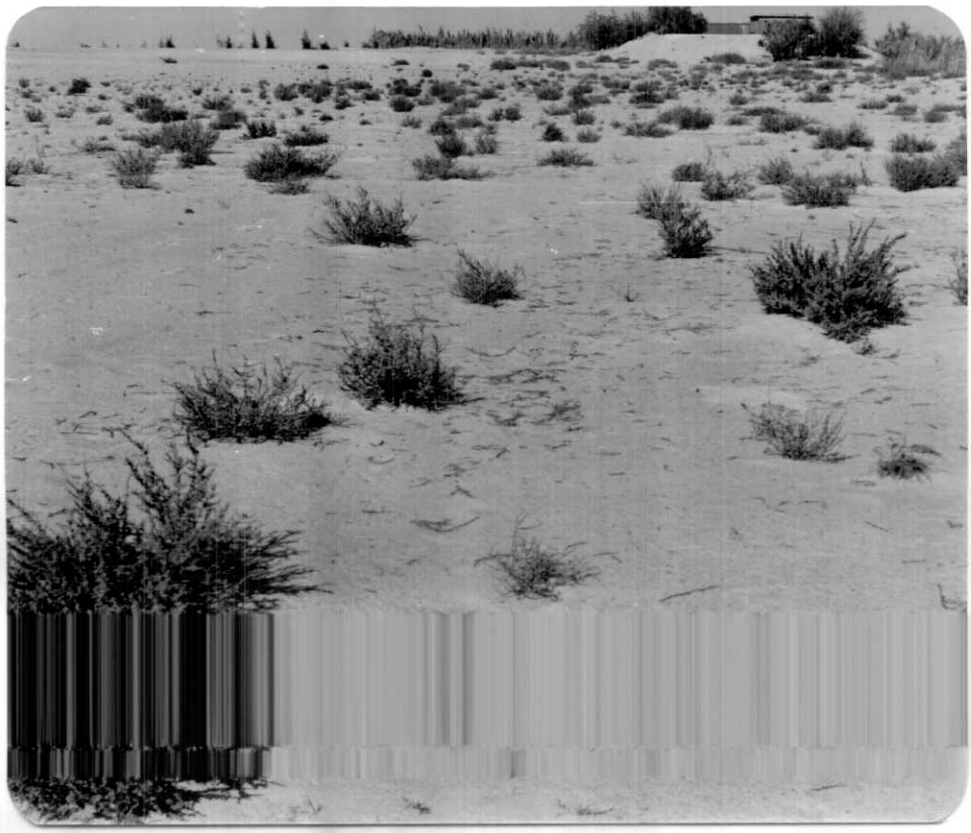
Leaves short, recurved, tapering from a clasping base into rigid spines (Photo 13). One or two of the perianth-segments in fruit with a long stout spine.

Flowering: During the autumn, i.e. from the end of August till the end of November, associated with the fruit formation during the same period. The flowers are formed on the new sprouts which began as light green then changed into blue green during the end of autumn until new sprouts formed at the beginning of the next autumn.

General distribution: Widely distributed in Mediterranean regions and in Persia and Afghanistan.

Habitat: Sandy gravels, on sandy soil and strong grounds.

Local distribution: Common of the Oases of the Egyptian Libyan desert and the Eastern Mediterranean coastal region and all the desert of Egypt.



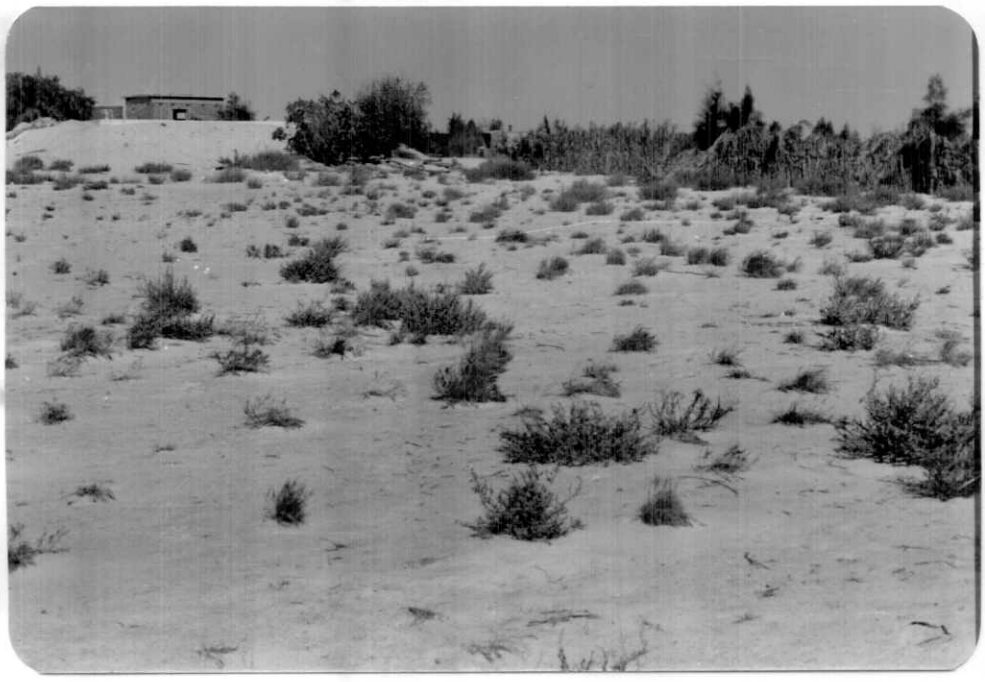
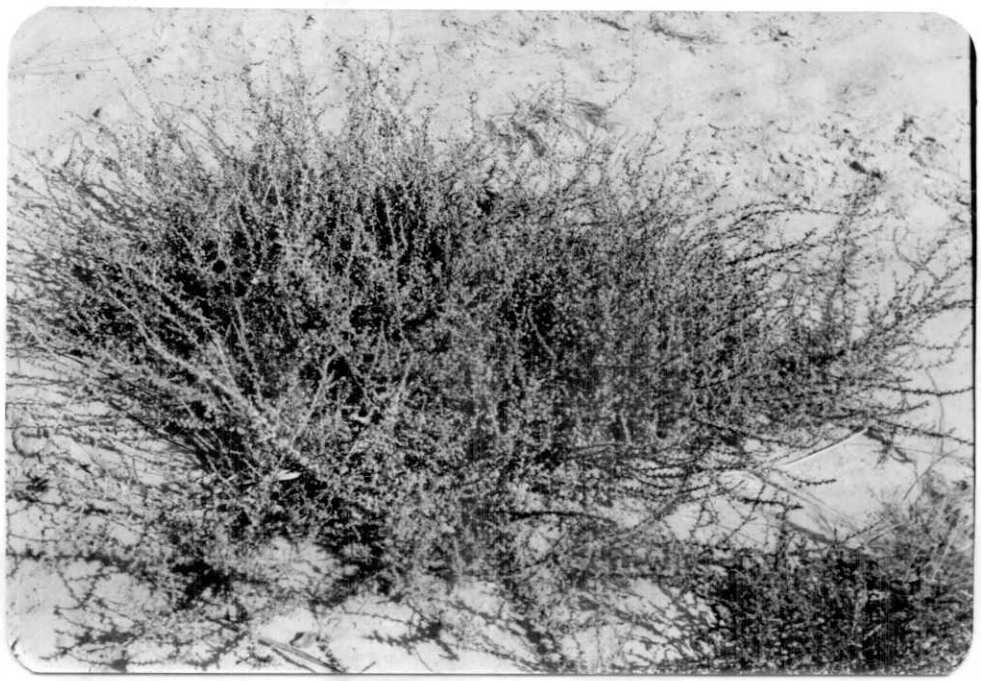


Photo (11) A pure communities of *Cornulaca monacantha* Del.
Family: Chenopodiaceae Grown in a very poor sandy soils



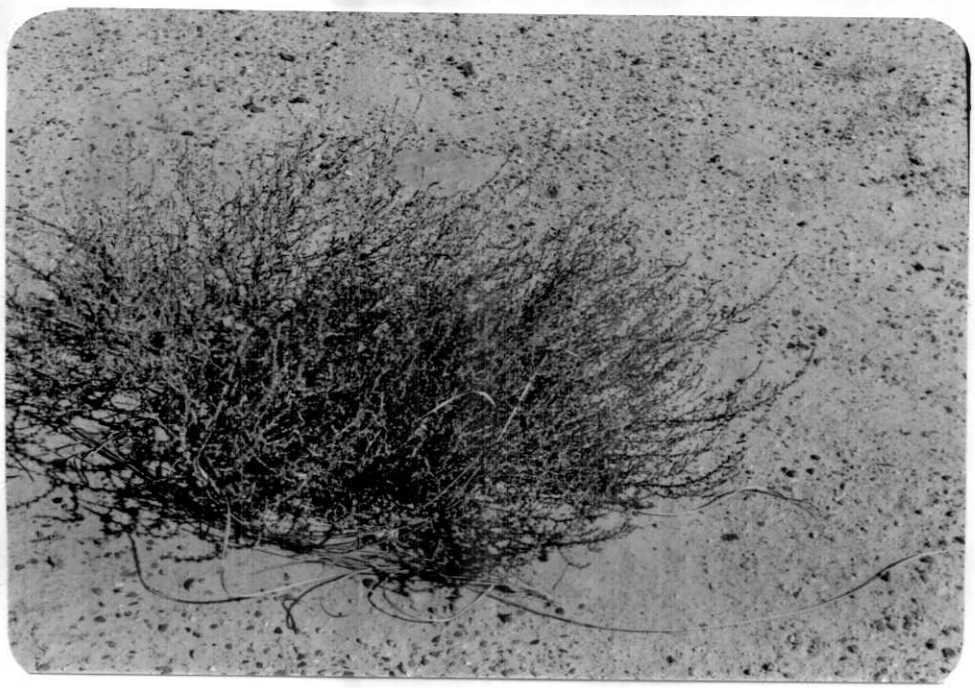


Photo (12) *Cornulaca monacantha* Del.
Family: Chenopodiaceae
A: Fruitng agrigated plants. (photo June, 1988).
B: Non fruiting agrigated plants (Photo April, 1988).
(B, plants grown in sand-gravel ecosystem).

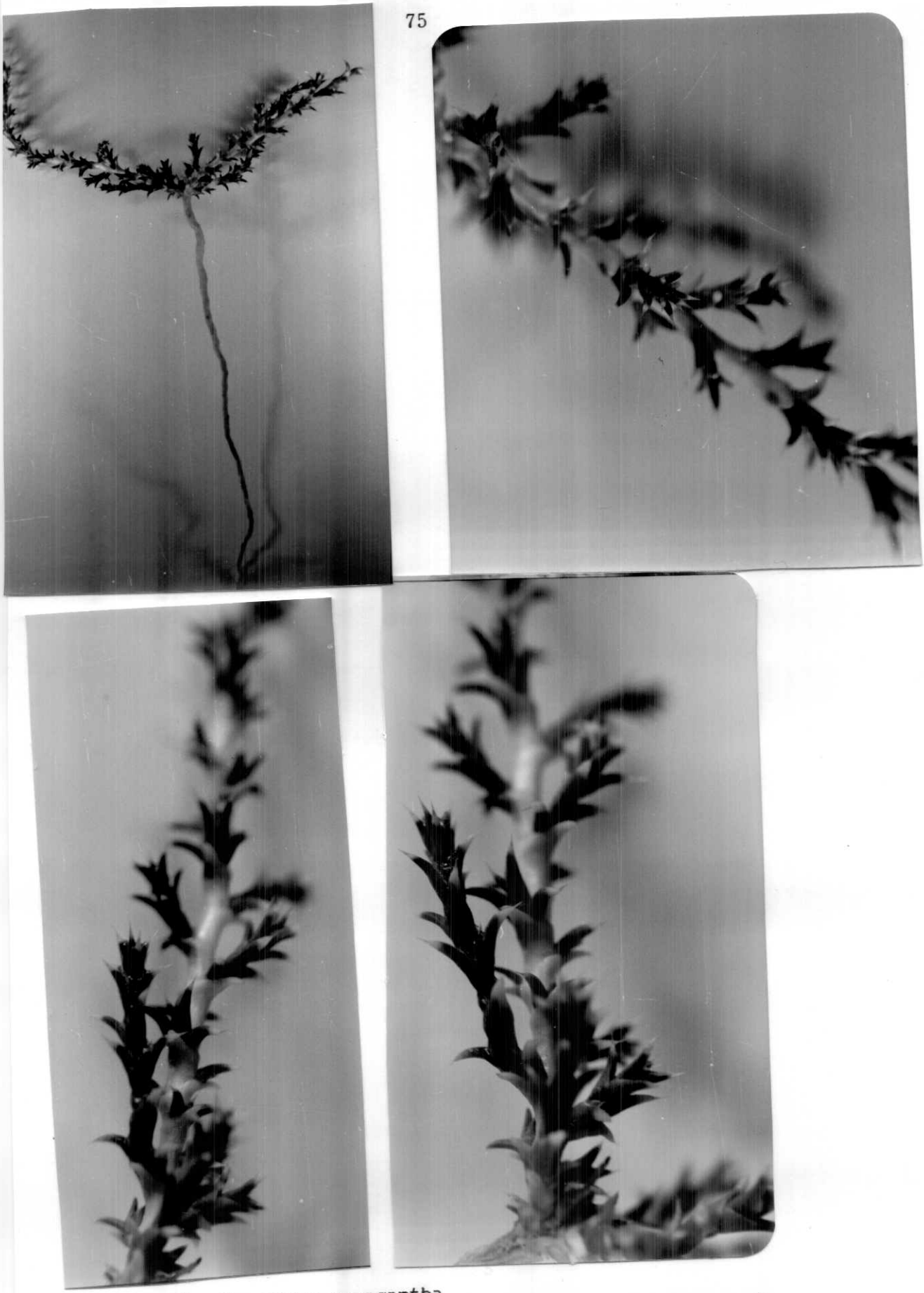


Photo (13) *Cornulaca monacantha*
A: plants during seedling stage (A very deep root).
B, C and D: Showing the branching system and recurved sping apex leaves.

Table (12) Averages of: roots length, plant height, cluster diameter, and numberof branches per plant of *Cornulaca monacantha* grown under natural conditions from km 30 to km 70 of Cairo Alexandria Road (Average of 20 plants).

Spot No.	Root length (cm)					Plant hight (cm)					Cluster diameter (cm)					Number of branches/plant				
	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average
Season 1986 - 1987																				
I	50	52	55	56	53	32	34	42	39	37	51	52	55	49	52	7	8	11	8	9
II	51	52	57	55	54	34	35	43	38	38	52	53	56	49	53	7	7	12	9	9
III	52	54	60	58	56	36	40	54	43	43	55	57	64	58	59	8	9	17	15	12
IV	54	55	57	55	55	31	36	44	39	38	50	49	58	53	53	7	7	10	9	8
V	51	51	56	53	53	32	36	45	38	38	51	48	57	54	53	7	7	12	9	9
Average	52	53	57	55	54	33	36	46	39	39	52	52	58	53	54	7	8	12	10	9
Season 1987 - 1988																				
I	58	60	57	55	58	39	42	49	41	43	55	57	60	50	56	8	12	14	8	11
II	58	61	57	54	58	40	43	49	44	44	56	58	63	51	57	8	11	14	9	11
III	55	64	61	60	60	42	49	57	50	50	60	65	70	61	64	8	14	19	14	14
IV	51	62	58	56	57	38	42	50	45	44	57	61	64	54	59	7	11	10	9	9
V	52	61	58	57	57	40	43	51	48	46	57	61	63	55	59	7	11	13	8	10
Average	55	62	58	56	58	40	44	51	46	45	57	60	46	54	59	8	12	14	10	11
Season 1988 - 1989																				
I	51	53	55	51	53	31	34	43	39	37	50	52	57	54	53	6	9	12	10	9
II	50	53	54	52	52	30	37	44	40	38	49	53	58	54	54	6	9	12	11	10
III	53	59	60	55	57	39	42	51	48	45	54	58	62	59	58	9	11	14	12	12
IV	54	56	58	54	56	32	35	41	40	37	50	53	57	51	53	9	9	13	11	11
V	54	56	57	53	55	33	35	40	38	37	49	54	57	51	53	8	9	13	12	11
Average	52	55	57	53	54	33	37	44	41	39	50	54	58	54	54	8	9	13	11	10
Total Average	53	57	57	55	55	35	39	47	42	41	53	55	60	54	56	8	10	13	10	10

Phenology :

Root length, cluster hight, diameter and number of basal main branches perone plant data are tabulated in Table (12).

It could be concluded from the data, and Photo (13 A) that root length exceed the shoot system height. During the seedling stage the development and the rate of roots growth was higher than that of shoot system (Photo.13 A). The extension of root system was always vertically to get its water requirement from the relative higher moisture deeper soil layers. Very fine lateral root branches appeared at the depth of 30-50 cm from soil surface.

It could be revealed also from that data, root increased gradually from autumn to spring then decline at summer. This means that root initiation and root growth in the dynamic change throughout the different season depending on the change in soil moisture level as may of lateral root branches may die during the dry season and another develop during the relatively wet season (winter and spring). It could be revealed also that there are some changes in the root length which are related to change of spot area conditions and the seasonal variation. As season 1987-1988 was more wet

than the other two seasons, yet some increase in root length may be observed. Also, spot III always having plants containing a relatively higher root length than the other four spots. Accordingly it may be concluded that root length, development and initiation depend on the prevailing environmental conditions.

With regard to plant height, it must be mentioned that gradual increase was gained from autumn to spring then decline again during summer. In this connection, from our observation, it was found that new sprouts emerged during autumn and elongation of these sprouts occurred slightly during winter, but higher extension and growth occurred during spring. However, in dry long season of summer, many of old branches seemed to die. As mentioned before, the flowering occurred during autumn on the very young developed branches (or sprouts). Thus, it could be concluded that *Cornulaca monacantha* seemed to have many stages of flushing, autumn flushing bearing flowers, winter one with slight growth, but the spring one is the most higher one. The above mentioned conclusion is in complete harmony with the results of number of main basal branch number (Table 12).

With regard to the cluster diameter, it must be concluded that more than one plant may be grown as a result of the germination of more than one seed near to

each other; and it was difficult to estimate the diameter of each one of such spiny plant. Cluster diameter is the reflection of the sprouts and branching growth and indicate the change in the growth behaviour, during the different seasons. From the available data, it may conclude that complete harmony of root growth and plant height with the cluster diameter extension and number of developing branches. As all of the parameters began at relatively low degree then slightly increased during winter and sharply increased during spring, then decline slightly during dry summer season. The diameter of cluster of the season 1987-1988 exceeded those of seasons (1986-987, and 1988-1989,and that related to the relatively higher rain fall of season 1987-1988. The spring growth aspect of *Cornulaca monacantha* depend on the amount of soil moisture level and the prevailing temperature. In addition, the relative air humidity may play an important role in the initiation of new sprouts during the autumn season. Day length seemed to have a role also in the flowering and we suggested that this perennial plant seemed to be a short day flowering plant. The seed germination occurred during the end of winter and the beginning of spring (the wet seasons).

Number of main basal branches was increased greatly during spring, however, many of these branches died

during long dry seasons, except the heart of the plant. Thus, the measurements did not include the died portions. It must be mentioned that every basal branch having many lateral branches but these branches always were less in their length than the main ones (see phots. 13 B, C and D).

Leaf length and diameter were not changed during different periods of growth and during different seasons, thus, it is out of our data. The length of leaf was about 7 o 14 mm, but its width was about 10 mm at the base and not more than 1 mm at the top (spin portion).

From the foregoing results, it could be mentioned that *Cornulaca monacantha* has many tools to survive under arid desert zone which may include a very deep root extension very short leaves, condensing branching formation which protect the basal hert of buds; and the growth began during the relatively wet seasons. the white-woolly hairs on main branches have protective root during the dry season.

Photo (14) *Eremobium aegyptiacum* (Spreng).
Asch. in Boiss. (= Molcolmia agegytpiaca Spreng.)
Family: Cruicferae
A): Apicie of plant showing fruits and flowers.
photo during April, 1987.
B): Whole plant photo during April (1988).
C): Apical portion of heavy branching plant showing the dehecient slique fruits the hellowish portion.
photo during June, 1989.

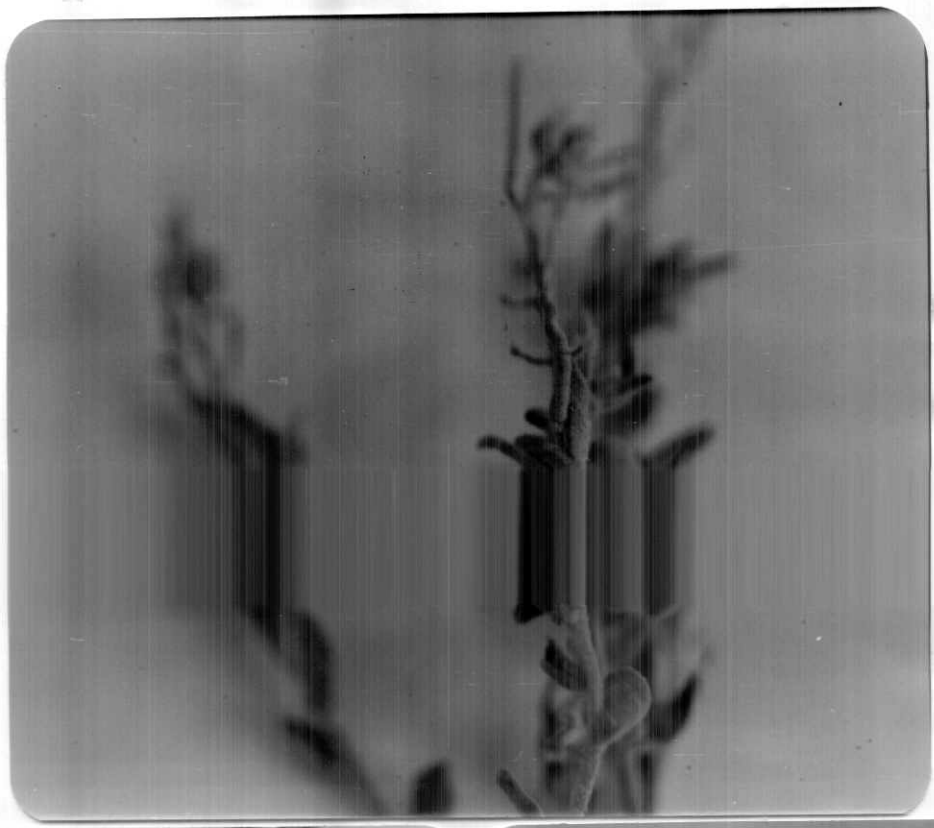


Photo (15) *Eremobium aegytiacum* (X2)
(A, B and C showing the very grey branches, leaves

Photo (16) *Eremobium aegyptiacum*
A) Whole plant (after fall maturation).(Photo July, 1989).
B) Apical branch portion showing fresh fruits (X2), and apical flowers. (photo. April, 1989).
C) Whole plant (after full maturation),(photo end of July, 1989).

Table (13) Phonology of *Eremobian aegyptiacum* in the terms of root length, plant height, main basal branches No., leaf length, leaf width, pod length, pod width, and No. of pods per plant.

Spot No.	Root length (cm)				Plant height (cm)				Main basal branch No.				Leaf length (mm)			
	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average
									Season 1986 - 1987							
I	35	40	41	39	9	19	21	16	4	10	11	8	7	18	18	14
II	31	43	42	39	9	19	22	17	4	11	12	9	7	18	19	15
III	39	47	46	43	12	25	28	22	6	14	15	12	8	20	22	17
IV	30	42	41	38	9	20	21	17	4	10	12	9	9	19	20	16
V	32	44	43	40	9	20	21	17	4	11	13	9	7	19	20	15
Average	33	43	43	40	10	21	23	18	4	11	13	9	8	19	20	16
									Season 1987 - 1988							
I	40	44	42	42	11	22	24	19	5	11	14	10	9	20	20	16
II	43	45	45	44	12	23	24	20	5	13	15	11	9	21	20	17
III	45	50	50	48	15	29	32	26	7	16	19	14	10	24	25	20
IV	39	44	45	43	10	24	26	20	6	14	15	12	9	21	20	17
V	40	44	45	43	11	24	27	21	6	14	16	12	9	21	20	17
Average	41	45	45	43	12	24	27	21	6	14	16	12	9	21	21	17
									Season 1988 - 1989							
I	33	34	31	33	8	17	22	16	4	9	10	8	7	22	20	16
II	34	37	35	35	8	18	22	16	4	10	12	9	7	22	20	16
III	39	39	37	38	11	23	29	21	4	13	14	10	9	24	23	19
IV	31	34	35	33	7	20	22	16	4	12	13	10	8	21	20	16
V	30	35	35	33	7	20	23	17	3	13	13	10	7	21	20	16
Average	33	36	35	35	8	20	24	17	4	11	12	9	8	22	21	17
Total average	36	41	41	39	10	22	25	19	5	12	14	10	8	21	21	17

Table (13) (Cont.)

Spot No.	Leaf width (mm)				Pod length (mm)				Pod width (mm)				No. of pods/plant			
	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average
Seasons 1986 - 1987																
I	2.2	4.1	4.1	3.5	7.2	13.2	12.2	10.9	1.1	1.1	1.2	1.1	31	89	95	72
II	2.3	4.2	4.2	3.6	7.4	13.2	13.2	11.3	1.2	1.1	1.1	1.1	31	89	94	71
III	2.5	6.3	5.4	4.7	7.9	15.3	14.4	12.5	1.2	1.1	1.0	1.1	40	99	100	80
IV	2.1	4.2	4.1	3.5	7.1	14.1	13.5	11.6	1.1	1.2	1.0	1.1	36	87	94	72
V	2.2	4.2	4.4	3.6	7.2	14.1	13.4	11.6	1.1	1.1	1.1	1.1	38	87	91	72
Average	2.3	4.6	4.4	3.8	7.4	14.0	13.3	11.6	1.1	1.1	1.1	1.1	35	90	95	73
Season 1987 - 1988																
I	3.3	5.3	5.2	4.6	8.1	13.1	13.1	11.2	1.0	1.1	1.2	1.1	34	91	98	74
II	3.1	5.1	5.2	4.5	8.2	14.2	13.3	11.9	1.2	1.0	1.1	1.1	35	93	97	75
III	4.2	6.5	5.1	5.3	9.4	16.3	14.6	13.4	1.2	1.0	1.2	1.1	45	107	114	89
IV	3.1	5.1	4.2	4.1	8.3	14.4	12.1	11.6	1.3	1.2	1.2	1.2	40	93	93	75
V	3.2	5.2	4.2	4.2	8.1	14.3	12.1	11.5	1.2	1.0	1.2	1.1	39	93	94	75
Average	3.4	5.4	4.8	4.5	8.4	14.5	13.1	12.0	1.2	1.1	1.2	1.2	39	95	99	78
Season 1988 - 1989																
I	3.1	4.2	4.2	3.8	6.2	11.3	10.3	9.3	1.0	1.0	1.1	1.0	27	81	91	66
II	3.2	3.3	4.3	3.6	6.3	12.3	10.2	9.6	1.0	1.0	1.1	1.0	23	82	90	65
III	4.3	5.3	5.4	5.0	6.8	14.2	13.4	11.5	1.0	1.0	1.2	1.1	30	93	97	73
IV	4.2	4.2	5.1	4.5	6.1	11.1	10.1	9.1	1.1	1.1	1.3	1.2	24	80	90	65
V	3.2	4.2	5.1	4.2	5.9	11.1	10.1	9.0	1.1	1.1	1.1	1.1	24	79	90	64
Average	3.6	4.2	4.8	4.2	6.3	12.0	10.8	9.7	1.1	1.0	1.2	1.1	26	83	92	67
Total average	3.1	4.7	4.7	4.2	7.4	13.5	12.4	11.1	1.1	1.1	1.2	1.1	33.3	89.3	95.3	72.7

Phenology

Root lengh, plant height, number of main basal branches, leaf length, width, pod length, bored and number of pods per plant, as the average of 20 plants are tabulated in Table (13).

Before discussing the data of Table (13), it must be mentioned that the appearance of Eremobium aegyptiacum on the land surfaces in the study areas was during December, January, February, March, April, May, June and July. But it disappeared completely during August, September, October and November. However, during May, June and July, the plants were in the complete dryness stage (Photos 16 A & C). Thus our data collected during winter, spring and summar.

It could be stated that the root length exceeded the plant height during different periods of growth. Root length reached its maximum during spring then decreased slightly during summer. Under the cultivation area (Spot III), *Eremobium aegyptiacum* root length was higher than those grown under uncultivated areas of km 30, 40, 60 and 70. This may be due to the higher soil moisture under the cultivated area than the uncultivated one. the same conclusion was also noticed with plant height main basal branches, leaf length, leaf width, pad length and pad number per plant, and

without significant differences with pad width.

Also, it may concluded that the different parameters of season 1988-1989 were less than those corresponding ones of season, 1986-1987, and season 1987-1988, and the later ones were the highest one. This could be explained on the bases that rainfall was higher during season 1987-1988 than of season 1986-1987, but rainfall during season 1988-1989 was the lowest one.

The following conclusions may also give a due information about the growth behaviour of *Eremobium aegyptiacum* grown under desert conditions:

a) Plant height was in its lowest value during winter but increased sharply during spring. Thus, its growth was spring aspect, however, the growth began during winter, and completely maturation during summer. This conclu-sion was also noticed with regard to the higher formation of main basal branch.

b) It must be mentioned that leaves formed during winter were shorter than those formed during spring. Thus, it was found that the lower leaves were shorter than the upper ones (except the terminal leaves). The same conclusion was also noticed with regard of pod

length, as the upper spring pods were longer than the lower winter ones. Many of middle spring pods reached into 20 mm, but the data of Table (13) showed only the total average of 20 plant including the spring and winter formed pods. In addition, the termenal ones seemed to be shorter than the spring ones. It could be concluded also, that winter leaves were narrower than those of spring formed ones, as the basal leaves width were less than those of the middle or upper ones.

c) Flowering and fruiting appeared duinrg January when the plants were very small in size, and such formation increased greatly during February and March then decline after that. Full maturation of pods and their dehiscence occurred during the summer season.

d) Leaves during the winter or spring were rough and fleshy (Phots. 15 A, B and C), but changes into dry soft during maturation stage. This dryness began from the top of the leaf, then increased downward to include all of the leaf (Photo 15 B).

e) It must be mentioined that it was very dificult to count the number of pods per plant, as many of the giant branching plants had more than 400 pods. The more formed pods occured during spring. Every pod contains 8 to 20 very small seeds (less than 0.5 mm). Their

colours were brown during fall maturation stage.

6) *Neurada procumbens* L.; Boiss

Macromorphology :

Annual, prostrate, woolly-conesent herb. stems spreading alternately branched, base often surrounded by the persisting calyx (Photo, 19 A & B). Leaves alternate, ovate-oblong, obtused sinuate-pinnatified, stipules minute (Photos 18, 19 A, B & C and 20 A). The colour is grey.

Flowers bisexual, actionomerphic, solitary and axillary, scattered along the branches, cloyx ovoid, with contracted throat, flat at base, persistant, triangular, 5-lobed, lobes triangular, 2 mm long, alternating with the 5 subulate bracteoles of the epicalyx, in the fruit, turning into prickles. Petals 5, obovate 3 mm long, whitish-yellow stamins 10, in 2 rows, inserted on the throat of the calyx tube. Carpels 10, connate at base and adnate to the calyx tube (hyperthium), tapering into a slightly exerted subulate style, latal elongating and becoming persistent, ovules, in each carpel, stigma capitate.

Fruit : dry, flattened, orbicular, 10-20 mm in diameter, persistant calyx with lateral, stout spines on the side including the ten membranous, nut-like

fruits, each nut let with one seed. Seeds curved without endosperm; testa membranous. For detail macromorpholoy study see photos 17; 18, 19 A, B & c; and 20 A, B &C).

Flowering and fruiting :Extended from December to the end of June, as the plants appeared during December and quickly formed flowers and fruiting immediatly appeared with the continuous vegetative growth and flowers formation. This does not mean that the life cycle was six monthes, but new plants appeared during winter and spring.

General distribution: Palestine, Cyprus, Iraq, Bahrain, Saudi Arabia, Oman, Iran and Kuwait.

Local distribution : Common in the Oases (W. El-Natrun), Mediteranean coast strip, all the Egyptian desert, Red Sea coastal region, Gebel Elba and Sinai.

Phenology :

Data of root length, plant diameter, number of branches, number of leaves, and number of fruits per plant are presented in Table (14) (as average of 10 plants).

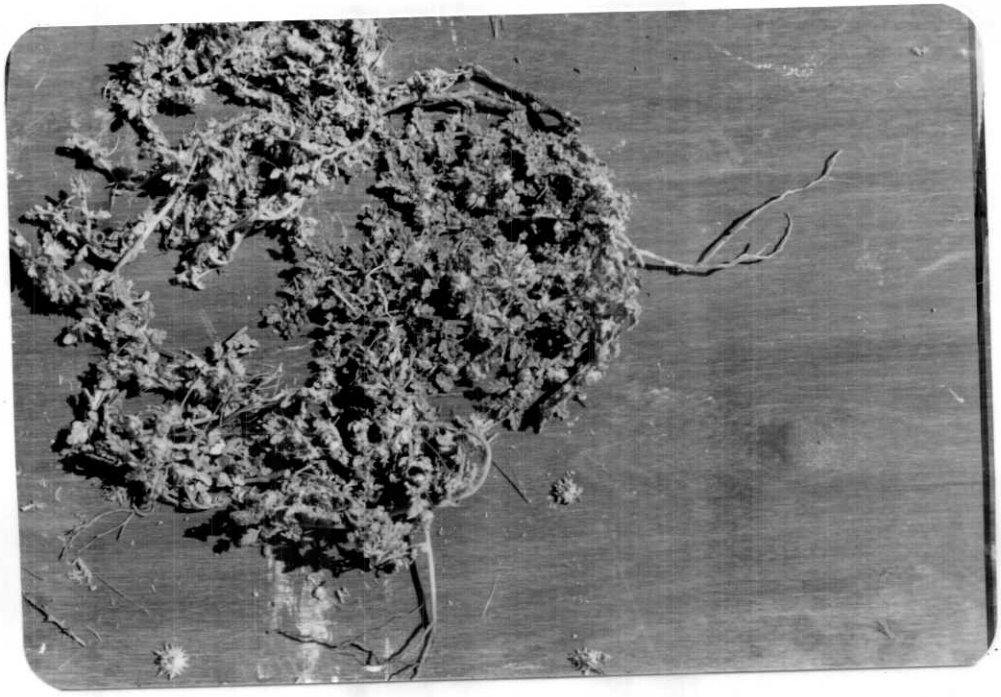


Photo (17) *Neurada procumbens* L.
Family Neuradaceae Woolly procumbens desert herb with small pinnatifid leaves. Fruit dry orbicular, spin, about 2 cm across. (photo April, 1987).

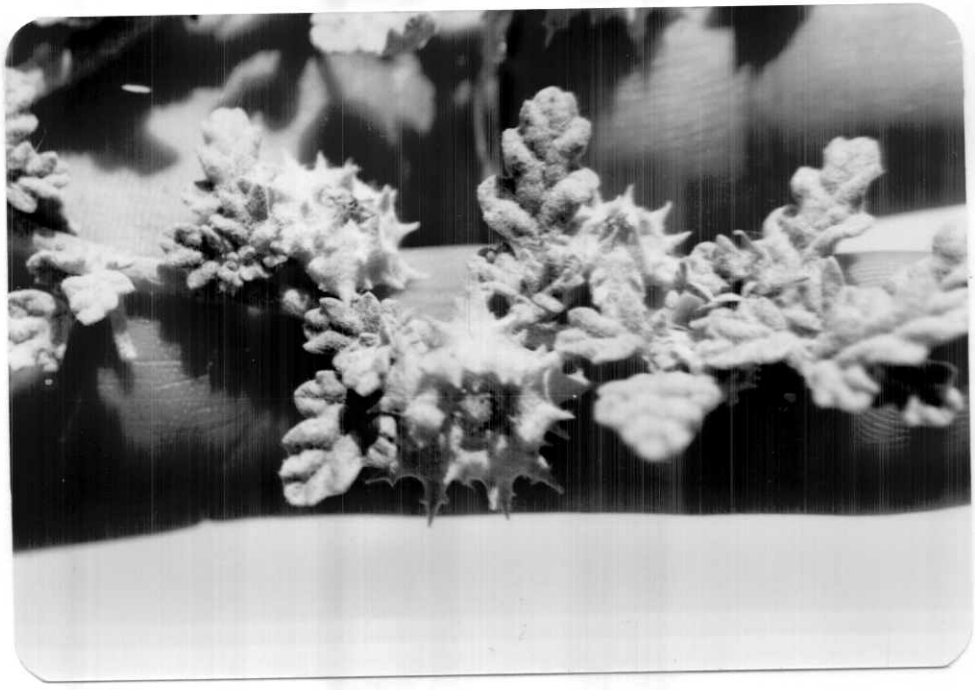


Photo (18) *Neurada procumbens*
Branches showing with grey wally colour see also the orbicular sping fruits)

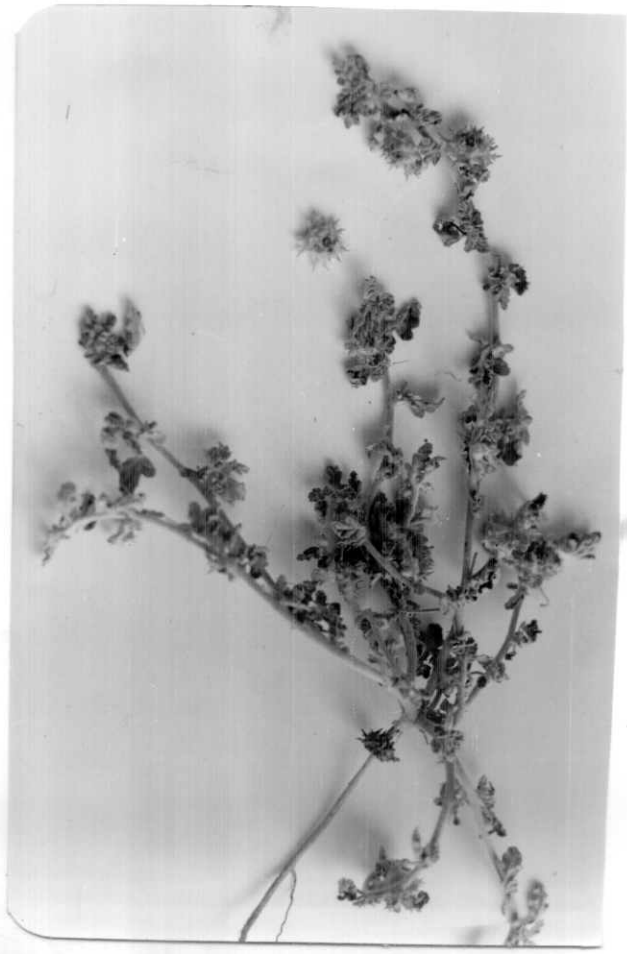


Photo (19) *Neurada procumbens* L.
Family: Neuradaceae
A): Entire plant.
B): Basal fruting and flowering plant showing: the very long and deep roots, solatrory exite sping fruits, see also the attached mother fruit with the root.
C): Apical flowering and fruiting branches of the plant.

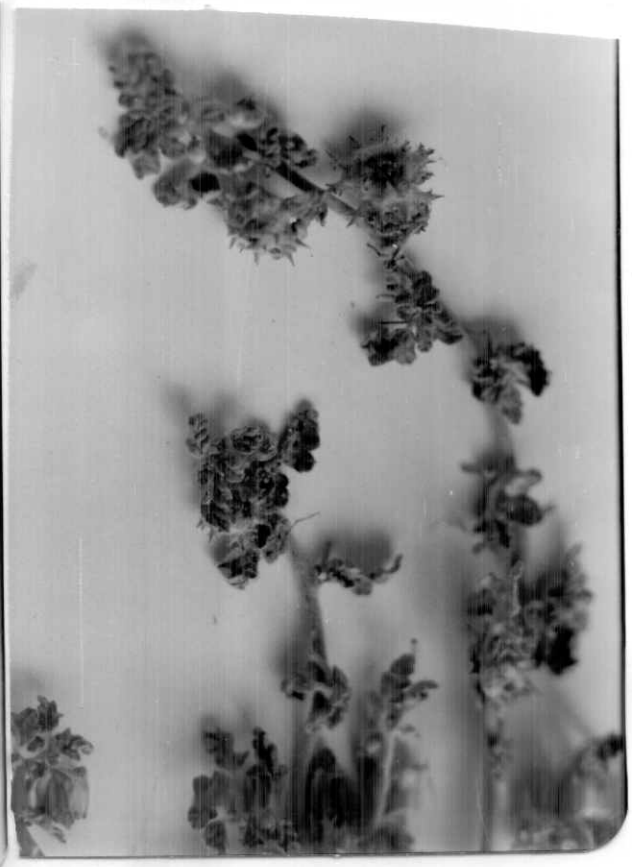


Photo (20) *Neurada procumbens*
A): Fruiting branch.
Photo (March, 1989).
Dry fruits B and C
Dry orbicular sping fruits
(photo. June, 1989).

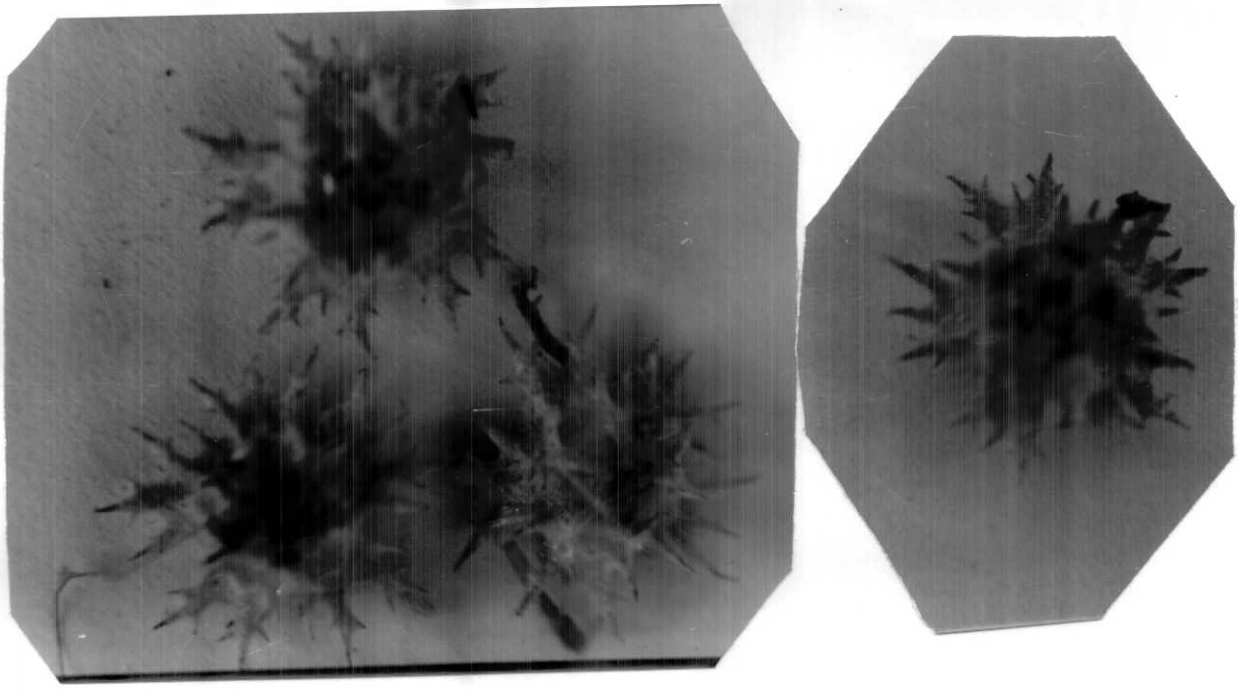


Table (14) Phenology of *Neurada procombens* in the terms of root length, plant diameter, main basal prostrate, branches number, leaves number, fruit numbers per plant

Spot No.	Root length					Plant diameter					Branches No./plant					Leaves No./plant					Fruits No./plant				
	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average
													Season 1986 - 1987												
I	25	35	31	30	22	35	30	29	4	8	7	6	35	50	41	42	6	18	11	12					
II	26	35	32	31	20	35	31	29	5	7	7	6	36	51	42	43	6	19	12	12					
III	30	42	39	37	29	43	39	37	5	9	7	7	39	63	49	50	8	25	18	17					
IV	27	32	30	30	21	40	31	31	4	8	7	6	33	50	41	41	5	20	11	12					
V	25	33	30	29	21	40	33	31	5	8	6	6	33	53	41	42	5	20	11	12					
Average	27	35	32	31	23	39	33	32	5	8	7	7	35	53	43	44	6	20	13	13					
													Season 1987 - 1988												
I	19	30	28	26	19	29	26	25	4	9	7	7	30	43	38	37	4	14	9	9					
II	18	29	27	25	18	28	26	24	5	8	7	7	30	44	36	37	3	14	10	9					
III	24	35	31	30	24	36	32	31	6	9	7	7	33	52	43	43	6	21	13	13					
IV	20	29	27	25	18	31	29	26	5	9	7	7	29	44	36	36	4	14	11	10					
V	20	29	25	25	17	31	29	26	5	8	7	7	28	44	37	36	4	14	11	10					
Average	20	30	28	26	19	31	28	26	5	9	7	7	30	45	38	38	4	15	11	10					
													Season 1988 - 1989												
I	26	34	29	30	25	32	29	29	4	7	6	6	35	52	39	42	5	19	10	11					
II	26	35	28	30	29	32	28	30	4	7	7	6	36	53	38	42	6	20	10	12					
III	32	43	35	37	34	41	35	37	4	7	7	6	39	60	52	50	8	27	15	17					
IV	23	37	33	31	26	36	28	30	3	8	6	6	31	51	38	40	5	20	11	12					
V	24	36	31	30	24	35	29	29	4	7	7	6	31	51	37	40	5	20	12	12					
Average	26	37	31	31	28	35	30	30	4	7	7	6	34	53	41	43	6	21	12	13					
Total Average	24	34	30	29	23	35	30	29	5	8	7	7	33	50	41	42	5	19	12	12					

As *Neurada procumbens* is prostrate plant, with semi circulation nature growth behaviour of its shoot, thus plant height is out of our data.

It may be concluded that root length increased sharply during spring and decline slightly during summer. This means that plants emerged from the soil during winter, the root growth increased greatly during the next spring, however, many plants which appeared during spring seemed to have shorter roots during the next summer. At any way, the root length of *Neurada procumbens* depends on the time of germination, as this plant has a short term of life cycle. In addition, the prevailing environmental factors affecting the root growth, as it was shown that plants collected during the season of 1987-1988 seemed to have shorter roots than those corresponding ones of season 1986-1986 or 1988-1989. It could be stated that *Neurada procumbens* has a deep top root with lateral many branches (see Photo 19 , B).

There is a correlation between prostrating basal main branches and plant diameter, as the basal main branches extended in to many directions forming a semi circular appearance plant. The center of the circle is on the base of root (Photos 19, A & B). It must be mentioned that both plant diameter and main basal plant

number were greater during spring, and the lowest values were gained during winter. Seasonal variation in plant diameter was clearly shown during season 1987-1988, during which plants showed less diameter than the others of both seasons of 1986-1987, and 1988-1989. However, basal prostrate branch number seemed to be more or less constant during different seasons. This indicate that branch number are closed to the connected to the inheritance plant tendency.

With regard to the number of leaves per plant and fruit number per plant, it could be mentioned that the same trend was gained as discussed with root length, plant diameter and branch number. It could be mentioned also that different studied parameters were higher under the cultivated area of km 50 than the other areas.

7) ***Zygophyllum album*** L. f.

As *Zygophullum album* was very rare distribution within the plant communities in the different studied areas during the successive seasons extended from 1986 till 1989, thus our study on macromorpholoy or phenology was not in details. From few plants founded and collected during only the seasons of 1987-1988 from spot II of km

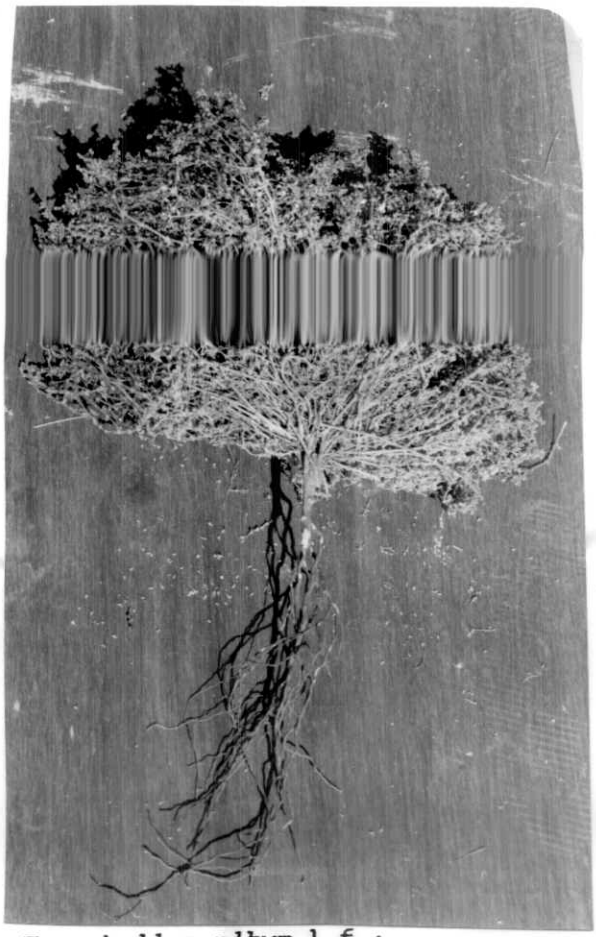


Photo (21) *Zygophyllum album* l.f.:
Family Zygophyllaceae.
Complete plant at fruiting stage (see the deep root and the heavy basal branches).

8) *Monsonia nivea* (Decne) Decne ex webb.

Syne: Erodium niveum Decne.

Macromorphology :

It is a herb, grey silvery with stems woody at base (Photos 22 and 25, A & B). All of the shoot system organs cover with very fine haris. Leaves opposite or sometime alternate, mostly basal (Photos 25 A & B), ovateoblong, oppressed - silvery - canescent, crenate - toothed, undulate; blade 1-3 cm long (varied greatly within individual plant); petiole 4-10 cm long (varied also within each plant), as many of the lower leaves seemed to have longer petiol than the upper one. Thus the variance in leaf petiols length resulted in the condensation of leaf blades in the lower plant half, but the upper half comprised the stalks of inflorescences (Photo 25, B).

Peduncle ascending, axillary, 7-17 cm long, overtapping the leaves. Infllorescence 5-6 flowered umbel (Photos 24, B & C and 25, B); bracts lanceolate, pilose, pedicels C 1 cm long. Flowers bisexual, actionmorphic, hypogynous. Sepals 5, distinct, obovate, conesent, 3.0-3.5 mm long, 3 nerved. Petals 5, distinct, imbricate, obavate, yellowish, 2.0-2.5 mm long. Nectar glands 5, alternating with petals. Stamins 15, all fertile anther-bearing; filaments palyadelphus, connate into a ring at base and united

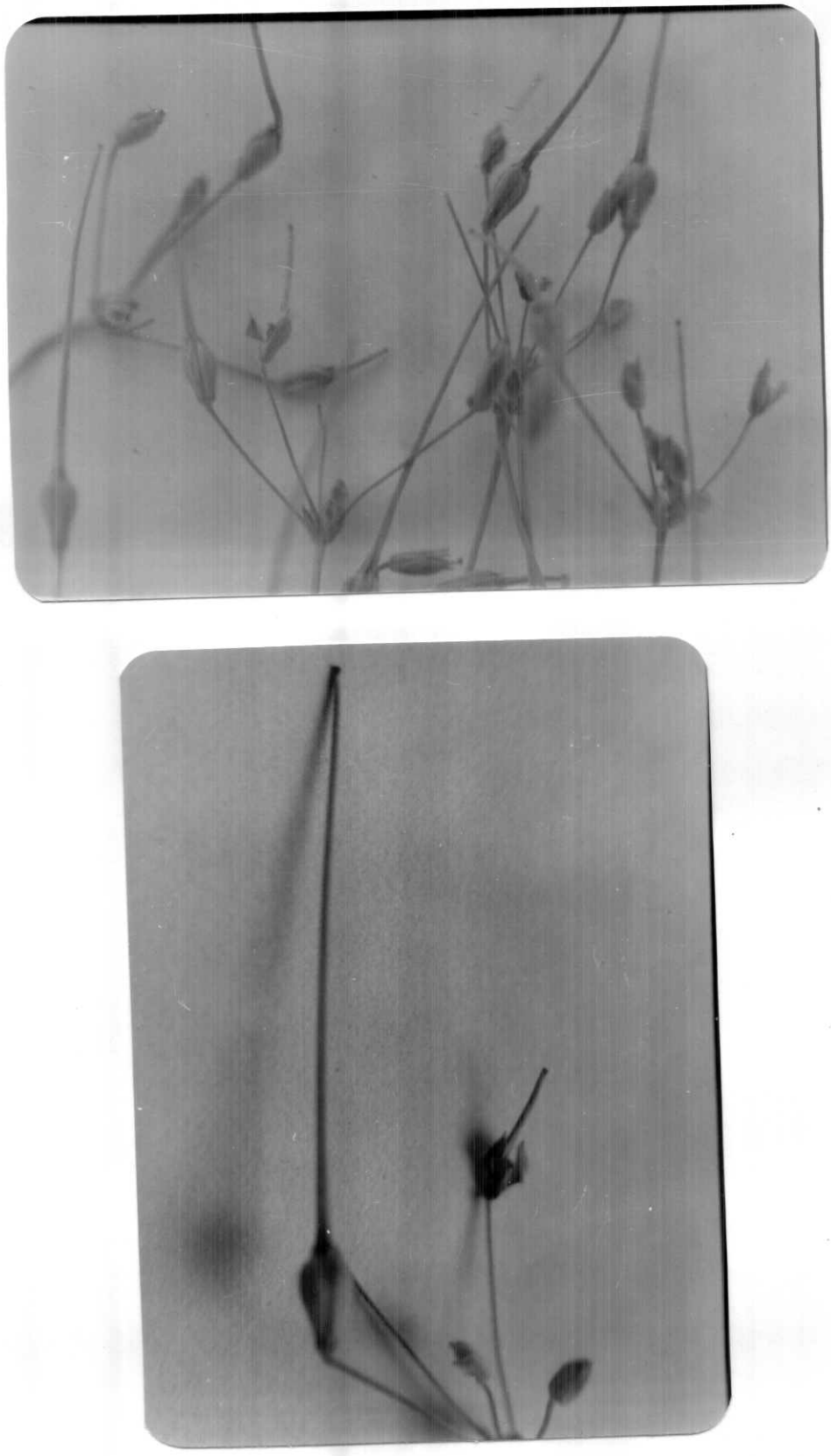


Photo (23) *Monsonia nivea*.
A and B flowers and fruits, April 1989.
(B x 2)

Photo (22) *Monsonia nivea* (Decne) Decne ex webb: Family Geraniaceae. Complete mature plant.

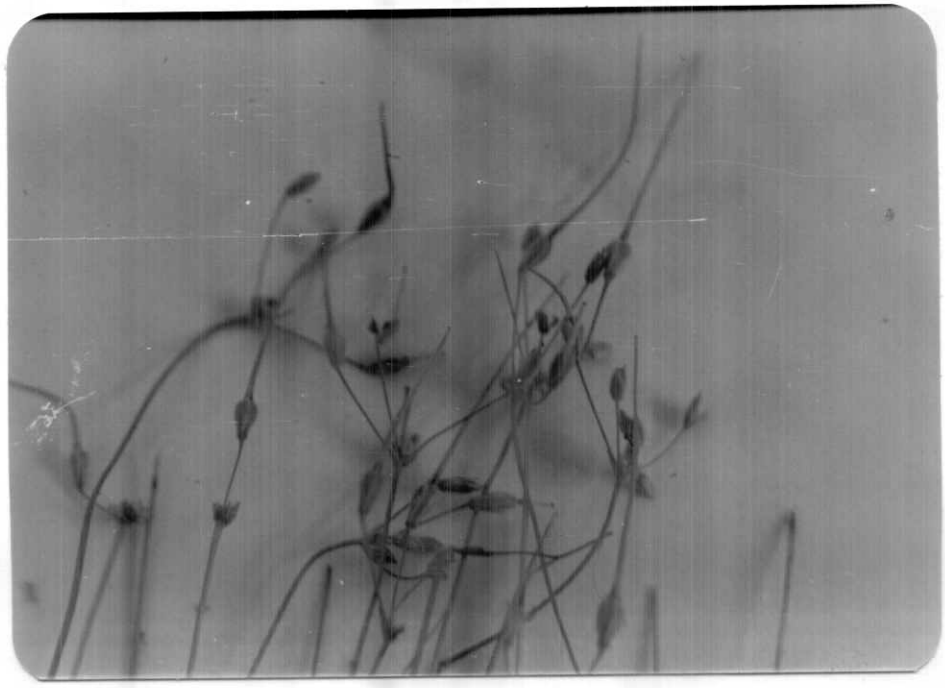
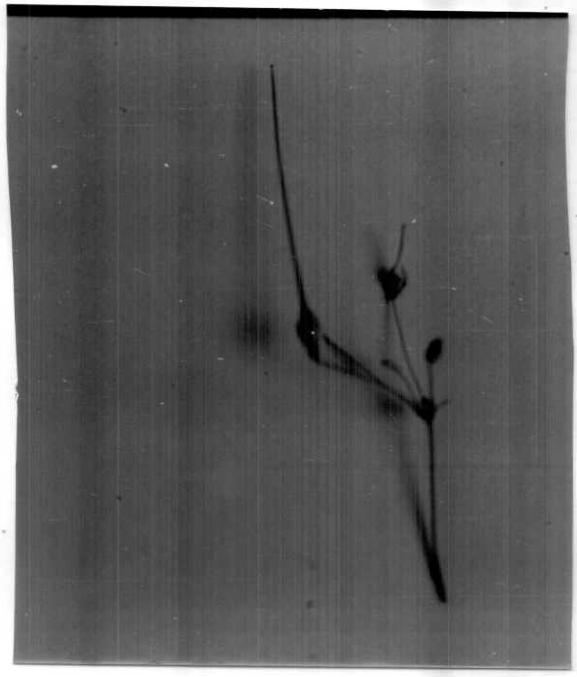
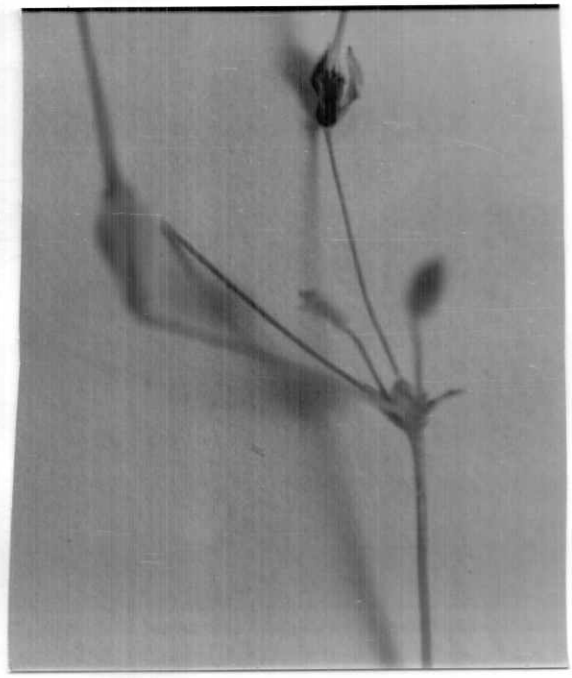


Photo (24) *Monsonia nivea*
A, B and C; flowers and fruits, Photo May, 1988.





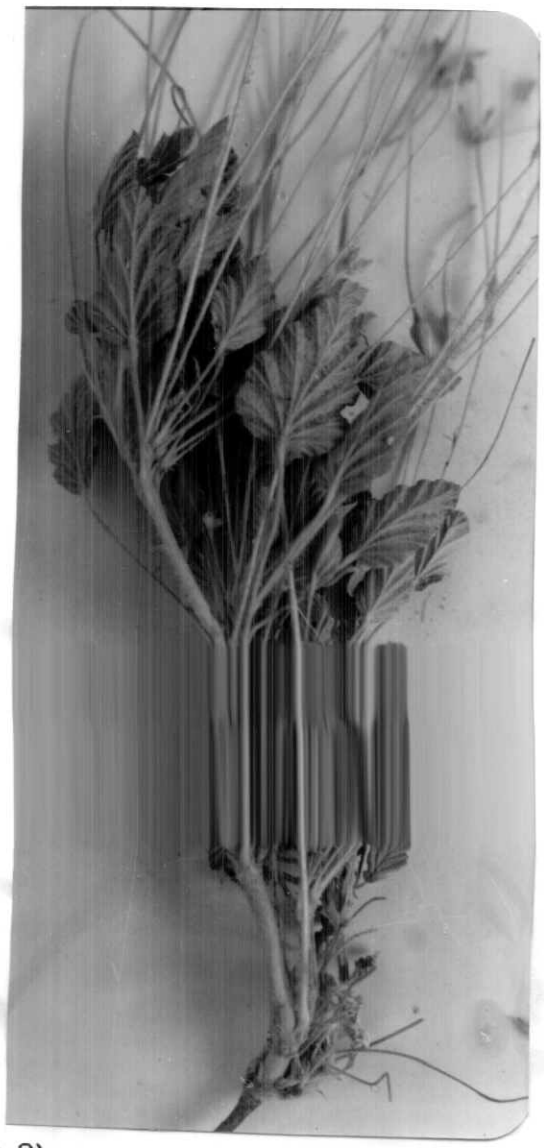


Photo (25) *Monsonia nivea*
A and C basal plant portion,
B whole fruiting plant. C (x 2)

Photo (26) *Monsonia nivea* (Decne) Decen ex wedd:
A. showing a basal rosette leaves, peduncles arising from the rosette and bearing from 5-6 flowers.
Fruit with a pumpse beak 4 cm. long
Family : Geraniaceae.

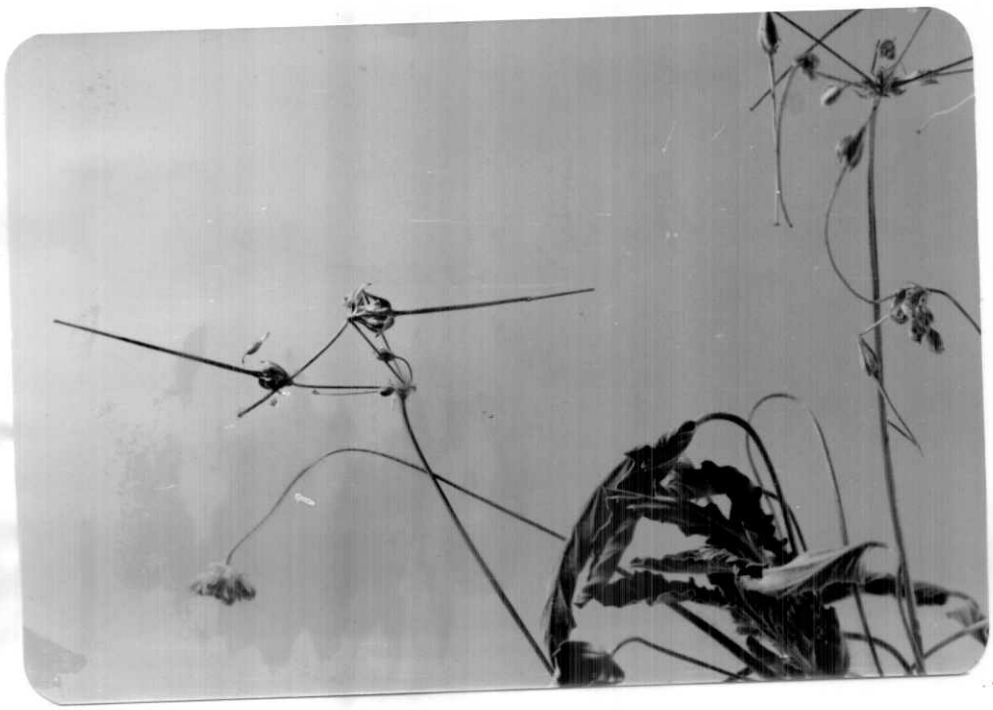


Photo (27) *Monsonia nivea*
Family: Geraniaceae
A): A pical plant portion showing peduncles, bearing flowers and fruits.
A and B palnts grown under plastic pots.
B): The same as the above.

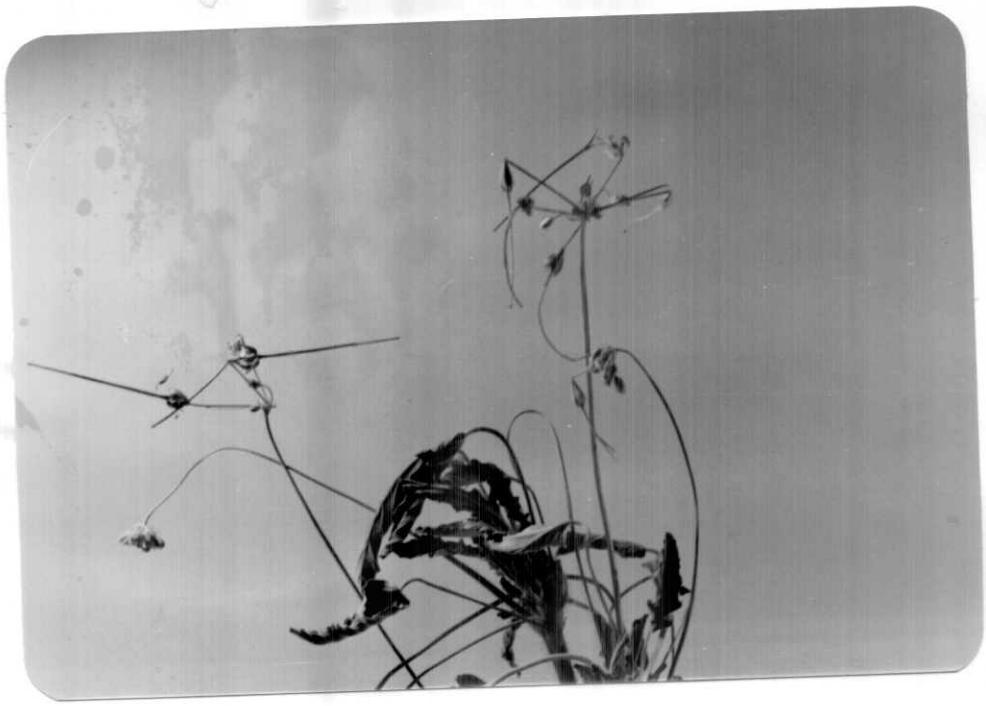


Table (15) Phenology of *Monsonia nivea* in terms of root length, plant hight, number of main basal branches, number of inflorescenes and number of leaves/plant, (averages of 20 plants).

t	Root length (cm)					Plant height (cm)					No. of main basal bandles					No. of inflorescences					No. of leaves/plant				
	Autumn	Winter	Spring	Summer	Average	Autmn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average
													Season 1986 - 1987												
I	20	24	21	22	15	17	15	16	4	5	6	5	8	9	10	9	40	53	47	47					
II	21	25	20	22	14	18	16	16	4	6	6	5	8	10	10	9	44	57	47	49					
II	25	30	28	28	19	22	21	21	5	8	7	7	10	13	11	11	53	70	65	60					
IV	23	26	22	24	14	20	18	17	4	5	6	5	9	11	9	10	40	57	49	49					
V	23	25	21	23	14	19	17	17	4	6	6	5	9	11	9	10	42	55	48	48					
erage	22	26	22	23	15	19	17	17	4	6	6	5	9	11	10	10	44	58	51	51					
													Season 1987 - 1988												
I	31	33	30	31	18	23	19	20	5	7	6	6	11	12	11	11	50	61	55	55					
II	32	34	31	32	19	22	20	20	6	6	7	6	11	12	11	11	53	64	57	58					
II	40	42	39	40	23	28	26	26	7	8	8	8	13	15	13	14	60	79	70	70					
IV	29	31	27	29	20	23	21	21	5	5	6	5	12	13	11	12	51	63	58	57					
V	28	32	25	28	20	24	22	22	5	5	6	5	12	13	11	12	53	65	57	58					
verage	32	34	30	32	20	24	22	22	6	6	7	6	12	13	11	12	53	66	59	59					
													Season 1988 - 1989												
I	22	24	20	22	14	18	15	16	3	5	6	5	8	10	9	9	44	52	49	48					
II	20	26	21	22	16	18	15	16	3	5	6	5	7	11	9	9	43	56	49	49					
III	26	29	26	27	20	23	21	21	4	6	8	6	11	14	12	12	54	73	67	65					
IV	19	23	20	21	16	19	17	17	3	4	5	4	7	10	8	8	41	56	49	49					
V	20	24	20	21	17	18	17	17	3	4	6	4	7	10	8	8	41	57	50	49					
verage	21	25	21	22	17	19	17	18	3	5	6	5	8	11	9	9	45	59	53	52					
Total average	25	28	24	26	17	21	19	19	4	6	6	5	10	12	10	10	47	61	54	54					

It must be mentioned that *Monsonia nivea* was never be founded during the Autumn season under the unculativated spot areas, except spot III (the cultivated area of km 50), in which it was presented all over the seasons (but in very rare amounts during autumn). Thus, the data of table (15) do not include the parameters of autumn.

It could be noticed that plants collected from the cultivated area (spot III of km 50) showed higher parameters than those corresponding ones of the uncultivaed spots areas. This indicates that cultivation conditions seemed to enhance the different measuring parameters, and thus change the plant growth behaviour.

It could be revealed, also, that root length exceed the plant height. In additiion, plants collected during spring seemed to have longer roots and higher shoots than those corresponding ones collected during winter or summer seasons. Also, plants collected from spot III (cultivated area) seemed to have deeper roots and higher shoots than the others of uncultivated areas. This finding was also true with regard to the number of main basal branches, number of inflorescences per plant and number of leaves per plant.

Leaves were variable in their number per plant and that may be partially related to enviromental conditions especially the available soil moisture (this number ranging from 15 to 100 leaves per one plant). It must be mentioned that the data of Table (15) are the average of 20 plants. Also, the leaf area, size, length and leaf petiol length were greatly variable within each plant.

It could be stated from our observations that the vegetative stage was very short, as the plants entered into flowering and fruiting stage after a short time and rapid vegetative growth. Also, there were variances in the developing inflorescence, as it was found that many flowers immediately formed fruits but many others were still in the flowering stage or flowers bud stage in every inflorescence (Photos 23 A &b; 24 A, B &C; 26 A & B and 27 A & B).

It could be revealed from the data that different studied parameters recorded higher values during the season of 1987-1988 than those corresponding ones of seasons 1986-1987 or 1988-1989. This may indicate the environmental conditions of season 1987-1988 were more suitable for good growth of *monsonia nevea* than those of other seaons especially the amount of rain fall, temperature, or/and relative humidity.

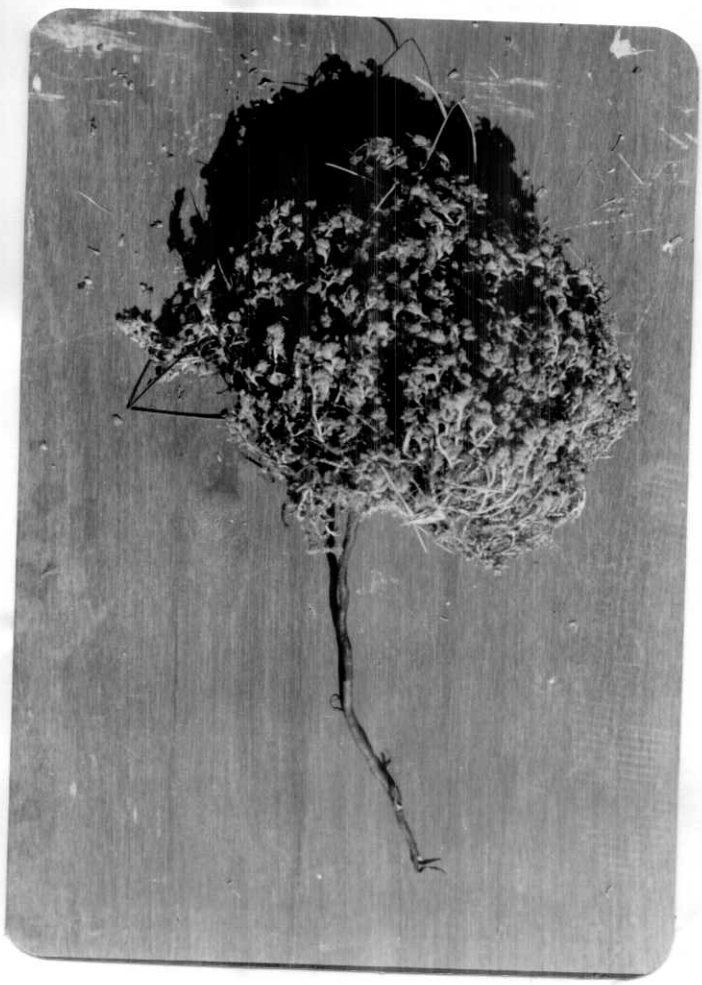


Photo (28) *Moltkiopsis ciliata* (Forssk) Hohnst. Entire plant during fruiting stage.
(Photographed at the end of August, 1988).

Photo (29) *Moltkiopsis ciliata* (Forssk) Hohnst.
Family: Boraginaceae.
See: The heavy basal branches.
A) Plant before flowering (vegetative stage)
(Photo February, 1988).
B): seedling plants
(Photo December, 1987).

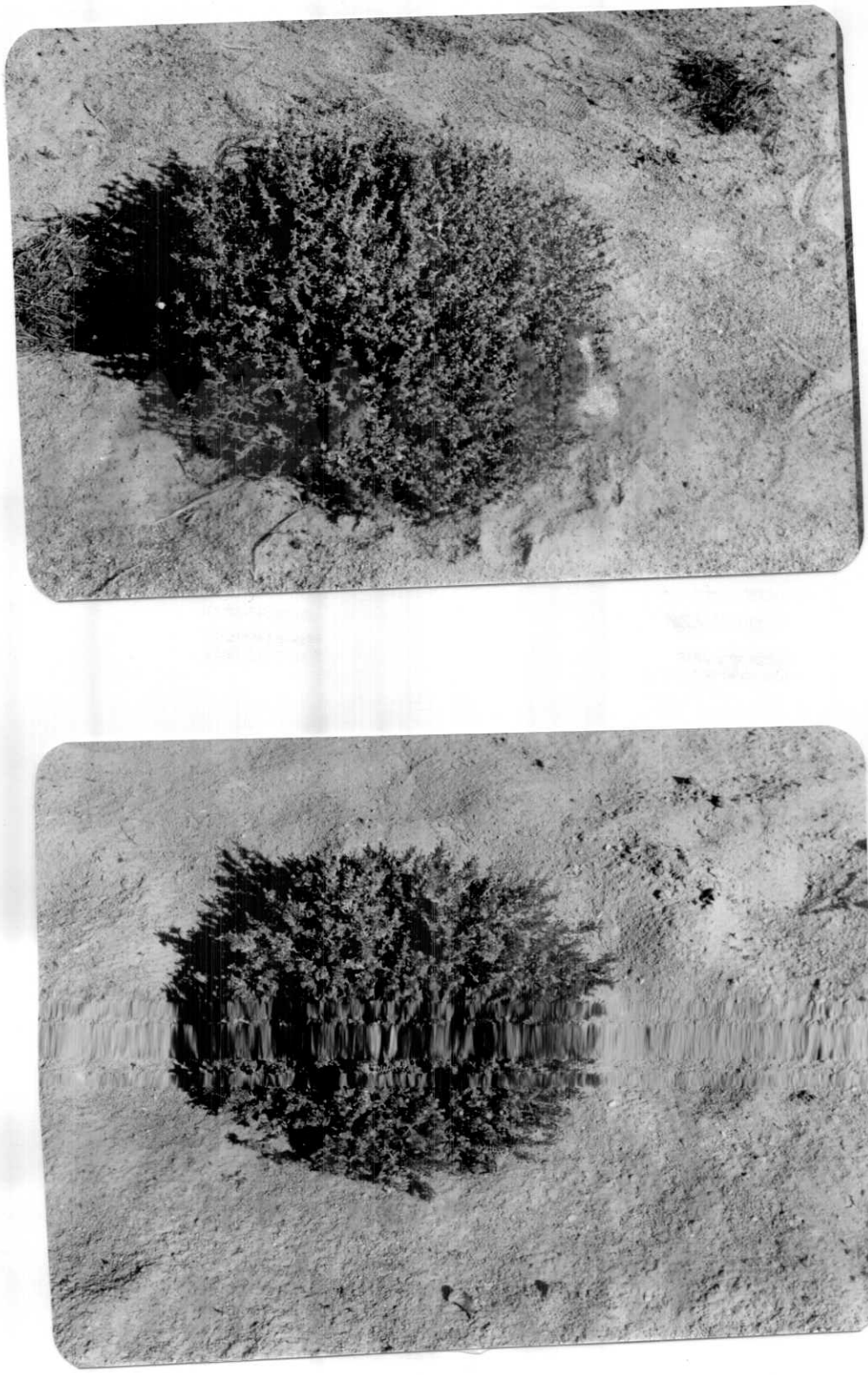


Photo (30) *Moltkiopsis Ciliata* (Forssk) Hohnst.
A) Plant cluster, during flowering stage (km. 50).
B) Plant cluster, during flowering stage (km. 60).

Photo (31) *Moltkiopsis ciliata*.
Flowering plant (April, 1989).

Table (16) Phenology of *Moltkiopsis ciliata* in terms of root length, plant hight, number of basal branches/plant.

Spot No.	Root length (cm)				Plant height (cm)				No. of basal branches			
	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average
						Season 1986 - 1987						
I	30	37	33	33	13	18	14	15	8	14	12	11
II	33	37	32	34	12	19	14	15	8	14	12	11
III	37	43	39	40	15	22	20	19	14	18	18	17
IV	32	38	34	35	13	18	15	15	10	14	13	12
V	33	38	34	35	13	19	15	16	11	15	11	12
Average	33	39	34	35	13	19	16	16	10	15	13	13
						Season 1987 - 1988						
I	36	42	39	39	15	19	17	17	10	16	14	13
II	39	42	39	40	15	19	18	17	11	15	14	13
III	44	47	45	45	17	24	21	21	17	20	18	18
IV	38	41	39	39	14	19	18	17	11	16	13	13
V	36	44	39	40	14	19	18	17	11	16	13	13
Average	39	43	40	41	15	20	18	18	12	17	14	14
						Season 1988 - 1989						
I	27	34	31	31	11	16	14	14	9	14	11	11
II	26	34	32	31	12	17	14	14	9	14	11	11
III	34	40	38	37	14	20	19	18	14	19	15	16
IV	27	34	32	31	11	15	13	13	10	13	11	11
V	27	35	33	32	11	17	14	14	10	13	11	11
Average	28	35	33	32	12	17	15	15	10	15	12	12
Total average	33	39	36	36	13	19	16	16	11	16	13	13

9) ***Moltkiopsis ciliate*** (Forssk.) Johnst.

Syns: ***Lithospermum ciliatum*** Forssk.

L. angustifolium Forssk.

L. callosum Vahl

L. Callosum Vahl var. *asperrimum* Bornm.

Moltkia callosa (Vahl) Wettst.

Moltkia ciliata (Forssk.) Maire.

Macromorphology :

Herbs, suffruticose to undershrubs, covered with stiff hispid and soft. hirsute hairs, stems woody, branched from base, decumbent to erect, forming mounds. Leaves 2-3 cm long, 2-4 mm wide, simple, alternate, sessile, elliptic - lancelate, hispid and hirsute on both surfaces, with callose margin covered with 1-2 mm long hispide hairs (Phots 32 A, B & C). Inflorescence scorpoid on surfaces and margin, 6-8 mm long; flowers bisexual, actionmorphic, hypogynous, subsessile. Calyx deeply 5-lobed, 3-4 mm long, covered with long, hispid, stiff and short hirsute, soft hairs, especially on the margin, (Photos 32, A, B & C). Corolla blue or blue - organe (sometime violet - it could be shown many colours of corolla in the same plants from white to violet, blue, pink or mixed of many colurs see photos 32 A, B & C). Corolla from 1.2 to 1.5 cm long, 3-4 times longer than the calyx, funnelform, soft hirsute on the outer surface, 5- lobed; lobes 0.8-2.0 mm long.

Stamins 5, epipetalous, 2 short included, and 3 long, nearly exserted. Corolla throat without scales. Ovary superior, 2-carpelled, 4-lobed, glabrous; style filiform, 10-15 mm long; stigma capitate, 2-lobed. Fruit 4 nutlets included in the persistent calyx. Nuts C 1 mm long, ovate-triangular, brownish, glossy, tubercled.

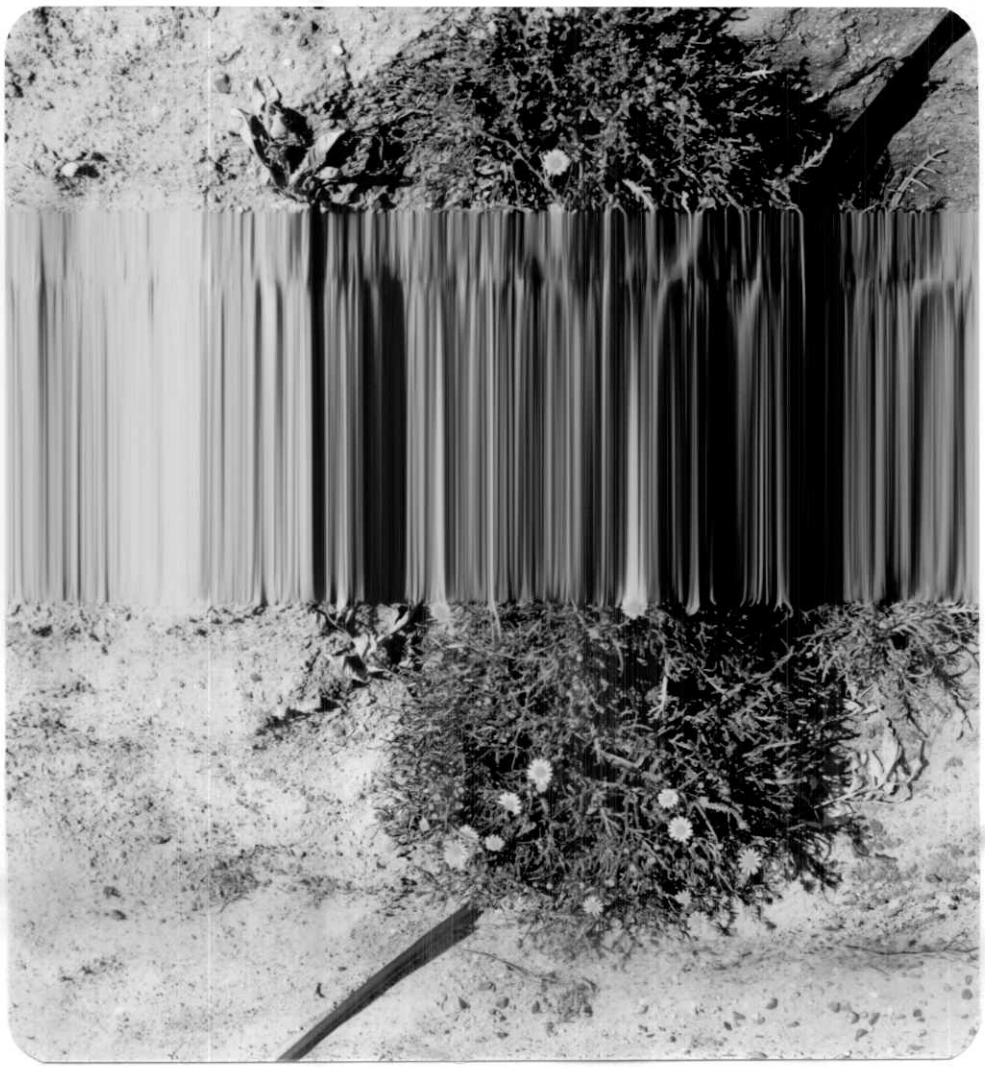
Flowering and fruiting : March, April, May, June and July; under the cultivated area flowering and fruiting seemed to be all over the year Habitat: Coarse, sandy, gravelly, compact soil.

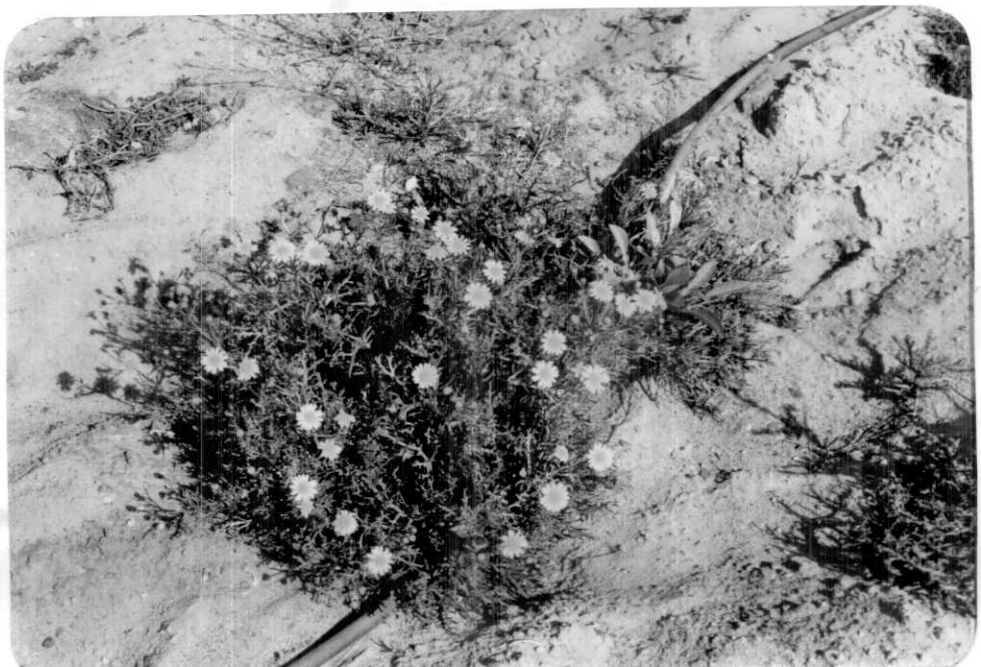
General distribution : Palestine, Iraq, Saudi Arabia, Qatar, Sharja, Dubai, Bahrain, Oman, Iran and Kuwait.

Local distribution : common in mediterranean coastal strip, all Egyptian deserts and Sinai.

Phenology :

It must be mentioned that *Moltkiopsis ciliata* plants seemed to disappear completely during the end of summer, autumn and early period of winter (from the end of July till the end of November). After rain fall the new vegetative shoot appeared immediately and the germination of new seedlings were shown (Photo 29, A & B). Accordingly, this plant species seemed to have





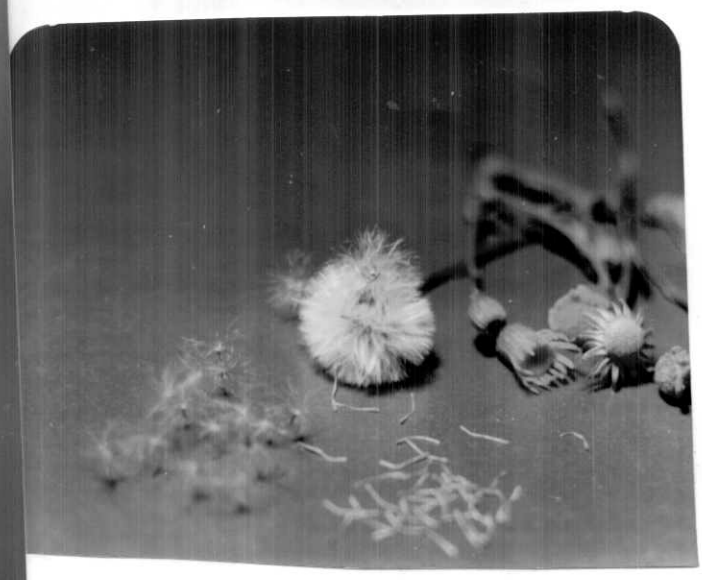


Photo (34) *Senecio desfontainei*
A): Heavy cluster floweing plants (March, 1988).
B and C: Heads and fruiting heads. Photo May 1988.

Photo (36) *Senecio desfontainei*.
A and B flowering plants grown in plastic pots
(see the more elongated branches than those grown under nature conditions)

Table (17) Phenology of *Senecio desfontainei* in terms of root length, plant height, number of main branches/plant, number of leaves/plant and cluster diameter, (average of 20 plants).

ot No.	Root length (cm)				Plant height (cm)				No. of branches/plant				No.of leaves/plant				Cluster diameter			
	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average
Season 1986 - 1987																				
I	15	23	17	18	24	33	30	29	6	10	8	8	30	49	40	40	22	30	26	26
II	23	17	19	25	32	29	29	29	5	11	9	8	27	48	42	39	21	35	27	28
III	17	25	20	21	32	41	38	37	7	15	12	12	35	60	55	50	28	41	42	37
IV	14	22	19	18	25	31	30	29	6	10	11	9	30	49	44	41	21	32	27	27
V	14	22	19	18	26	34	31	30	6	9	10	8	30	47	44	40	21	33	23	26
verage	15	23	18	19	26	34	32	31	6	11	10	9	30	51	45	42	23	34	29	29
Season 1987 1988																				
I	17	24	20	20	29	39	30	33	7	11	10	9	32	53	49	45	20	35	29	28
II	19	24	21	21	31	38	32	34	7	12	10	10	33	51	48	44	23	37	30	30
III	22	28	24	25	37	47	39	41	9	15	13	12	45	72	66	61	30	45	37	37
IV	17	25	21	21	30	36	30	32	6	9	11	9	30	51	50	44	20	37	31	29
V	19	23	20	21	31	37	30	33	6	9	11	9	32	51	51	45	20	38	33	30
Average	19	25	21	22	32	39	32	34	7	11	11	10	34	56	53	48	23	38	32	31
Season 1988 - 1989																				
I	14	20	18	17	26	32	30	29	6	11	9	9	31	42	41	38	25	31	30	29
II	15	21	19	18	27	31	30	29	5	11	9	8	31	43	41	38	23	32	30	28
III	18	25	21	21	33	38	36	36	8	15	13	12	40	49	49	46	29	40	37	35
IV	14	20	19	18	26	31	29	29	5	11	10	9	28	41	40	36	23	34	29	29
V	14	20	18	17	28	30	28	29	5	10	11	9	29	42	40	37	25	33	28	29
Average	15	21	19	18	28	32	31	30	6	12	10	9	32	43	42	39	25	34	31	30
Total Average	16	23	19	20	29	35	32	32	6	11	10	9	32	50	47	43	24	35	31	30

Local distribution: Very common in Nile region Oases, the Mediterranean coastal strip Isthmic desert and as a weed in many cultivated areas.

Phenology : For general macromorphology see photos. (33, 34, 35, and 36). Data of root length plant height, number of branches/plant, and number of leaves per plant are tabulated in Table (17). It could be concluded from the available data that shoot height always exceeded the root length. It could also be mentioned that different parameters. i.e., root length, plant height number of main branches, plant, number of leaves/plant and cluster diameter were in their lowest values during winter, while these values were in their maximum during spring. As the leaves of *Senocia desfontainei* function as the storage organs, thus different plants grown under various areas possessed a numerous lot of leaves number to serve as water (and other nutrients) donators during the dry periods. Accordingly, the number of leaves and number of main basal branches formations as well as, cluster diameters and plant height extension depend on the available soil moisture content. Season of (1987-1988) was fare wetted than the other two seasons, thus, the above mentioned parameters were in their maximum values during season 87-1988 than the corresponding ones of the other two seasons.

It may be concluded that . *Senecio desfontainei* plants possess many tools to survive under arid desert conditions which may be summarized as follows:

a) Leaves act as donator storage organs.

b) The very short vegetative growth stage.

c) The winter, spring and early summer growth aspect (the more wet season).

d) The flowering seemed to be more or less from the long day type, as the plants exhibited their flowers immediately on very dwarf plants when seeds germinated during the early summer season.

e) the very higher inflorescence information per plant.

11) ***Ifloga spicata*** **(Forssk.) Sch.-Bip.**

Syne: I. fontanesii Casse.

Macromorphology :

Annual, small herbs, stems mostly branched from the base to the summit with clusters of very small, discoid heads, together forming dense, leafy spikes, 3-6 cm larg/photos, 37, 38 A and 39, A). Leaves linear-subulate, protruding from the spike, pointed and flattened, 7-17 mm long, densely pubescent with soft, matted wool or glatrescent. Heads many flowered, 2-3 in cluster. Receptacles

elongated, naked at the centre marginal florets pistillate, filiform. Control florets tubular, perfect and staminate. Anthers with a tail-shaped terminal appendage. Branches of style thread like, elongated in the pistillate and shorter in the perfect flowers. Scales of involucre golden yellow, scarious, ovate, tapering into long point, innermost bracts oblong-lanceolate, nearly obtuse, scarious below, membranous above. Bristles of pappus lightly toothed at base. Achenes 0.5-0.75 mm.

Flowering and fruiting: March, April, and May.

General distribution: Spain, N. X S. Africa, Saudi Arabia, Palestine, Syria, Iraq, Afghanistan, Baluchistan and N.W. India.

Local distribution: It is distributed and grows in sandy soil of all the Egyptian desert, the Red sea coastal region, Sinai and Gebel Elba. It is considered as one of the main weeds in the cultivated area of El-Nobaria and resulted in many problems to the farmer.

Photo (38) *Ifloga spicata*
A. Basal fruiting brancheing plant. (Photo April, 1988).

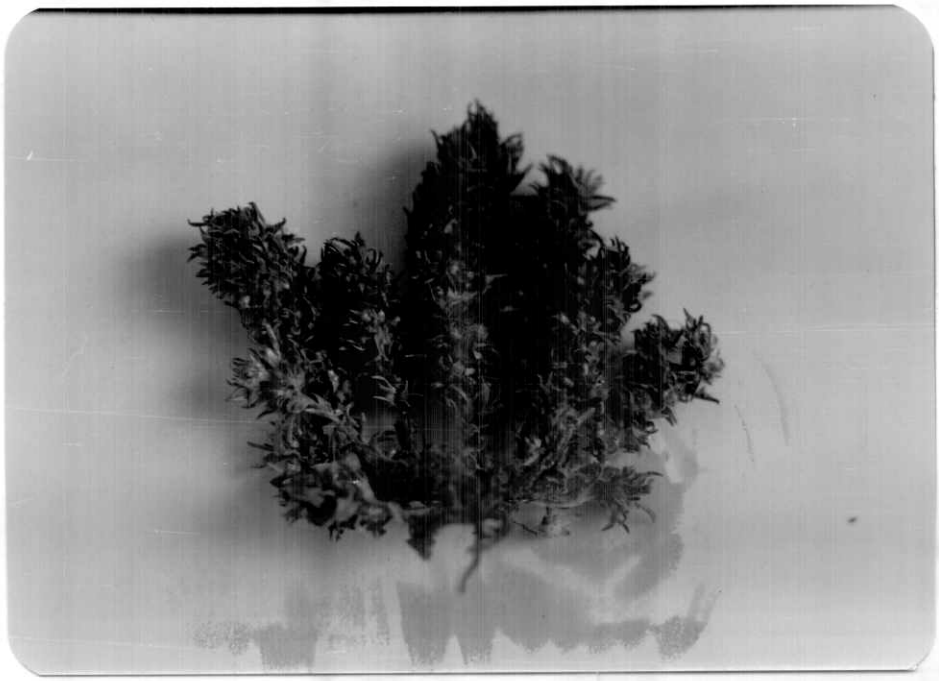
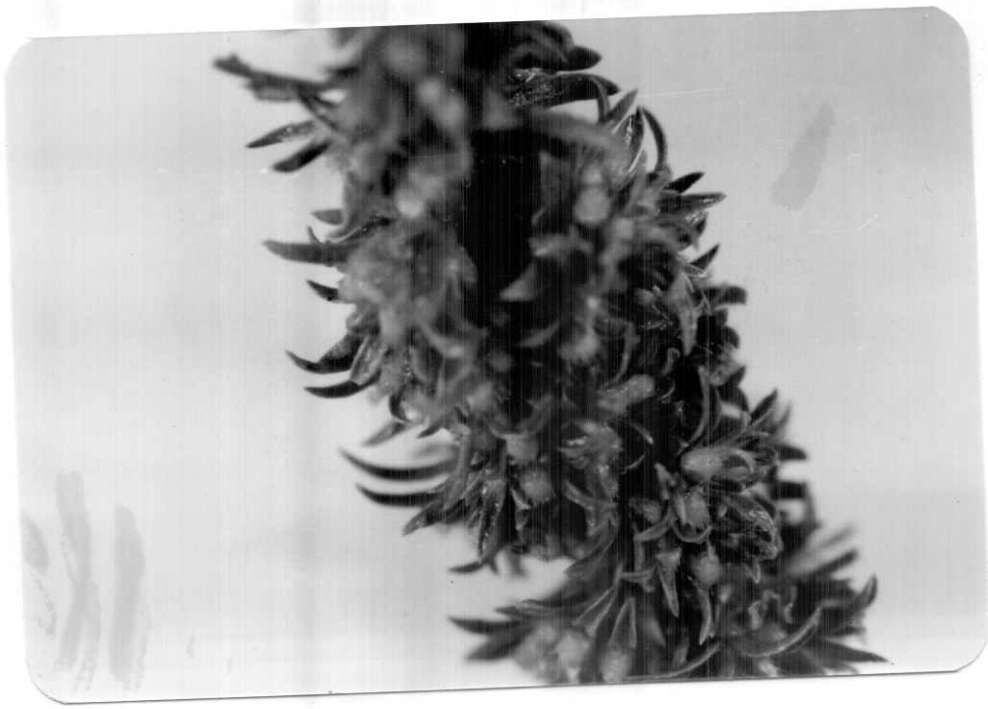


Photo (39) *Ifloga spicata* (Forssk.) Sch. Bip.
Family compositae
A) A heavy basal fruiting branching plant.
(Photo May, 1989).



Phenology:

There was no clear differences in the shape, plant height, root length between the collected plants during the different seasons extended from 1986-1989 of various studied areas. But, it was shown that plant height varied from 5 to 10 cm, but the number of branches varied from 2 to 7 and rarly single main shoot (see the potos 37; 38; A & B; and 39, A & B). It must be mentioned that Tackholm (1974) mentioned that many multiform species and the common one in the Cairo-Alexandria desert road was *Ifloga spicata* ssp. *labillardiesi* (Pamp.) Chrtek which is to right to dark green with leaves long and heads shorter, mostly 3.5 mm. also with short-pointed involucral-scales.

According to our observation, *Ifloga spicata* seemed to have many tools that aid this species to survive under arid desert conditions such as:

a) The very short shoot;

b) Basal branches forming a compacting condensed shoot system;

c) The winter and spring growth aspects (the growth is during the wet season);

d) The reduction in the size of plant, leaf, inflorescence, fruit and internode;

e) The roset thread shape.

All the above take part in the survival of Iflage spicata under arid desert conditions.

12) *Cot a cinerea* Del

Macromorphology :

Grey-woolly small hairy annual aromatic herbs, 7-15 cm. high, branching from the neck, erect or ascending grown in clusters containing more than one plant. Leaves finely dissected with somewhat fleshy hairy (woolly) flat lobes, with 1-1.5 cm long, wedge shaped, pinnatified with entire lobes. The herb with yellow discoid heads of hemispherical shape, 5-7 mm. broad, terminal.Heads many-flowred, homogamous. Involucre imbricated, with scales shorter than the disc. Receptacle hemispherical, naked papillose. Flowers all perfect. Corolla-tube translucent, compressed, 4-5-toothed. Achenes obovate-oblong, somewhat compressed, striate with white ribs, pappus absent. See photos 40: 41, 42, 43, 44, A, B & C, 45, 46, A, B & C, 47 and 48.

Flowering and fruiting: February till June, flowering occurred immediatly after short vegetative growth stage.

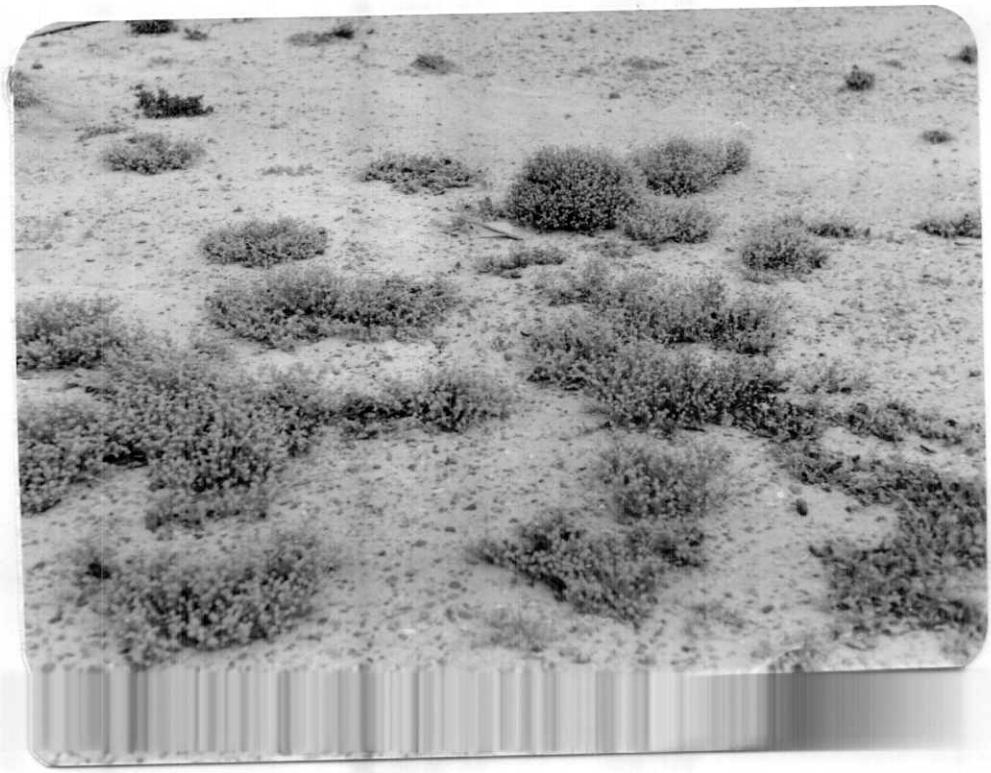


Photo (40) : A pure community of *Cotula cinerea* (Del.), (grown in the farm at K 50 Cairo– Alexandria Desert Road).
(Photo, April, 1989).

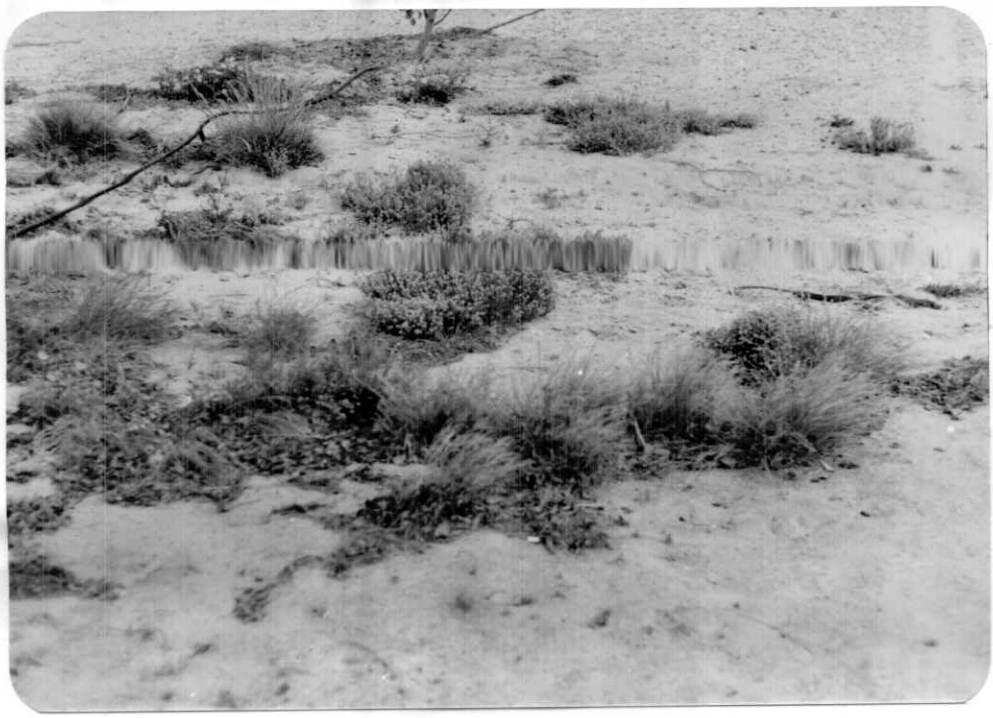


Photo (41): A mixed community of *Cotula cinerea*, *Senecia desfontainei*, and *Stipagrostis Plumosa* (Photo April, 1989) (grown in the farm at K 50, Cairo– Alexandria Desert Road.)

Photo (42): *Cotula cinerea*. The grey-wooly herb (Plant grown in the farm at K 50, Cairo-Alexandria Desert Road (Photo, May, 1988).

Photo (43): *Cotula cinerea*, the yellow discoid heads of terminal, hemispherical shape. (Photo. May 1988 from plants grown in the farm at K 50, Cairo-Alexandria Desert Road).

A

Photo (44) : *Cotula cinerea* (A. small plant at the begenning of flowering) (B and C flowering plants showing terminal heads in variable developing stage) Photo March, 1988 grown at K 70 Cairo-Alexandria Desert Road).

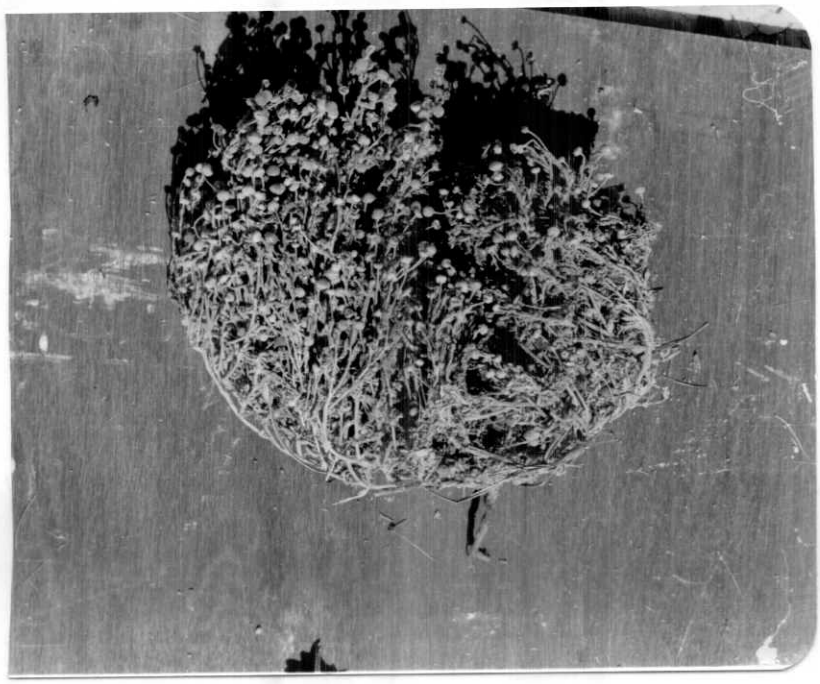


Photo (45): *Cotula* (L.) *Cinerea* Del.
Family compositae small annuals with yellow, discoid heads of hemispherical shape. It show the very heavy branched and compacting plant during the later stage of growth (photo. at the end of June of 1987).

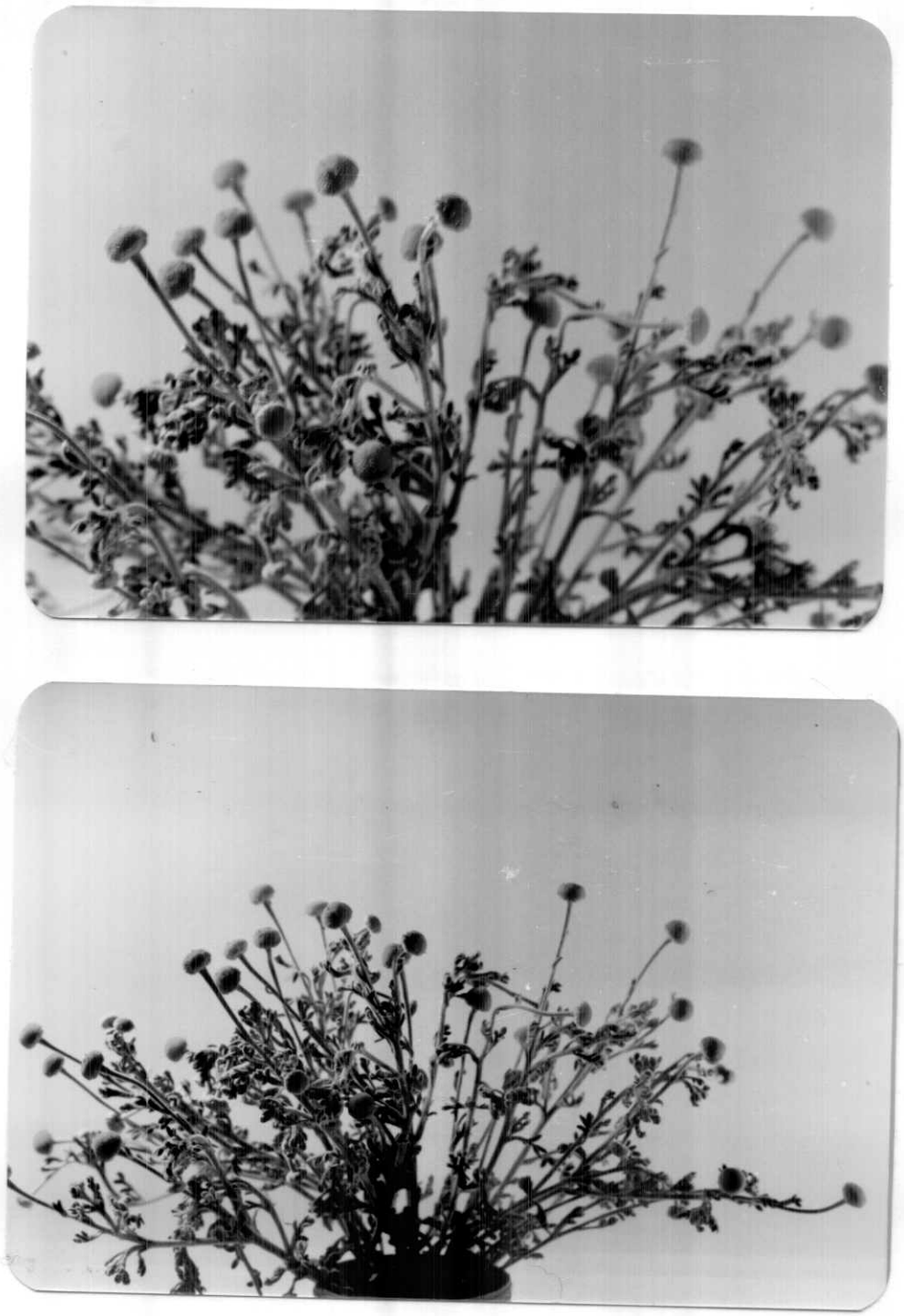


Photo (46) : *Cotula cinerea* grown in plastic pots (It show a more elongated branches than those grown under nature conditions.

Photo (47): *Cotula cinerea*. comple plant at the begenning of growth season (Febreuary, 1988).

Table (18) Phenology of *Cotula cinerea* in terms of root length, plant height, number of main basal branches per plant and number of inflorescences/plant (average of 20 plants)

t No.	Root length (cm)				Plant height (cm)				Number of main basal branches				Number of inflorescences/plant			
	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average
							Season 1986 - 1987									
I	15	21	19	18	6	11	13	10	6	9	10	8	4	24	30	19
II	13	22	18	18	5	12	14	10	4	9	10	8	6	30	34	23
II	17	27	24	23	8	14	17	13	8	11	15	11	10	40	45	32
IV	16	21	17	18	5	11	13	10	7	10	11	9	6	31	35	24
V	13	21	17	17	5	11	14	10	6	11	13	10	5	30	36	24
rage	15	22	19	19	6	12	14	11	6	10	12	9	6	31	36	24
							Season 1987 - 1988									
I	13	23	21	19	5	10	15	10	6	11	12	10	7	27	34	23
II	13	24	20	19	5	9	15	10	7	12	13	11	9	29	35	24
III	15	29	25	23	7	13	19	13	9	14	17	13	14	44	49	36
IV	13	23	21	19	6	11	14	10	7	11	14	11	11	30	36	26
V	13	24	21	19	6	11	14	10	7	13	13	11	9	30	36	25
verage	13	25	22	20	6	11	15	11	7	12	14	11	10	32	38	27
							Season 1988 - 1989									
I	11	24	22	19	5	11	15	10	6	10	11	9	7	29	35	24
II	12	25	24	20	5	13	14	11	5	10	10	8	5	30	34	23
III	16	31	29	25	7	15	18	13	9	13	16	13	9	43	47	33
IV	10	26	24	20	5	11	16	11	7	10	10	9	6	30	37	24
V	10	24	21	18	4	13	16	11	7	9	11	9	5	30	36	24
verage	12	26	24	21	5	13	16	11	7	10	12	10	6	32	38	25
Total average	13	24	22	20	6	12	15	11	7	11	13	10	7	32	37	25

General distribution : Seemed to be common in many Mediterranean countries.

Local distribution : Very common in many Egyptian deserts, Western Mediterranean Coastal Region, all the Egyptian deserts, the Red Sea Coastal region and Sinai, as it is grown in sand and gravel soils.

Phenology :

Root length, plant height, basal main branches number/plant, and number of inflorescences per plant are tabulated in Table (18).

It could be concluded from the data that *Cotula cinerea* have root length more taller than plant height. The very deep root system aid the plant to survive under desert conditions. It must be mentioned that *Cotula cinerea* plants appeared during the late of December and January (late winter) and flowered immediately after very short period of vegetative growth stage.

Also, it may be noticed that different plant parameters increased greatly during spring and very small increase during summer. The large number of infloresences during spring and summer indicates that such plant produce very large amounts of seeds.

It may be mentioned that root length differed during the study seasons, without clear trends, however, shoot system length seemed to be more or less constant during the different seasons and that may be due to discussed on the basis that soil moisture was not enough to stimulate the elongation of shoot system under our study areas. It was shown that under pot irrigation system the plants seemed to be taller than those grown under natural conditions (see photos, 46 A, B & C). The higher obtained plants under pot conditions were connected with the sharp increase in internodes.

It could be mentioned that *Cotula cinerea* seemed to have many tools aid this plant to survival under arid desert conditions which may be summarized as follows :

a) The deep root extension and the very shorter compacting shoot system, i.e., the longer the water abosrption organ and the shorter of the transpiration organ.
b) The production of too lot amounts of seeds.
c) The covering of lot amounts of hairs.
d) The leaves seemed to be a water storage organ, as it is fleshy, also the grey colour of the shoot system.
e) the winter, and spring growth aspects, i.e., during

the wet season, as the plants disappeared during the late of summer and the autumn (dry season).

f) It must be mentioned that the dwarfness of *Cattula cinerea* under nature conditions may be related to the lack of moisture in the soil, as the plants grown under the irrigated pot conditions possessed higher and taller shoot system, as the plant height reached 25 cm with longer internode and less compacting phenomenon, and the leaves seemed to be more or less semi flattened.

g) The curvature of theleaves margins either into the upper leaf surfaces or into the lower leaf surfaces under natural conditions indicating that soil moisture content was not enough to supply the growing plants with their requirement. In fact the curvature of leaf margin under nature conditions may be considered as one of the main tools for tolerating the aird conditions.

13) ***Reichardia tingitana*** (L.) Roth Bot.

Syn: *Scorzonera tingitana* L.

S. Orientalis L.

Picridium tingitanum (L.) Desf.

P. Orientale (L.) Dc.

R. Orientalis (L.) tlochreutiner.

Macromorphology :

Annual herb with stem decumbent, thickened, rosetted. Leaves glaucous, somewhat fleshy, variously shaped, oblong-ovate, typically pinnatified, usually denticulate, the uppermost smaller, undivided, half-clasping, radical leaves tapering to a petiole. Head large, long and broad yellow to orange, in the middle often blackish-red on stout peduncles. Achenes tetragonal, 4-furrowed, more or less rugose-tuberculate, truncate or slightly tapering at both ends; outer achenes, greyish brown; inner achenes longer, white; innermost achenes nearly smooth. Pappus much longer than achenes. (see photos; 49; 50 A&B); 51 A, B&C; 52, 53, 54k 55, A, B& C; and 56 A, B&C).

Flowering and fruiting : March-July.

General distribution : Canaries, Mediterranean region, Abyssinia arabia, W. Iindia, Iraq, Iran, Pakistan, Afghanistan, Australia, Polynesia and Kuwait.

Photo (49) : *Reichardia tingitana*
Two plants during flowering stage collected from K 70 Cairo-Alexandria Desert Road. (Photo, April, 1987).

Photo (50) : *Reichardia tingitana*.
A) show two heads (see also the middle blackish red colour).

Photo (50) : *Reichardia tingitana*. B) head from the side

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Photo (54) : *Richardia tingitana* during fruiting stage (Photo, May 1989).

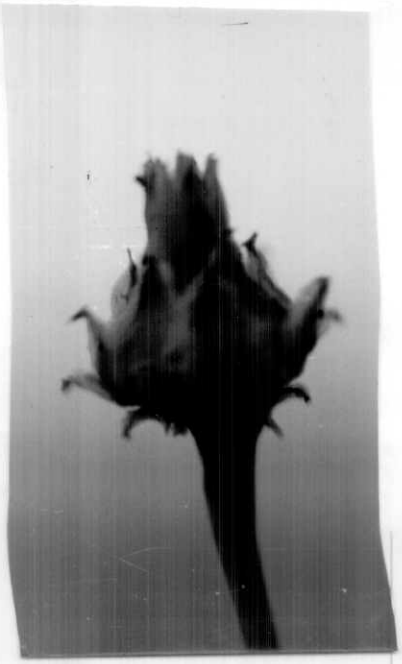

Photo (55) : *Reichardia tingitana* A, B and C (different stages of developing closed head to fruiting stage (head closed during night and opend during day light)

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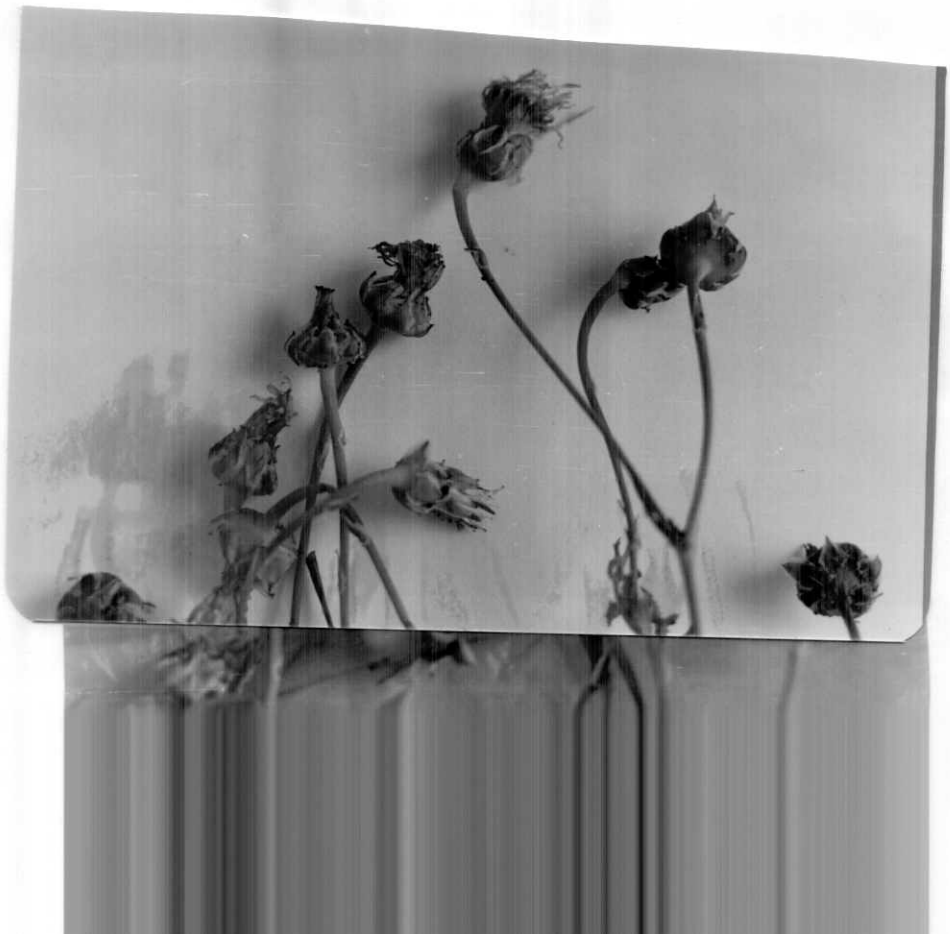


:)Developing
fruiting
heads.

Table (19) Phenology of *Reichardia tingitana* in the terms of root length, plant height, number of main basal branches/plant and number of inflorescences/plant (average of 15 plants)

t No.	Root length (cm)				Plant height (cm)				Number of main basal branches				Number of florescences			
	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average	Winter	Spring	Summer	Average
							Season 1986 - 1987									
I	20	27	28	25	7	9	11	9	4	10	12	9	6	16	17	13
II	21	29	30	27	8	10	12	10	4	11	13	9	5	17	19	14
III	23	33	39	32	15	19	28	21	7	14	17	13	4	23	25	17
IV	21	30	35	29	7	10	12	10	4	9	12	8	5	20	21	15
V	21	30	35	29	7	11	14	11	3	8	12	8	5	19	21	15
erage	21	30	33	28	9	12	15	12	4	10	13	9	5	19	21	15
							Season 1987 - 1988									
I	26	33	37	32	9	9	13	10	3	9	11	8	5	14	17	12
II	27	35	38	33	10	9	14	11	3	9	12	8	5	15	16	12
III	30	39	41	37	17	22	35	25	6	17	19	14	8	24	27	20
IV	25	34	37	32	7	9	14	10	3	9	11	8	4	21	23	16
V	26	35	37	33	10	9	15	11	3	7	11	7	5	21	23	16
verage	27	35	38	33	11	12	18	14	4	10	13	9	5	19	21	15
							Season 1988 - 1989									
I	20	26	31	26	7	9	14	10	4	8	10	7	6	13	16	12
II	19	26	30	25	9	11	14	11	5	7	11	8	6	13	19	13
III	23	29	36	29	16	23	35	25	9	14	17	13	9	19	26	18
IV	21	25	31	26	9	11	14	11	6	7	10	8	4	11	21	12
V	21	27	31	26	10	12	14	12	6	8	11	8	4	11	20	12
Average	21	27	32	27	10	13	18	14	6	9	12	9	6	13	20	13
Total average	23	31	34	29	10	12	17	13	5	10	13	9	5	17	21	14

compacting grow behaviour was also noticed when plants grown under natural conditions (compare between photo 51 A and 51 B & C).

It could be mentioined also that plants continued to produce inflorescences while many of it changed into fruiting stage (Photo 52). It may be mentioined also that *Reichardia tingitana* seemed to have a very short period of vegetative growth, as plants changed into flowering and fruiting stage after vey short period of vegetative growth. In addition more branches were formed during fruiting and flowering stage.

It could be stated also that plants grown under cultivated area were more taller than those grown under uncultivated areas. In addition, it may be concluded also, that the variance in the climatic factors during the study of the three seasons, i.e., 1986-1987, 1987-1988, and 1988-1989 seemed to have less effect on the different studied para-meters. *Reichardia tingitana* is considered as a weed and produce a lot of seeds which is distributed by wind.

14) ***Launaea mucronata*** **(Forssk.) Muschler.**

Syn: *Leontodon mucrunatum* Forssk.

Zollikoferia chondrilloides Dc.

Z. mucronata Forssk. Boiss

Sonchus Candolleanus Jaub. & Spach

Macromorphology :

Glabrous herbs, stem erect, dichotomously branched and loosely croymbose. Leaves petiolate, lanceolate in outline, lipinnatipartite or lobed, lobes oblong, auricle-toothed or many-cleft at base. Heads terminal, ovate, on rather long peduncles. Involucral scales white margined, ovate to oblong, tip of the outer ones contracted into an obtuse prickle. Florets much longer than involucre. A Chances columnar-prismatic, 5-6 furrowed, 4-horned at base, truncate at apex, the outer ones velvet-like, 5-7 mm, the inner achenes glabroces, somewhat longer. Pappus persistent, snow-white, bristles longer than the achene. (See photos 57; 58; 59 A & B, and 60).

Flowering and fruiting : February till July.

General distribution : Palestine, Jordan, Cyprus, Iraq, Saudi Arabia, Bahrain, Persia, Pakistan and Kuwait.

Local distribution Common in all the Egyptian Deserts.

Photo (57) : *Launaea mucronata* (Forssk.) Muschler.
Whole folowering and fruiting plant (photo, May 1988, km 40) (see the very heavy flowering branches and the lot of inflorescences productivity).

Photo (58): *Launaea mucronata* (Forssk.) Muscher.
Flowering and fruiting branches (Photo July, 1988, km 30)

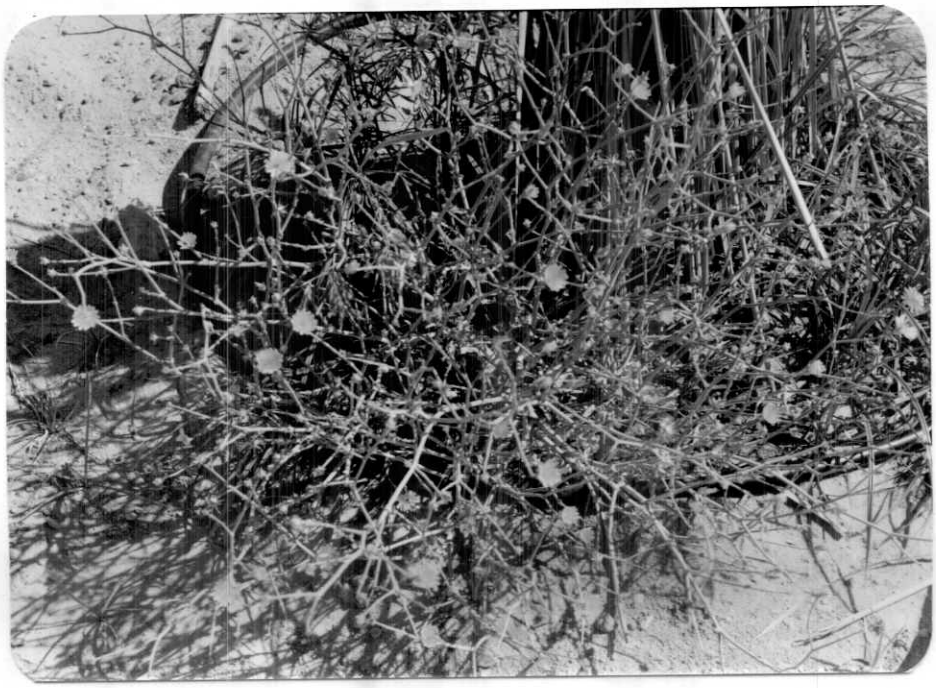


Photo (59) : *Launaea mucronata* (Forssk.) Muschl.
A) Whole flowering and fruiting plant grown under the the cultivated area of km 50 near the irrigated pipe. (Photo April, 1987).
B) Inflorescences, opened, closed and floral buds.

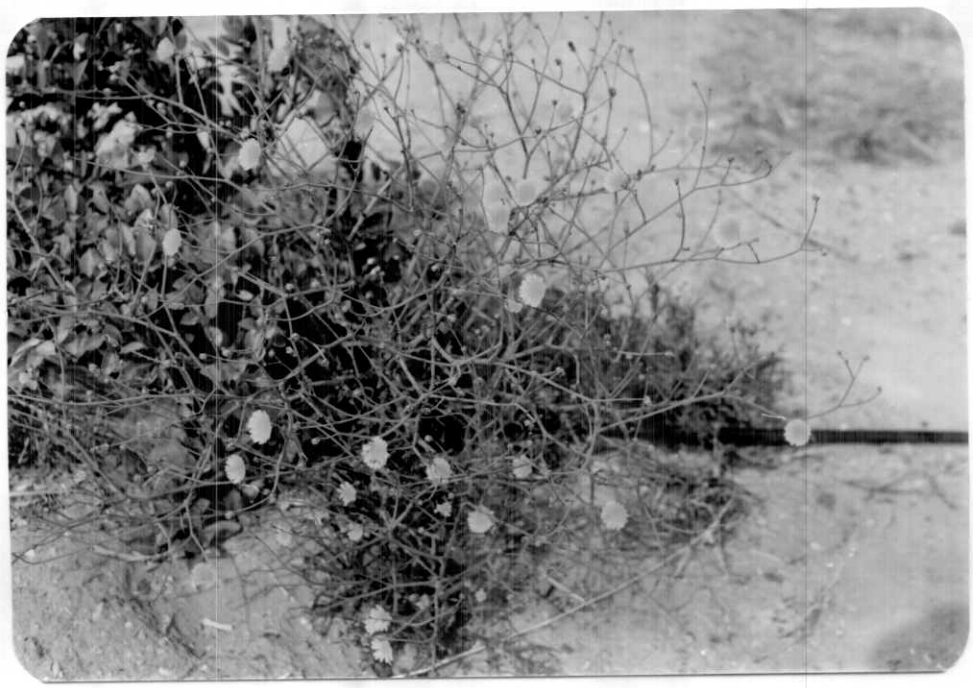


Photo (60) : *Launaea mucronata* (Forssk.) muschler.
Flowering plant grown near the irrigated pipe
of the cultivated area of km 50 (Photo March, 1987).

Table (20) Phenology of *Launaea mucronata* in the terms of root length, plant height, number of main branches and number of inflorescences per plant (Average of 15 plants)

	Root length (cm)					Plant height (cm)					No. of main basal branches					No. of Inflorescences/plant			
	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer
Season 1986 - 1987																			
	20	29	32	30	28	10	12	35	28	21	2	7	14	8	8	-	1	40	44
	21	27	31	31	28	10	13	36	27	22	3	6	13	9	8	-	2	43	45
	24	31	38	37	33	12	16	43	32	25	6	10	17	11	11	-	4	66	68
	21	27	31	30	27	10	13	32	22	19	2	7	12	8	7	-	2	41	46
	20	25	30	30	26	9	12	34	24	20	2	5	12	8	7	-	2	42	46
age	21	28	32	32	28	10	13	36	27	22	3	7	14	9	8	-	2	46	50
Season 1987 - 1988																			
	27	32	35	34	32	9	14	36	29	22	4	8	15	10	9	-	1	47	48
I	25	33	34	33	31	8	14	38	33	23	5	9	17	11	11	-	1	45	45
I	33	36	39	37	36	11	20	47	41	30	7	14	21	16	15	-	5	70	65
V	25	31	34	31	30	10	13	35	30	22	4	8	15	10	9	-	2	43	41
	23	30	33	30	29	9	14	36	30	22	5	8	15	10	10	-	2	44	41
rage	27	32	35	33	32	9	15	38	33	24	5	9	17	11	11	-	2	50	48
Season 1988 - 1989																			
I	21	30	35	30	29	8	11	33	26	20	2	6	11	6	6	-	1	36	40
II	22	30	34	31	29	7	13	32	27	20	2	7	12	6	7	-	1	37	41
II	29	35	39	35	35	12	17	41	34	26	4	11	17	11	11	-	3	55	58
IV	20	28	33	30	28	8	10	32	25	19	2	7	11	7	7	-	1	33	34
V	19	26	32	31	27	9	12	33	25	20	2	6	12	7	7	-	1	35	35
verage	22	30	35	31	30	9	13	34	27	21	2	7	13	7	8	-	1	39	42
otal verage	24	30	34	35	30	9	14	36	30	22	3	8	11	9	8	-	2	45	47

Phenology :

Root length, plant height, number of main basal branches and number of inflorescences per plant are tabulated in Table (20).

It could be revealed from the data that, during the autumn, winter and summer root length was always higher than shoot height. However, during spring shoot height was longer than root length. This could be discussed on the basis that *Launaea muronata* regulate the balance between the absorbed organ (root system) and the transperent organ (shoot system) according to the soil moisture content.

It may be concluded also, that the growth of *Launaea mucronata* was higher under the culti-vated area than those corresponding ones grown under uncultivated area. This also indicated that soil moisture content affected the growth of each plant. Also, there were some variance between the different studied parameters under the different examined seasons.

It could be stated also that *Launaea mucronata* seemed to have a spring growth aspect, as the highest increase in root length, plant height, number of main branches and inflorescences were gained during spring. It may be

concluded also that *Launaea mucronata* seemed to be from the long day plant group, as the highest number of inflorescences was gained during spring while in autumn there was no flowering plants were observed and very small number of inflorescences was produced during winter.

It may be concluded from the data and our observations that *Launaea mucronata* plants seemed to have many tools arid the plants to survival under desert arid conditions which may be summarized as follows :

a) The regulation balances between root system and shoot system according to the contents of soil moisture.
b) The lot of seeds productivity during spring.
c) The very small amounts of foliage leaves, as most of branches are flowering branches with very small size of branch leaves (invocular).
d) Stem leaves take a roset shape and extended horizontally on the soil surface and seemed to be yellowish at fruiting stage (seem photo 57).
e) The vegetative organ was reduced greatly in size and shape during autumn and early winter.

15) ***Launaea nudicaulis*** (L.) Hook

Syn: Chondsilla nudicoulis L.

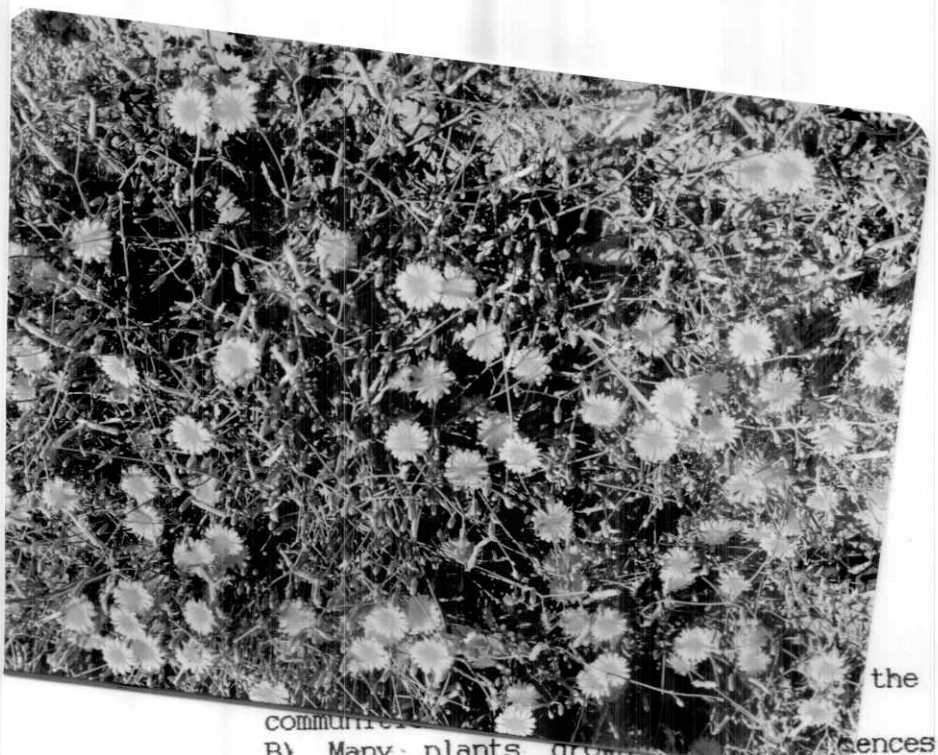
Zollikoferia nudicoulis (L.) Boiss.

Macromorphology

Glabrous herbs, loosely corymbose above, stems erect or decumbent, slender, thin, upwards dichotomously and irregularly branching. Radical leaves rosetted oblong to linear-spathulate in outline, runcinate, deeply lobed, white-aculeate along margin, stem leaves few, small at the lower forks. Heads lateral and terminal (Photo 63), cylindrical, bracteate, short pedicelled, often nodding in fruit, solitary or clustered, subracemose. Involucral bracts herbaceous white, broadly hyaline margins, the outer ones triangular, very short, ovate, the inner ones oblong-linear, acute. Florets much longer than involucre. Achenes columnar prismatic, scarcely compressed 5-6 furrowed, obtuse at tip, the inner smoth, the outer ones wrinbled-muricate. Pappus persistent, white, longer than achene. (See also photos 61, 62 and 63.

Flowering and fruiting : March - July.

General distribution : Palestine, Iraq, Bahrain, Qater, Afghanistan and Kuwait.



the very dences

B) Many plants grow... ...dences and compacting communities showing the heavy flowering branches in various stage of growth.

Photo (62) *Lounaea nudicaulis*
Fruiting plant.

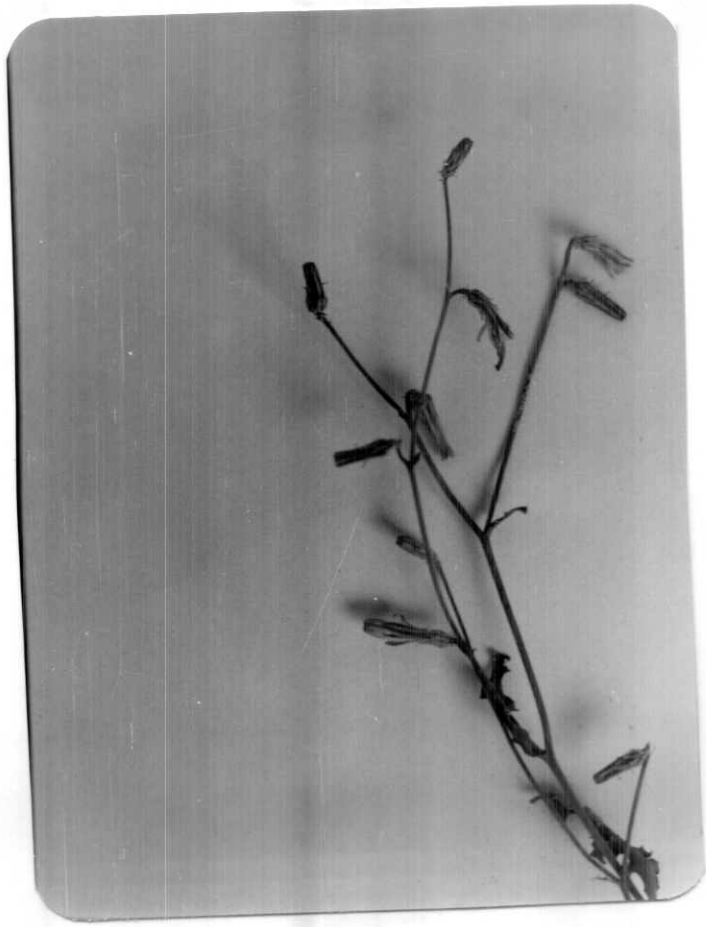


Photo (63) *Launaea nudicaulis*
Flowering branches.

able (21) Phenology of *Launaea nudicaulis* in terms of root length plant height, number of main branches and number of inflorescences per plant (average of 10 plants).

	Root length (cm)					Plant height (cm)					No. of main basal branches				No. of inflorscences/plant			
	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer
Season 1986 - 1987																		
I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	20	23	27	34	26	1	2	16	17	9	-	-	6	9	-	-	18	30
IV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
rage	20	23	27	34	26	1	2	16	17	9	-	-	6	9	-	-	18	30
Season 1987 - 1988																		
I	15	20	24	26	21	1	2	12	16	8	-	-	4	8	-	-	15	23
II	12	19	22	23	19	1	2	13	15	8	-	-	3	7	-	-	14	22
II	24	26	29	36	29	1	2	19	24	12	-	-	7	11	-	-	22	34
IV	13	20	23	26	21	1	2	11	15	7	-	-	3	6	-	-	14	22
V	12	20	22	25	20	1	2	11	14	7	-	-	3	6	-	-	14	21
erage	15	21	24	27	22	1	2	13	17	9	-	-	4	8	-	-	16	24
Season 1988 - 1989																		
I	14	20	22	24	20	1	2	12	14	7	-	-	3	6	-	-	16	20
II	11	18	21	25	19	1	2	13	16	8	-	-	4	7	-	-	13	24
III	22	27	29	34	28	1	2	20	22	11	-	-	8	12	-	-	20	31
IV	10	19	23	27	20	1	2	14	13	8	-	-	3	6	-	-	11	20
V	11	19	22	26	20	1	2	14	12	7	-	-	3	6	-	-	11	20
verage	14	21	23	27	21	1	2	15	15	8	-	-	4	7	-	-	14	23
otal verage	16	22	25	29	23	1	2	15	16	9	-	-	5	8	-	-	16	26

Local distribution : very common in Egyptian deserts and the Nile region of Delta and Valley.

Phenology :

Table (21) represents the data of root length, plant height, number of main branches, and number of inflore-scences per plant.

It was mentioned that during the season of 1986-1987 the *Launaea nudicaulis* was not appeared in spot number I, II, IV and V, i.e., uncultivated areas, but it was shown only in few amounts under the cultivated area. However, during the more met season of 1987-1988 and 1988-1989 some populations of this plant were shown in all the studied area. It could be concluded from the foregoin results that *Launaea nudicaulis* seemed to require higher soil humidity than the other desert plant.

It could be concluded from the data that root length always exceed the plant height as many other discussed sandy plants. It could be also stated that root length increased in length from autumn till the end of summer, as it is progressevely increased with increasing the relative air and soil humidity.

It could be revealed from the data that plant height

was in the lowest amount during autumn and winter and then increased sharply during spring. The plant during autumn and spring contains only the radical rosetted leaves without a very short and dwarf main stem. During this stage plants in compleat vegetative stage without any branches as the folowering was mostly during February till April. Accordingly, it could be stated that *Launaea nudicaulis* seemed to have two definit stages which connected directly with the environmental factors. The first stage is vegetative while the second is sexual reproduction stage. The vegetative stage occure during the dry season with short day, while the second occure during the wet season with long day.

It may be stated also that plants grow under the cultivated area having more parameters than those grow under uncultivated areas. Also, some plant growth behaviours were influenced by the changes in climatic factors, as there was some fluctuation in the parameters duriing different seasons.

16) ***Lounaea capitata*** (spreng) Dandy

Syne: Sonchus capitatus Spreng.

Lomatolepis glomerata cass.

Lollikoferia glomerata (cass) Boiss.

Launaea glomerata (Cass) Hook.

Microrhynchus glomeratus (Cass.) Houb. & Spach.

glabrous herbs. Stems stout, stiff, very short to elongated, almost naked. Leaves lyrate-cleft, forming a dense rosette. Radical leaves oblong in outline, tapering at base, runcinate-pinnatified into numerous, traingular-ovate, sinuate-dentate lobes, stem leaves auricled at base or absent. Heads short, nearly sessile, thick, the terminal one solitary or clustered, the lateral ones usually solitary, oblong-cylindrical. Florets longer than involucre. Involucral scales with broad, white-hyaline margins, obtuse, the outer ones ovate, the iuner ones oblong, elongate. Acheves short, white, spong, tuberculate-scobrid, compressed, truncate-retuse, 4-winged at both lateral edges and at the middle ridge. Poppus deciduous, white, 5-6 mm.

Flowring and Fruiting : February-till June.

General Distribution : Palestine, Iraq, Saudi Arabia, Aden, Iran, Pakistan and Kuwait.

Local distribution : very common in Egyptian deserts and Nile Delta on sand soil.

Phenology :

It could not be estimated as the distribution was not common in all spots.

17) ***Stipagrostis plumosa*** (L.) Manro

Sun: ***Aristida plumosa*** L.

Macromorphology :

A densety tufted grass with erect or shortly geniculate culms; both nodes and internodes covered with wool as the lower sheaths are covered with fugacious wool. Leaf-blades rigid, convolute, filiform, flexuous, often curved in a half or full circle, Inflorescence a panicle about 12-15 cm long, lateral branches of the own naked, the central plumose-ciliate in the upper two-thirds.

Flowering and fruting :

The first of March-Jully.

Photo (64): *Stipagrostis plumosa* (L.) Munro ex T. and Anders = *Aristida plumusa* L.).
Family : Gramineae.
(A): A fine, densely, tufted plant grown in a new reclaimed sandy soil at K 50 (May, 1989)
(B): Densely branching plant collected during April of 1988 season, from a new reclamed area of K 26.

Table(22) Phenology of *Stipagrostis plumosa* in the terms of root length, fibrious root number, tillers number and plant height (Average of 20 plant).

ot No.	Root length (cm)					Fibrious root No./cluster					No. of tillers/cluster					Plant height (cm)				
	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average
									Season 1986 - 1987											
I	11	13	19	20	16	11	17	23	24	19	10	17	21	23	18	25	30	34	33	31
II	10	15	18	20	16	14	19	24	26	21	10	18	23	24	19	26	30	35	31	31
III	14	18	20	24	19	15	24	27	28	24	13	23	27	33	31	31	34	39	34	35
IV	13	15	19	21	17	11	20	22	24	19	10	20	25	27	21	24	31	31	30	22
V	14	16	20	20	18	10	21	23	24	19	11	20	25	26	21	25	30	33	30	30
erage	12	15	19	21	17	12	20	24	25	20	11	20	24	27	22	26	31	34	32	30
									Season 1987 - 1988											
I	10	14	20	23	17	9	20	24	26	20	14	19	23	23	20	29	36	38	34	34
II	10	15	21	24	18	8	22	26	30	21	16	19	25	27	22	28	37	37	35	34
III	11	17	23	26	19	11	27	29	30	24	16	24	33	36	28	29	40	41	36	37
IV	12	16	21	24	18	10	20	21	26	29	11	20	26	30	22	27	37	39	32	34
V	13	17	21	25	19	10	21	22	27	20	12	20	27	29	22	26	36	38	34	34
verage	11	16	21	24	18	10	22	24	28	21	14	20	27	29	23	28	37	39	34	35
									Season 1988 - 1989											
I	10	14	20	22	17	10	16	20	22	17	9	17	20	23	17	25	30	31	30	29
II	9	14	20	21	16	9	17	21	24	18	9	16	18	21	16	24	31	31	29	29
III	11	19	20	24	19	10	23	25	26	21	12	20	23	29	21	27	34	35	31	32
IV	10	13	20	22	16	9	22	25	26	21	9	15	20	23	17	23	30	30	28	28
V	11	14	19	21	16	9	21	23	25	20	8	16	18	22	16	24	31	30	26	15
Average	10	15	20	22	17	9	21	23	25	19	9	23	20	24	17	25	25	31	29	27
Total average	11	15	20	22	17	10	21	24	26	20	11	21	24	27	21	26	31	35	32	31

General distribution :

Europe (E. Medteranean Balkans), Syprus, Syria, Palestine, Jordan, Suadi Arabia, Turkey, Caucosus, Iran, W. Pakistan Afghanistan, C. Asia (Turkmania to Pamir-Alai), N.W. India, W. Tibet, N. Africa (Morocco, Algeria, Central Sahara, Tunisia, Lipya, Tropical Africa (Mauritania, Nubia) and Kuwait.

Local distribution :

This species are very common in all the Egyptian regions and contain an multiform species (i.e., Six Botanical Varieties). Some of them grow in the Nile Valley, and the others are distributed in most of the desert.

It is grazed by comels, sheep and other livestock.

Phenology :

Table (22) represents the data of root lenght, lateral fibrous root number, tiller number, and plant height 30 cm . It must e mentioned that, it was deficult to separate or to define one plant grown in the study areas, as *Stipagrostis plumosa* grow in a clusters. Accordingly, it was thought advisable to measure the different parameters on the basis of the agregated plants not on one plant.

It must be mentioned also, that root seemed to be more or less fleshy and thick, and may be serve as storage organ, however, it was welted directly after removal from the soil. The adhearing sand particles were not easly removed from the root system. Thus, it was suggested that *Stipagrostis plumosa* roots excrete adhesive compounds to support the plants in sand soil and also to extract the different salts. The root system of *Stipagrostis plumosa* as any other graminous members, is fibrous adventesious root, and the number of this type of roots increases or decreases according to the growth activity of the plant shoots. The depth of the root was not great, but the number of fibrous roots increases with increasing the tillers productivity. Thus, it was observed that the activity of tillering emergency was associated with the new fibrous roots formation.

It could be noticed from the data that different parameters are in the lowest values during autumn and increased sharply during winter and spring and seemed ot be more or less declined slightly during summer. This may indicate that *Stipagrostis plumosa* seemed to have a winter and spring gowth aspect, i.e., during the wet seasons. Also, the large number of tillers per cluster indicating that *Stipagrostis plumosa* having a compacting growth behaviour to menimize the water

losses, as inner hert of the plant always far from the expossure of direct climatic factors (photos 64 A & B and 65), and the protection of the inner growing point occur.

It could be concluded also that, the growth behaviour of *Stipagrostis plumosa* showed some increase during the more wetted season of 1987-1988 than the other both seasons of 1986-1987 and 1988-1989. The later season was relatively having less rainfall. Also, under the cultivated area, the growth of *Stipagrostis plumosa* was higher than those corresponding ones grow under uncultivated areas.

This plant could be grown naturally well for grazing purposes when a sufficient of water is available.

The fugacious wool covering the leaf-sheath is considered as a tool for protection from great losses of water from the plant.

fodder for camels, goats and donkey. Thus, it is used fro grazing and collected it when green and store to be used as a dry fodder for their domestic animals during the depleted seasons. See also photos. 66 and 67 for more macromorphological studies.

Phenology :

Table (23) represents the data of root length, number of fibrous roots/cluster, number of tillers/cluster, and plant height.

It could be concluded from the available data that *Pennisetum divisum*, grown in clusters, i.e., more than one plant as a congetated plants. Thus, it could not be separated the plants from each other under the natural conditions. Accordingly, the data were recorded on the cluster which may contain more than one plants.

It could be noticed from the data that there are clear changes in the tested parameters. As these parameters are in their lowest values during autumn and increase during winter and spring. However, the highest increases are during the spring, then decline during summer. According to this finding, it may stated that Pennisetum divisum seemed to have spring growth aspect.

Photo (66) *Pennisetum divisum*
A) Apical plant portion
B) Whole plant during flowering stage
C) Infloresence
(The floret open within 2 hour after removal the plant from the soil. The length of inflorescence seemed to be from 1/3 to 114.

Photo (67) *Pennisetum divisum* (L.C. Rich) (Forssk ex J.F. Gmel) Henrard (= P. dichotomum (Forssk.) Del).
Family, Gramineae. Observe its grown in large thickets. Branches with large yellow empty sheaths at the swollen nodes. False spike cylindric, 5-12 cm. with white owns.

Table (23) Phenology of *Pennisetum divisum* interms of root length, number of fibrous roots, clusters, number of tillus/cluster and plant height (as average of 10 plants of the seasons 1987-1988 and 1988-1989).

t No.	Root length (cm)					Fibrous root No./cluster					No. of tillers/cluster					Plant height (cm)				
	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average	Autumn	Winter	Spring	Summer	Average
Season 1986 - 1987																				
I	7	14	20	11	13	14	20	27	13	19	10	12	22	15	15	13	15	30	17	19
II	8	16	21	10	14	13	21	26	11	18	11	14	21	15	15	14	16	28	18	19
III	11	20	29	16	19	17	26	35	22	25	16	18	29	22	22	16	20	37	30	26
IV	9	14	19	11	13	11	20	23	20	21	10	12	20	14	14	10	14	22	16	16
V	9	15	18	12	14	11	20	23	19	18	9	12	19	13	13	9	14	25	16	16
erage	9	16	21	12	15	13	21	27	17	20	11	14	22	16	16	12	16	28	19	20
Season 1987 - 1988																				
I	10	18	25	11	16	16	23	30	17	22	14	17	27	17	19	14	17	34	21	22
II	12	16	26	13	17	16	22	29	17	21	16	18	29	18	23	16	19	35	22	23
III	16	14	30	21	20	20	33	36	26	24	23	25	34	24	27	20	24	39	33	29
IV	11	16	24	14	16	15	20	30	22	22	17	20	26	17	20	13	18	30	21	21
V	10	17	24	15	17	13	21	30	20	21	15	20	24	16	19	13	19	30	21	21
verage	12	14	26	17	17	16	24	31	20	23	17	20	28	18	20	15	19	37	24	21
Season 1988 - 1989																				
I	7	12	17	8	11	11	19	22	11	16	9	10	20	13	13	11	13	25	16	16
II	8	13	16	9	12	12	18	24	10	16	8	11	20	12	13	11	13	25	16	16
III	10	16	21	13	15	17	25	29	19	23	14	17	25	20	19	14	19	30	23	23
IV	6	11	16	10	11	10	19	20	11	18	10	11	19	11	13	10	11	22	14	14
V	6	11	16	10	11	10	19	20	11	18	9	11	19	11	13	8	11	24	16	15
Average	7	13	17	10	12	20	20	23	12	23	10	12	21	13	14	11	13	25	15	19
Total average	9	14	21	13	15	20	22	27	16	22	13	15	24	16	16	13	16	30	19	20

During autumn, the grown plants without any inforescences, but the first inflorescences appeared during the end of Febreuary and sill appeared till the end of June. In additioin, some parts of dry inflorescences without grains were observed during summer season.

The plants begain to be green during the end of autumn and winter, but such plants, seemed to be in dry state and pail green colour during summer and the begenning of autumn. In addition, plants grow in spot III (cultivated area) alenoys having higher parameters than those corresponding ones which grow under the uncultivated areas.

It could be noticed also, that the soil moisture level, affected the growth behaviour of *Pennisetum divisum*. This comes from the finding of more growth of the collected plants during the more relative wit season of 1987-1988 than those of other two seasons. Also, the plants which be collected form the cultivated area having higher parameters than those of uncultivated areas.

19) *Chloris gayana* kunth

Macromorphology

As this plant was very rare distributed in the study areas and was not shown in many seasons (except season 1986-1987), but disappeared after that. Accordingly the record phenology and macromorphology data are out of the discussion in this respect.

V) Vegetation Analysis :

Tables (24, 25 and 26) representing the data of floristic composition of a stand of 20 quadrates (every one 10x10 m) in different spots areas extended from km 30 to km 70 of Cairo-Alexandria Desert Road (on the left side from Cairo) during the end weeks of Arpil of 1987, 1988 and 1989 respectively. This time (the end of spring season), from our opinion, is more suitable for studying the vegetation analysis as most of the forementioned plant species grown under natural conditions having a spring growth aspects under the study hepitat area. In most cases, the end of spring may be considered as the end of vegetative and reproductive growth. In addition, it is considered as the net gain of dynamic growth period.

It could be stated from the data that *Cornulaca monacantha* is the most abandant plant in the community

in different study area. Its frequency index was more or less stable during different study seasons and most examined spot areas. The only exception in this respect spot III of km 50 the cultivated area of seasons 1988 and 1989. This exception may be due to partially the continous control of weeds by the farmers or partially may be due to the excess of soil moisture over its need. In other words, the heigher soil moisture over the desert plant needed may affect the nature plant growth.

It could be also mentioned from the data that the community of *Cornulaca monacantha* included many other perennial, biennial and annual. These variable species were in compleat dynamic changes in their number and in most cases in their frequency index and hens their frequency class.

It could be noticed that the number of vegetation was heigher during season of 1988, followed by season of 1987, but the vegetation number of 1989 was the lowest in this respect. This variance may be related to the amount of rainfall and air relative humidity.

In this connection, the amount of rainfall during the season of 1987-1988 was more than of season 1986-1987, and lowest amout was gained during the season of 1988-

Table (24) Floristic composition of a stand of 20 quadrates (every one 10 x 10 m) representing Cornulaca monacantha Community studied in different spot areas extended from km 30 to km 70 of Cairo-Alexandria Desert Road during spring of 1987 (at the end of week of April, 1987).

Species	Spot I (Km. 30)				Spot II (Km. 40)				Spot III (Km. 50)				Spot IV (Km. 60)				Spot V (Km. 70)			
	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %
1. Cornulaca monacantha	188	100	5	29.19	210	100	5	30.57	110	100	5	11.64	160	100	5	22.04	130	100	5	17.45
2. Bassia muricata	110	85	5	17.08	99	90	5	14.41	91	80	5	9.63	88	70	4	12.12	99	70	4	13.29
3. Polycarpaea repens	130	80	5	20.19	88	85	5	12.81	91	85	5	9.63	89	70	4	12.26	100	80	5	13.42
4. Calligonum comosum	31	50	3	4.81	35	60	3	5.09	24	50	3	2.54	22	40	2	3.03	24	50	3	3.22
5. Moltkiopsis ciliata	26	40	2	4.04	31	60	3	4.51	35	70	4	3.70	21	60	3	2.89	30	50	3	4.03
6. Mosonia nivaea	20	30	2	3.11	30	60	3	4.37	45	70	4	4.76	36	60	3	4.82	30	50	3	4.03
7. Eremobium aegyptiacum	26	30	2	4.04	33	45	3	4.80	57	70	4	6.03	38	45	3	5.23	31	45	3	4.16
8. Ifloga specata	21	30	2	3.26	34	45	3	4.95	23	40	2	2.43	91	40	2	12.53	113	45	3	15.17
9. Cotula cinerea	15	20	1	2.33	25	25	2	3.64	57	70	4	6.03	70	25	2	9.64	35	25	2	4.70
10. Senecio disfontainei	12	10	1	1.86	22	10	1	3.20	88	70	4	9.31	21	20	1	2.89	34	30	2	4.56
11. Reichardia tingitana	11	10	1	1.71	16	10	1	2.33	47	60	3	4.97	20	20	1	2.75	34	30	2	4.56
12. Stipagrostis plumosa	15	10	1	2.33	17	10	1	2.47	88	70	4	9.31	19	10	1	2.62	20	20	1	2.68
13. Pennisetum divisum	10	10	1	1.55	17	10	1	2.47	71	70	4	7.51	11	10	1	1.52	20	20	1	2.68
14. Launaea nudicaulis	10	5	+	1.55	7	5	+	1.02	37	50	3	3.92	13	10	1	1.79	74	10	1	1.88
15. Launaea macronata	9	5	+	1.40	8	5	+	1.16	31	50	3	3.28	12	5	+	1.65	13	5	+	1.74
16. Neurada procumbens	6	5	+	0.93	8	5	+	1.16	20	30	2	2.12	10	5	+	1.38	7	5	+	0.94
17. Launaea capitata	4	5	+	0.62	7	5	+	1.02	25	10	1	2.65	4	5	+	0.55	5	5	+	0.67
18. Chloris gayana	-	-	-	-	-	-	-	-	3	5	+	0.32	1	5	+	0.14	3	5	+	0.40
19. Zygophyllum album	-	-	-	-	1	5	+	0.15	2	5	+	0.21	1	5	+	0.14	3	5	+	0.40
	644			100	687			100	687			100	945			100	726			100

F.I. = Frequency index (%) F.C. = Frequency class (%) P. = Presence (%) as related to the total number

Table (25) Floristic composition of a stand of 20 quadrates (every one 10 x 10 m) representing Cornulaca monacentha communitity studied in different spot areas extended from km 30 to km 70 of Cairo-Alexandria Desert Road during spring of 1988 (at the end of weekd of April, 1988).

Species	Spot I (Km. 30)				Spot II (Km. 40)				Spot III (Km. 50)				Spot IV (Km. 60)				Spot V (Km. 70)			
	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %
1. Cornulaca monacantha	201	100	5	18.06	215	100	5	18.10	60	50	3	3.15	113	90	5	7.94	170	100	5	14.49
2. Bassia muricata	130	100	5	11.68	111	100	5	9.34	61	50	3	3.20	115	90	5	8.08	111	90	5	9.46
3. Polycanpaea repens	100	100	5	8.98	101	100	5	8.50	170	100	5	8.92	99	95	5	6.96	108	85	5	9.21
4. Calligonum comosum	61	50	3	5.48	71	70	4	6.00	30	15	1	1.57	47	70	4	3.30	77	70	4	6.56
5. Moltkiopsis ciliata	71	70	4	6.38	76	85	5	6.40	190	100	5	9.97	117	70	4	8.22	73	75	4	6.22
6. Mosonia nivaea	81	70	4	7.28	87	85	5	7.32	210	100	5	11.02	107	75	4	7.52	70	65	4	5.97
7. Eremobium aegyptiacum	69	70	4	6.20	79	85	5	6.65	203	100	5	10.66	101	65	4	7.10	73	60	3	6.22
8. Ifloga specata	20	30	2	1.80	35	25	2	2.95	13	15	1	0.68	116	60	3	8.15	41	60	3	3.50
9. Cotula cinerea	80	30	2	7.19	90	30	2	7.58	206	100	5	10.81	89	60	3	6.25	78	60	3	6.65
10. Senecio disfontainei	50	30	2	4.49	60	25	2	5.05	215	100	5	11.29	81	60	3	5.69	57	50	3	4.86
11. Reichardia tingitana	50	30	2	4.49	55	25	2	4.63	103	70	4	5.41	133	70	4	9.35	85	50	3	7.25
12. Stipagrostis plumosa	88	85	5	7.91	61	85	5	5.13	219	100	5	11.50	100	75	4	7.03	81	50	3	6.90
13. Pennisetum divisum	40	70	4	3.59	50	80	5	4.21	113	90	5	5.93	57	70	4	4.92	83	50	3	7.08
14. Launaea nudicaulis	24	25	2	2.16	30	20	1	2.52	35	20	1	1.84	51	20	1	3.58	21	20	1	1.79
15. Launaea macronata	20	20	1	1.80	30	10	1	2.52	47	20	1	2.47	95	20	1	6.68	20	15	1	1.70
16. Neurada procumbens	25	15	1	2.25	35	10	1	2.95	27	20	1	1.42	1	5	+	0.07	23	20	1	1.960
17. Launaea capitata	1	5	+	0.09	1	5	+	0.08	1	5	+	0.05	1	5	+	0.07	1	5	+	0.09
18. Chloris gayana	1	5	+	0.09	-	-	-	-	1	5	+	0.05	-	-	-	-	-	-	-	-
19. Zygophyllum album	1	5	+	0.09	-	-	-	-	1	5	+	0.05	-	-	-	-	-	-	-	-
	1113			100	1188			100	1905			100	1423			100	1173			100

F.I. = Frequency index (%) F.C. = Frequency class (%) P. = Presence (%) as related to the total number

Table (26) Floristic composition of stand of 20 quadrates (every one 10 x 10 m) representing Cornulaca monacantha community studied in different spot areas extended from km 30 to km 70 of Cairo-Alexandria Desert Road during spring of 1989 (at the end week of April 1989).

Species	Spot I (Km. 30)				Spot II (Km. 40)				Spot III (Km. 50)				Spot IV (Km. 60)				Spot V (Km. 70)			
	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %	Total No.	F.I. %	F.C. %	P %
1. Cornulaca monacantha	110	100	5	19.82	117	100	5	20.67	31	30	2	2.93	88	90	5	14.86	70	100	5	13.21
2. Bassia muricata	78	100	5	14.05	90	100	5	15.90	20	20	1	1.89	97	95	5	16.39	61	100	5	11.51
3. Polycarpaea repens	67	70	4	12.07	79	90	5	13.96	110	70	4	10.41	87	85	5	14.70	70	85	5	13.21
4. Calligonum comosum	11	20	1	1.98	15	15	1	2.65	12	10	1	1.13	8	10	1	1.35	9	10	1	1.70
5. Moltkiopsis ciliata	35	30	2	6.31	36	50	3	6.36	101	85	5	9.55	35	25	2	5.91	27	20	1	5.09
6. Mosonia nivea	34	30	2	6.13	31	35	3	5.48	99	80	5	9.37	34	30	2	5.74	25	10	1	4.72
7. Eremobium aegyptiacum	30	25	2	5.41	37	40	2	6.54	124	75	4	11.73	33	30	2	5.57	33	25	2	6.23
8. Ifloga specata	22	20	1	3.96	13	10	1	2.30	10	5	+	0.95	27	25	2	4.56	30	20	1	6.23
9. Cotula cinerea	22	20	1	3.96	15	10	1	2.65	111	80	5	10.50	19	20	1	3.21	23	20	1	4.34
10. Senecio disfontainei	21	15	1	3.78	13	10	1	2.30	115	80	5	10.88	21	15	1	3.55	22	20	1	4.15
11. Reichardia tingitana	10	10	1	1.80	13	10	1	2.30	88	75	4	8.33	29	15	1	4.90	23	15	1	4.34
12. Stipagrostis plumosa	58	50	3	10.45	59	50	3	10.42	111	90	5	10.50	56	40	2	9.50	75	35	2	14.15
13. Pennisetum divisum	41	45	3	7.39	42	40	2	7.42	71	60	3	6.72	41	45	3	6.93	44	30	2	8.30
14. Launaea nudicaulis	5	5	+	0.90	1	5	+	0.18	16	10	1	1.51	3	5	+	0.51	3	5	+	0.57
15. Launaea macronata	6	5	+	1.08	1	5	+	0.18	18	15	1	1.70	3	5	+	0.51	6	5	+	1.13
16. Neurada procumbens	5	5	+	0.90	4	5	+	0.71	19	15	1	1.80	11	5	+	1.86	9	5	+	1.70
17. Launaea capitata	-	-	-	-	-	-	-	-	-	5	+	0.09	-	-	-	-	-	-	-	-
18. Chloris gayana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19. Zygophyllum album	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	555				566			100	1057			100	592			100	530			100

F.I. = Frequency index (%) F.C. = Frequency class (%) P. = Presence (%) as related to the total number

II- ECO-PHYSIOLOGICAL STUDIES

1) Water saturation deficit (W.S.D.)

As mentioned before water saturation deficit is the proporiton of the absorbed water by living tissues as related to the differences between the saturation and dry matter contents, $\frac{(\text{Saturation} - \text{fresh weight})}{\text{saturation} - \text{dry weight}} \times 100$ according to Slatyer and Macllory (1961). It must be mentioned that many precaution had been done to avoid and menimize water losses from the plant material from collection to determination of W.S.D. Water saturation deificit is the capacity of plant material tissues to absorb distilled water. Many factors affecting this capacity. The collecting data of W.S.D. are tabulated in Tables (27 and 28). It could be revealed from the data the following conclusions:

1) In general, water satuation deficits were higher during the season of 1989 than those corresponding season 1988. This may be related partially to the fact that the season of 1988 was more wet than season 1989.
2) As a general, also, the water saturation levels were higher in different plants species organs during the middle of May (the begenning of dry season) than corresponding ones of those estimated during the first

of March (the end of wet season). This is of course connected partially with the higher level of water in plant tissues materials during the wet season than dry season. The higehr soil moisture level is the higher in water absorption by plant. In addition, temperature, wind velocity, and relative humidity of the surrounding air to the plant, all of them affecting water absorption and plant water losses throughout transpiration system. This means that all the climatic and soil factors affecting the absorption and the losses of water and hence play important role in the values of water saturation deficit levels.

The same conclusion may be discussed the lower of W.S.D. of the collected plants organs from the spot III of the cultivated area of Km 50 than those corresponding ones of km 70 of the uncultivated area.

3) The water saturation deficit levels were varies with the studied plant organs of the different plant species, Plant species its self differed in the values of W.S.D. This conclusions may be discussed on one or more of the following factors which affecting water absorption by any of plant tissue organ.

a) Every plant species having its own specific morphological and anatomical structures to exceed the

amount of water absorption over the water losses. hence, different plants are varies in its capacities to absorb water and minimize the water loss accordingly to the morphological structure which discussed before through macromorphology and phenology. With regard to the variable anatomical structure, the detail studies must be carried out if the question is to be fully answered. However, it must be mentioned that all of the desert habitat plants having good anatomical structure to exceed water uptake over the water loss, and that are through different plant organs.

b) The inner different physiological processes play aditional role for the variable levels of water saturation deficit. Cell sap concentration and osmotic potential are in complete dinamic changes according to the degree of water stress conditions either in soil or in plant. This dinamic changes of cell sap concentration and its osmotic potential are varies in the degree from plant to another, from organ to another, and from tissue to another. It is concluded by many workers that water stress increases the cell sap concentration and osmotic potential (Petinov and Ivanov, 1957; Sherbenesku, 1960; Birke, 1965; Inoscu,

1968; Brici et al., 1969; Gabr et al., 1974 and Batanouny et al., 1988). Osmotic potential is the function of solute concentration in the cell, so that loss of water from the cell increases solute concentration, which is turne leads to reduction in osmotic potential to more negative values (Simpson, 1981). The same author concluded also that the adjustment of osmotic potential helps to maintai cell and tissue tusgor, which is necessary for continued cell function and growth. The solutes that accumulate during osmoregulation seem to be varies with plant species but may include organic acids and sugars.

It is known that water in cell sape is found in two forms bound and free water (Avetisjan and Smbatjan, 1962; Gabr et al., 1970 and Kandil, 1982). Under water stress the bound water related to free water increases progressively with increasing water stress and that correlating with the reduction of growth (Avetisjana and Smbatjan, 1962). It could be discussed our finding of the growth reduction of different studied plant species which had been mention before through phenology under water stress period or habitat to the conclusion of Avetisyjana and Smbatjan (1962) which was discussed later.

considerable amount of colloidal material is present in both living and dead plant cells, proteins and polypeptides are hydrophilic colloids - that are they have strong attraction for water, i.e, strong water imbibition materials. In addition, plant cells possess considerable amount of carbohydrate, in the form of cellulose and starch, by which water is strongly attracted. The adsorption of water to the surfaces of these hydrophillic collids is of major importance to the imbibition process. The water potential of biological system is more negative by the presence of these adsorptive, or water-binding materials. To these materials or to the forces they generate, the term "matric potential" is applied instead of "imbibition pressure". Many plant material could retard or inhibit the adsorption of water, as wax, which cover many of plant organs, and the thickness of this material is differed from plant to another. The above mentioned informations were concluded after Devlin and Witham (1983).

According to the above mentioined information the water saturation deficit variability between different plants species and variable tested plants organs which collected from variable conditions may be related not

Table (27) Water saturation deficit (W.S.D.) in the collected plants from Spot III and V during the first of March, (the end of wet season), and the middle of May, (the begenning of dry season), of 1988.

Species	2.3.1989										16.5.1989									
	Spot III (km 50)					Spot V (km 70)					Spot III (km 50)					Spot V (km 70)				
	Root	Stem	Leaves	*Fruits	Average	Root	Stem	Leaves	*Fruits	Average	Root	Stem	Leaves	*Fruits	Average	Root	Stem	Leaves	*Fruits	Average
Calligonum comosum	20.1	21.1	-	-	20.6	22.1	23.3	-	-	22.7	25.1	25.3	-	-	25.2	26.2	27.7	-	-	26.95
Polycarpaea repens	35.1	30.4	44.2	40.1	37.45	36.4	33.7	45.6	40.7	39.1	36.6	33.4	42.1	43.7	38.95	38.9	35.4	46.5	44.7	41.38
Bassia muricata	34.4	37.5	40.1	-	37.33	35.6	38.6	41.3	-	38.5	36.6	39.4	44.5	-	40.17	39.5	40.4	46.7	-	42.2
Cornulaca monacantha	42.4	45.5	50.1	-	46.0	45.6	46.7	51.3	-	47.87	45.9	47.5	51.9	-	48.43	46.7	48.6	53.9	-	49.73
Eremobium aegyptiacum	31.4	33.7	35.2	40.1	35.1	33.7	34.6	37.4	42.1	36.95	35.0	37.7	39.1	44.1	38.98	37.3	39.1	40.2	46.7	40.83
Neurada Procumbens	44.0	40.2	43.4	20.0	36.9	45.5	43.4	44.9	23.8	39.4	47.7	44.9	46.3	25.2	41.03	49.8	46.7	48.9	30.5	43.98
Monsonia nivea	31.5	30.5	43.0	19.2	31.05	33.7	35.1	44.5	19.9	33.3	35.6	37.6	46.7	23.8	35.98	37.9	38.9	48.6	30.4	38.95
Molthiopsis ciliata	35.6	41.2	35.1	-	37.3	37.2	44.8	37.9	-	39.97	40.4	47.5	40.3	-	42.73	41.3	50.6	43.5	-	45.13
Senecio disfontianei	30.2	34.4	32.2	40.1	34.26	33.4	35.8	33.7	44.9	36.95	36.7	37.9	35.9	50.1	40.15	39.9	39.8	39.4	53.6	43.18
Ifloga specata **	30.1	-	40.3	-	35.2	35.1	-	44.8	-	39.95	37.7	-	49.8	-	43.75	38.9	-	53.1	-	46.0
Cotula cinerea	32.0	19.4	40.2	43.4	33.75	34.9	21.3	43.4	46.5	36.65	37.9	24.5	45.6	49.7	39.43	40.1	28.8	50.1	53.6	43.15
Reichardia tingitana	34.2	30.1	39.4	22.1	31.45	38.9	33.4	44.1	29.2	36.4	40.4	37.7	46.3	33.5	49.48	43.1	40.3	49.1	35.6	42.02
Launea nudicaulis	30.1	22.4	30.1	40.2	30.7	33.9	27.9	34.1	45.1	35.25	37.9	30.4	36.5	49.5	38.58	40.4	35.6	39.5	51.2	41.68
Launea macronata	32.2	35.1	36.1	31.2	33.65	35.1	37.2	37.9	33.5	35.93	37.2	39.5	39.5	37.8	38.5	40.1	44.2	43.7	40.9	42.23
Stipagrostis plumosa	30.1	7.2	30.6	34.5	25.6	37.2	9.3	35.7	37.9	30.03	40.4	13.5	40.2	39.7	33.45	43.1	17.2	44.5	44.9	37.43
Rennisetum divisium	35.5	34.1	36.7	30.4	33.68	35.6	35.6	37.9	34.6	35.93	37.7	37.5	39.3	37.7	38.05	38.3	39.4	41.2	39.5	39.6
Average	32.9	30.9	37.9	32.8	37.96	35.6	33.4	41.0	36.2	36.55	38.0	35.6	42.9	39.5	38.93	40.1	38.2	56.2	50.5	41.53

* Fruits incLude different stages of varialbe fruit ripening (from fruit set till fruit ripenning
** It is dificult to separate stems from leaves
- = Not available during estimation time or it was difficult to separate it from whole plant.

Table (28) Water saturation deficit (W.S.D.) in the collected plants from Spot III and V during the first of March, (the end of wet season), and the middle of May, (the beginning of dry season), of 1989.

Species	2.3.1989										16.5.1989									
	Spot III (km 50)					Spot V (km 70)					Spot III (km 50)					Spot V (km 70)				
	Root	Stem	Leaves	*Fruits	Average	Root	Stem	Leaves	*Fruits	Average	Root	Stem	Leaves	*Fruits	Average	Root	Stem	Leaves	*Fruits	Average
Calligonum comosum	-	35.8	-	-	35.8	-	40.6	-	-	40.6	-	39.4	-	-	39.4	-	44.5	-	-	44.5
Polycarpaea repens	50.9	56.8	60.1	60.5	57.1	52.7	60.3	61.5	61.7	59.05	55.1	63.1	62.4	63.7	60.6	57.1	63.2	64.1	65.1	62.38
Bassia muricata	48.6	55.9	51.2	-	51.9	50.3	57.2	53.4	-	53.63	51.9	59.1	56.1	30.1	49.3	53.4	60.2	58.9	31.2	50.93
Cornulaca monacantha	58.9	57.6	61.9	-	59.5	61.4	60.4	63.2	-	61.7	64.5	61.3	64.1	-	63.3	65.9	64.1	67.5	-	65.83
Eremobium aegyptiacum	43.2	50.9	57.4	54.5	51.5	45.1	51.4	60.0	60.3	54.2	47.3	53.5	64.1	61.7	56.65	49.5	55.1	65.1	61.8	57.88
Neurada Procumbens	53.6	54.4	58.9	24.1	47.8	55.7	56.5	60.2	25.3	49.43	54.5	57.7	61.2	30.4	50.95	55.6	58.9	63.4	32.5	52.6
Monsonia nivea	42.8	49.9	50.1	25.1	42.0	44.2	53.4	52.1	26.4	44.03	46.5	54.7	54.1	28.5	45.95	47.7	55.9	56.7	33.5	48.45
Molthiopsis ciliata	48.1	63.2	51.2	-	54.2	50.4	65.4	54.3	-	56.7	49.9	64.7	57.1	-	57.23	53.5	66.7	60.1	-	60.1
Senecio disfontianei	46.8	53.9	42.4	50.7	48.5	50.1	56.5	49.1	54.5	52.55	51.7	57.8	50.6	55.5	53.9	53.4	59.1	52.9	57.0	55.6
Ifloga specata**	47.7	-	55.3	-	51.5	53.4	-	60.4	-	56.9	54.5	-	60.1	-	57.3	56.7	-	36.1	-	46.4
Cotula cinerea	47.3	29.5	54.4	59.3	47.6	51.1	32.1	56.5	61.4	50.28	53.2	33.1	57.7	61.5	51.38	59.5	35.6	59.4	61.7	52.8
Reichardia tingitana	52.4	44.6	59.0	36.4	48.1	55.1	50.1	60.1	38.5	50.95	56.7	53.5	61.3	39.4	52.73	57.7	54.5	61.7	39.7	53.4
Launea nudicaulis	47.2	32.7	44.9	50.2	43.8	50.1	36.4	49.5	52.4	4.71	49.9	36.7	50.1	53.4	47.53	51.1	3.74	51.5	55.6	48.9
Launea macronata	50.6	49.9	50.3	47.4	49.6	51.3	50.1	53.1	50.0	51.13	53.0	51.6	54.1	52.0	52.68	55.1	53.2	55.3	55.6	54.8
Stipagrostis plumosa	43.1	16.4	44.9	50.2	38.65	45.1	15.5	46.1	52.1	39.7	44.1	17.2	47.5	54.1	40.73	46.2	19.1	47.9	55.9	42.28
Rennisetum divisium	59.2	53.3	59.0	50.1	55.4	60.1	55.1	60.3	53.4	57.23	60.2	56.0	60.0	52.1	57.08	61.3	57.9	60.7	53.4	58.33
Average	51.2	46.3	53.4	50.8	48.93	52.3	49.4	56.0	44.7	51.57	52.3	51.1	57.4	48.5	52.29	54.9	48.4	57.4	50.0	53.45

** It is difficult to separate stems from leaves.
* Fruits include different stages of variable fruit ripening(from fruit set till fruit repening).
- = Not available during estimation time or it was difficult to separate it from whole plant

only from the dinamic changes in cell sap, but also to the matric potential variabilities as well.

It must be mentioned that detail studies must be carried out to clarify the co-relation between the studied plants components and structures, and the water deficit, to get some clue informations about the dwarfism growth behaviour of such plants under arid zone, and the role of plant-water relationships in this respect.

2) Seasonal changes in the percentage of total ash and crude fibers :

It could be concluded from the previous study that every plant grown under natural conditions of Cairo-Alexandria desert road zone near Cairo having its own characteristic morphogenesis aspects for tolerating the drought conditions. It is known that every plant having also its own physiological tools for additional tolerations to droughtness. Ash, fibers, minerals status, charbohydrates, protein and amino acids are ones of those help the plant to survival under drought conditions.

Ash and crude fibers contents as percentage are tabulated in Table (29).

It could be revealed from the data that there is some fluctuation in the percentage of total ash and crude fibers within the study species. This may be discussed on the bases that the capacity of different minerals uptake by the plants is quite vary, hence the accumulation of such minerals are variable between different plant species. It must be mentioned that many of the salts in the plant play an important role as water holding substances in plant tissues, i.e., enhancing the osmotic potential. This depends on the characteristic of ionization capacity of the salt.

It could be stated also that total ash percentage are higher under the uncultivated area (Spot V of km 70) of the different studied plant species than those corresponding ones grown under the cultivated area. This means that the growing plants under the more drought conditions directed their effort to the more accumulation of different salts to raise their osmotic potential capacity.

It could be also revealed that the accumulation of different salts (ash) increased during the more dry season over those found during the end of wet season. This may be related to the tendency of the plant to directed its effort to the highr uptake and hence the more accumulation of

mineral salts during the most dry season and habitat to raise the osmotic potential.

With regards to the crude fibers percentage, it could be revealed that the major component of this matter is composed mainly cellulose. Such metabolic product which play an important role for preserving water in plant tissues, as such product is one of the main colloidal system in plant and can adheir and adsorb water.

Accordingly it was found from the data that such product increased either under more arid zone (Sot V) over the less arid zone (Spot III) or under the more arid season than the less one. In other words, different desert studied plants under discussion, direct their efforts to the more formation and accumulation of crude fibers, i.e., mainly cellulose under either the more arid zone or season. this is considered as one of the environmental factors that affecting the metabolic physiological process within the plant. This change may be essential for supporting plant life unde drought conditions.

It was clear form the above mentioined results that as and fibers percentage changed under drough conditions. Accordingly, our study was extended to clarify the

Table (29) Percentage of total ash and crude fibers (1988)

Species	Ash %				Crude fibers %			
	1.3.1988		14.5.1988		1.3.1988		14.5.1988	
	Spot III	Spot V	Spot III	Spot V	Spot III	Spot V	Spot III	Spot V
Calligonum comosum	10.13	11.14	11.33	12.99	33.17	35.16	34.17	36.39
Polycarpaea repens	11.12	11.99	12.22	13.65	30.33	34.25	31.45	36.23
Bassia muricata	10.33	11.21	11.77	13.63	29.17	33.21	30.23	35.17
Cornulaca monacantha	10.44	11.54	11.85	13.67	35.16	36.34	36.79	37.79
Eremobium aegyptiacum	10.51	11.42	11.63	13.81	34.17	35.45	35.34	37.81
Neurada procumbens	10.21	11.23	11.39	12.91	29.17	33.22	31.19	35.61
Monsonia nivea	9.94	10.89	11.17	12.15	28.19	30.33	30.27	35.19
Moltkiopsis ciliata	10.19	11.23	11.88	12.17	31.27	32.16	33.19	33.21
Senecio disfontianei	10.91	11.35	11.74	12.55	20.17	25.21	25.21	29.32
Ifloga specata	10.00	11.71	11.83	12.93	28.21	29.34	30.71	33.29
Cotula cinerea	10.12	11.13	11.44	12.81	29.97	31.82	30.89	33.73
Reichardia tingitana	10.99	11.27	11.82	12.94	30.14	31.74	32.19	33.17
Launea nudicaulis	10.51	11.34	11.77	12.96	30.27	31.76	31.97	33.72
Launea macronata	9.94	11.99	11.34	13.19	28.19	29.94	30.25	34.78
Stipagrostis plumosa	9.79	10.17	10.17	14.61	34.72	36.42	35.19	38.31
Pennisetum divisum	9.00	10.61	10.97	12.73	33.17	35.44	35.63	38.92

concentrations of some minerals in the plant tissues during the end of the wet season of 1988, 1.3.1988.

3. Status of some macro-and micro-nutrients in different plant tissues during the end of wet season of 1988.

Tables 30 and 31 represented the data of some macro and micro-nutrients in different plant species during the end of wet season of 1988 in the terms of concentration (mg/gr or ppm, i.e. mg on dry weight basis) and the percentage distribution of different nutrients as related to the total amount, respectively.

Before discussing the data, it must be mentioined that we consider sodium as one of the macro-nutrient, as it is one of the beneficial elements for many plants especially those adapted to grow under soils contain high amounts of salt. Also, magnesium was found to contain a relatively lower amounts than the normal cultivated plants, thus, it was arranged under micro-elements. It must be mentioned also that the polutant heavy metals of lead and cadmium were absent completely from the various tested plants in spite of the presence of our plants near the road, and as such elements resulted from the waste of the cars either using benzene or solar. This finding may be explained on the basis that the studied plants can not absorb such toxic

limiting variance between the concentration of calcium in the different plant species tissues, but all of them are grouped under Calcicole. This based on our finding that calcium is the main abondance element in all of the studied plants species. Cornulaca monacantha is the master in this respect with may other species. This is means that different vegetations community having the same homogenous calcium requrement. Thus, every plants found in this community is adapted to the higher amounts of calcium in the soil.

It has been notice by Crawford (1978), that certain plants growing on calcareous soils take up large quantities of soluble calcium and this is matched in the plant by the accumulation of large quantities of malate. Other species contain very little soluble calcium as the presence of oxalic acid rather than malate in these species ensures that any calcium that does find its way into the cell is precipitated as oxalate salt. On the basis of Crawford (1978) conclusion, he suggested that plants fall into three categories in the relation to the calcium status of the cell sap:

a) The oxalate type plants in which calcium is insoluble form (calcium oxalate, b) the calciotrophe type plants which contain a high concentration of soluble calcium compounds.

heavy metals or may be related to the higher calcium in plant tissues and soils, as it was concluded by Abd El Dayem (1987) that the presence of calcium affected the absorption of lead and cadmium.

It could be revealed from the data the following conclusions :

a) Calcium is the most abondant element within the different studied plants species. This conclusion could be stated from the data calculated as concentration or the proportion. This finding is naturally expected as the main prevalig cation in the soil was calcium. It must be mentioned in this respect that there are two Categories of plants, in general nature, in relation to calcium status in plants and soils (Crawford, 1978) Calcium-loving (Calcicole) and Calcium-avoiding (Calcifuge) plants. Accordingly, the amount of calcium in the soil defined the type of vegetation distribution in any area, as the calcicale (Calcium-loving) plants could be servival under calcareous soil while the other type of the plants (Calcifuge) could not grow or distributed under this soil.

According to this conclusion, our discussed plant are from the Calcicole type, as the main abondance element is Ca in different studied plants tissues. In spite of the

c) The potassium type in which potassium is found in higher amounts than calcium. In our plants, potassium is found in a very low concentration.

Accordingly, we suggested that our plant may be grouped under the first or second group, i.e., the oxalate type of calciotrophe type. It must be mentioned that further studies must be carried out to define the group of every studied plant, if the question is to be fully unswered.

d) The presence of high calcium in the soil reduced the uptake of many elements such as Mg P, K, Fe, Zn and Mn (Crowford, 1978 and Devlin and Witham, 1983). Accordingly, the above mentioned elements are found in very low concentration in different plant species. On other hand, high concentration of calcium in the soil increased availability of Cu. Accordingly it was found a high accumulation of Cu in different studied plant, as Cu concentration in different plant species exceeded greatly the cocentration of Fe.

It could be concluded from the above mentioned results that different studied plants under the environmental conditions prevailing in the study areas accumulated less

Table (30) *Concentration of some macro-and micro-nutrients of the different tested plants at the end of wet season of 1988 (1.3.1988).

Species	Concentration of macro-nutrients (mg/gr dry weight)						micro-nutrient concentration (p.p.m. on dry weight basis)								Total concentration of macro nutrients (mg/gr.)
	N	P	K	Ca	Na	Total	Mg**	Fe	Zn	Cu	Mn	Ca	Se	Total	
igonum comosum	8.90	1.70	0.71	55.10	10.55	76.96	49.05	21.63	2.48	47.83	2.18	0.38	2.38	125.91	77.08591
carpaea repens	8.36	1.67	1.00	54.21	10.00	75.24	49.05	20.45	2.00	43.20	1.65	0.05	1.30	117.70	75.3577
ia muricata	6.22	1.82	0.21	53.21	15.66	77.03	49.33	19.85	1.43	40.88	1.75	0.25	1.00	114.49	77.14449
laca monacantha	6.34	1.65	0.49	62.02	7.05	77.55	49.01	19.75	1.44	38.95	1.89	0.00	0.75	111.79	77.66179
obium aegyptiacum	9.74	1.77	0.70	52.13	6.10	70.44	48.85	15.90	1.58	41.83	1.73	0.03	1.83	111.75	70.55175
ada procumbens	9.74	1.79	0.03	52.34	5.35	69.25	48.63	17.78	2.23	26.35	1.50	1.00	0.45	97.94	69.34794
onia nivea	7.38	1.72	0.50	52.21	5.55	67.36	49.15	21.10	1.80	41.65	1.75	0.03	1.30	116.78	67.47678
kiopsis ciliata	9.82	1.50	0.51	55.21	10.65	77.69	49.15	21.10	1.80	41.65	1.75	0.25	1.30	117.00	77.807
ecio disfontianei	7.94	1.62	1.00	62.21	15.55	88.32	48.85	20.48	1.93	41.28	1.63	0.13	1.48	115.78	88.43578
oga specata	6.42	1.82	0.28	59.73	12.50	80.75	48.90	21.35	1.95	41.30	1.53	0.25	3.18	118.46	80.86846
ula cinerea	6.96	1.56	1.50	64.37	6.65	81.04	49.05	21.63	2.68	43.90	1.78	0.50	1.55	121.09	81.16109
chardia tinqitana	6.96	1.67	1.70	73.25	6.05	89.63	49.00	18.90	1.70	37.15	2.13	0.33	0.70	109.91	89.73991
naea nudicaulis	6.72	1.62	0.92	69.76	6.65	85.67	48.20	22.08	3.00	46.95	1.78	0.03	0.80	122.84	85.79284
naea macronata	6.88	1.84	0.52	63.31	7.05	79.60	48.93	16.65	1.78	41.63	1.03	0.00	1.30	111.32	79.71132
pagrostis plumosa	9.40	1.70	0.07	59.03	6.05	76.25	48.40	19.58	2.15	48.88	1.83	0.75	1.03	122.62	76.37262
nnisetum divisum	5.54	1.58	0.60	55.04	6.10	68.86	49.40	18.25	3.30	46.83	2.05	0.25	1.88	121.96	68.98196

* Determination was carried out on the whole plants collected from different spot areas (whole plant including all different plant organs presented during determination).

** As the concentration of Mg is very low, thus is consedered in this cas as one of micro-nutrients.

Table (31) Percentage distribution of some mineral nutritios as related to the total amounts of the different tested plants at the end of wet season of 1988 (1.3.1988).

Species	% distribution as related to total macro-nutrients						% distribution as related to total micro-nutrients								% of macro-	% of micro-	Total
	N	P	K	Ca	Na	Total	Mg**	Fe	Zn	Cu	Mn	Ca	Se	Total			
lligonum comosum	11.6	2.2	0.9	71.6	13.7	100	39.0	17.2	2.0	38.0	1.7	0.3	1.9	100	99.84	0.16	100
lycarpaea repens	11.1	2.2	1.3	72.0	13.3	100	41.7	17.4	1.7	36.7	1.4	0.0	1.1	100	99.84	0.16	100
ssia muricata	8.1	2.4	0.3	69.0	20.3	100	43.1	17.3	1.2	35.7	1.5	0.2	0.9	100	99.85	0.15	100
rnulaca monacantha	8.2	2.1	0.6	80.0	9.1	100	43.8	17.7	1.3	34.8	1.7	0.0	0.7	100	99.86	0.14	100
enobium aegyptiacum	13.8	2.5	1.0	74.0	8.7	100	43.7	14.2	1.4	37.0	1.5	0.0	1.6	100	99.84	0.16	100
urada procumbens	14.1	2.6	0.0	75.6	7.7	100	49.7	18.2	2.3	26.9	1.0	0.5	0.5	100	99.86	0.14	100
nsonia nivea	11.0	2.6	0.7	77.5	8.2	100	42.1	18.1	1.5	35.7	1.5	0.0	1.1	100	99.83	0.17	100
ltkiopsis ciliata	12.6	1.9	0.7	71.1	13.7	100	42.0	18.1	1.5	35.6	1.5	0.2	1.1	100	99.85	0.15	100
enecio disfontianei	9.0	1.8	1.1	70.4	17.6	100	42.2	17.7	1.7	35.7	1.4	0.1	1.3	100	99.87	0.13	100
floga specata	8.0	2.3	0.3	74.0	15.5	100	41.3	18.0	1.6	34.9	1.3	0.2	2.7	100	99.85	0.15	100
otula cinerea	8.6	1.9	1.9	79.4	8.2	100	40.5	17.9	2.2	36.3	1.5	0.4	1.3	100	99.85	0.15	100
eichardia tingitana	7.8	1.9	1.9	81.7	6.7	100	44.6	17.2	1.5	33.8	1.9	0.3	0.6	100	99.88	0.12	100
aunaea nudicaulis	7.8	1.9	1.1	81.4	7.8	100	39.2	18.0	2.4	38.2	1.4	0.0	0.7	100	99.86	0.14	100
aunaea macronata	8.6	2.3	0.7	79.5	8.9	100	44.0	15.0	1.6	37.4	0.9	0.0	1.2	100	99.86	0.14	100
Stipagrostis plumosa	12.3	2.2	0.1	77.4	7.9	100	39.5	16.0	1.8	39.9	1.5	0.6	0.8	100	99.84	0.16	100
Pennisetum divisum	8.0	2.3	0.9	79.9	8.9	100	40.5	15.0	2.7	38.4	1.7	0.2	1.5	100	99.82	0.18	100

* Determination was carried out on the basis of data presented in Table (30)

** As the amount of Mg was very low, thus it is consedered in this case as one of micro-nutirents.

proportions of P, K, Mg, Fe, Zn and Mn than Cu. The high concentration of Cu may be toxic to many plants (Dwlin and Withan, 1983). However, our plants may tolerate the toxicity of high Cu. The high concentration and the proportion of Cu in our plants indicate that such plants absorb and accumulate more Cu than other of the micro-nutrients elements. This lead us to the assumption that the different studied plant species adapted their physiological process to survival under the high amounts of Cu. In addition, the studied plants could be used for removal of Cu from the soil to be used for cultivation. The toleration of different species to the high accumulation of Cu indicates that the different plant species under discussion are related to each others in their nutrients uptake, accumulation and balance. Hence, they are homogeneous in their nutrient requirements.

b) As the soil is poor in potassium, and the low capacity of the studied plants to absorb this element, thus, the accumulation and the proportion of K are very low. At the same time high sodium accumulation may replace partically the function of K as one of the main cation affecting osmostic potential. The high accumulation and proportion of sodium in different plants tissues indicate also the homogeneous of the studied plants in the community

In addition, it was suggested that high calcium proportion and concentrtion in different plants tissues may play a role for preventing the toxicity of high sodium concentration. It could be concluded that the different plant species under the environmental conditions prevailijng i the studied areas adapted their growth to the low level of potassium in the soil and accumulated high proportion of sodium.

It could be noticed from the different above mentioned information that the distribution of different studied plant species under the community of *Cornulaca monacantha* were not found by chance in this area but they well adapthed to the edaphic conditions, beside the climatic factors. Also, the different plant species survival under this community are homogeneous in their requirements from the nutrient.

4) Photosynthetic Pigments :

It was observed that different plant species grown under the different environmental conditions seemed to have a variable degree of green colour. Also, it was reported by many workers that water deficit affected the formation of chloroplast pigments, Moursi et al., 1978 and 1979; Hussein et al., 1980, Maranville and Paulsen, 1970; Albert et al.,

1977; Gabr et al., 1979, Batanouny et al., 1988 and Many others). Accordingly, it was thought advisable to extend our study to include the accumulation of chloroplast pigments in relation to the fresh weight unit. Also, the ratio between chlorophyll a to b, and a + b to carotenoids was also included. Such data are tabulated in Table (32).

It could be noticed from the data the following conclusions :

a) The concentration of chlorophyll a was higher in different tested plants than chlorophyll b. Thus, the ratio between chlorophyll a to b was always higher indicating the dominance of chlorophyll a in diffrent plant species.

b) It is well known that chlorophyll a is blue-green, while chlorophyll b is yellow green. This indicate that the pall green colour or the grey of many plants is not related to the concentration of chlorophyll but related to the matrerials covering the plant surfaces such as hairs or waxes. For example, *Neurade procumbens* and *Monsonia nivea* seemed to be grey green, but they contain higher amounts than many of the studied plants. This finding added more support evidence that every plant could adapt its growth by many ways and could protect itself from the bright sun-lite

under desert conditions, as the hairs and waxes may lower the danger effects of bright sun-light by reflecting it again to the atmosphere, beside lowring the loss of water.

c) It could be concluded also that the concentration of chlorophyll a or b is variable from plant to another, as seemed to be have its own preservation to avoid the photooxidation of chlorophyll under the open area. This preservation may include the concentration of carotenoids. One of the possible role of carotenoids is the protection of chlorophyll from photoorxidation. accordingly, the high level of carotenoids in *Monsonia nivea, senecio disfentainie, launea nudicaulis* and many others, may be one of the great adaptability of such plants to survival under desert conditions. This is not mean that other plant species do not having a protective tools for minimizing the dangrous effect of the bright sun-light under desert conditions. the compacting growth behaviour of many plant as discussed before surve as one of this protection.

d) It could be concluded that different plant species survived under this community seemed to have a great variable concentration of chloroplast pigments, and they are not homogeneous in this respect.

Table (32) Different fraction of chloroplast pigments as concentration (mg/gr fresh weight) and the ratio between each other of the different tested plants at the end of wet season of 1988 (1.3.1988).

Species	mg/gr fresh weight					Ratio	
	Chlo. a	Chlo. b	a+b	Caro.	a+b + Caro.	a/b	a+b/ Caro
Calligonum comosum	0.46	0.17	0.63	0.21	0.84	2.71	3.00
Polycarpaea repens	0.58	0.20	0.78	0.25	1.03	2.90	3.21
Bassia muricata	0.42	0.18	0.60	0.22	0.82	2.33	2.73
Cornulaca monacantha	0.48	0.11	0.59	0.28	0.87	4.36	2.11
Eremobium aegyptiacum	0.64	0.22	0.86	0.39	1.25	2.91	2.21
Neurada procumbens	0.70	0.37	1.07	0.23	1.30	1.89	4.65
Monsonia nivea	0.72	0.26	0.98	0.41	1.39	2.77	2.39
Moltkiopsis ciliata	0.51	0.21	0.72	0.23	0.95	2.43	3.13
Senecio disfontianei	0.85	0.30	1.15	0.38	1.53	2.80	3.03
Ifloga specata	0.53	0.23	0.76	0.26	1.02	2.30	2.92
Cotula cinerea	0.44	0.13	0.57	0.26	0.83	3.38	2.19
Reichardia tingitana	0.41	0.17	0.58	0.24	0.82	2.41	2.42
Launaea nudicaulis	0.81	0.32	1.13	0.39	1.52	2.53	2.90
Launaea macronata	0.31	0.12	0.43	0.19	0.62	2.58	2.26
Stipagrostis plumosa	0.41	0.22	0.63	0.20	0.83	1.86	3.15
Pennisetum divisum	0.28	0.07	0.35	0.18	0.53	4.00	1.94

Chlo. = Chlorophyll. Caro. = Caretenoids

5) Carbohydrate Contents :

Table (33) representing the data of some fractions of carbohydrates, i.e., reducing and non-reducing sugars, as well as poly hydrolizable saccharides in the terms of mg/gr dry weight as well as the ratio between each others.

It could be revealed, as a general that reducing sugars are the main dominant fractions of carbohydrate, followed by poly-saccharides and the nun-reducing sugars ranging the their in this respect, as it is the lowest fractions found in different plant species.

It is well known that carbohydrates accumulation in plant tissue is in complete dynamic changes from fraction to another, and a newly daily formation of carbohydrates is carried out through photothynetic process. On the other hand, some of carbohydrates may be consumed for releasing the vital energy, and some of it may be changed into a more complex compounds, as the most of different organic matters in the plants are derived from carbohydrate.

It could be mentioned, as a general, that different tested plants occupied high concentratin of reducing sugars which functionaly as one of the main materials for regulating more water holding capacity, through the control

Table (33) *Carbohydrates factions expressed as mg dextrose/gr dry weight of the different tested plants at the end of wet season of 1988 (1.3.1988).

Species	Carbohydrates concentration as mg dextrose/gr dry weight					% as related to total sugars			% as related to total carbohydrates		
	R.S.	N.R.S.	T.S.	P.S.	T.C.	R.S.	N.R.S.		T.S.	P.S.	
Calligonum conosum	52.72	4.65	57.37	15.54	72.91	91.89	8.11	100	78.69	21.31	100
Polycarpaea repens	48.55	4.75	53.30	18.52	71.82	91.09	8.91	100	74.21	25.79	100
Bassia muricata	58.92	4.74	63.66	17.10	80.76	92.55	7.45	100	78.83	21.17	100
Cornulaca monacantha	48.65	3.13	51.78	16.00	67.78	93.96	6.04	100	76.39	23.61	100
Eremobium aegyptiacum	49.16	5.16	54.32	19.00	73.32	90.50	9.50	100	74.09	25.91	100
Neurada procumbens	36.41	4.73	41.14	16.52	57.66	88.50	11.50	100	71.35	28.65	100
Monsonia nivea	56.32	5.72	62.04	19.51	81.55	90.78	9.22	100	76.08	23.92	100
Moltkiopsis ciliata	56.31	4.71	61.02	18.93	79.95	92.28	7.72	100	76.32	23.68	100
Senecio disfontianei	54.97	6.15	61.12	12.01	73.13	89.94	10.06	100	83.58	16.42	100
Ifloga specata	50.77	3.12	53.89	13.52	67.41	94.21	5.79	100	79.94	20.06	100
Cotula cinerea	42.42	10.11	52.53	25.01	77.54	80.75	19.25	100	67.75	32.25	100
Reichardia tingitana	40.31	9.61	49.92	13.00	62.92	80.75	19.25	100	79.34	20.66	100
Launea nudicaulis	52.72	3.22	55.94	20.51	76.45	94.24	5.76	100	73.17	26.83	100
Launea nacronata	50.34	6.91	57.25	23.14	80.39	87.93	12.07	100	71.22	28.78	100
Stipagrostis plumosa	48.12	12.31	60.43	2.51	62.94	79.63	20.37	100	96.01	3.99	100
Pennisetum divisum	47.83	9.21	57.04	2.00	59.04	83.85	16.15	100	96.61	3.39	100

S. Sugars; C. = Carbohydrates; T. = Total; R. = Reducing; N = Non; P.S. = Polyhydrolyzable Sacchasides

* Deter was carried out on the whole plants collected from different spot areas (whole plant including all different plant organs presented during determination).

of osmotic potential. It could be revealed in this respect that all of the studied plants are homogeneous in this respect under the environmental conditions prevailing in the study area.

6) Protein Contents :

Data of different protein fractions are tabulated in Table (34).

It could be revealed from the data that the main domentant fraction is the water soluble protein, followed by borate buffer soluble one, with some exceptions. It is well known that proteinous compounds play an important role for water holding capacity. This water holding capacity is higher when the protein is found in the form of water soluble. With increasing the proportion of water soluble protein the atraction of water increased and the more bound water increased. Accordingly, one of the main water preservation process in different studied plants is the higher accumulation of water soluble protein except *Cornulaca menacantha* and *Ifloga specata* plants in which the borate buffer soluble protein exceed the water soluble one. However, both species have a pronouncing proportion and amounts of water soluble protein. The other species possesed variable amounts and proportions of water soluble

Table (34) Protein fractions expressed as mg/gr dry weight and their percentage distribution as related to the total amounts of the different tested plants at the end of wet season of 1988 (1.3.1988).

Species	Mg/gr dry weight					% destribution				
	W.S.	SaS.	A.S.	B.S.	T.	W.S.	Sa.S.	A.S.	B.S.	T.
Calligonum comosum	21.25	4.25	4.90	20.29	51.20	41.30	8.30	9.56	39.62	100
Polycarpaea repens	19.44	5.06	5.91	16.88	47.25	41.14	10.71	12.51	35.72	100
Bassia muricata	14.03	9.25	4.44	6.17	33.89	41.40	27.29	13.10	18.21	100
Cornulaca monacantha	9.97	7.34	1.32	15.99	34.62	28.80	21.20	3.81	46.19	100
Eremobium aegyptiacum	22.30	14.03	1.40	18.17	55.90	39.89	25.10	2.50	32.50	100
Neurada procumbens	20.92	11.16	7.70	16.01	55.79	37.50	20.00	13.80	28.70	100
Monsonia nivea	14.11	7.36	5.18	14.48	41.13	34.31	17.89	12.59	35.21	100
Moltkiopsis ciliata	21.99	19.79	4.51	10.09	56.38	39.00	35.10	8.00	17.90	100
Senecio disfontianei	16.33	10.18	3.08	15.04	44.63	36.59	22.81	6.90	33.70	100
Ifloga specata	7.96	4.60	10.19	12.65	35.13	21.89	13.09	29.01	36.01	100
Cotula cinerea	11.94	9.28	7.07	9.74	38.03	31.40	24.40	18.59	25.61	100
Reichardia tingitana	13.21	10.01	2.96	12.32	38.50	34.31	26.00	7.69	32.00	100
Launaea nudicaulis	26.79	4.40	1.44	4.37	37.00	72.40	11.89	3.89	11.81	100
Launaea nacronata	23.60	3.91	3.27	7.22	38.00	62.11	10.29	8.61	19.00	100
Stipagrostis plumosa	22.84	8.06	2.69	20.29	53.88	42.39	14.96	4.99	37.66	100
Pennisetum divisum	14.21	6.25	0.37	9.80	30.63	46.39	20.40	1.21	31.99	100

S = Soluble, W = Water, Sa = Salt, A = Alcohol, B = Buffer borate, T = Total

* Determination was carried out on the whole plants collected from different spot areas (whole plant including all different plant organs presented during determination.

protein. This variation indicated that variable proportions of water preservation within the plants which due to protein function in this respect. this is not mean that all of the other protein, without functional effect in this respect, but the higher functional one is the water soluble:

7) Total Amino Acids :

The picture of the total amino-acids in the different studied plants are presented in Table (35).

The main conclusion could be summarized as follows :

1) Their complete variations in the picture of different amino acids was detected with the studied plants.

2) With regard to the protein, it was found that this amino acid was completely varied in different plant species. The presence of this amino acids is considered as the indirect indicator or monitor to the water stress under which the plants survival. The higher amount of protein, the higher water stress occurs. *Stipagrostis plumosa* possessed the highest protein, this indicates that such plant seemed to very sensitive to the water stress.

It could be concluded from various eco-physiological studies that water saturation deficit, as well as the

Table (35) *Total amino acid fractions expressed as mg/gr dry weight of the different tested plants at the end of wet season of 1988 (1.3.1988).

Species	Aliphatic A.A.			Hydroxylic A.A.		Sulpher A.A.		Acidic A.A.		Basic A.A.			Aromatic A.A.			Imino acid or secondary	Total amino acid
	Alanine	Valine	Leucine & Isoleucine	Threonine	Serine	Methionine	Cystine or/ and cysteine	Aspartic	Glutamic or/ and Glycine	Arginine	Thistidine	Lysine	Phenyl-alamine	Tirosine	Proline		
Alligonum comosum	6.55	3.23	4.97	5.29	3.08	2.92	2.51	4.97	5.68	3.63	1.86	1.49	1.81	1.49	1.49		50.97
Glycarpaea repens	5.75	2.89	3.53	1.81	1.57	2.01	1.81	3.73	3.53	3.24	2.01	1.57	1.57	1.57	1.82		38.41
Ossia muricata	7.55	2.93	3.96	2.93	1.31	2.33	1.49	2.75	1.91	2.05	1.72	1.31	1.72	1.72	1.31		36.99
Ornulaca monacantha	6.16	4.60	6.65	1.23	2.75	1.75	2.53	6.95	3.00	7.17	1.73	1.26	2.04	2.03	2.02		50.87
Zenobium aegyptiacum	7.50	5.21	6.21	5.76	5.70	2.13	2.40	1.43	3.35	6.60	2.00	1.46	2.41	2.00	1.41		55.57
Zurada procumbens	6.51	5.50	6.51	2.81	3.51	3.81	2.81	4.50	3.50	1.73	2.11	1.74	3.81	3.80	2.80		55.45
Onsonia nivea	5.63	3.06	3.85	3.61	1.41	2.26	1.95	2.51	3.61	2.50	2.26	1.71	2.50	2.26	1.95		41.07
Oltkiopsis ciliata	4.90	4.60	5.60	5.34	2.61	3.50	2.50	3.51	5.75	5.64	2.01	3.00	2.04	2.00	2.01		55.01
Senecio disfontianei	5.55	4.11	5.99	1.36	5.19	0.89	0.72	7.00	2.66	3.24	3.75	0.89	1.36	0.89	0.72		44.41
Sfloga specata	10.99	2.75	1.75	7.54	1.53	0.53	0.90	4.27	0.90	0.90	0.47	0.47	0.90	0.47	0.47		34.84
Sotula cinerea	3.81	3.36	4.26	1.85	3.16	2.76	1.60	3.36	2.55	1.40	1.60	1.15	2.50	2.76	1.86		37.98
Seichardia tingitana	4.64	4.06	4.64	1.80	3.22	2.06	1.22	1.22	4.06	5.52	1.22	0.90	1.48	1.22	1.22		38.48
Launaea nudicaulis	4.98	3.33	4.23	4.92	1.14	1.14	1.59	1.59	2.93	4.23	1.59	1.14	2.04	1.14	0.94		36.93
Launaea macronata	3.26	4.71	3.78	1.94	1.94	1.94	1.94	2.87	1.94	3.78	1.02	1.94	2.86	1.02	1.02		35.96
Stipagrostis plumosa	6.47	5.56	5.52	2.09	3.85	4.71	2.42	4.97	2.42	1.50	1.83	1.50	3.27	4.12	3.59		53.82
Pennisetum divisum	2.87	3.69	3.50	1.99	1.99	2.87	0.93	2.43	1.99	1.12	0.93	0.92	2.23	2.23	0.92		30.61

A.A. = Amino acid T. = Total

* Detrmination was carried out on the whole plants collected from different spots areas.
(whole plant including all different plant organs presented during determination).

status of ash, crude fibres nutrient elements, photosynthetic pigments carbohydrates, proteins and amino acids all of them take a part for tolerating the water stress under which the studied plants could be survival under one of the most arid zone of Egypt. Again, most of the studied plants adapted their selves to survival undre the adverse environmental conditions with many tools including the macromorphological structural and the inner physiological regulation processes.