Enumeration of species

The following checklist of the flora of Sharkiya Governorate, 231 species arranged according to Engler system as reported by Täckholm (1974) El-Hadidi and Fayed (1995) and Boulos (1995, 1999, 2000 and 2002). All species were collected by` the author of the present study and their voucher specimens are kept in Herbarium of Botany Department, Faculty of Science, Benha University.

1- Pteridophyta

AZOLLACEAE

1- *Azolla filiculoides* Lam.

2- *A. pinnata* R.B.,Prodr.FL.Nov.Holl.

ADIANTACEAE

3- *Adiantum capillus-veneris* L.

MARSILEACEAE

4- *Marsilea aegyptiace* Willd.

2- Dicotyledoneae

SALICACEAE

5- *Salix mucronata* Thunb.

6- *S. tetrasperma* Roxb.

URTICACEAE

7- *Urtica urens* L.

POLYGONACEAE

8- *Emex spinosa* (L.) Campd.

9- *Persicaria salicifolia* (Willd.) Assenov.

10- *P. senegalensis* (Meisn.) Soják

11- *Polygonum equisetiforme* Sm.

12- *Rumex dentatus* L.

13- *R. crispus* L.

AIZOACEAE

14- *Mesembryanthemum nodiflorum* L.

15- *M. crystallinum* L.

16- *M. forsskaolii* Boiss.

17- *Aizoon canariense* L.

PORTULACACEAE

18- *Portulaca oleracea* L.

CARYOPHYLLACEAE

19- *Silene villosa* Forssk.

20- *S. rubella* L.

21- *Stellaria pallida* (Dumort.) Piré.

22- *Spergularia marina* (L.) Griseb.

23- *Spergula fallax* (Lowe) E. H. L. Krause

24- *Paronychia arabica* (L.) DC.

25- *P. argentea* Lam.

CHENOPODIACEAE

26- *Beta vulgaris* L. subsp. *maritima* (L.) Arcang.

27- *Chenopodium murale* L.

28- *C. album* L.

29- *Atriplex inflata* F. Muell.

30- *Bassia muricata* (L.) Asch.

31- *B. indica* (Wight) A. J. Scott

32- *Halocnemum strobilaceum* (pall.) M. Bieb.

33- *Arthrocnemum macrostachyum* (Moric.) K.Koch

34- *Sarcocornia fruticosa* (L.) A.J.Scott

35- *Suaeda maritima* (L.) Dumort.

36- *Salsola kali* L.

37- *Haloxylon salicornicum* (Moq.) Bunge ex Boiss.

38- *Cornulaca monacantha* Delile

39- *Agathophora alopecuroides* (Delile) Fenzl ex Bunge

AMARANTHACEAE

40- *Amaranthus hybridus* L.

41- *A. hybridus* L. subsp. *cruentus* (L.) Thell.

42- *A. graecizans* L.

43- *A. lividus* L.

44- *A. viridis* L.

RANUNCULACEA

45- *Ranunculus sceleratus* L.

CERATOPHYLLACEAE

46- *Ceratophyllum demersum* L.

CRUCIFERAE

47- *Sisymbrium irio* L.

48- *Matthiola longipetala* (Vent.) DC.

49- *Farsetia aegyptia* Turra

50- *Brassica tournefortii* Gouan

51- *B. nigra* (L.) Koch

52- *Zilla spinosa* (L.) Prantl

53- *Lepidium sativum* L.

54- *Coronopus squamatus* (Forssk.) Asch.

55- *C. didymus* (L.) Sm.

56- *Capsella bursa-pastoris* (L.) Medik.

LEGUMINOSAE

57- *Trigonella stellata* Forssk.

58- *T. hamosa* L.

59- *Medicago polymorpha* L.

60- *M. intertexta* (L.) Mill.var. *ciliaris* (L.) Heyn.

61- *M. laciniata* (L.) Mill.var. *brachyacantha* Boiss.

62- *M. sativa* L. (Brot.)

63- *Melilotus segetalis* (Brot.) Ser.

64- *M. messanensis* (L.) All.

65- *M. elegans* Ser.

66- *M. indicus* (L.) All.

67- *Trifolium resupinatum* L.

68- *Lotus creticus* L.

69- *L. glaber* Mill.

70- *Sesbania sesban* (L.) Merr.

71- *Astragalus peregrinus* Vahl.

72- *Alhagi graecorum* Boiss.

73- *Vicia sativa* L.

74- *V. monantha* Retz.

75- *Lathyrus hirsutus* L.

76- *L. pseudocicera* Pamp.

77- *Pisum sativum* L. subsp. *sativum*

OXALIDACEAE

78- *Oxalis corniculata* L.

GERANIACEAE

79- *Erodium crassifolium* L'Hér.

ZYGOPHYLLACEAE

80- *Fagonia glutinosa* Delile

81- *Zygophllum simplex* L. Mant.

82- *Z. album* L.

83- *Tribulus terrestris* L.

84- *Nitraria retusa* (Forssk.) Asch.

EUPHORBIACEAE

85- *Euphorbia peplis* L.

86- *E. forsskaolii* J. Gey

87- *E. heterophylla* L.

88- *E. retusa* Forssk.

89- *E. helioscopia* L.

90- *E. peplus* L.

91- *E. hirta* L.

MALVACEAE

92- *Malva parviflora* L.

93- *Sida alba* L.

94- *Hibiscus trionum* L.

TAMARICACEAE

95- *Tamarix tetragyna* Ehrenb.

96- *T. nilotica* (Ehrenb.) Bunge

ONAGRACEAE

97- *Ludwigia stolonifera* (Guill. & Perr.) P. H. Raven

HALORAGIDACEAE

98- *Myriophyllum spicatum* L.

UMBELLIFERAE

99- *Ammi visnaga* (L.) Lam.

100- *A. majus* L.

101- *Foeniculum vulgare* Mill.

PRIMULACEAE

102- *Anagallis arvensis* L.

PLUMBAGINACEAE

103- *Limonium pruinosum* (L.) Chaz.

GENTINACEAE

104- *Centaurium pulchellum* (Swartz.) Druce

ASCLEPIADACEAE

105- *Cynanchum acutum* L.

CONVOLVULACEAE

106- *Convolvulus lanatus* Vahl

107- *C. arvensis* L.

108- *Ipomoea carnea* Jacq.

109- *I. cairica* (L.) Sweet

110- *Cressa cretica* L.

CUSCUTACEAE

111- *Cuscuta pedicellata* Ledeb.

BORAGINACEAE

112- *Heliotropium curassavicum* L.

113- *H. supinum* L.

114- *Echium rauwolfii* Delile.

VERBENACEAE

115- *Phyla nodiflora* (L.) Greene.

116- *Verbena supina* L.

LABIATAE

117- *Mentha microphylla* C.Koch.

SOLANACEAE

118- *Solanum nigrum* L.

119- *Lycium shawii* Roem. & Schult.

120- *Datura stramonium* L.

121- *D. innoxia* Mill.

122- *Hyoscyamus muticus* L.

SCROPHULARIACEAE

123- *Peplidium maritimum* (L. f.) Asch.

124- *Bacopa monnieri* (L.) Pennell.

125- *Veronica anagallis-aquatica* L.

OROBANCHACEAE

126- *Orobanche ramose* L.

127- *O. crenata* Forssk.

128- *O. cernua* Loefl.

PLANTGINACEAE

129- *Plantago arenaria* Waldst. & Kit.

130- *P. major* L.

131- *P. amplexicaulis* Cav.

COMPOSITAE

132- *Echinops spinosus* L.

133- *Carduus getulus* Pomel

134- *Silybum marianum* (L.) Gaertn.

135- *Centaurea glomerata* Vahl

136- *C. calcitrapa* L.

137- *C. pumilio* L.

138- *Ethulia conyzoides* L.

139- *Pluchea dioscoridis* (L.) DC.

140- *Conyza bonariensis* (L.) Cronquist

141- *C. aegyptiaca* (L.) Dryand.

142- *Symphyotrichum squamatum* (Spreng.) Nesom.

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

144- *Filago desertorum* Pomel

145- *Pseudognaphalium luteo-album* (L.) Hilliard & B. L. Burtt

146- *Limbarda crithmoides* (L.) Dumort.

147- *Xanthium pungens* Wallr. emend.

148- *X. spinosum* L.

149- *Eclipta prostrata* L.

150- *Bidens pilosa* L.

151- *Cotula cinerea* Delile

152- *Senecio glaucus* L. subsp. *coronopifolius* (Maire) C. Alexnader

153- *S. vulgaris* L.

154- *S. aegyptius* L.

155- *Calendula arvensis* L.

156- *Cichorium endivia* L. subsp. *divaricatum* (Schousb.) P. D. Sell.

157- *Urospermum picroides* (L.) F. W. Schmidt

158- *Launaea nudicaulis* (L.) Hook. f.

159- *L. massauensis* (Fresen.) Sch. Bip. ex Kuntze.

160- *L. fragilis* (Asso) Pau.

161- *Reichardia tingitana* (L.) Roth

162- *Sonchus oleraceus* L.

163- *S. asper* (L.) Hill

164- *S. macrocarpus* Boulos & C. Jeffrey

165- *Lactuca saligna* L.

3- MONOCOTYLEDONEAE

POTAMOGETONACEAE

166- *Potamogeton nodosus* Poir.

167- *P. pectinatus* L.

168- *P. trichoides* Cham. & Schlecht.

PONTEDERIACEAE

169- *Eichhornia crassipes* (C. Mart.) Solms

JUNCACEAE

170- *Juncus subulatus* Forssk.

171- *J. acutus* L.

172- *J. rigidus* Desf.

GRAMINEAE

173- *Stipa capensis* Thunb.

174- *Lolium temulentum* L.

175- *L. perenne* L.

176- *L. multiflorum* Lam.

177- *Cutandia memphitica* (Spreng.) K. Richt.

178- *Avena sativa* L.

179- *A. sterilis* L.

180- *A. fatua* L.

181- *Phalaris minor* Retz.

182- *Polypogon viridis* (Gouan) Breistr.

183- *P. monspeliensis* (L.) Desf.

184- *Bromus catharticus* Vahl

185- *B. aegyptiacus* Tausch

186- *B. rubens* L.

187- *Elymus elongatus* (Host) Runemark

188- *Hordeum vulgare* L.

189- *H. marinum* Huds.

190- *H. marinum* Huds. subsp. *gussoneanum* (Parl .) Thell.

191- *H. murinum* L. subsp. *glaucum* (Steud) Tzvelev

192- *H. murinum* L. subsp. *leporinum* (Link) Arcang.

193- *Schismus barbatus* (L.) Thell.

194- *Arundo donax* L.

195- *Phragmites australis* (Cav.) Trin. ex Steud.

196- *Leptochloa fusca* (L.) Kunth

197- *Dinebra retroflexa* (Vahl) Panz.
198- *Eleusine indica* (L.) Gaertn.
199- *Dactyloctenium aegyptium* (L.) Willd.
200- *Desmostachya bipinnata* (L.) Stapf
201- *Sporobolus spicatus* (Vahl) Kunth
202- *S. pungens* (Schreb.) Kunth
203- *Cynodon dactylon* (L.) Pers.
204- *Panicum turgidum* Forssk.
205- *P. repens* L.
206- *P. coloratum* L.
207- *Echinochloa stagnina* (Retz.) P. Beauv.
208- *E. crusgalli* (L.) P. Beauv.
209- *E. colona* (L.) Link
210- *Brachiaria reptans* (L.) C.A. Gardner & C.E. Hubb.
211- *Paspalum distichum* L.
212- *Setaria verticillata* (L.) P. Beauv.
213- *S. viridis* (L.) P. Beauv.
214- *S. italica* (L.) P. Beauv.
215- *Paspalidium geminatum* (Forssk.) Stapf
216- *Digitaria sanguinalis* (L.) Scop.
217- *Pennisetum glaucum* (L.) R. Br.
218- *Cenchrus echinatus* L.
219- *Saccharum spontaneum* L. subsp. *aegyptiacum* (Willd.) Hack.
220- *Imperata cylindrica* (L.) Raeusch.
221- *Sorghum virgatum* (Hack.) Stapf
222-*Dichanthium annulatum* (Forssk.) Stapf

LEMNACEAE

223- *Spirodela polyrhiza* (L.) Schleiden
224- *Lemna gibba* L.
225- *Pseudowolffia hyalina* (Delile) Hartog & Plas

TYPHACEAE

226- *Typha domingensis* (Pers.) Poir. ex Steud.

CYPERACEAE

227- *Scirpus litoralis* Schrad.
228- *Cyperus laevigatus* L.
229- *C. rotundus* L.
230- *C. articulatus* L.
231- *C. alopecuroides* Rottb.

Floristic Analysis

Taxic Diversity

The pteridophytic families are 3 represented by 3 genera and 4 species **(Table 6)**. The dicotylydoneae families are 35 the highly represented of them are Compositae (34 species), Leguminosae (21 species), Chenopodiaceae (14 species), Cruciferae (10 species), two families are represented by 7 species (Caryophyllaceae and Euphorbiaceae). One family by 6 species (Polygonacea), 4 families by 5 species (Amaranthaceae, Convolvulaceae, Solanaceae and Zygophyllaceae). One family by 4 species (Aizoaceae), six families by 3 species (Malvaceae, Boraginaceae, Scrophulariaceae, Orobanchaceae, Plantaginaceae and Umbelliferae), 3 families by 2 species (Tamaricaceae, Verbinaceae and Salicaceae), 14 families by one species (Urticaceae, Portulacaceae, Ranunculaceae, Ceratophyllaceae, Oxalidaceae, Geraniaceae, Onagraceae, Haloragidaceae, Primulaceae, Plumbaginaceae, Gentinanaceae, Asclepiadaceae, Cuscutaceae and Labiatae).

Seven monocotyledonous families are recognized **(Table 6)**, the highly represented of them were Gramineae (50 species), Cyperaceae (5 species), 3 families are represented by 3 species (Potamogetonaceae,. Juncaceae and Lemnaceae) and 2 families by one species (Pontedriaceae and Typhaceae). Collectively seven families (Gramineae, Compositae, Legumionsae, Chenopodiaceae, Cruciferae, Caryophyllaceae and Euphorbiaceae) comprise 143 species (62.1% of the total flora of Sharkiya Governorate).

The taxic diversity of the major taxonomic groups indicated that pteridophyta has a minimum number of species, genera and families, while dicotyledonae had a maximum number of subspecies, species, genera and families. The ratio of genus to family (G/F) had maximum value in monocotyledoneae followed by dicotyledonae and a minimum in pteridophyta. The ratio of species to genus (S/G) had a maximum value in monocotyledonae and a minimum in peteridophyta, while the ratio of sub-species to species (Sub/S) is very low for all the major taxonomic groups **(Table 7)**.

Table (6). Family representation in the flora of Sharkiya Governorate. F: Frequency and P(%): Presence estimate.

Family	Genus		Species		Subspecies or varities	
	F	P	F	P	F	P
Pteridophyta						
Azollaceae	1	0.65	2	0.87	-	-
Adiantaceae	1	0.65	1	0.43	-	-
Marsileaceae	1	0.65	1	0.43	-	-
Dicotyledoneae						
Salicaseae	1	0.65	2	0.87	-	-
Urticaceae	1	0.65	1	0.43	-	-
Polygonaceae	4	2.6	6	2.6	-	-
Aizoaceae	2	1.3	4	1.7	-	-
Portulacaceae	1	0.65	1	0.43	-	-
Caryophyllaceae	4	2.6	7	3	-	-
Chenopodiaceae	12	7.8	14	6.1	1	8.3
Amaranthaceae	1	0.65	5	2.2	1	8.3
Ranunculaceae	1	0.65	1	0.43	-	-
Ceratophyllaceae	1	0.65	1	0.43	-	-
Cruciferae	8	5.3	10	4.3	-	-
Leguminosae	11	7.2	21	9.1	4	33.3
Oxalidaceae	1	0.65	1	0.43	-	-
Geraniaceae	1	0.65	1	0.43	-	-
Zygophyllaceae	4	2.6	5	2.2	-	-
Euphorbiaceae	1	0.65	7	3.03	-	-
Malvaceae	3	1.9	3	1.3	-	-
Tamaricaceae	1	0.65	2	0.87	-	-
Onagraceae	1	0.65	1	0.43	-	-
Haloragidaceae	1	0.65	1	0.43	-	-
Umbelliferae	2	1.3	3	1.3	-	-
Primulaceae	1	0.65	1	0.43	-	-
Plumbaginaceae	1	0.65	1	0.43	-	-
Gentianaceae	1	0.65	1	0.43	-	-
Asclepiadaceae	1	0.65	1	0.43	-	-
Convolvulaceae	3	1.9	5	2.2	-	-
Cuscutaceae	1	0.65	1	0.43	-	-
Boraginaceae	2	1.3	3	1.3	-	-

Family	Genus		Species		Subspecies or varities	
	F	P	F	P	F	P
Verbenaceae	2	1.3	2	0.87	-	-
Labiatae	1	0.65	1	0.43	-	-
Solanaceae	4	2.6	5	2.2	-	-
Scrophulariaceae	3	1.9	3	1.3	-	-
Orobanchaceae	1	0.65	3	1.3	-	-
Plantaginaceae	1	0.65	3	1.3	-	-
Compositae	24	15.8	34	14.7	3	21.4
Monocotyledoneae						
Potamogetonaceae	1	0.65	3	1.3	-	-
Pontederiaceae	1	0.65	1	0.43	-	-
Juncaceae	1	0.65	3	1.3	-	-
Gramineae	32	21	50	21.6	4	28.6
Lemnaceae	3	1.9	3	1.3	-	-
Typhaceae	1	0.65	1	0.43	-	-
Cyperaceae	2	1.3	5	2.2	-	-

Table (7). Taxic diversity of the major taxonomic groups of the flora of SharkiyaGovernorate. F: Frequency and P(%): Presence estimate.

Taxonomic group	Family (F)		Genus (G)		Species (S)		Sub species (Sub)		Sub/S	S/G	G/F
	F	P	F	P	F	P	F	P			
Pteridophyta	3	7	3	2	4	1.7	-	-	-	1	1
Dicotyledoneae	35	78	108	71	161	69.6	8	66.7	0.05	1.49	3.08
Monocotyledoneae	7	15	41	27	66	28.6	4	33.3	0.06	1.6	5.8
Total	**45**	**100**	**152**	**100**	**231**	**100**	**12**	**100**	**0.06**	**1.51**	**3.4**

The presence of twenty six of the recorded species is restricted to one habitat (11.25%), while 51 species are recorded in two habitats (22.1%), 34 species in 3 habitats, 21 species in 4 habitats, 13 species in 5 habitats, 19 species in 6 habitats, 23 species in 7 habitats, 20 species in 8 habitats and 14 species in 9 habitats **(Table 8)**. On the other hand, 10 species have wide habitat distribution. (occur in ≥ 10 out of 13 habitats). One of them occurs in all of the 13 habitats (*Cynodon dactylon*), 6 in 11 habitats (*Chenopodium murale*, *Cyperus rotundus*, *Phragmites australis*, *Sonchus oleraceus*, *Beta vulgaris* and *Senecio glaucus*) 3 in 10 habitat (*Bassia indica, convolvulus arvensis*, *Symphotrichum squamatum*). The relation between the number of species and number of habitats in which they occur indicated an exponential decrease in the number of speices in relation to the number of habitats **(Fig. 2)**.

Three families are restricted to one habitat, while seven families to 2 habitats, 3 to 3 habitats, 2 to 4 habitats, 4 to 5 habitats, 3 to 6 habitats, 2 to 7 habitats and 4 to 8 habitats **(Table 9)**. On the other hand, 17 families had a wide distribution range (occur in ≥ 9 out of 12 habitatst) 3 of them were represented in all 13 habitats (Leguminosae, Compositae and Gramineae), 7 in 12 habitats (Caryophyllaceae, Chenopodiaceae, Cruciferae, Convolvulaceae, Polygonaceae, Plantaginaceae and Cyperaceae), 3 in 11 habitats (Amaranthaceae, Euphorbiaceae and Malvaceae), one in 10 habitats (Solanaceae) and 3 in 9 habitats (Portulacaceae, Zygophyllaceae and Verbenaceae). The relation between the number of families and number of habitats in which they occur indicated more or less equal relationship between them. The number of families of one as well as those of 12 habitats is higher than those of the other categories **(Fig.3)**.

The taxic diversity of 13 habitats indicated that sand flats had the minimun number of families, genera species and subspecies. On the other hand,drainage canals had maximum number of families and genera, while irrigation canals had maximum number of species and subspecies. The ratio of number of genera to number of families (G/F) had the maximum value in the salt marshes and the minimum value in sand dunes. The ratio of species to genera (S/G) had the minimum value in waste land and maximum in irrigation cancals. Finally, the sub-species to species ratio (Sub/S) had the minimum value in the field of summer crops and the maximum value in orchards**(Table 10)**.

Table (8). Disturbution of the recorded species in relation to the 13 habitats identified in Sahrkiya Governorate (◆). Sf: Sand flats, Sd: Sand dunes, Sm: Salt marshes, Rw: Railways, Hw: Highways, Wl: Wastelands, Af: Abandoned fields, Or: orchards, Sc: Fields of summer crops, Wc: Fields of winter crops, Rl: Reclaimed lands, Ic: Irrigation canals and Dc: Drainage canals. F: Frequency and P(%): Presence estimate.

Species	Habitat													Total	
	Desert			Urban				Cultivated			Recclaimad	Wetlands			
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	F	P
Cynodon dactylon (L.) Pers.	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	*13*	*100*
Chenopodium murale L.			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	*11*	*84.6*
Cyperus rotundus L.			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	*11*	*84.6*
Phragmites australis (Cav.)Trin.ex Steud.	◆		◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	*11*	*84.6*
Sonchus oleraceus L.		◆		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	*11*	*84.6*
Beta vulgaris subsp. *maritima* (L.) Arcang.			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	*11*	*84.6*
Senecio glaucus subsp. *coronopifolius* (Maire) C. Alexander	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆	*11*	*84.6*
Bassia indica (Wight) A.J.Scott				◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	*10*	*76.9*
Convolvulus arvensis L.				◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	*10*	*76.9*
Symphyotrichum squamatum (Spreng.) Nesom.				◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	*10*	*76.9*
Polyogonum equsetiforme Sm.		◆	◆	◆	◆	◆	◆	◆				◆		*9*	*69.2*
Polypogonum monspeliensis (L.) Desf.			◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	*9*	*69.2*
Amaranthus viridis L.				◆	◆	◆	◆	◆	◆	◆		◆	◆	*9*	*69.2*
Plantago major L.				◆	◆	◆	◆	◆	◆	◆		◆	◆	*9*	*69.2*
Spergularia marina (L.) Griseb.	◆	◆		◆		◆	◆	◆	◆	◆		◆		*9*	*69.2*
Malva parviflora L.			◆	◆	◆		◆	◆		◆	◆	◆	◆	*9*	*69.2*
Conyza bonariensis (L.) Cronquist				◆	◆		◆	◆	◆	◆	◆	◆	◆	*9*	*69.2*
Rumex dentatus L.				◆	◆	◆	◆	◆		◆	◆	◆	◆	*9*	*69.2*
Silybum marianum (L.) Gaertn.				◆	◆	◆	◆	◆		◆	◆	◆	◆	*9*	*69.2*
Sisymbrium irio L.				◆	◆	◆	◆	◆		◆	◆	◆	◆	*9*	*69.2*
Solanum nigrum L.				◆	◆	◆		◆	◆	◆	◆	◆	◆	*9*	*69.2*

Species	Habitat													Total	
	Desert			Urban				Cultivated			Recclaimad	Wetlands			
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	F	P
Cichorium endivia L.subsp. *divaricaturm* (Schousb.) P.D.Sell.			◆	◆	◆			◆	◆	◆	◆	◆	◆	*9*	*69.2*
Coronopus squamatus (Forssk.) Asch.				◆	◆	◆	◆	◆		◆	◆	◆	◆	*9*	*69.2*
Portulaca oleracea L.					◆	◆	◆	◆	◆	◆	◆	◆	◆	9	*69.2*
Avena fatua L.				◆	◆	◆	◆	◆		◆		◆	◆	*8*	*61.5*
Lotus glaber Mill		◆		◆	◆	◆	◆	◆		◆			◆	*8*	*61.5*
MeIilotus messanensis (L.) All.					◆	◆	◆	◆	◆	◆		◆	◆	*8*	*61.5*
Urospermum picroides (L.) F.W.Schmidt				◆	◆	◆	◆	◆		◆		◆	◆	*8*	*61.5*
Cressa cretica L.			◆	◆	◆	◆	◆				◆	◆	◆	*8*	*61.5*
Imperata cylindrica (L.) Raeusch.			◆	◆	◆		◆	◆			◆	◆	◆	*8*	*61.5*
Chenopodium album L.					◆	◆		◆	◆	◆	◆	◆	◆	*8*	*61.5*
Phyla nodiflora (L.) Greene		◆		◆	◆		◆	◆	◆		◆	◆		*8*	*61.5*
Alhagi graecorum Boiss.	◆	◆	◆	◆	◆	◆	◆				◆			*8*	*61.5*
Tamarix nilotica (Ehrenb.) Bunge			◆	◆	◆	◆	◆	◆			◆	◆	◆	*8*	*61.5*
Typha domingensis (Pers.) Poir.ex Steud.		◆		◆	◆	◆	◆				◆	◆	◆	*8*	*61.5*
Anagallis arvensis L.					◆		◆	◆	◆	◆	◆	◆	◆	*8*	*61.5*
Dinebra retroflexa (Vahl) Panz.				◆	◆		◆	◆	◆	◆	◆		◆	*8*	*61.5*
Echinochloa crus-galli (L.) P.Beauv.				◆		◆	◆	◆	◆		◆	◆	◆	*8*	*61.5*
Euphorbia peplus L.		◆			◆		◆	◆	◆	◆	◆	◆		*8*	*61.5*
Hibiscus trionum L.					◆	◆	◆	◆	◆	◆	◆		◆	*8*	*61.5*
Oxalis corniculata L.					◆	◆		◆	◆	◆	◆	◆	◆	*8*	*61.5*
Paspalum distichum L.				◆	◆		◆	◆	◆		◆	◆	◆	*8*	*61.5*
Xanthium spinosum L.				◆	◆	◆	◆	◆			◆	◆	◆	*8*	*61.5*
Panicum repens L.				◆	◆		◆	◆	◆		◆	◆	◆	*8*	*61.5*
Hordeum murinum subsp. *leporinum* (Link) Arcang.		◆		◆	◆		◆	◆				◆	◆	*7*	*53.8*
Limbarda crithmoides (L.) Dumort.		◆	◆		◆	◆	◆					◆	◆	*7*	*53.8*
Persicaria salicifolia (Willd.) Assenov				◆	◆	◆	◆	◆				◆	◆	*7*	*53.8*

Species	Habitat													Total	
	Desert			Urban				Cultivated			Recclaimad	Wetlands			
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	F	P
Cyperus alopecuroides Rottb.			◆		◆		◆	◆	◆			◆	◆	7	53.8
Pluchea dioscoridis (L.) DC.				◆	◆	◆	◆	◆				◆	◆	7	53.8
Arthrocnemum macrostachyum (Moric.) K.Koch	◆	◆	◆		◆		◆	◆					◆	7	53.8
Ammi visnaga(L.)Lam.				◆	◆		◆	◆		◆		◆	◆	7	53.8
Hordeum murinum L. subsp. glaucum (Steud.) Tzvelev			◆	◆	◆	◆		◆				◆	◆	7	53.8
Lolium perenna L.			◆		◆	◆	◆	◆				◆	◆	7	53.8
Melilotus segetalis (Brot.) Ser.				◆	◆	◆	◆			◆		◆	◆	7	53.8
Centaurea calcitrapa L.						◆	◆	◆	◆	◆		◆	◆	7	53.8
Pseudognaphalium luteo-album (L.) Hilliard & B.L. Burtt		◆			◆	◆		◆		◆		◆	◆	7	53.8
Sonchus asper (L.) Hill					◆		◆	◆	◆	◆		◆	◆	7	53.8
Melilotus indicus (L.) All.					◆		◆	◆		◆	◆	◆	◆	7	53.8
Senecio vulgaris L.		◆			◆			◆		◆	◆	◆	◆	7	53.8
Cyperus articulatus L.				◆	◆		◆	◆			◆	◆	◆	7	53.8
Brassica nigra (L.) Koch					◆	◆		◆		◆	◆	◆	◆	7	53.8
Trifolium resupinatum L.					◆		◆	◆		◆	◆	◆	◆	7	53.8
Zygophyllum album L.	◆	◆	◆		◆		◆				◆		◆	7	53.8
Sida alba L.						◆	◆	◆	◆		◆	◆	◆	7	53.8
Medicago polymorpha L.							◆	◆	◆	◆	◆	◆	◆	7	53.8
Dichanthium annulatum (Forssk.) Stapf				◆	◆	◆	◆	◆			◆	◆		7	53.8
Salsola kali L.	◆	◆	◆		◆	◆	◆						◆	7	53.8
Echinochloa stagnina (Retz.)P.Beauv				◆	◆		◆		◆			◆	◆	6	40.1
Cynanchum acutum L.				◆	◆	◆	◆			◆			◆	6	40.1
Capsella bursa-pastoris (L.) Medik.							◆	◆	◆	◆		◆	◆	6	40.1
Reichardia tingitana (L.)Roth	◆	◆		◆	◆	◆							◆	6	50
Sesbania sesban (L.) Merr.					◆	◆		◆	◆			◆	◆	6	40.1
Juncus rigidus Desf.			◆	◆	◆	◆	◆						◆	6	40.1
Eclipta alba (L.)Hassk.					◆	◆		◆	◆			◆	◆	6	40.1
Mentha microphylla C.Koch.		◆		◆	◆			◆				◆	◆	6	46.1
Polypogon viridis (Gouan) Breistr.					◆		◆	◆		◆		◆	◆	6	46.1
Phalaris minor Retz.					◆		◆	◆		◆		◆	◆	6	46.1

Species	Habitat													Total	
	Desert			Urban				Cultivated			Recclaimad	Wetlands			
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	F	P
Desmostachya bipinnata (L.) Stapf				◆	◆		◆	◆			◆		◆	6	46.1
Echinochloa colona (L.) Link							◆	◆	◆	◆	◆	◆		6	46.1
Lepidium sativum L.					◆			◆		◆	◆	◆	◆	6	46.1
Setaria verticillata (L.) P.Beauv.				◆	◆			◆	◆		◆	◆		6	46.1
Medicago intertexa (L.) Mill.var.*ciliaris* (L.) Heyn							◆	◆		◆	◆	◆	◆	6	46.1
Silene rubella L.					◆		◆	◆		◆	◆	◆		6	46.1
Urtica urens L.					◆			◆		◆	◆	◆	◆	6	46.1
Vicia sativa L.					◆			◆		◆	◆	◆	◆	6	46.1
Cyperus laevigatus L.	◆				◆		◆		◆		◆		◆	6	46.1
Paspalidium geminatum (Forssk.) Stapf			◆	◆	◆							◆	◆	5	38.5
Ranunculus sceleratus L.						◆		◆		◆		◆	◆	5	38.5
Saccharum spontaneum subsp. *aegyptiacum* (Willd.) Hack.				◆	◆		◆					◆	◆	5	38.5
Brachiaria reptans (L.)C.A.Gardner & C.E.Hubb.								◆	◆	◆		◆	◆	5	38.5
Lolium temulentum L.			◆					◆		◆		◆	◆	5	38.5
Tamarix tetragyna Ehrenb.		◆	◆		◆	◆	◆							5	38.5
Euphorbia helioscopia L.							◆	◆		◆	◆		◆	5	38.5
Ethulia conyzoides .subsp.*conyzoides* L.			◆		◆					◆	◆		◆	5	38.5
Euphorbia forsskaolii J.Gay				◆	◆					◆	◆	◆		5	38.5
Dactyloctenium aegyptium (L.) Willd.						◆		◆		◆	◆	◆		5	38.5
Digitaria sanguinalis (L.) Scop.								◆	◆		◆	◆	◆	5	38.5
Launaea nudicaulis (L.) Hook.f.		◆		◆	◆						◆		◆	5	38.5
Xanthium pungens Wallr.		◆							◆	◆		◆	◆	5	38.5
Mesembryanthemum nodiflorum L.		◆	◆	◆									◆	4	30.8
Mesembryanthemum forsskaolii Boiss.		◆	◆	◆									◆	4	30.8
Coronopus didymus (L.) Sm.				◆				◆				◆	◆	4	30.8
Hordeum marinum Huds.		◆	◆									◆	◆	4	30.8

Species	Habitat													Total	
	Desert			Urban				Cultivated			Recclaimad	Wetlands			
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	F	P
Juncus acutus L.			◆	◆	◆		◆							4	30.8
Cutandia memphitica (Spreng.) K.Richt.		◆	◆		◆								◆	4	30.8
Lolium multiflorum Lam.					◆					◆		◆	◆	4	30.8
Echinops spinosus L.		◆	◆		◆								◆	4	30.8
Avena sativa L.					◆			◆		◆			◆	4	30.8
Ammi majus L.					◆					◆		◆	◆	4	30.8
Arundo donax L.				◆	◆		◆					◆		4	30.8
Astragalus peregrinus Vahl	◆	◆	◆				◆							4	30.8
Lathyrus hirsutus L.								◆		◆		◆	◆	4	30.8
Melilotus elegans Ser.in DC.							◆			◆		◆	◆	4	30.8
Pisum sativum L. subsp. *sativum*								◆	◆	◆		◆		4	30.8
Ipomoea carnea Jacq.					◆						◆	◆	◆	4	30.8
Amaranthus hybridus L.								◆		◆	◆	◆		4	30.8
Amaranthus lividus L.								◆			◆	◆	◆	4	30.8
Euphorbia heterophylla L.								◆	◆	◆	◆			4	30.8
Medicago sativa L.(Brot.)					◆		◆				◆	◆		4	30.8
*Salix mucronata Th*unb.				◆	◆							◆	◆	4	30.8
Centaurium pulchellum (Swartz)Druce			◆									◆	◆	3	23.1
Zygophyllum simplex L.	◆	◆	◆											3	23.1
Mesembryanthemum crystallinum L.		◆	◆	◆										3	23.1
Euphorbia peplis L.				◆				◆				◆		3	23.1
Amaranthus graecizans L.		◆			◆							◆		3	30.1
Atriplex inflata F.Muell.							◆	◆					◆	3	23.1
Brassica tournefortii Gouan					◆			◆		◆				3	23.1
Bromus catharticus Vahl				◆								◆	◆	3	21.1
Calendula arvensis L.	◆		◆		◆									3	23.1
Cenchrus echinatus L.								◆	◆	◆				3	23.1
Schismus barbatus (L.)Thell.	◆				◆							◆		3	23.1
Sorghum virgatum (Hack.)Stapf									◆			◆	◆	3	23.1
Sporobolus pungens (Schreb.)Kunth		◆			◆	◆								3	23.1
Sporobolus spicatus (Vahl) Kunth		◆		◆	◆									3	23.1
Vicia monantha Retz.								◆		◆		◆		3	23.1

Species	Habitat													Total	
	Desert			Urban				Cultivated			Recclaimad	Wetlands			
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	F	P
Ipomoea cairica (L.) Sweet				◆				◆				◆		3	23.1
Launaea massauensis (Fresen.) Sch.Bip.ex Kuntze	◆	◆	◆											3	23.1
Launaea fragilis (Asso) Pau.	◆	◆					◆							3	23.1
Ludwigia stolonifera (Guill.&Perr.) P.H.Raven						◆						◆	◆	3	23.1
Peplidium maritimum (L.f.) Asch.in Schweinf & Asch.									◆			◆	◆	3	23.1
Plantago amplexicaulis Cav.	◆	◆	◆											3	23.1
Plantago arenaria Waldst.&Kit.	◆	◆	◆											3	23.1
Salix tetrasperma Roxb.				◆	◆							◆		3	23.1
Cornulaca monacantha Delile	◆				◆	◆								3	23.1
Zilla spinosa (L.) Prantl in Engl.& Prantl	◆			◆	◆									3	23.1
Emex spinosa (L.) Campd.					◆						◆		◆	3	23.1
Bromus aegyptiacus Tausch	◆	◆									◆			3	23.1
Convolvulus lanatus Vahl	◆				◆						◆			3	23.4
Orobanche crenata Forssk.										◆	◆	◆		3	23.1
Orobanche ramosa L.								◆		◆	◆			3	23.1
Conyza aegyptiaca (L.) Dryand.											◆	◆	◆	3	23.1
Spergula fallax (Lowe) E.H.L.Krause in Sturm		◆									◆		◆	3	23.1
Setaria viridis (L.) P.Beauv.											◆	◆	◆	3	23.1
Setaria italica (L.) P.Beauv.									◆	◆	◆			3	23.1
Azolla filiculoides Lam.												◆	◆	2	15.4
Lemna gibba L.									◆				◆	2	15.4
Limonium pruinosum subsp.*pruinosum* (L.) Chaz.	◆		◆											2	15.4
Potamogeton trichoides Cham.&Schlecht.												◆	◆	2	15.4
Potamogeton pectinatus L.												◆	◆	2	15.4
Potamogeton nodosus Poir.												◆	◆	2	15.4
Pseudowolffia hyaline (Delile) Hartog&Plas												◆	◆	2	15.4
Azolla pinnata R.B., Prodr. FL.Nov.Holl.												◆	◆	2	15.4

Species	Habitat													Total	
	Desert			Urban				Cultivated			Recclaimad	Wetlands			
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	F	P
Sarcocornia fruticosa (L.) A.J.Scott			◆										◆	2	15.4
Ceratophyllum demersum L.												◆	◆	2	15.4
Eichhornia crassipes (C.Mart.)Solms												◆	◆	2	15.4
Erodium crassifolium L'Hér.		◆			◆									2	15.4
Bassia muricata (L.)Asch.	◆						◆							2	15.4
Bidens pilosa L.				◆								◆		2	15.4
Bromus rubens L.		◆		◆										2	15.4
Carduus getulus Pomel	◆	◆												2	15.4
Centaurea glomerata Vahl	◆	◆												2	15.4
Aizoon canariense L.		◆	◆											2	15.4
Cotula cinerea Delile					◆	◆								2	15.4
Echium rauwlfii Delile		◆	◆											2	15.4
Eleusine indica (L.) Gaertn.	◆							◆						2	15.4
Elymus elongatus (Host) Runemark	◆	◆												2	15.4
Euphorbia retusa Forssk.		◆				◆								2	15.4
Fagonia glutinosa Delile							◆	◆						2	15.4
Filago desertorum Pomel	◆		◆											2	15.4
Foeniculum vulgare Mill.								◆		◆				2	15.4
Heliotropium curassavicum L.	◆					◆								2	15.4
Hordeum marinum Huds. subsp.*gussoneanum* (Parl.)Thell.						◆				◆				2	15.4
Hordeum vulgare L.												◆	◆	2	15.4
Veronica anagallis-aquatica L.										◆		◆		2	15.4
Lactuca saligna L.	◆											◆		2	15.4
Lathyrus pseudocicera Pamp.										◆		◆		2	15.4
Leptochloa fusca (L.) Kunth							◆					◆		2	15.4
Lotus creticus L.	◆	◆												2	15.4
Lycium shawii Roem.&Schult.				◆								◆		2	15.4
Medicago laciniata (L.) Mill.var.*barchyacantha* Boiss.								◆		◆				2	15.4
Halocnemum strobilaceum (Pall.) M.Bieb.	◆		◆											2	15.4
Orobanche cernua Loefl.	◆									◆				2	15.4
Panicum turgidum Forssk.		◆			◆									2	15.4
Paronychia arabica (L.)DC.		◆			◆									2	15.4

Species	Habitat													Total	
	Desert			Urban				Cultivated			Recclaimad	Wetlands			
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	F	P
Rumex crispus L.	◆									◆				2	15.4
Paronychia argentea Lam.		◆			◆									2	15.4
Pennisetum glaucum (L.) R.Br.								◆				◆		2	15.4
Persicaria senegalensis (Meisn.)Soják												◆	◆	2	15.4
Senecio aegyptius L.												◆	◆	2	15.4
Sonchus macrocarpus Boulos&C.Jeffrey												◆	◆	2	15.4
Tribulus terrestris L.						◆		◆						2	15.4
Trigonella glabra Thunb.					◆	◆								2	15.4
Hyoscyamus muticus L.	◆				◆									2	15.4
Amaranthus hybridus subsp. *cruentus* (L.) Thell.						◆					◆			2	15.4
Silene villosa Forssk.	◆	◆												2	15.4
Adiantum capillus-veneris L.												◆		1	7.7
Agathophora alopecuroides (Delile) Fenzl ex Bunge													◆	1	7.7
Avena sterilis L.												◆		1	7.7
Bacopa monnieri (L.)Pennell							◆							1	7.7
Centaurea pumilio L.	◆													1	7.7
Cuscuta pedicellata Ledeb.										◆				1	7.7
Datura innoxia Mill.					◆									1	7.7
Datura stramonium L.						◆								1	7.7
Euphorbia hirta L.								◆						1	7.7
Farsetia aegyptia Turra					◆									1	7.7
Haloxylon salicornicum (Moq.)Bunge ex Boiss.				◆										1	7.7
Heliotropium supinum L.													◆	1	7.7
Ifloga spicata (Forssk.) Sch.Bip.		◆												1	7.7
Juncus sublatus Forssk.			◆											1	7.7
Marsilea aegyptiaca Willd.												◆		1	7.7
Matthiola longipetala (Vent.) DC.		◆												1	7.7
Panicum coloratum L.													◆	1	7.7
Scripus litoralis Schrad.												◆		1	7.7
Myriophyllum spicatum L.													◆	1	7.7

Species	Habitat													Total	
	Desert			Urban				Cultivated			Recclaimad	Wetlands			
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	F	P
Spirodela polyrhiza (L.) Schleiden												◆		*1*	*7.7*
Stellaria media (L.) Vill.										◆				*1*	*7.7*
Stipa capensis Thunb.					◆									*1*	*7.7*
Suaeda maritima (L.) Dumort.													◆	*1*	*7.7*
Trigonella stellata Forssk.					◆									*1*	*7.7*
Verbena supina L.										◆				*1*	*7.7*
Nitraria retusa (Forssk.) Asch.			◆											*1*	*7.7*
Total	*38*	*54*	*48*	*73*	*116*	*63*	*84*	*100*	*50*	*85*	*76*	*133*	*131*	*231*	

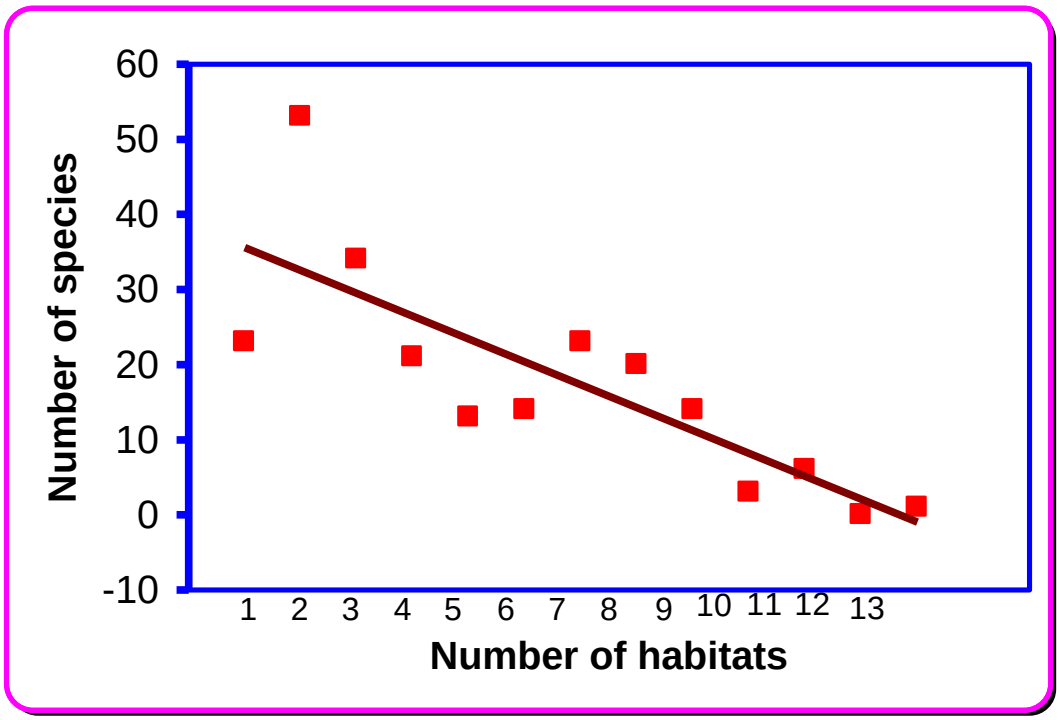

Fig.2. Regression line of the relation between the number of species in relation to the number of habitats in which they occur.

Table (9). Distribution of the recorded families in 13 habitats identified in Sharkiya Governorate. Sf: Sand flats, Sd: Sand dunes, Sm: Salt marshes, RW: Railways, HW: High ways, Wl: Waste land, Af: Abandoned fields, Or:Orchards, Sc: Field of summer crops, Wc: Field of winter crops, Rl: Recliamed lands, Ic: Irriegtion canals, Dc: Drainage canals.

Family	Habitat													Total
	Desert			Urban				Cultivated			Reclaimed	Wetlands		
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	
Pteridophyta														
Azollaceae	-	-	-	-	-	-	-	-	-	-	-	2	2	2
Adiantaceae	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Marsileaceae	-	-	-	-	-	-	-	-	-	-	1	1	-	2
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**4**	**1**	**3**
Dicotyledoneae														
Salicaceae	-	-	-	2	2	-	-	-	-	-	-	2	1	4
Urticaceae	-	-	-	-	1	-	-	1	-	1	1	1	1	6
Polygonaceae	1	1	1	3	4	3	3	3	-	2	2	4	5	12
Aizoaceae	-	4	4	3	-	-	-	-	-	-	-	-	2	4
Portulacaceae	-	-	-	-	1	1	1	1	1	1	1	1	1	9
Caryophyllaceae	2	5	-	1	2	1	2	2	1	3	2	2	1	12
Chenopodiaceae	5	2	6	3	7	6	7	6	4	4	4	4	10	12
Amaranthaceae	-	1	-	1	2	2	1	3	1	2	3	4	2	11
Ranunculaceae	-	-	-	-	-	1	-	1	-	1	-	1	1	5
Ceratophyllaceae	-	-	-	-	-	-	-	-	-	-	-	1	1	2
Cruciferae	1	1	-	4	7	3	3	7	1	6	4	6	6	12
Leguminosae	3	4	2	3	11	6	11	12	4	14	7	14	11	13
Oxalidaceae	-	-	-	-	1	1	-	1	1	1	1	1	1	8
Geraniaceae	-	1	-	-	1	-	-	-	-	-	-	-	-	2
Zygophyllaceae	3	2	2	-	1	1	2	2	-	-	1	-	1	9
Euphorbiaceae	-	2	-	2	2	1	2	5	2	4	4	3	1	11
Malvaceae	-	-	1	1	2	2	3	3	2	2	3	2	3	11
Tamaricaceae	-	1	2	1	2	2	2	1	-	-	-	-	1	8
Onagraceae	-	-	-	-	-	1	-	-	-	-	-	1	1	3
Haloragidaceae	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Umbelliferae	-	-	-	1	2	-	1	2	-	3	-	2	2	7
Primulaceae	-	-	-	-	1	-	1	1	1	1	1	1	1	8
Plumbaginaceae	1	-	1	-	-	-	-	-	-	-	-	-	-	2
Gentinanaceae	-	-	1	-	-	-	-	-	-	-	-	1	1	3

Family	Habitat													Total
	Desert			Urban				Cultivated			Reclaimed	Wetlands		
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc	
Asclepiadaceae	-	-	-	1	1	1	1	-	-	1	-	-	1	6
Convolvulaceae	1	-	1	3	4	2	2	2	1	1	4	4	3	12
Cuscutaceae	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Boraginaceae	1	1	1	-	-	1	-	-	-	-	-	-	1	5
Verbenaceae	-	1	-	1	1	-	1	1	1	1	1	1	-	9
Labiatae	-	1	-	1	1	-	-	1	-	-	-	1	1	6
Solanaceae	1	-	-	2	3	2	-	1	1	1	1	2	1	10
Scrophuloriaceae	-	-	-	-	-	-	1	-	1	1	-	2	1	5
Orbanchaceae	1	-	-	-	-	-	-	1	-	3	2	1	-	5
Plantaginaceae	2	2	2	1	1	1	1	1	1	1	-	1	1	12
Compositae	10	14	8	12	20	13	12	13	8	13	11	21	23	13
Total	**32**	**43**	**32**	**46**	**80**	**51**	**57**	**71**	**31**	**68**	**53**	**84**	**87**	**35**
Monocotyledoneae														
Potamogetonaceae	-	-	-	-	-	-	-	-	-	-	-	3	3	2
Pontederaceae	-	-	-	-	-	-	-	-	-	-	-	1	1	2
Juncaceae	-	-	3	2	2	1	2	-	-	-	1	-	1	7
Gramineae	6	10	10	21	28	9	20	26	15	16	17	34	30	13
Leminaceae	-	-	-	-	-	-	-	-	1	-	-	2	2	3
Typhaceae	-	1	-	1	1	1	1	-	-	-	1	1	1	8
Cyperaceae	1	-	2	2	4	1	4	3	3	1	3	4	4	12
Total	**7**	**11**	**15**	**26**	**35**	**12**	**27**	**29**	**19**	**17**	**22**	**45**	**42**	**7**

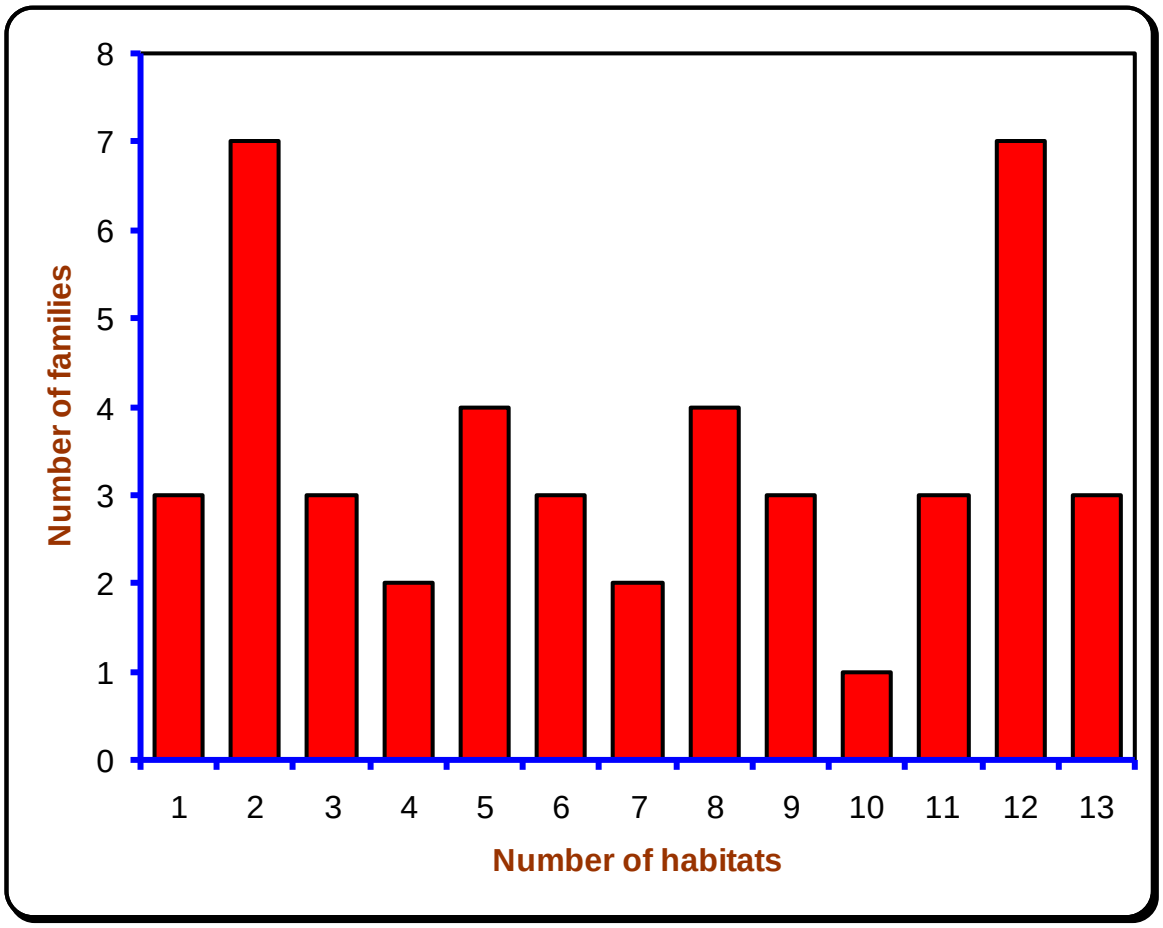

Fig.3. Number of families recorded in Sharkiya Governorate in relation to the number of habitats in which they occur.

Table (10): Taxic diversity of the 13 major habitats identified in Sharkiya Governorate. F: Frequency and P(%): Presence estimate.The maximum and minimum relation values are underlined.

Habitat	Family (F)		Genus (G)		Species (S)		Sub species (Sub)		Sub/S	S/G	G/F
	F	P	F	P	F	P	F	P			
Sand flats	15	33.3	34	22.4	38	16.4	2	14.3	2.3	1.11	0.05
Sand dunes	18	40.0	40	26.3	54	23.3	2	14.3	2.22	1.35	0.04
Salt marshes	16	35.6	38	25.0	48	20.8	6	42.8	2.4	1.76	0.13
Railways	23	51.1	63	41.4	73	31.6	6	42.8	2.7	1.2	0.08
Highway	28	62.2	92	60.5	116	50.2	7	50.0	3.3	1.26	0.06
Waste land	24	53.3	58	38.1	63	27.3	5	35.7	2.4	1.08	0.07
Abandoned field	23	51.1	68	44.7	84	36.4	5	35.7	2.9	1.23	0.05
Orchards	25	55.5	78	51.3	100	43.3	7	50	3.1	1.28	0.07
Fields of summer crops	19	42.2	42	27.6	50	21.6	3	21.4	2.21	1.19	0.06
Fields of winter crops	25	55.5	63	41.4	85	36.8	9	64.2	2.5	1.34	0.10
Reclaimed lands	23	51.1	58	38.1	76	32.9	5	35.7	2.5	1.3	0.06
Irrigation canals	35	77.7	94	61.8	133	57.6	9	64.2	2.6	1.4	0.06
Drainage canals	38	84.4	100	65.7	131	56.7	8	57.1	2.6	1.3	0.06
Total	**45**		**152**		**231**		**14**		**3.4**	**1.51**	**0.06**

Life Forms

The determination of the life forms of the recorded species indicated that therophytes (134 species = 58.01% of the total species) and cryptophytes (44 species = 18.6 % of the total species) are the most represented life forms. Of the 44 cryptophytic species, 32 are geophytes-helophytes (13.8%) and 12 are hydrophytes (5.2%). On the other hand, phanerophytes (9 species = 3.9%) and parasites (4 species = 1.7%) are the less represented life forms **(Fig.4)**. Regarding the flora of the different habitats, phanerophytes had the highest relative value in the railways and the lowest in the fields of winter crops. Chamaephytes had the highest relatives value in the sand flats and the lowest in the fields of winter crops, hemicryptophytes had the highest in the sand flats and the lowest in the drainage canals, geophytes-helophytes had the highest values in the railways and the lowest one in the fields of winter crops, hydrophytes had the highest values in the drainage canals and the lowest

values in the wast lands, parasites had the highest values in the fields of winter crops and the lowest values in irrigation canals, and therophytes had the highest in the fields of winter crops and the lowest values in the salt marshes **(Table 11)**.

Regarding the classes of the flora of different family, phanerophytes had the highest relative value in the families of < 5 species and lowest in Compositae. Chamaephytes had the highest relative value in families of < 15 – 10 species and lowest in families < 5 species geophytes-helophytes had the highest value in Gramineae and lowest in the families of < 10 – 5 species, hemicryptophytes had the highest relative value in Leguminosae and lowest in Compositae. Therophytes had the highest relative value in Leguminosae, Gramineae and Compositae and lowest in the families of < 5 species. Hydrophytes and parasites are found only in families of < 5 species **(Table 12)**.

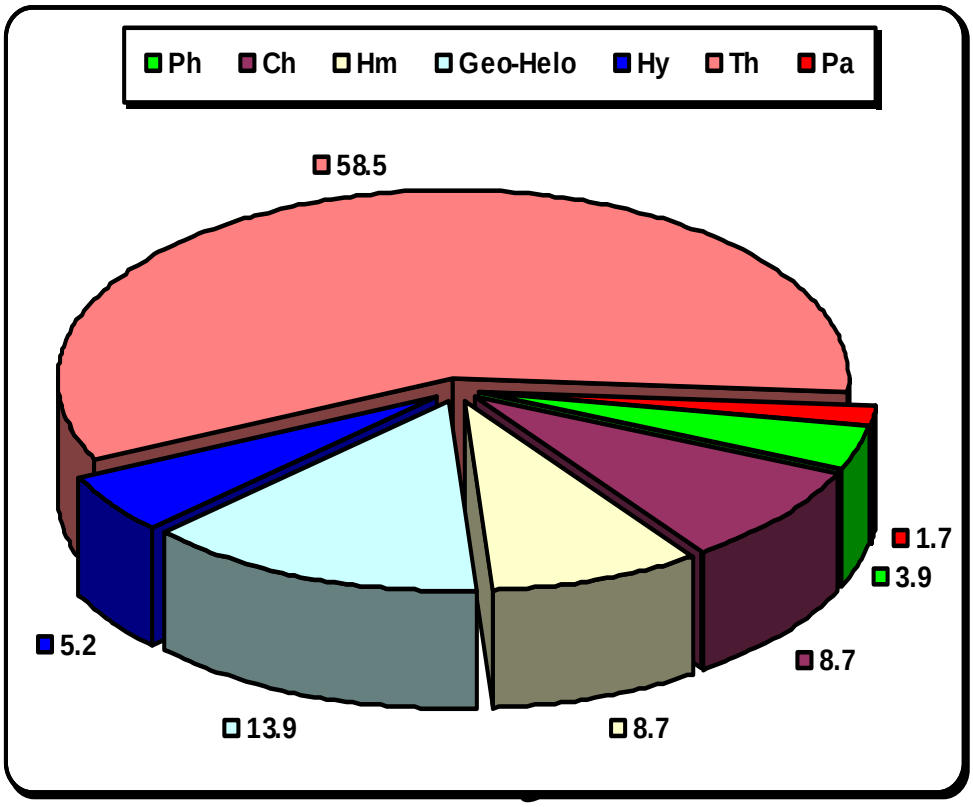

Fig.4. Life from spectrum of the recorded species in Sharkiya Governorate

Table 11 عرضى

Table 12 عرضى

Sex Forms

The sex of the recorded species are expressed in the following forms: bisexual (i.e. hermaphrodites), unisexual (either monoecious or dioecious) and polygamous **(Table 13).** They are arranged ascendingly as followes: dioecious (3 species = 1.3%), polygamous (5 species = 2.1%), monoecious (19 species 8.2%) and bisexual (199 species = 86.5%) **(Fig.5)**. The monoecious, dioecious and polygamous species are indicated in **(Table 14)**. There are also four non-flowering pteridophytic species that propagated by sporangia and archegonia in gametophytes stage and spore in sporophyte stage (*Azolla filiculoides*, *Azolla pinnata*, *Adiantum capillus-veneris* and *Marsilea aegyptiaca*). Regarding the variation in relation to types of habitats, bisexual had the maximum relative value in the salt marshes, that of the monoecious in the reclaimed lands, that of the dioecious in the railways, polygamous in orchards and spores in irrigation canals **(Table 15)**. Regarding the variation to life forms, bisexual had the maximum relative value in the parasites, that of the monoecious and spores in the hydrophytes, that of the dioecious and polygamous in the phanerophytes **(Table 16)**. Regarding the variation in relation to the major taxonomic groups, it is clear that monoecious, dioecious and polygamous had the maximum relative in dicotyledonous families, that of the bisexual in monocotyledonous families **(Table 13 and 17)**. Regarding the flora of different classes, it is clear that monecious had the maximum relative value in families of < 10-5 species, that of the dioecious and spores in families of < 5 species., that of polygamous in families of < 15-10 species., that of the bisexual in Gramineae and Leguminosae **(Table 18)**

Table (13). Sex form spetra of the recorded species in relation of their families in Sherkiya Governorate.

Family	Sex form				
	Unisexual		Bisexual	Polygamous	Spores
	Monoecious	Dioecious			
Pteridophyta					
Azollaceae	-	-	-	-	1
Adiantaceae	-	-	-	-	1
Marsileaceae	-	-	-	-	1
Total	**-**	**-**	**-**	**-**	**3**
Dicotyledoneae					
Salicaceae	-	2	-	-	-
Urticaceae	1	-	-	-	-
Polygonaceae	1	-	5	-	-
Aizoaceae	-	-	4	-	-
Portulacaceae	-	-	1	-	-
Caryophyllaceae	-	-	7	-	-
Chenopodiaceae	-	-	13	1	-
Amaranthaceae	5	-	-	-	-
Ranunculaceae	-	-	1	-	-
Ceratophyllaceae	1	-	-	-	-
Cruciferae	-	-	10	-	-
Leguminosae	-	-	21	-	-
Oxalidaceae	-	-	1	-	-
Geraniaceae	-	-	1	-	-
Zygophyllaceae	-	-	4	-	-
Euporbiaceae	5	-	1	1	-
Malvaceae	-	-	3	-	-
Tamaricaceae	-	-	2	-	-
Onagraceae	-	-	1	-	-
Halorgidaceae	-	-	1	-	-
Umbelliferae	-	-	3	-	-
Primulaceae	-	-	1	-	-
Plumbaginaceae	-	-	1	-	-
Gentianaceae	-	-	1	-	-
Asclepiadaceae	-	-	1	-	-
Convolvulaceae	-	-	5	-	-
Cuscutaceae	-	-	1	-	-
Boraginaceae	-	-	3	-	-

Family	Sex form				
	Unisexual		Bisexual	Polygamous	Spores
	Monoecious	Dioecious			
Verbenaceae	-	-	2	-	-
Labiatae	-	-	1	-	-
Solanaceae	-	-	5	-	-
Scrophulariaceae	-	-	3	-	-
Orobanchaceae	-	-	3	-	-
Plantaginaceae	-	-	3	-	-
Compositae	3	1	26	3	-
Total	**16**	**3**	**136**	**5**	**-**
Monocotyledoneae					
Potamogetonaceae	-	-	3	-	-
Pontederiaceae	-	-	1	-	-
Juncacea	-	-	3	-	-
Gramineae	-	-	50	-	-
Lemmnaceae	2	-	1	-	-
Typhaceae	1	-	-	-	-
Cyperaceae	0	-	5	-	-
Total	3	-	63	-	-

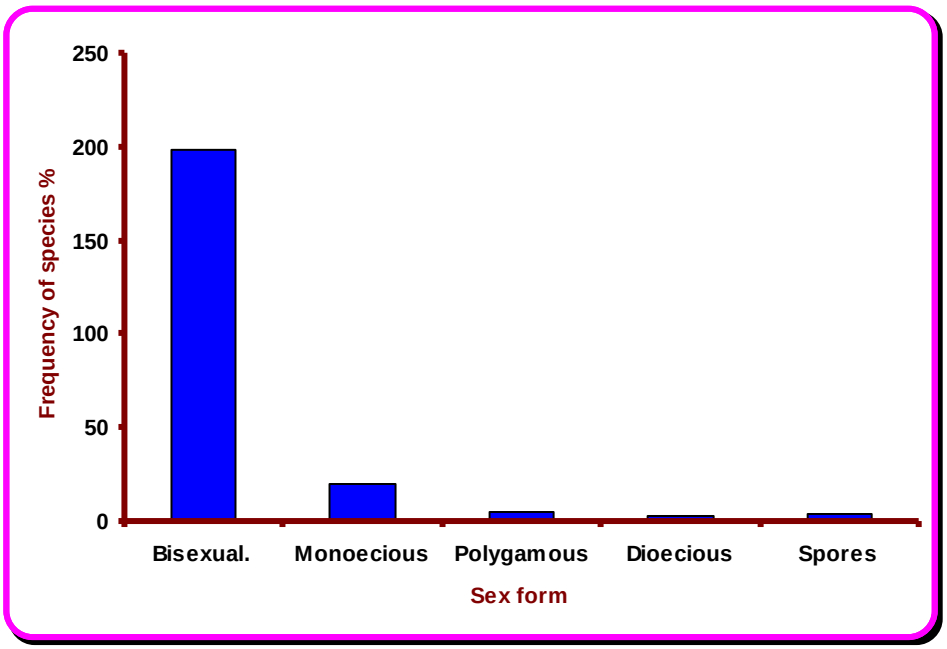

Fig.5. Frequency of the recorded species in Sharkiya Governorate in relation to their sex forms.

Table (14). List of the unisexual and polygamous species recorded in Sharkiya Governorate

Species	Unisexual		Polygamous
	Monoecious	Dioecious	
Salix mucronata	-	1	-
Salix tatcasperma	-	1	-
Urtica urens	1	-	-
Emex spinosa	1	-	-
Atriplex inflata	-	-	1
Amaranthus hybridus	1	-	-
Amarathus graecizams	1	-	-
Amaranthus lividus	1	-	-
Amaranthus viridis	1	-	-
Ceratophyllum demersum	1	-	-
Euphorbia hirta	-	-	1
Euphorbia forsskaolii	1	-	-
Euphorbia heterophylla	1	-	-
Euphorbia helioscopia	1	-	-
Euphorbia peplus	1	-	-
Euphorbia peplis	1	-	-
Centaurea pumilio	1	-	-
Pluchea dioscorides	-	-	1
Conyza bonariensis	-	-	1
Conyza aegyptiaca	1	-	-
Symphyotrichum squamatum	-	-	1
Xanthium pungens	1	-	-
Xanthium spinosum	1	-	-
Cotula cinerea	-	1	-
Spirodela polyrhiza	1	-	-
Lemna gibba	1	-	-
Typha domingensis	1	-	-

Table (15). Sex form spectra of the recorded species in the 13 habitats indentfied in Sharkiya Governorate. F: Frequency and P(%): Presence estimate. The maximum values are underlined.

Habitat	Total species	Sex form									
		Unisexual				Bisexual		polygamous		spores	
		Monoecious		Dioecious							
		F	P	F	P	F	P	F	P	F	P
Sand flats	38	1	2.6	-	-	37	97.4	-	-	-	-
Sand dunes	54	4	7.4	-	-	50	92.6	-	-	-	-
Salt marshes	48	-	-	-	-	48	100	-	-		
Railways	73	5	6.8	2	2.7	63	8.6	3	4.1	-	-
Highways	116	8	6.9	3	2.6	102	87.9	3	2.6	-	-
Watse land	63	4	6.3	1	1.6	56	88.9	2	3.2	-	-
Abandoned filed	84	5	5.9	-	-	75	89.3	4	4.7	-	-
Orchards	100	9	9	-	-	86	86	5	5	-	-
Fields summer crops	50	5	10	-	-	43	86	2	4	-	-
Fields of winter crops	85	8	9.4	-	-	75	88.2	2	2.3	-	-
Reclaimed lands	76	12	15.8	-	-	61	80.3	2	2.6	1	1.3
Irrigation canals	133	14	10.5	2	1.5	110	82.7	3	2.2	4	3.01
Drainage canasls	131	11	8.3	1	0.8	113	86.2	4	3.05	2	1.5

Table (16). Sex form spectra of the recorded species in the relation to their froms in Sharkiya Governorate. F: Frequency and P(%): Presence estimate.The maximum values are underlined.

Life form	Total species	Sex form									
		Unisexual				Bisexual		polygamous		spores	
		Monoecious		Dioecious							
		F	P	F	P	F	P	F	P	F	P
Phanerophytes	9	-	-	2	22.6	6	66.7	1	11.1	-	-
Chamaephytes	20	-	-	-	-	19	95	1	5	-	-
Hemicryptophytes	20	-	-	-	-	18	90	-	-	2	10
Geophytes-Helophytes	32	1	3.1	-	-	31	96.9	-	-	-	-
Hydrophytes	12	3	25	-	-	7	58.3	-	-	2	16.7
Therophytes	134	16	11.9	1	0.7	114	85.1	3	2.2	-	-
Parasites	4	-	-	-	-	4	100	-	-	-	-
Total	**231**	**20**	**8.6**	**3**	**1.3**	**199**	**86.1**	**5**	**2.1**	**4**	**1.7**

Table (17). Sex form spectra of the major taxonomic groups of the flora of Sharkiya Governorate. F: Frequency and P(%): Presence estimate.The maximum values are underlined.

Taxonomic	Total species	Sex form									
		Unisexual				Bisexual		polygamous		spores	
		Monoecious		Dioecious							
		F	P	F	P	F	P	F	P	F	P
Pteridophyta	4	-	-	-	-	-	-	-	-	4	100
Dicotyledoneae	161	17	10.5	3	1.8	136	84.5	5	3.1	-	-
Monocotyledoneae	66	3	4.5	-	-	63	95.4	-	-	-	-
Total	**231**	**20**	**8.6**	**3**	**1.3**	**199**	**86.1**	**5**	**2.1**	**4**	**1.7**

Table (18). Relationship between the sex forms species-per-family classes of the flora of Sharkiy Governorate. The first line is the frequency value and the second line is the presence estimate (%). The maximum relative values are underlined.

Month	Families of > 20 species			Families of < 15-10 species	Families of < 10-5 species	Families of < 5 species	Total
	Gramineae	Compositae	Ledguminosae				
Unisexual							
A] Monoecious	-	4	-	-	11	5	**20**
		11.7			24.4	8.9	
B] Dioecious	-	1	-	-	-	2	**3**
	-	2.9				3.5	
Bisexual	50	26	21	23	33	46	**199**
	100	76.4	100	95.8	73.3	82.1	
Polygamous	-	3	-	1	1	-	**5**
	-	8.8		4.2	2.2		
Spores	-	-	-	-	-	4	**4**
						7.01	
Total	**50**	**34**	**21**	**24**	**45**	**57**	**231**

Chorological Affinities

In general, many of the recoreded species belong to the Mediterranean chorotype (120 species = 51.9 % of the total species), followed by Irano-Turanian (90 species = 38.9 %), Saharo-Arabian (58 species = 25.1 %), Euro-Siberian (48 species = 20.8 %) and Sudano-Zambezian (21 species = 9.1 %). The general trend of these regions were pluri-regional > bi-regional > mono-regionals. The mono-regionals were not represented in Euro-Siberian and Irano-Turanian.

It was noticed that the mediterranean and Saharo-Arabian elements had the maximum relative values in sand flats, while Sudano-Zambezian chorotype in wast lands (**Table 19**). Regarding the variation in relation to life forms, (**Table 20**) Mediterranean chorotype had the maximum relative values in hemicryptophytes (3 = 15 %), Saharo-Arabian had the maximum relative values in chamaephytes and Sudano-Zambezian chorotype in phanerophytes (1 = 11.1 %).

To sum up, the results of the total chorological analysis of the surveyed flora presented in **Table 21** revealed that 15.1% of the studied species were monoregional, of which 2.6% being native to the Sudano-Zambeziam chorotype. Typical Mediterranean and Saharo-Arabian chorotypres were very modestly represented. Endemic chorotype constituted the lowest values 0.4%. A bout 57.1% of the recorded species were biregional and pluriregional, extending their distribution all over the Saharo-Arabian, Sudano-Zambezian, Irano-Turanian and Mediterranean chorotypes. The biregional Saharo-Arabian and Mediterranean, the Saharo-Arabian and Irano-Turanian and the Saharo-Arabian and Sudano-Zambezian chorotypes constituted the highest values (3.5, 2.6 and 2.6% respectively), while Pantropic and Temperate taxa were rarely occurre

Table (19). Spectra of the chorotypes in relation to the 13 habitats identified in Sharkiya Governorate. The frist line is the actual value and the second line is the relative value (%). Sf: Sand flats, Sd: Sand dunes, Sm: Salt marshes, Rw: Railways, Hw: Highways, Wl: Waste lands, Af: Abandoned fields, Or: Orchards, Sc: Fields of summer crops, Wc: Fields of winter crops, Rl: Reclaimed lands, Ic: Irrigation canals and Dc: Drainage canals, ME: Mediterranean, IR-TR: Irano-Turanian, SA-SR: Saharo Arabia, ER-SR: Euro-Siberian, SU-ZA: Sudano-Zambezian, COSM: Cosmoplitan, PAL: Palaeotropical, NEO: Neotropical AU:Australian. The maixmum relative values are underlined.

Chorotypes	Habitat												
	Desert			Urban				Cultivated			Reclaimed	Wetlads	
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc
Monoregional													
Endemics	-	-	-	-	-	-	-	-	-	-	-	-	1 0.76
ME	6 15.8	8 14.8	2 4.2	1 1.4	7 6.03	2 3.2	1 1.2	3 3	1 2	4 4.7	1 1.3	4 3	2 1.52
SA – AR	8 21.1	6 11.1	5 10.4	1 1.4	3 2.6	3 4.8	3 3.6	2 2	-	1 1.2	1 1.3	-	1 0.76
SU – ZA	-	-	-	2 2.7	2 1.7	2 3.2	-	2 2	1 2	1 1.2	2 2.6	3 2.2	3 2.3
Biregional													
ME + SA -- AR	2 5.3	5 9.3	3 6.2	-	5 4.3	1 1.6	4 4.8	2 2	-	1 1.2	2 2.6	-	3 2.3
ME + IR – TR	2 5.3	5 9.3	5 10.4	8 10.9	13 11.2	6 9.5	10 11.9	14 14	3 6	14 16.5	6 7.9	15 11.3	13 9.9
ME + ER - SR	-	1 1.8	2 4.2	2 2.7	2 1.7	2 3.2	2 2.4	4 4	2 4	4 4.7	3 3.9	5 3.7	5 3.8
ME+ SU - ZA	-	-	-	-	-	-	1 1.2	-	-	1 1.2	-	1 0.75	1 0.76
SA – AR + SU - ZA	1 2.6	2 3.7	1 2.1	3 4.1	3 2.6	2 3.2	1 1.2	1 1	-	-	-	2 1.5	2 1.52
IR – TR + SU - ZA	-	-	-	1 1.4	2 1.7	1 1.6	-	1 1	1 2	1 1.2	1 1.3	1 0.75	1 0.76
IR – TR + SA - AR	5 13.2	2 3.7	3 6.2	3 4.1	4 3.4	3 4.8	5 5.9	1 1	-	1 1.2	1 1.3	1 0.75	3 2.3
Pluriregional													
COSM	2 5.3	2 3.7	2 4.2	2 2.7	9 7.7	6 9.5	6 7.1	8 8	7 14	7 8.2	7 9.2	12 9.02	14 10.7
PAN	-	-	-	-	-	1 1.6	1 1.2	1 1	2 4	-	1 1.3	2 1.5	2 1.52

Chorotypes	Habitat												
	Desert			Urban				Cultivated			Reclaimed	Wetlads	
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc
PAL	1 2.6	2 3.7	2 4.2	7 9.6	8 6.9	2 3.2	5 5.9	7 7	5 10	4 4.7	4 5.3	9 6.8	9 6.9
NEO	1 2.6	-	-	4 5.5	3 2.6	2 3.2	2 2.4	5 5	4 8	3 3.5	4 5.3	6 4.5	5 3.8
Temperate	-	-	-	3 4.1	4 3.4	1 1.6	1 1.2	2 2	-	2 2.3	-	3 2.2	3 2.3
Borealo – tropical	1 2.6	2 3.7	1 2.1	3 4.1	4 3.4	4 6.3	3 4.8	6 6	5 10	3 3.5	4 5.3	9 6.8	7 5.3
Temperate + NEO	-	-	-	-	-	1 1.6	-	-	-	1 1.2	1 1.3	1 0.75	-
ME + PAL	-	-	-	-	-	1 1.6	-	1 1	-	1 1.2	1 1.3	2 1.5	-
ME + NEO	-	-	-	1 1.4	1 0.9	-	1 1.2	1 1	1 2	1 1.2	1 1.3	1 0.75	1 0.76
PAL + NEO	-	-	1 2.1	2 2.7	5 4.3	3 4.8	4 4.8	5 5	2 4	-	3 3.9	6 4.5	5 3.8
ME + IR – TR + ER – SR	2 5.3	5 9.3	5 10.4	16 21.9	20 17.2	13 20.6	19 22.6	22 22	9 18	23 27.1	16 21.05	26 19.5	26 19.8
ME + ER – SR + SA – AR	-	2 3.7	1 2.1	1 1.4	1 0.9	1 1.6	1 1.2	-	-	-	-	1 0.75	2 1.52
ME + ZU – ZA + SA - AR	-	-	1 2.1	-	2 1.7	1 1.6	-	-	-	-	1 1.3	-	1 0.76
ME + PAL + NEO	-	-	-	1 1.4	1 0.9	-	1 1.2	1 1	1 2	-	1 1.3	1 0.75	1 0.76
ME + IR – TR + PAL	-	1 1.8	-	1 1.4	1 0.9	1 1.6	1 1.2	-	-	-	1 1.3	2 1.5	1 0.76
ME + IR –TR + SA - AR	4 10.5	3 5.5	5 10.4	3 4.1	8 6.9	-	2 2.4	2 2	1 2	4 4.7	2 2.6	3 2.2	3 2.3
ME + IR –TR + SU – ZA	-	-	-	-	-	-	-	-	-	-	-	-	1 0.76
ME + IR-TR + Aust	-	-	1 2.1	1 1.4	1 0.9	-	1 1.2	-	-	-	-	-	-
IR – TR + SU – ZA + SA – AR	-	3 5.5	-	1 1.4	1 0.9	1 1.6	-	1 1	-	-	1 1.3	1 0.75	-
ME+ IR –TR + SA – AR + PAL	-	-	-	1 1.4	-	-	1 1.2	-	-	-	-	1 0.75	1 0.76
ME + IR- TR + ER – SR + PAL	-	1 1.8	2 4.2	-	-	1 1.6	-	-	-	1 1.2	-	2 1.5	-
ME + IR-TR + ER – SR+ SA – AR	2 5.3	-	1 2.1	-	1 0.9	1 1.6	1 1.2	1 1	-	-	1 1.3	2 1.5	1 0.76
ME+ IR–TR+ SA–AR + PAL+NEO	1 2.6	-	2 4.2	2 2.7	1 0.9	-	2 2.4	2 2	1 2	1 1.2	2 2.6	2 1.5	2 1.52
ME + IR –TR +	-	-	-	1	2	-	2	1	-	1	1	-	1

Chorotypes	Habitat												
	Desert			Urban				Cultivated			Reclaimed	Wetlads	
	Sf	Sd	Sm	Rw	Hw	Wl	Af	Or	Sc	Wc	Rl	Ic	Dc
SA – AR+SU – ZA				1.4	1.7		2.4	1		1.2	1.3		0.76
ME + IR –TR + ER – SR+SU – ZA	-	-	-	-	-	-	-	1 1	-	-	1 1.3	-	1 0.76
ME + ER – SR + PAL + NEO	-	-	1 2.1	-	-	-	-	-	-	-	-	-	1 0.76
ME + IR- TR + PAL + NEO	-	1 1.8	-	2 2.7	2 1.7	1 1.6	3 3.6	3 3	3 6	2 2.3	2 2.6	3 2.2	1 0.76
Total	**38**	**54**	**48**	**73**	**116**	**63**	**84**	**100**	**50**	**85**	**76**	**133**	**131**

Table (20) . Relationship between the life forms and the chorotypes of the recorded species in Sharkiya Governorate. The frist line is the actual value and the second line is the relative value (%). Ph: Phanerophytes, Ch: Chamaephytes, Hm: Hemicryptophytes, Ge-He: Geophytes-helophytes, Hy: Hydrophytes,Th: Therophytes and Pa: Parasite, ME: Mediterranean, IR-TR: Irano-Turanian, SA-SR: Saharo Arabia, ER-SR: Euro-Siberian, SU-ZA: Sudano-Zambezian, COSM: Cosmoplitan, PAL: Palaeotropical, NEO: Neotropical and AU: Australian. The maixmum relative values are underlined.

Chorotypes	Life-form							Total
	Ph	Ch	Hm	Ge-He	Hy	Th	Pa	
Monoregional								
Endemics	-	1 5	-	-	-	-	-	1
ME	-	1 5	3 15	2 6.25		8 5.97	-	14
SA – AR	1 11.1	3 15	2 10	-	-	8 5.97	-	14
SU – ZA	1 11.1	1 5	-	-	1 8.3	3 2.2	-	6
Biregional								

Chorotypes	Life-form							Total
	Ph	Ch	Hm	Ge-He	Hy	Th	Pa	
ME + SA -- AR	1 11.1	2 10	2 10	-	-	3 2.2	-	8
ME + IR - TR	-	1 5	1 5	-	1 8.3	16 11.9	3	22
ME + ER - SR	-	2 10	-	-	-	6 4.5	-	8
ME+ SU - ZA	-	-	-	-	-	1 0.7	-	1
SA – AR + SU - ZA	2 22.2	2 10	-	1 3.1	-	1 0.7	-	6
IR – TR + SU - ZA	-	-	-	-	-	1 0.7	-	1
IR – TR + SA - AR	1 11.1	-	-	-	-	5 3.7	-	6
Pluriregional								
COSM	-	-	1 5	2 6.25	3 25	11 8.2	-	17
PAN	-	-	1 5	-	-	1 5	-	2
PAL	-	-	2 10	7 21.8	-	6 4.5	-	15
NEO	-	3 15	-	1 3.1	1 8.3	4 2.9	-	9
Temperate	2 22.2	-	-	-	-	2 1.5	-	4
Borealo – tropical	-	-	1 5	2 6.25	3 25	4 2.9	-	10
Temperate + NEO	-	-	-	-	-	1 0.7	-	1
ME + PAL	-	-	-	-	-	1 0.7	-	1
ME + NEO	-	-	-	-	-	1 0.7	-	1
PAL + NEO	-	-	-	4 12.5	1 8.3	5 3.7	-	10
ME + IR – TR + ER – SR	2 22.2	-	4 20	2 6.25	-	24 17.9	-	32

Chorotypes	Life-form							Total
	Ph	Ch	Hm	Ge-He	Hy	Th	Pa	
ME + IR – TR + US – ZA	-	1 5	-	-	-	-	-	1
ME + ER – SR + SA – AR	-	1 5	-	-	-	1 0.7	-	2
ME + SU – ZA + SA - AR	-	-	-	-	-	3 2.2	-	3
ME + PAL + NEO	-	-	-	1 3.1	-	-	-	1
ME + IR – TR + PAL	-	-	-	2 6.25	-	-	-	2
ME + IR – TR + SA – AR	-	-	1 5	1 3.1	-	7 5.2	1	10
ME + IR – TR + AU	-	-	-	1 3.1	-	-	-	1
IR – TR + SU – ZA+ SA– AR	-	1 5	-	-	-	-	-	1
ME + IR – TR + ER – SR + PAL	-	-	-	-	-	2 1.5	-	2
ME + IR – TR + ER – SR+ SA – AR	-	1 5	-	-	-	2 1.5	-	3
ME + IR – TR + SA – AR + PAL	-	-	-	1 3.1	-	-	-	1
ME + IR - TR + SA – AR + PAL+ NEO	-	-	-	2 6.25	-	-	-	2
ME + IR – TR + SA – AR + SU – ZA	-	-	-	1 3.1	-	-	-	1
ME + IR – TR + ER – SR + SU – ZA	-	-	-	-	-	1 0.7	-	1
ME + IR – TR + PAL+ NEO	-	-	1 5	1 3.1	-	1 0.7	-	3
Total	**9**	**20**	**20**	**32**	**12**	**134**	**4**	**224** **231**

Table (21) . Chorotype analysis of the species examined as numbers and percentages of the total species recorded. SA-AR = Saharo-Arabian, Me = Mediterranean, IR-TR = Irano-Turanian, ER-SR = Euro-Siberian, SU-ZA = Sudano-Zambezian.

Chorotypes	Number of species	(%)
Monoregional		
Endemic	1	0.4
Mediterranean	14	6.1
Saharo-Arabian	14	6.1
Sudano-Zambeziam	6	2.6
Total	**35**	**15.1**
Biregional		
Me + SA-AR	8	3.5
SA-AR + SU-ZA	6	2.6
SA-AR + IR-TR	6	2.6
Me + ER-SR	8	3.5
Me + IR-TR	22	9.5
Others	2	0.9
Total	**52**	**22.5**
Pluriregional		
SA-AR + Me + IR-TR	11	4.8
SA-AR + Me + ER-SR	2	0.9
SA-AR + SU-ZA + IR-TR	1	0.4
SA-AR + SU-ZA + Me	3	1.3
Others	63	27.3
Total	**80**	**34.6**
Paleotropic	15	6.5
Pantropic	2	0.9
Cosmopolitan	17	7.3
Neotropical	9	3.9
Temperate	4	1.7
Boreal-Tropical	10	4.3
	57	24.7
Total	**231**	**100**

Rarity Forms

In the present study, the majority of species (76 species = 33.04% of the total species) had small geographical distribution, narrow habitat specificity and were non-abundant (SNN), while the minority (15 species = 6.5% of the total species) had small geographical distribution, wide habitat specificity and non-abundant (SWN) **(Fig.6)**. Regarding the variation in relation to habitats, LWA had the maximum relative value in waste lands, while LWN, SWN and SNN in abandoned fields, LNA in highways, and LNN in the salt marshes **(Table 22)**. Regarding the variation in relation to the life forms, the LWA species had the maximum relative value in phanerophytes while LWN and LNN in the chamaephytes, LNA in the parasites, SWN in hemicryptophytes and SNN in the hydrophytes **(Table 23)**.

Dispersal type

The determination of the dispersal types of the recorded species indicated that the ballochore (35 species = 15.1 % of the total species) and pogonochore (44 species = 19.1 %) were highly represented **(Fig. 7)**. On the other hand, cyclochore (5 species = 2.1 %) and barochore (2 species = 0.9 %) were the less represented dispersal types. Regarding the variation in relation to type of habitat, the barochores and desmochore had the highest values in the fields of summer crops. Pyrenochores and pogonochores had the highest values in the sand dune, microsclerochores in the salt marshes, ballochores in the waste lands, auxochores in the irrigation canals, cyclochores and sarcochore in the sand flats, pterochores in the rialways and sporochore had the highest value in the reclaimed lands **(Table 24)**.

The variation in relation to the life forms, revealed that the barochores had the maximum relative value in therophytes. Pyrenochores had the maximum relative value in geophytes-helophytes, microsclerochores in hemicryptophytes, ballochores in chamaephytes and auxochores in hydrophytes. Cyclochores had the maximum relative value in geophytes-helophytes, pterochores in chamaephytes, pogonochores in phanerophytes, desmochores in hemicrytophytes, sporochores in parasites and sarcochores in hemicryptophytes **(Table 25)**.

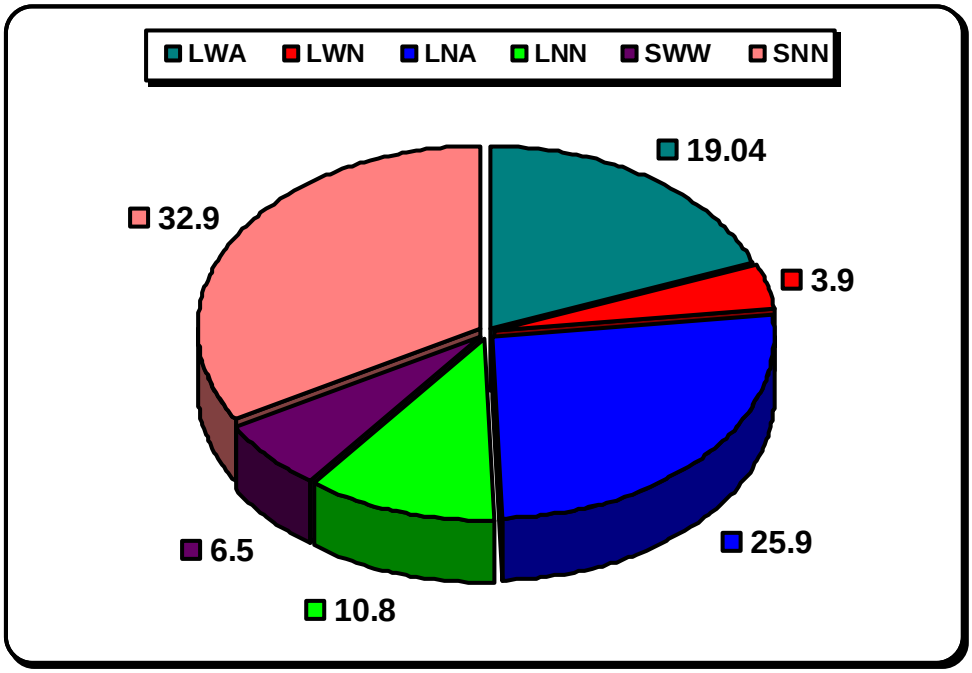

Fig.6. **Rarity forms spectrum of the recorded species in Sharkiya Governorate. LWA: Large geographic, Wide habitat and abundant gradients; LWN: Large geographic, Wide habitat and non abundant gradient; SWA: Small geographic, Wide habitat and abundant gradients, LNA: Large geographic, Narrow habitat and abundant gradients; LNN: Large geographic, Narrow habitat and non abundant gradients; SWN: Small geographic, Wide habitat and non abundant gradients; SNA: Small geographic, Narrow habitat and abundant gradients and SNN: Small geographic, Narrow habitat and non abundant gradients.**

Table 2٢ عرضى

Table 23 عرضى

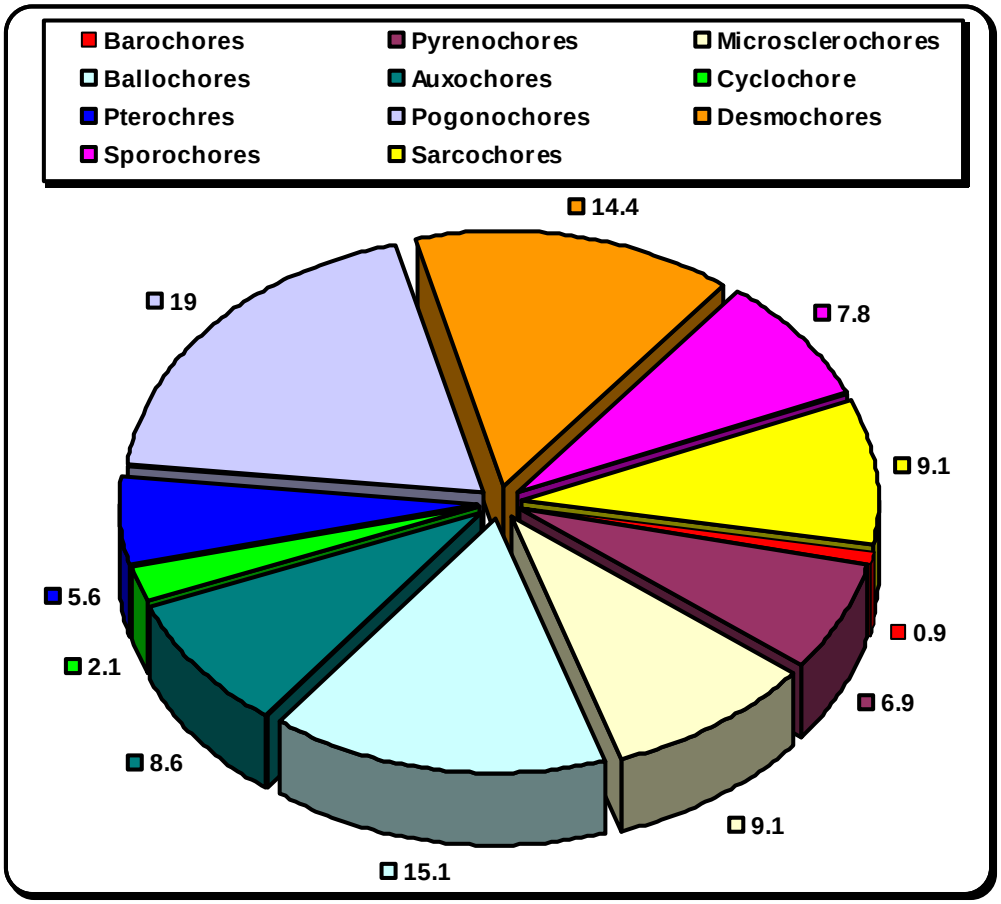

Fig.7. Dispersal type spectrum of the recorded species in Sharkiya Governorate.

Table 24 عضى

Table 25 عرضى

It can be also noted that Gramineae was the only family that included more than one dispersal type. The distributions of the different dispersal types within the families were given in **Table 26**. It can be noted that auxochores (13 species or 5.62% of the total species) belonging to 9 families (Azollaceae, Adiantaceae, Marsileaceae, Certophyllaceae, Onagraceae, Haloragidaceae, Potamagetonaceae, Pontederiaceae and Lemnaceae) were mostly represented in the wetland habitats (irrigation and drainage canals). The pogonochores were 38 species (16.4% of the total flora) belonging to 6 families (Salicaceae, Geraniaceae, Tamaricaceae, Asclepiadaceae, Compositae and Typhaceae).

Environmental Importance

154 species in Sarkiya provenice (66.9% of the total species) have at least one aspect of the environmental importance (**Appendix 2**). The environmental role of the recorded species could be arranged descendingly as follows: segetals (89), ruderal (62), poisoners (18), both of water invaders and bank retainers (11), weed controllers (8), sand controllers (6), wind breaks (5) both of water purificators and shaders (4) and nitrogen fixers (2) **(Fig. 8)**.

108 of the environmental important species had only one importance (70.1% of the total environmental important species), 34 species had two importances (22.1%) and 12 species have three importances (6.8%). Regarding the variation in relation to types of habitat, the ruderals, poisoners and water purificators had the maximum relative number in the sand flats. Sand controllers in the sand dunes, the bank retainers, shaders and wind breaks in salt marshes, water invaders in railways, weed controllers in abandoned fields and segetal weed and nitrogen fixers in fields of winter crops **(Table 27)**.

The variation in relation to the life forms, the wind breaks had the maximum relative number in the phanerophytes, the sand controllers and bank retainers in the chamaephytes, the weed controllers in the hemicryptophytes, ruderals and water invaders in the geophytes-helophytes, nitrogen fixers in therophytes and poisoners in the parasites **(Table 28)**.

Table (26). Dispersal type spectra of the recorded species in relation to their families in Sharkiya Governorate. Bar: Barochore, Pyr: Pyrenochor, Mic: Microsclerochore, Bal: Ballochore, Aux: Auxochore, Cyc: Cyclochore, Pte: Pterochore, Pog: Pogonochore, Des: Desmochores, Spo: Sporochore and Sar: Sarcochore. Figures refer to number of species within each family.

Family	Dispersal type										
	Autochore					Heterochore					
	Bar	Pyr	Mic	Bal	Aux	Cyc	Pte	Pog	Des	Spo	Sar
Azollaceae	-	-	-	-	1	_-	-	-	-	-	-
Adiantaceae	-	-	-	-	1	-	-	-	-	-	-
Marsileaceae	-	-	-	-	1	-	-	-	-	-	-
Certophyllaceae	-	-	-	-	1	-	-	-	-	-	-
Onagraceae	-	-	-	-	1	-	-	-	-	-	-
Haloragidaceae	-	-	-	-	1	-	-	-	-	-	-
Potamagetonaceae	-	-	-	-	3	-	-	-	-	-	-
Pontederiaceae	-	-	-	-	1	-	-	-	-	-	-
Lemnaceae	-	-	-	-	3	-	-	-	-	-	-
Oxalidaceae	-	-	-	1	-	-	-	-	-	-	-
Primulaceae	-	-	-	1	-	-	-	-	-	-	-
Verbenaceae	-	-	-	2	-	-	-	-	-	-	-
Amaranthaceae	-	-	5	-	-	-	-	-	-	-	-
Ranunculaceae	-	-	1	-	-	-	-	-	-	-	-
Labiatae	-	-	1	-	-	-	-	-	-	-	-
Aizoaceae	-	4	-	-	-	-	-	-	-	-	-
Juncaceae	-	3	-	-	-	-	-	-	-	-	-
Euphorbiaceae	-	-	-	-	-	-	-	-	-	-	7
Plumbaginaceae	-	-	-	-	-	-	-	-	-	-	1
Boraginaceae	-	-	-	-	-	-	-	-	-	-	3
Cuscutaceae	-	-	-	-	-	-	-	-	-	1	-
Orobanchaceae	-	-	-	-	-	-	-	-	-	3	-
Urticaceae	-	-	-	-	-	-	-	-	1	-	-
Portulacaceae	-	-	-	-	-	-	-	-	1	-	-
Salicaceae	-	-	-	-	-	-	-	2	-	-	-
Geraniaceae	-	-	-	-	-	-	-	1	-	-	-
Tamaricaceae	-	-	-	-	-	-	-	2	-	-	-
Asclepiadaceae	-	-	-	-	-	-	-	1	-	-	-
Compositae	-	-	-	-	-	-	-	31	-	-	-
Typhaceae	-	-	-	-	-	-	-	1	-	-	-
Plantaginaceae	-	-	-	-	-	-	3	-	-	-	-
Gramineae	1	6	8	4	3	1	-	4	18	5	-

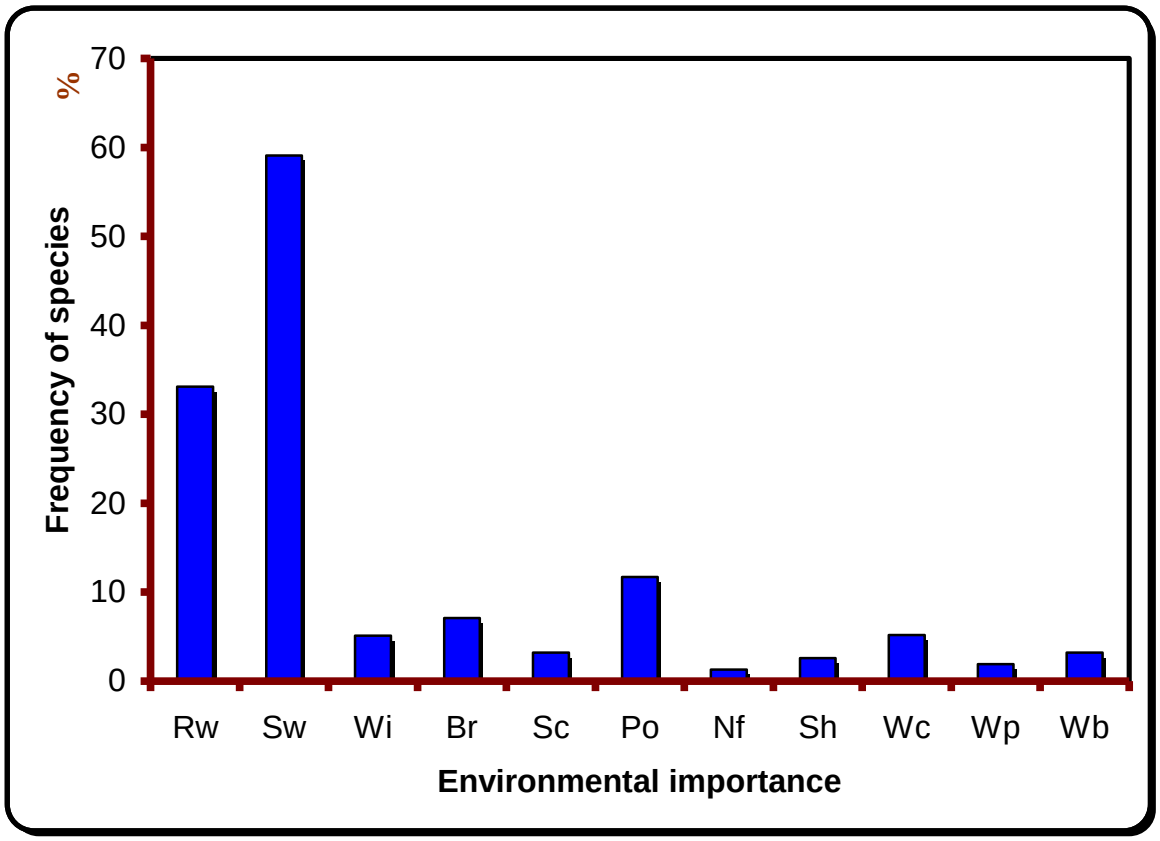

Fig.8. Descending arrangement of the environmental importances in Sharkiya Governorate. Rw: Rnderad weed, Sw: Segetal weed, Wi: Water invader, Br: Bank rataimers, Sc: Sand controllers, Po: Poisoner, Nf: Nitrogen fixer, Sh: Shader, Wc: Weed controllers, Wp: Water purificator and Wb: Wind breaks.

Table (27). Environmental importance of the recorded species in the 13 habitats identified in Sharkiya Governorate. Rw: Ruderal weed, Sw: Segetal weed, Wi: Water invaders, Br: Bank retainers, Sc: Sand controllers, Po: Poisoners, Nf: Nitrogen fixer, Sh: Shader, Wc: Weed controllers, Wp: Water purificator and Wb: Wind breaks. The first line is the frequency value and the second line is the presence estimate (%). The relative maixmum and minimum values for each importance are underlined.

Habitats	Total species	Environmental Importance										
		Rw	Sw	Wi	Br	Sc	Po	Nf	Sh	Wc	Wp	Wb
Sand flats	19	5	10	1	3	4	3	-	-	2	1	-
		55.6	52.6	5.3	15.8	5.3	15.8			10.5	5.3	
Sand dunes	24	6	11	-	3	4	2	-	1	2	1	1
		25	45.8	-	12.5	16.7	8.3		4.2	8.3	4.2	4.2
Salt marshes	22	10	7	2	5	3	-	-	2	2	1	2
		45.4	31.8	9.1	22.7	13.6	-	-	9.1	9.1	4.5	9.1
Railways	55	22	28	6	7	1	4	-	3	5	2	4
		40	50.9	10.9	12.7	1.8	7.3	-	5.4	9.1	3.6	7.3
Highways	89	31	49	6	10	3	7	1	4	8	2	5
		34.6	55.0	6.7	11.2	3.4	7.9	1.1	4.5	8.9	2.2	5.6
Waste land	46	17	26	-	3	-	5	-	2	1	1	2
		36.9	56.5	-	6.5	-	10.9	-	4.3	2.2	2.2	4.3
Abandoned fields	71	24	42	6	8	2	2	1	2	8	2	3
		33.8	59.1	8.4	11.3	2.8	2.8	1.4	2.8	11.3	2.8	4.2
Orchards	86	24	59	4	6	1	9	2	1	5	1	1
		27.4	68.6	4.6	6.9	1.2	10.5	2.3	1.2	5.8	1.2	1.2
Fields of summer crops	44	14	29	4	2	-	4	1	-	1	1	-
		31.8	65.9	9.1	4.5	-	9.1	2.3	-	2.3	2.3	-
Fields of winter crops	73	13	60	1	1	-	11	2	-	2	1	-
		17.8	82.2	1.4	1.4	-	15.1	2.7	-	2.7	1.4	-
Reclaimed lands	65	20	43	3	5	1	9	1	-	5	2	-
		30.8	66.1	4.6	7.7	1.5	13.8	1.5		7.7	3.1	
Irrigation canals	108	36	64	11	8	-	8	2	2	5	4	3
		33.3	59.2	10.2	7.4		7.4	1.8	1.8	4.6	3.7	2.8
Drainage canals	98	37	52	10	7	2	4	1	2	6	4	3
		37.7	53.1	10.2	7.1	2.1	4.1	1.1	2.1	6.1	4.1	3.1

Table 28 عرضى

Economic importance

One hundred and sixty species in Sharkiya Governorate (69.3%) of the total species) have at least one aspect of the potential or actual economic uses (Appendix 2,Table 29). 6 species have ≥ 4 economic uses. These are Polygonum equisetiforme, Zilla spinosa, Tamarix tetragyna, Tamarix nilotica, Phragmites australis (4 uses) and Schismus barbatus (5 uses). The economic uses of the recorded species could be arranged descendingly as follows (Fig.9): Grazing (105) ➔ medicinal (83) ➔ human food (45) ➔ fuel (9) ➔ timber (6).

One species has five uses (0.6%), 5 species have four uses (3.1%), 10 species have three uses (6.2%), 50 species have two uses (30.6%) and 94 species have only one use (57.5% of the total economic species. Regarding the variation in relation to types of habitat, the grazing species had the relative maximum value in the abandoned fields, medicinal species in the sand flats, human food species in reclaimed lands, timber species in railways and fuel species had the relative maximum value in the salt marshes (Table.30). Regarding the variation in relation to the life forms (excluding the parasites) the results indicate that the grazing species had the relative maximum value in geophtes-helophytes, the medicinal species in hemicrptophytes, human food had the relative maximum value species in therophytes and timber, fuel species in phanerophytes (Table.31).

Table (29). Economic uses of the recorded species relation to their families in Sharkiya Governorate. GR: Grazing, ME: Medicinal, HF: Human food, FU: Fuel and TI: Timber.

Family	Total species	Economic use				
		GR	ME	HF	FU	TI
Pteridophyte						
Azollaceae	2	2	2	-	-	-
Adiantaceae	1	-	1	-	-	-
Total	**3**	**2**	**3**	**-**	**-**	**-**
Dicotyledoneae						
Salicaceae	2	-	-	-	-	2
Urticaceae	1	-	1	-	-	-
Polygonaceae	6	5	4	4	1	-
Portulacaceae	1	1	1	1	-	-
Caryophyllaceae	7	4	1	2	-	-
Chenopodiaceae	14	8	5	4	2	-
Amaranthaceae	5	-	3	3	-	-
Ranunculaceae	1	-	1	-	-	-
Ceratophyllaceae	1	1	1	-	-	-
Cruciferae	8	4	4	4	1	-
Leguminosae	16	9	5	4	-	-
Oxalidaceae	1	-	1	-	-	-
Geraniaceae	1	-	1	-	-	-
Zygophyllaceae	3	1	1	-	-	-
Malvaceae	3	2	1	1	-	-
Tamaricaceae	2	2	2	-	2	2
Umbellifera	3	-	2	2	-	-
Primulaceae	1	-	1	-	-	-
Plumbaginaceae	1	1	1	-	-	-
Convolvulaceae	4	3	1	2	-	-
Boraginaceae	3	1	-	-	-	-
Verbenaceae	3	1	1	1	-	-
Labiatae	1	-	1	1	-	-
Solanaceae	5	-	4	1	-	1
Scrophulariaceae	1	1	1	-	-	-
Plantaginaceae	1	1	-	-	-	-
Compositae	32	12	17	9	-	-
Total	**117**	**57**	**61**	**39**	**6**	**5**
Monocotyledoneae						
Potamgetonaceae	3	3	-	-	-	-
Pontederiaceae	1	1	-	-	-	-
Juncaceae	3	3	2	-	-	-
Gramineae	43	31	15	7	2	1
Lemnaceae	2	2	-	-	-	-
Typhaceae	1	1	1	1	-	-
Cyperaceae	5	5	2	-	-	-
Total	**58**	**46**	**20**	**8**	**2**	**1**

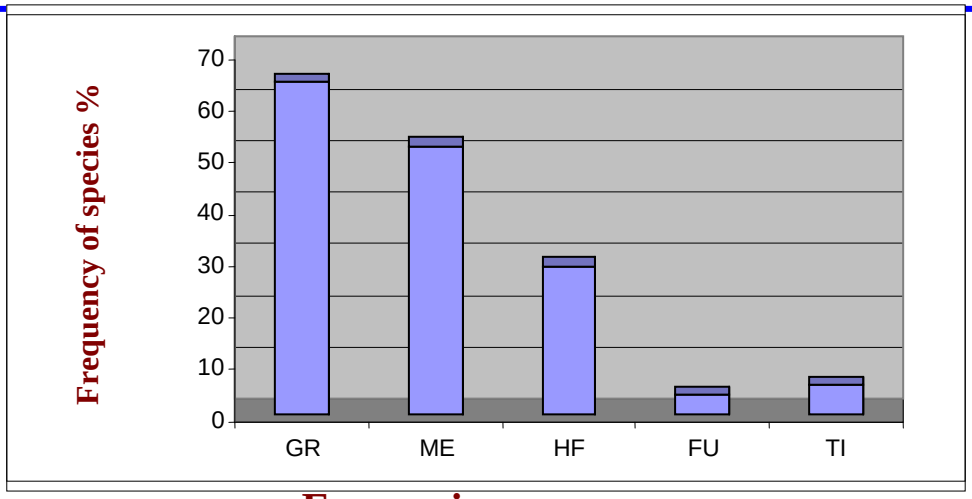

Fig.9. Descending arrangement of the economic uses of the recorded species in Sharkiya Governorate. GR: grazing, ME: medicinal, HF: human food, FU: fuel and TI: timber use.

Table (30): Economic uses of the recorded species in the 13 habitats indentified in Sharkiya Governorate.GR:Grazing, ME: Medicinal, HF:Human food, TI: Timber and FU: Fuel. F: Frequency and P(%): Presence estimate.The maximum and minimum values of each use are underlined.

Habitat	Total species	Economic use									
		GR		ME		HF		TI		FU	
		F	P	F	P	F	P	F	P	F	P
Sand flats	28	18	64.3	18	64.3	11	39.3	1	3.6	2	7.1
Sand dunes	30	18	60	17	56.6	11	36.7	1	3.3	1	3.3
Salt marshes	34	24	70.6	20	58.8	10	29.4	2	5.9	6	17.6
Railways	57	40	70.2	28	49.1	18	31.6	4	7.0	3	5.3
Highways	102	65	63.7	52	50.9	35	34.3	5	4.9	8	7.8
Waste lands	52	28	53.8	32	61.5	18	34.6	2	3.8	3	5.8
Abandoned fields	70	53	75.7	35	50	20	28.6	2	2.8	5	7.1
Orchards	77	46	59.7	43	55.8	28	36.4	1	1.3	4	5.2
Fields of summer crops	39	27	69.2	16	41.0	12	30.8	-	-	1	2.5
Fields of winter crops	64	37	57.8	34	53.1	25	39.0	-	-	1	1.6
Reclaimed lands	57	41	71.9	27	47.4	24	42.1	-	-	1	1.7
Irrigation canals	106	64	60.3	51	48.1	37	34.9	4	3.8	4	3.8
Drainage canals	109	70	64.2	51	46.8	32	29.3	2	1.8	5	4.6

Table (31): Economic uses of the recorded species in relation to their life forms in Sharkiya Governorate.GR: Grazing, ME: Medicinal, HF: Human food, TI: Timber and FU: Fuel. F: Frequency and P(%): Presence estimate.The maximum value of each use are underlined.

Habitat	Total species	Economic use									
		GR		ME		HF		TI		FU	
		F	P	F	P	F	P	F	P	F	P
Phanerophytes	7	4	57.1	3	42.8	1	14.3	5	71.4	2	28.6
Chamaeophytes	15	11	73.3	8	53.3	4	26.7	-	-	4	26.7
Hemicryptophytes	14	7	50	9	64.3	3	21.4	-	-	-	-
Geophytes-helophytes	26	24	92.3	14	53.8	6	23.1	-	-	2	7.7
Hydrophytes	9	8	88.9	2	22.2	-	-	-	-	-	-
Therophytes	89	51	57.3	47	52.8	32	35.9	1	1.1	1	1.1
Parasites	-	-	-	-	-	-	-	-	-	-	-
Total	**160**	**105**	**65.6**	**83**	**51.8**	**46**	**28.7**	**6**	**3.7**	**9**	**5.6**

Physical defenses

67 have some sort of physical defense (29.1% of the total species). These species were sorted into six groups according to their mode of defense **(Appendix 2, Fig. 10)**. Group I includes 25 species (37.3% of the species that have physical defense) with hairy leathery leaves and hairy stems; sometimes the hairs become stiff or rough and stinging (e.g. *Urtica urens* and *Bassia indica*). Group II comprises 20 species (29.8%) with spiny organs such as spiny stipules, leaves, branches, inflorescences and fruits. (e.g. *Alhagi gracorum*, *Salsola kali*, *Cornulaca monacantha* and *Echinops spinosus*). Group III includes 17 species (25.4%) that have sticky latex with unpleasant taste and odour (e.g. *Euphorbia hirta*, *Ranunculus sceleratus* and *Sonchus asper*). Group IV has 2 species (4.8%) with leathery leaves with pleasant odour(e.g. *Chenopodium mural* and *Calendula arvensis*). Group V contains 5 species (11.9%) that develop hard woody branches with spine-like terminates which become intermingled into close cages or box-like structures enveloping the younger branches and flowers (e.g. *Convolvulus lanatus*, *Ipomoea carnea* and *Lycium shawii*). Group VI has only one species (1.5%) which

does not show any form of physical defense but they occur under shrubs or rocks, i.e. hidden plants (e.g.*Rumex dentatus*).

Table 32 showes the relation between the types of habitat and the physical defenses. Group I had the relative maximum number in the reclaimed lands, while group II had the relative maximum number in the salt marshes, group III in sand dunes, groups IV and V in the sand flats and group VI in the railways.Considering the variation in relation to the life forms, excluding the parasites and hydrophytes, it can be concludes that the group I, III and IV had the relative maximum number in hemicryptophtes, while group II in the geophytes-helophytes, groups V in phanerophytes and group VI in therophytes **(Table 33)**.

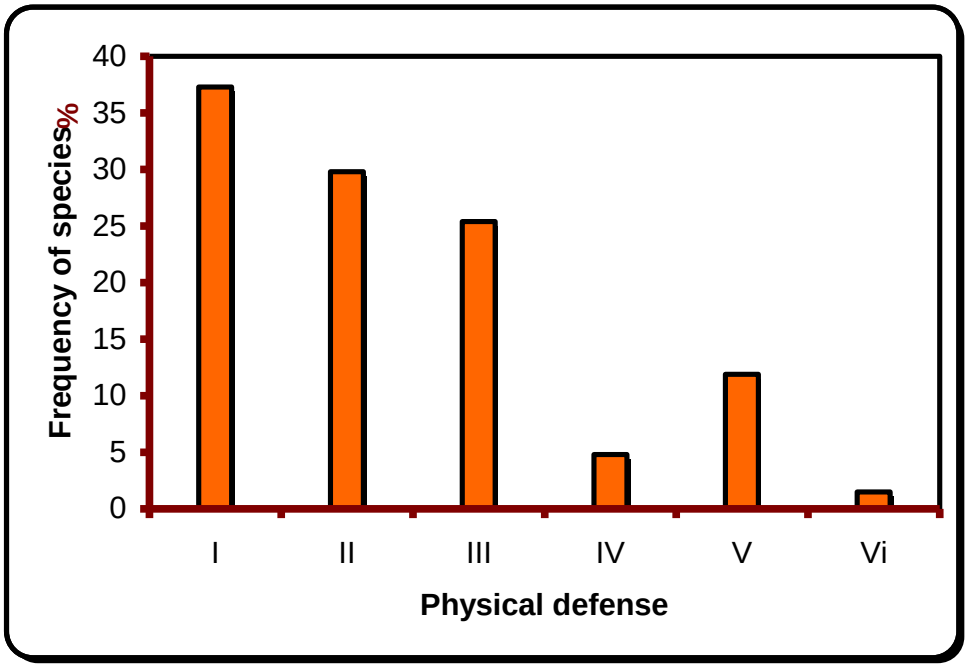

Fig.10. Descending arrangement of the recorded species in Sharkiya Governorate in relation to their physical defense. I: Hairy leathery leaves and hairy stems, II: Spiny organs, III: Sticky latex with unpleasant taste and odour, IV: Leathery leaves with unpleasant odour, V: Hard woody branches with spine-like terminates, and VI: Hiding plants (Occur under shrubs and rocks).

Table (32). Physical defenses spectra of the recorded species in the 13 habitats identified in Sharkiya Governorate. I: hairy leathery leaves and hairy stems, II: spiny organs, III: sticky latex with unpleasant taste and odour, IV: leathery leaves with unpleasant odour, V: hard woody branches with spine-like terminates, and VI: hiding plants (occur under shrubs and rocks). F: Frequency and P(%): Presence estimate. The maximum and minimum values are underlined.

Habitat	Total species	Physical defense groups											
		I		II		III		IV		V		VI	
		F	P	F	P	F	P	F	P	F	P	F	P
Sand flats	12	4	33.3	4	33.3	4	33.3	2	16.7	2	16.7	-	-
Sand dunes	15	6	40	4	26.6	5	33.3	1	6.7	-	-	-	-
Salt marshes	12	5	41.7	6	50	-	-	2	16.7	-	-	-	-
Railways	20	8	40	5	25	4	20	1	5	1	5	1	5
Highways	36	14	38.3	12	33.3	5	13.9	3	8.3	2	5.5	1	2.8
Waste lands	21	8	38.1	9	42.8	2	9.5	1	4.7	-	-	1	4.7
Abandoned field	25	9	36	9	36	4	16	2	8	-	-	1	4
Orchards	34	12	35.3	8	23.5	9	26.5	4	11.8	-	-	1	2.9
Fields of summer crops	14	6	42.8	3	21.4	4	28.6	1	7.1	-	-	-	-
Fields of winter crops	30	13	43.3	5	16.7	9	30	2	6.7	-	-	1	3.3
Reclaimed lands	26	12	46.1	5	19.2	5	19.2	1	3.8	2	7.7	1	3.8
Irrigation canals	31	13	41.9	7	22.6	7	22.6	1	3.2	2	6.4	1	3.2
Drainage canals	32	14	43.7	10	31.2	4	12.5	2	6.2	1	3.1	1	3.1

Table (33). Physical defenses spectra of the recorded species in relation to their life forms in Sharkiya Governorate. I: hairy leathery leaves and hairy stems, II: spiny organs, III: sticky latex with unpleasant taste and odour, IV: leathery leaves with unpleasant odour, V: hard woody branches with spine-like terminates, and VI: hiding plants (Occur under shrubs and rocks). F: Frequency and P(%): Presence estimate. The maximum values are underlined.

Life form	Total species	Physical defense groups											
		I		II		III		IV		V		VI	
		F	P	F	P	F	P	F	P	F	P	F	P
Phanerophytes	3	1	33.3	-	-	-	-	-	-	2	66.7	-	-
Chamaephytes	5	1	20	3	60	-	-	-	-	1	20	-	-
Hemicryptophytes	10	4	40	3	30	4	40	1	10	-	-	-	-
Geophytes-Helophytes	4	-	-	3	75	1	25	-	-	-	-	-	-
Hydrophytes	-	-	-	-	-	-	-	-	-	-	-	-	-
Therophytes	42	16	38.1	11	26.2	12	28.6	1	2.4	2	4.8	1	2.4
Parasites	3	3	100	-	-	-	-	-	-	-	-	-	-
Total	**67**	**25**	**37.3**	**20**	**29.8**	**17**	**25.4**	**2**	**4.8**	**5**	**11.9**	**1**	**1.5**

Vegetation analysis

Sixty-nine vegetation groups were identified in Sharkiya Governnorate. These vegetation groups are categorized according to their leading dominant species into 33 associations, which in turn could be arranged according to their habitat preferability into five groups of associations **(Table 34 to 38)**.

I – Associations of wetlands.

a-Submerged associations: Three associations dominated by submerged species *Potamogeton trichoides*, *Potamogeton pectinatus* and *Ceratophyllum demersum* inhabit the open water zone of the irrigation canals and drainage canals. The common associates of *Potamogeton trichoides* was included *Eichhornia crassipes*, while that of *Potamogeton pectinatus* was *Spirodela polyrhiza* and that of *Ceratophyllum demersum* were *Potomogeton nodosus* and *Eichhornia crassipes* **(Table 34)**.

b- Free floating association: Two associations dominated by the free floating species *Lemna gibba* and *Eichhornia crassipes* that inhabit the open water zone of the irrigation and drainage canals. The common associates of *Lemna gibba* association were *Typha domingensis*, *Phragmites australis* and *Paspalidium geminatum*, while those of *Eichhornia crassipes* were *Phragmites australis, Azolla filiculoides*, *Ceratophyllum demersum* and *Echinochloa stagnina* (**Table 34**).

c- Emergent associations: There are ten associations dominated by emergent species inhabit the terraces and the banks of the irrigation and the drainage canals. These associations are named after their dominat species as follows, *Phragmites australis*, *Echinochloa stagnina*, *Panicum repens*, *Persicaria salicifolia*, *Imperata cylindrica*, *Chenopodium murale*, *Paspalum distichum*, *Typha domingensis*, *Symphyotrichum squamatum* and *Sarcocornia fruticosa* (**Table 34**).

The common associates of *Panicum repens* were *Cyperus alopecroides* and *Cynodon dactylon*, while those of *Persicaria salicifolia* were *Polypogon monspeliensis* and *Rumex dentatus*. The associates of *Imperata cylindrica* were *Alhagi graecorum* and *Phragmites australis* and those of *Chenopodium murale* were *Cynodon dactylon* and *Rumex dentatus*. The associates of *Paspalum distichum* was *Cyperus alopecuroides,* while that of *Typha domingensis* was *Phragmites australis*. The comonon associate of *Symphyotrichum squamatum* was *Rumex dentatus* and that of *Sarcocornia fruticosa* was *Chenopodium album.*

Phragmites australis association occupies awide environmental gradient and could be classified into wet, mesic and arid sub-associations based on the hydric adaptation. **Wet sub-association** occupies the open water and water edge of the irrigation canals and drainage canals with *Ceratophyllum demersum* and *Azolla filiculoides* as common associates. **Mesic sub-association** occupies the water edge and banks of irrigation and drainage canals with *Typha domingensis*, *Scirpus litoralis* and *Echinochloa stagnina* as common associates. **Arid sub-association** occupies the terraces and slopes of the irrigation and drainage canals. The common associates were *Chenopodium album*, *Convolvulus arvensis, Imperata cylindrica, Cynodon dactylon, Rumex dentatus* and *Pluchea dioscoridis*.

Echinochloa stagnina association can be divided into wet and mesic sub-association. **Wet sub-association** occupies the open water and water edge of the irrigation and drainage canals with *Eichhornia crassipes* and *Ceratophyllum demersum* as common associates. **Mesic sub-association** occupies the water edge, terraces and slopes of the irrigation and drainage canals with *Phragmites australis* and *Cynodon dactylon*, as common associates.

Table (34). Arrangements of the indentified vegetation groups of wet lands in Sharkiya Governorate according to their leading dominant species, Ic: Irrigation canals and Dc: Drainage canals, P: Presence percentage and C: Cover percentage.

Veg. Group	No.of stands	No.of Species	Species Richness	Habitat		First dominant species	P (%)	C (%)	Second dominant species	P (%)	C (%)
				Major	Minor						
(1) Submerged association											
Potamogeton trichoides											
I	4	6	3	Wetlands	Ic, Dc	*Potamogeton trichoides*	100	22	*Eichhornia crassipes*	75	3
Potamogeton pectinatus											
I	5	20	2	Wetlands	Ic. Dc	*Potamogeton pectinatus*	100	85	*Spirodela polyrhiza*	20	15
Ceratophyllum demersum											
I	7	42	3	Wetlands	Ic	*Ceratophyllum demersum*	100	68	*Potamogeyon nodosus*	55	11
II	4	5	3	Wetlands	Ic, Dc	*Ceratophyllum demersum*	100	14	*Eichhornia crassipes*	75	13
(2) Free floating association											
Lemna gibba											
I	10	50	6	Wetlands	Ic. Dc	*Lemna gibba*	81	32	*Typha domingensis*	50	16
II	11	26	5	Wetlands	Ic. Dc	*Lemna gibba*	35	32	*Phragmites australis*	50	14

Veg. Group	No.of stands	No.of Species	Species Richness	Habitat		First dominant species	P (%)	C (%)	Second dominant species	P (%)	C (%)
				Major	Minor						
III	4	14	8	Wetlands	Dc	*Lemna gibba*	100	34	*Paspalidium geminatum*	100	29
Eichhornia crassipes											
I	4	25	2	Wetlands	Ic. Dc	*Eichhornia crassipes*	100	85	*Phragmites australis*	25	7
II	3	8	4	Wetlands	Ic	*Eichhornia crassipes*	100	30	*Azolla filiculoides*	100	18
III	2	5	4	Wetlands	Ic	*Eichhornia crassipes*	100	50	*Ceratophyllum demersum*	100	35
IV	6	26	6	Wetlands	Ic. Dc	*Eichhornia crassipes*	100	45	*Echinochloa stagnina*	100	30
(3) Emergent associations ***Phragmites australis***											
a) Wet											
I	6	5	2	Wetlands	Ic. Dc	*Phragmites australis*	100	13	*Ceratophyllum demersum*	50	45
II	13	18	6	Wetlands	Ic. Dc	*Phragmites australis*	100	17	*Azolla filiculoides*	85	29
b) Mesic											
I	70	53	4	Wetlands	Ic. Dc	*Phragmites australis*	100	7	*Typha domingensis*	25	5
II	5	20	2	Wetlands	Ic	*Phragmites australis*	100	53	*Scirpus litoralis*	20	15
III	4	35	3	Wetlands	Ic. Dc	*Phragmites australis*	100	40	*Echinochloa stagnina*	100	22
c) Dry											
I	2	4	3	Wetlands	Dc	*Phragmites australis*	100	65	*Chenopodium allbum*	50	19
II	4	34	11	Wetlands	Ic. Dc	*Phragmites australis*	100	40	*Convolvulus arvensis*	100	13
III	7	58	7	Wetlands	Ic. Dc	*Phragmites australis*	100	43	*Imperata cylindrica*	85	31
IV	7	42	6	Wetlands	Ic. Dc	*Phragmites australis*	100	58	*Cynodon dactylon*	42	62
V	54	99	5	Wetlands	Ic. Dc	*Phragmites australis*	80	7	*Rumex dentatus*	46	1
VI	4	12	4	Wetlands	Ic. Dc	*Phragmites australis*	50	49	*Pluchea dioscoirides*	50	12
Echinochloa stagnina											
a) Wet											
I	5	23	10	Wetlands	Ic, Dc	*Echinochloa stagnina*	100	41	*Eichhornia crassipes*	100	29
II	6	66	5	Wetlands	Ic	*Echinochloa stagnina*	100	66	*Ceratophyllum demersum*	66	14
b) Mesic											
I	9	44	7	Wetlands	Ic, Dc	*Echinochloa stagnina*	100	59	*Phragmites australis*	44	13
II	2	14	10	Wetlands	Ic, Dc	*Echinochloa stagnina*	100	42	*Cynodon dactylon*	100	6
Panicum repens											
I	6	61	7	Wetlands	Ic	*Panicum repens*	83	40	*Cyperus alopecuroides*	66	10

Veg. Groups	No.of stands	No.of Species	Species Richness	Habitat		First dominant species	P (%)	C (%)	Second dominant species	P (%)	C (%)
				Major	Minor						
II	6	55	6	Wetlands	Ic, Dc	*Panicum repens*	100	58	*Cynodon dactylon*	66	6
Persicaria salicifolia											
I	10	42	10	Wetlands	Ic, Dc	*Persicaria salicifolia*	90	22	*Polypogon monspeliensis*	90	13
II	2	14	7	Wetlands	Ic, Dc	*Persicaria salicifolia*	100	4	*Rumex dentatus*	100	1
Imperata cylindrical											
I	5	19	6	Wetlands	Ic, Dc	*Imperata cylindrica*	100	29	*Alhagi graecorum*	67	4
II	19	37	5	Wetlands	Ic, Dc	*Imperata cylindrica*	85	58	*Phragmites australis*	40	10
Chenopodium murale											
I	7	19	7	Wetlands	Ic, Dc	*Chenopodium murale*	100	6	*Cynodon dactylon*	70	10
II	3	20	12	Wetlands	Dc	*Chenopodium murale*	100	62	*Rumex dentatus*	100	5
Paspalum distichum											
I	7	47	8	Wetlands	Ic, Dc	*Paspalum distichum*	85	22	*Cyperus alopecuroides*	71	9
Typha domingensis											
I	3	3	2	Wetlands	Dc	*Typha domingensis*	100	72	*Phragmites australis*	100	25
Symphyotrichum squamatum											
I	5	14	4	Wetlands	Ic, Dc	*Symphyotrichum squamatum*	100	27	*Rumex dentatus*	60	10
Desmostachya bipinnata											
I	8	60	7	Wetlands	Dc	*Desmostachya bipinnata*	100	60	*Imperate cylindrica*	75	4

II – Associations of cultivated lands

a- Orchards associations: Two associations are indentified in the orchards of fruit trees (*Cynodon dactylon*, and *Oxalis corniculata*). The common associates of *Cynodon dactylon* association were *Chenopodium murale*, *Stellaria pallida* and *Melilotus indicus*, while that of *Oxalis corniculata* was *Anagallis arvensis* **(Table 35)**.

b- Winter crops associations: Three associations inhabit the main winter crops such as clover, broad beans and wheat. They are dominated by *Vicia sativa*, *Beta vulgaris* and *Amaranthus viridis*. The common associates of *Vicia sativa* association was *Medicago polymorpha*, while that of *Beta vulgaris* was *Trifolium resupinatum* and that of *Amaranthus viridis* was *Cichorium endivia* subsp *divaricatum* **(Table 35)**.

c- Summer crops association: Two associations inhabit the main summer crops such as cotton, maize and rice. They are dominated

by *Cynodon dactylon* and *Sida alba*. The common associates of *Cynodon dactylon* was *Echinochloa crusgalli*, while that of *Sida alba* was *Sesbania sesban* **(Table 35)**.

III- Associations of reclaimed lands

Four association were identified in the reclaimed lands. They are dominated *by Launaea nudicaulis*, *Imperata cylinderica*, *Marsilea aegyptiaca* and *Dicanthium annulatum*. The common associate of *Launaea nudicaulis* was *Cyperus rotundus*, while those of *Imperata cylinderica* were *Paspalum distichum* and *Sida alba*. The common associates of *Marsilea aegyptiaca* were *Convolvulus lanatus* and *Dactyloctenium aegyptium*, while that of *Dicanthium annulatum* was *Digitaria sanguinalis* **(Table 36)**.

Table (35). Arrangements of the indentified vegetation groups of cultivated lands in Sharkiya Governorate according to their leading dominant species, Or: Fields of orchard, Sc: Fields of summer crops and Wc: Fields of winter crops. P: Presence percentage and C: Cover percentage.

Veg. GROUP	No.of stands	No.of Species	Species Richness	Habitat		First dominant species	P (%)	C (%)	Scond dominant species	P (%)	C (%)
				Major	Minor						
I	30	69	6	Cultivated lands	Or	*Cynodon dactylon*	56	8	*Chenopodium murale*	30	6
II	19	71	10	Cultivated lands	Or	*Cynodon dactylon*	100	5	*Stellaria pallida*	100	5
III	17	65	4	Cultivated lands	Or	*Cynodon dactylon*	100	8	*Melilotus indicus*	52	4
IV	35	81	10	Cultivated lands	Or	*Oxalis corniculate*	100	6	*Anagallis arvensis*	70	2
V	13	75	10	Cultivated lands	Wc	*Vicia sativa*	85	55	*Medicago polymorpha*	35	19
VI	10	65	9	Cultivated lands	Wc	*Beta vulgaris*	100	75	*Trifolium resupinatum*	100	35
VII	55	65	8	Cultivated lands	Wc	*Amaranthus viridis*	75	45	*Cichorium endivia* subsp. *divaricatum*	75	45
VIII	11	95	8	Cultivated lands	Sc	*Cynodon dactylon*	70	65	*Echinochloa crus galli*	70	51
IX	9	20	6	Cultivated lands	Sc	*Sida alba*	75	36	*Sesbania sesban*	50	31

Table (36). Arrangements of the indentified vegetation groups of reclaimed lands in Sharkiya Governorate according to their leading dominant species, Ri: Reckaimed lands, P: Presence percentage and C: cover percentage.

Veg. GROUP	No.of stands	No.of Species	Species Richness	Habitat		First dominant species	P (%)	C (%)	Scond dominant species	P (%)	C (%)
				Major	Minor						
I	4	25	6	Reclaimed lands	RI	*Launaea nudicaulis*	100	89	*Cyperus rotundus*	25	7
II	3	8	6	Reclaimed lands	RI	*Imperate cylinderica*	100	30	*Paspalum distichum*	100	18
III	2	5	4	Reclaimed lands	RI	*Imperate cylinderica*	100	49	*Sida alba*	100	34
IV	18	11	2	Reclaimed lands	RI	*Marsilea aegyptiaca*	83	7	*Convolvulus lanatus*	39	15
V	6	26	4	Reclaimed lands	RI	*Marsilea aegyptiaca*	100	43	*Dactyloctenium aegyptium*	100	30
VI	6	60	3	Reclaimed lands	RI	*Dicanthium annulatum*	100	29	*Digitaria sanguinalis*	66	14

IV – Associations of urbanized area.

There were five associations dominated by Cynodon dactylon, Desmostachya bipinnata, Pluchea dioscoridis, Bassia indica and Phragmites australis. The common associates of Cynodon dactylon were Imperata cylindrica and Panicum repens. The common associates of Desmostachya bipinnata were Bassia indica and Phragmites australis, while that of Pluchea dioscoridis were Arundo donax and Chenopodium murale and that of Bassia indica and Phragmites australis was Chenopodium murale (Table 37).

V – Associations of desert habitats

Six associations were identified in the desert habitats. That include sand flats, sand dunes and salt marshes. These associations are named after the domimant species as follows: *Paronychia arabica, Lactuca saligna, Zygophyllum album, Mesembryanthemum nodiflorum, Halocnemum strobilaceum* and *Tamarix nilotica.* The common associates of *Paronychia arabica* were *Plantago amplexicaulis* and *Launaea fragilis* while that of *Lactuca saligna* was *Calendula arvensis*. The associates of *Zygophyllum album* was *Salsola kali* and that of *Mesembryanthemum nodiflorum* were *Salsola kali* and *Alhagi graecorum*, while that of *Halconemum strobilaceum* was *Arthrocnemum macrostachyum* and the associates of *Tamarix nilotica* was *Juncus acutus* **(Table 38)**.

The application of TWINSPAN classification on the floristic composition of the 69 vegetation groups led to classify them into 21 groups

at level six and 5 major groups at level three **(Fig. 11.a)** . This consistent with the results of DCA **(Fig.11.b)**. The 5 major groups (Vegetation types) could be recognized according to their habitat preferabitity. **Vegtation type I** include 38 of the original vegetation groups that characterize, the water zone of the drainage and irrigation canals of Sharkiya Governorate was dominated by *Potamogeton pectinatus, Ceratophyllum demersum* and *Eichhornia crassipes* in open water zone and *Phragmites australis, Echinochloa stagnina, Persicaria salicifolia, Imperata cylindrica, Typha domingensis* and *Desmostachya bipinnata* on canal bank. **Vegetion type II** include 9 of the orignial vegetation group that characterize the cultivated lands in the whole of Sharkiya Governorate (orchards, fields of winter crops and fields of summer crops). 4 group are dominated by *Cynodon dactylon*. Each of the followeding species dominate only one groups: *Oxalis corniculata*, *Vicia sativa, Beta vulgaris, Amaranthus viridis* and *Sida alba*. **Vegetation type III** comprises 6 of the original vegetation groups that characterize the reclaimed lands of Sharkiya Governorate.These include 2 groups dominated by *Imperata cylindrica* and 2 by *Marsilea aegyptiaca*. Each of the following species dominated only one groups: *Launaeae nudicaulis* and *Dicanthium annulatum.*

Table (37). Arrangements of the indentified vegetation groups of Urbanized Area in Sharkiya Governorate according to their leading dominant species, Rw: Rail ways, Hw: High ways, Wl: Waste lands and Af: Abandoned filelds. P: Presence percentage and C: cover percentage.

Veg. GROUP	No.of stands	No.of Species	Species Richness	Habitat		First dominant species	P (%)	C (%)	Scond dominant species	P (%)	C (%)
				Major	Minor						
I	6	19	10	Urbanized area	Rw	*Cynodon dactylon*	100	12	*Imperata cylindrica*	100	11
II	24	79	10	Urbanized area	Rw,Af	*Cynodon dactylon*	94	23	*Panicum repens*	50	16
III	6	8	4	Urbanized area	Rw	*Desmostachya bipinnata*	100	70	*Bassia indica*	65	7
IV	8	9	4	Urbanized area	Rw,Hw	*Desmostachya bipinnata*	100	78	*Phragmites australis*	70	8
V	11	39	10	Urbanized area	Hw.Rw	*Pluchea dioscridis*	86	89	*Arundo donax*	55	25
VI	3	26	11	Urbanized area	Wl,Hw	*Pluchea dioscoridis*	100	33	*Chenopodium murale*	100	3
VII	69	99	11	Urbanized area	Rw,Hw, Wl,Af	*Bassia indica*	95	25	*Chenopodium murale*	86	7
VIII	30	77	13	Urbanized area	Wl,Af,Rw	*Phragmites australis*	83	26	*Chenopodium murale*	76	71

Table (38). Arrangements of the indentified vegetation groups of Desert habitat in Sharkiya Governorate according to their leading dominant species, Sf: Sand flats, Sd: Sand dunes and Sm: Salt marshes. P: Presence percentage and C: Cover percentage.

Veg. GROUP	No.of stands	No.of Species	Species Richness	Habitat		First dominant species	P (%)	C (%)	Scond dominant species	P (%)	C (%)
				Major	Minor						
I	5	21	9	Desert habitat	Sd	*Paronychia arabica*	100	25	*Plantago amplexicaulis*	100	14
II	6	27	9	Desert habitat	Sd	*Paronychia arabica*	100	15	*Launaea fragilis*	100	8
III	4	15	4	Desert habitat	Sf	*Lactuce saligna*	65	13	*Calendula arvensis*	59	7
IV	9	13	4	Desert habitat	Sf	*Zygophyllum album*	70	16	*Salsola kali*	70	3
V	9	22	5	Desert habitat	Sm	*Mesembryanthemum nodiflorum*	100	13	*Salsola kali*	69	3
VI	4	9	6	Desert habitat	Sm	*Mesembryanthemum nodiflorum*	100	75	*Alhagi graecroum*	100	3
VII	4	10	4	Desert habitat	Sm	*Halocnemum strobilaceum*	75	27	*Arthrocnemum macrostachyum*	75	6
VIII	10	22	7	Desert habitat	Sm	*Tamarix nilotica*	100	15	*Juncus acutus*	100	4

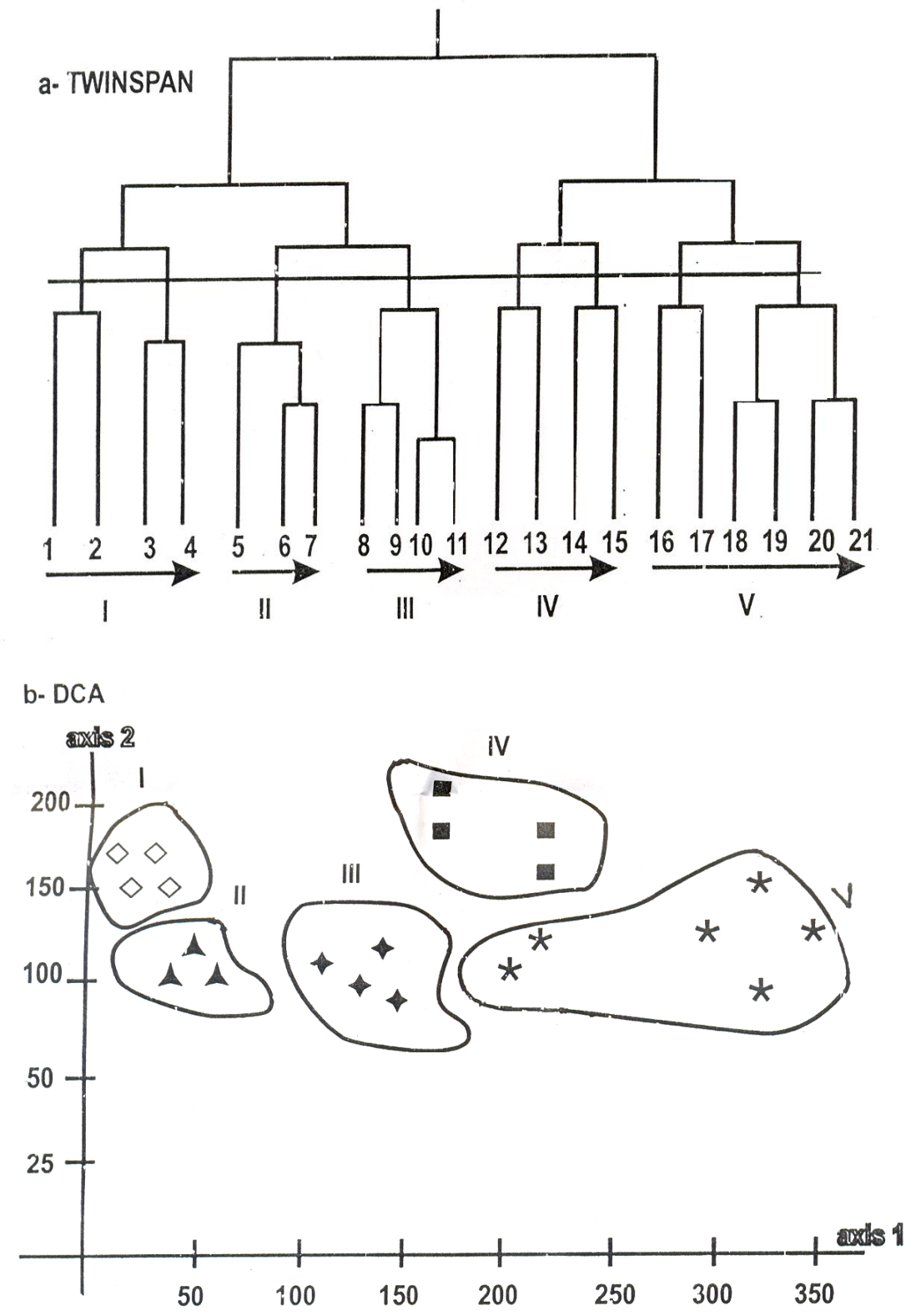

Fig.11.(a,b) . The relationship between the 5 vegetation groups generated after the application of TWINSPAN classification technique (a) and their clusters along the DCA axes 1 and 2 (b). The indicator species are abbreviated on the head of groups. I; Water zone, II; Cultivated lands, III; Reclaimed lands, IV; Urbanized areas and V; Desert habitats.

Vegetation type IV comprises 8 of the original vegetation groups that occupy wide gradients (railways, abandoned fields, highways and waste lands). These include 2 groups dominated by *Cynodon dactylon*, 2 by *Desmostachya bipinnata* and 2 groups dominated by *Pluchea dioscoridis*. Each of the following species dominate one groups: *Bassia indica* and *Phragmites australis.*

Vegetation type V comprises 8 of the orignial vegetation groups that characterize the desert habitat (sand flats, sand dunes and salt marshes). These include 2 groups dominated by *Paronychia arabica* in sand dunes, 4 by *Mesembryanthemum nodiflorum*, *Halocnemum strobilaceum* and *Tamarix nilotica* in salt marshes and 2 by *Lactuca saligna and Zygophyllum album* in sand flats .

Soil-Vegetation relationships

Almost-all the association and soil variables assoicated with 5 vegetation types (VT: I-V) differ significantly between each type. Vegetation type (II) of the cultivated land had the highest value of alpha diversity (10.7 species / stand) and Shannon-Wener index (H`= 1.74). Vegetation type (I) of the wet-land had the lowest alpha diversity (0.6 species / stand) and Shannon-Wener index (H`= 0.23).

Soils of vegetation type (V) of the desert habitat contained the highest values of coarse sand (33.7%), fine sand (56.2%) and SO_4 (18.4%) while the vegetation type (II) had the highest values of silt and clay (45.5%), O.M. (3.5%), Mg (4.5%), K (3.4%) and P (3.6%). The vegetation type (I) had the lowest value of coarse sand (6.6%), fine sand (38.2%), HCO_3 (1.4%), Cl (2.8%) but has a highest value of M.C. (29.6%) **(Table 39)**.

Regarding variables, the DCA axis1 correlates positively with the Shannon-Weaver index (r = 0.59), alpha diversity (r = 0.74) and total species (r = 0.62). The soil variables that correlate positively with axis1 are O. M. (r = 0.25), PH (r = 0.55), E. C. (r = 0.73), HCO_3 (r = 0.82), P (r = 0.87) and Cl (r = 0.64); and those that correlate negativley are fine fractions (r = 0.72), M. C. (r = 0.89), SO_4 (r = 0.78) and Ca (r = 0.67). On the other hand, axis2 correlates positively with coarse sand (r = 0.57), Mg (r = 0.57) and Na (r = 0.53), and negatively with Ca (r = 0.55) and SO_4 (r = 0.44) **(Table 40)**.

Table (39). Results of one-way analysis of variance of the community and soil variables of the 5 vegetation groups. Common letters indicate significant different means according to LSD. * = P < 0.05, ** = P < 0.01 and *** = P < 0.0001, according to F-test.

Soil variables	Vegetation type					Mean	Fvalue
	I	II	III	IV	V		
Coarse sand (%)	6.6	13.6	13.9	15.1	a 33.7	16.58	19.5***
Fine sand (%)	ab 38.2	40.5	ab 42.9	45.4	cd 56.2	44.7	13.6***
Silt & clay (%)	37.1	45.2	24	40.8	19.3	33.28	11.9***
M.C. (%)	29.6	9.6	c 6.9	15.4	2.7	12.8	74.4***
O.M. (%)	cd 2.1	ab 3.5	2.1	1.1	1.6	2.3	12.23***
PH	7.7	ab 7.9	7.1	8.1	8.8	7.9	3.01*
E.C mS cm-1	cd 1.2	ab 3.4	3.1	4.3	ab 1.7	2.79	30.78***
HCO_3 mg./ 100gm.	1.4	3.5	abc 3.5	2.3	1.6	1.3	38.68***
C l mg./100gm	2.8	6.2	5.9	7.4	4.2	5.3	7.76**
SO_4 mg./100gm.	4.2	4.9	6.2	a 14.3	18.4	9.5	43.93***
Ca mg./100gm,	3.7	5.6	a 4.1	8.4	b 9.2	6.2	59.01***
Mg mg./100gm.	3.5	5.4	3.6	c 3.1	3.16	3.7	24.06***
Na mg./100gm.	0.5	c 1.9	b 6.1	3.7	1.7	2.8	25.96***
K mg./100gm.	ab 1.1	3.4	2.4	1.6	2.7	2.3	25.20***
P mg./100gm.	1.7	3.6	2.3	2.6	3.2	2.7	8.99***
Vegetation variables							
Total species	a 9.5	ab 64.5	b 31	c 30	d 14	29.8	3.99*
Representation	b 11.6	ab 79.1	abc 38.2	37.3	d 17.2	36.68	4.13*
Alpha diversity	ac 0.6	10.7	2.35	d 2.5	1.1	3.45	34.62**
Beta diversity	ab 5.1	12.95	7.35	10.2	abc 9.7	9.06	249.15***
Sh-Weaver index	a 0.23	abc 1.74	0.78	Ab 1.05	ac 0.36	0.83	10.51***
Simpson index	0.5	0.65	0.25	0.9	d 0.8	0.63	7.41***
X1	c 13	233.75	189.3	128.95	65.82	126.16	30.62***
X2	pc 151.8	125.95	196.85	121.37	112	141.59	8.53**

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