J. Plant Production, Mansoura Univ., Vol. 6 (5): 749 - 756, 2015

STUDY ON THE ECOLOGY OF *Chenopodium murale* L. IN NILE DELTA, EGYPT.

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ABSTRACT

This study offers a description of the vegetation of *Chenopodium murale* community and evaluating the plant and soil parameters relationships. Classification analysis (TWINSPAN) revealed three vegetation groups; group A dominated by *Chenopodium murale*, group B dominated by *Melilotus indicus* and group C was dominated by *Pseudognaphalium luteo-album.* The ordination analysis (CCA) evaluate the *Chenopodium murale* and soil parameters relationship. The results indicated that *Chenopodium murale* showed a close relationship with soil clay, porosity, moisture content and total phosphorous whereas negatively correlated with electric conductivity, total dissolved salts, sodium and sulphate.

INTRODUCTION

Weeds are considered as an annoyance, especially in crop fields. *Chenopodium murale* is widely distributed weed which affect the crop productivity (Parker, 1997a).

Chenopodium murale belongs to family Chenopodiaceae. It is native to temperate Asia, Europe and Africa (Grin, 2000). In Egypt, it called Abu efein, Al zorbaih and Sonetar (Täckholm, 1974). It is described as an erect, grayish, annual weed, covered with mealy hairs, stem have few branches. The leaves alternating, broadly ovate to diamond-shaped, dentate. Inflorescence small, axillary and terminal paniculate spikes. Concerning distribution it grows at roadsides, gardens, damp habitats and canal banks (Felger, 2000 and Parker, 1997b). It grows also in new reclaimed land which may be salt-effected. Plant is used as a diuretic, anthelmintic, mild laxative, activating for liver, calmative. Leaves are edible as in U.A.E leaves used as a green salad. It is used as food in Africa and India (Holm *et al*., 1997). Qasem and Abu-Blan (1995) reported that *C. murale* has a pesticidal effect and affected a wide range of microorganisms.

MATERIALS AND METHODS

The field studies were carried out during March and April 2014. 15sites in the north-eastern Nile Delta of Egypt were selected for this study. In each site, all plants were documented in four plots (5x5 m^2) and then summarized in one plot (100 m^2). The frequency of each species was estimated at each site (Muller-Dombois and Ellenberg, 1974). The identification and nomenclature of plant species was, according to Täckholm (1974) and Boulos (1995, 1999, 2000, 2002, 2005, 2009).

Soil samples were collected at 0-50 cm depth at each site. Porosity, water holding capacity (WHC) and soil texture were estimated according to Allen *et al*. (1986). Organic carbon (OC) was measured by Walkely and Black's rapid titration. Soil water extract of 1:5 was used for estimation of conductivity (µS/cm), total dissolved salts (mg/L) and pH using a multi-meter CONSORT Model C535, while chloride (Cl^-) was estimated by direct titration against silver nitrate solution (N/35.5) and 5% potassium chromate indicator according to Jackson (1962). Carbonates ($CO3^{--}$) and bicarbonates (HCO_3^-) were estimated by titration with H_2SO_4 (0.1N) and phenol phthalein and methyl orange indicators as reported by Allen et al. (1986). Sulphates ($SO4^{--}$) were estimated using 5% barium chloride solution, (Piper, 1947). The classification of species data were statistically analyzed using the Two- Way Indicator Species Analysis TWINSPAN (Hill, 1979 a&b).

RESULTS

The results of Two – Way Indicator Species Analysis (TWINSPAN) illustrated in Figure (1) based on frequency values given three vegetation groups that reproduce the structure of the normal plant communities in the study area. Each group includes a set of sites that most homogenous of their vegetation from the other group. The data are given in Table (1).

Group A was the largest group, where it comprised eight sites situated in the relatively saline soils. This group was dominated by *Chenopodium murale* (F=62.4), while the indicator species include *Conyza bonariensis* (F=12.5). The other important species was *Cynodon dactylon* (F= 45.23). Group B included four sites, this group was dominated by *Melilotus indicus* (F=50). In this group, the indicator species was *Coronopus didymus* (F=16.85) and the other preferential species were *Cakile maritime* (F= 50) and *Cynodon dactylon* (F= 50).

Group C involves three sites, this group was dominated by *Pseudognaphalium luteo-album* (F=66.67). The indicator species in this group was *Cynodon dactylon* (F=50). The most important species were *Paspalum distichum* (F=58.33) and *Solanum nigrum* (F=58.33).

Concerning the soil analysis, Table 2 showed the average values of soil properties of the different vegetation groups from TWINSPAN analysis. The results indicated that group A revealed the lowest mean values of electrical conductivity (EC), total dissolved salts (TDS), bicarbonates (HCO_3), chlorides (Cl^-), sulphates (SO_4^{2-}), and clay (926.88 µs/cm, 474.75 mg/l, 0.07, 0.11 mg/l, 0.12 mg/l and 3.80% respectively). Meanwhile it possessed the highest value of organic carbon (OC= 1.05%), total phosphorous (TP= 8.09ppm), total nitrogen (TN= 18.02ppm), porosity (38.52%) and water holding capacity (50.40%).

Group B showed the highest mean values of pH (7.54), EC (1959 µS/cm), TDS (1075.25 mg/L) and sand (91.12%). Group C categorized by the second level of the mean value of EC (1846 µS/cm), TDS (958.67 mg/L) and MC (4.08%). This group attained the highest mean values of Cl^- (0.20 %) and the lowest mean values of TN (11.97ppm), TP (5.01ppm), porosity (30.70%) and sand (89.69%).

Figure (1): TWINSPAN analysis of the 15 sites based on frequency Indicator species are abbreviate to the first three letters of the genus and the first three letters of species name respectively see Table 1.

Table (1): Frequency *of C. murale* and the associated species of different vegetation groups from TWINSPAN in the study area.

	Taxon	A	B	C
1	*Alternanthera sessilis* (L.)DC.	10.25	9.25	8.00
2	*Amaranthus lividus* L.	0	6.25	0
3	*Amaranthus hybridus* L.	18.75	6.25	16.67
4	*Symphyotrichum squamatum* (Spreng.) Nesom	18.75	0	0
5	*Atriplex portulacoides* L.	25	25	0
6	*Anagallis arvensis* var. *arvensis* L.	0	0	0
7	*Apium graveolens* (L.) Lag.	0	0	16.67
8	*Alhagi graecorum* Boiss.	0	12.5	0
9	*Bassia indica* (Wight) A.J.Scott.	0	0	0
10	*Beta vulgaris* L.	18.75	6.25	0
11	*Bidens pilosa*(L.) Lam	0	0	0
12	*Chenopodium ficifolium* Sm.	12.5	6.25	0
13	*Chenopodium album* L.	0	0	8.33
14	*Chenopodium glaucum* L.	6.25	0	0
15	*Chenopodium murale* L.	62.4	37.5	50.00
16	*Coronopus didymus* (L.) Sm.	12.5	16.85	0
17	*Cynodon dactylon* (L.)Pers.	45.23	50	50.00
18	*Cyperus rotundus* L.	12.5	9.25	0.00
19	*Cakile maritima Scop.* subsp. *aegyptiaca* (Willd.) Nyman	0	50	16.67
20	*Conyza bonariensis* (L.) Cronquist.	12.5	0	0
21	*Capsella burse Pastoris* (L.) Medik.	12.5	12.5	0
22	*Convolvulus arvensis* L.	25	37.5	0.00
23	*Coronopus squamatus* (Forssk.) Asch.	0	0	0
24	*Cressa cretica* L.	0	0	0
25	*Euphorbia peplus* L.	0	0	0
26	*Erucaria hispanica* (L.) Druce	0	0	0
27	*Heliotropium curassavicum* L.	0	6.25	0
28	*Imperata cylindrica* (L.) Raeusch.	25	0	8.33
29	*Lepidium sativum* L.	0	18.75	50.00
30	*Limbarda crithmoides* L. Dumort.	0	0	25.00
31	*Lolium perenne* L.	0	0	16.67
32	*Malva parviflora* L.	0	6.25	41.67
33	*Melilotus indicus* (L.) All.	0	50	16.67
34	*Mentha longifolia* (L.) Huds.	0	18.75	25.00
35	*Mesembryanthemum crystallinum* L.	0	0	0
36	*Paspalidium geminatum* (Forssk.) Stapb	0	18.75	0
37	*Paspalum distichum* L.	0	12.5	58.33
38	*Parapholis incurve* (L.) C.E. Hubb	0	0	0
39	*Persicaria salicifolia* (Willd.) Assenov	0	12.5	0
40	*Phragmites australis* (Cav.) Trin. exsteud.	0	6.25	0
41	*Plantago major* L.	0	25	50.00
42	*Polypogon monspeliensis* (L.)Desf.	6.25	31.25	16.67
43	*Portulaca oleracea* L.	0	18.75	0
44	*Pseudognaphalium luteo-album* (L.) Hilliard & B.L.Burtt	0	0	66.67
45	*Ranunculus sceleratus* L.	0	0	16.67
46	*Rorippa palustris* (L.) Besser	0	12.5	0
47	*Rumex dentatus* L.	0	12.5	0
48	*Schismus barbatus* (L.) Thell.	0	0	0
49	*Senecio glaucus* L.	0	0	16.67
50	*Sisymbrium irio* L.	12.5	25	8.33
51	*Solanum nigrum* L.	12.5	12.5	58.33
52	*Sonchus oleraceus* L.	0	0	0
53	*Spergularia marina* (L.)Griseb.	0	31.25	0
54	*Suaeda maritima* (L.)Dumort	25	37.5	50.00
55	*Trifolium resupinatum* L.	0	0	0
56	*Urtica urens* L.	0	0	0
57	*Veronica anagallis-aquatica* L.	0	0	0
58	*Vicia sativa* L.	12.5	0	0

Table (2) :Soil properties of the different vegetation groups from TWINSPAN in the study area.

parameters	A	B	C
pH	7.09	7.54	7.06
Electrical Conductivity µS/cm	926.88	1959.00	1846.00
Total dissolved salts(mg/L)	474.75	1075.25	958.67
Bicarbonates %	0.07	0.11	0.11
Chlorides %	0.11	0.15	0.20
Sulphates%	0.12	0.23	0.21
Organic carbon%	1.05	0.94	0.67
Total nitrogen ppm	18.02	14.68	11.97
Total phosphorus ppm	8.09	5.71	5.01
Porosity%	38.52	35.38	30.70
Water holding capacity%	50.40	47.81	48.60
Clay	3.80	3.95	5.21
Silt%	5.87	4.70	4.91
Sand%	90.27	91.12	89.69
Moisture content%	5.90	3.19	4.08

Species – soil relationships: Canonical Correspondence (CCA) analysis gives the ordination diagram concerning the relationship between the plant species and soil parameters in the study area (Figure2). The points represent species and the arrows represent environmental variables of soil.

The correlation between vegetation and soil characteristics was shown in the ordination diagram produced by CCA of the biplot of species and environmental variables (Figure 2). From the illustrated data, it is clear that *Chenopodium murale* showed close relationship with soil clay, porosity, moisture content and total phosphorous on the upper right side of CCA diagram. On the other hand, it showed a reverse correlation with electric conductivity, total dissolved salts, sodium and sulphate.

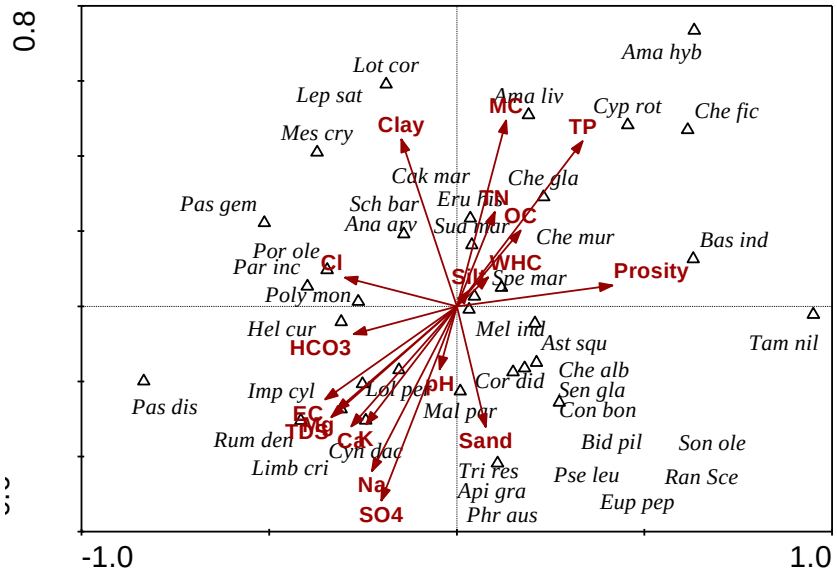

Figure (2): CCA analysis showing the soil and species relationship. The species abbreviation listed in Table 1.

DISCUSSION

The weed vegetation considered as a progression of plant species in a habitat where ecological confliction is mainly due to the crop management system. The productivity analysis of this vegetation is mainly focused on identifying the agronomic factors responsible for its variations (Ferrari *et al*., 1984). Several studies have described the effects agronomic factors on species ecology and biology (Mohler & Liebman, 1987; Ghersa and Holt, 1995).

Radosevich & Holt (1984) reported that weeds represent an important constituent of the environment. Weeds steadiness is significant in vision of the efforts to remove them, and permits greater attention.

Weed species affect the crop yield where reduce the farm revenue and represents an economically problem (Fayed *et al*., 1997).

Application of TWINSPAN analysis revealed that the vegetation of *C. murale* community produced three groups, group A was the largest group (8 sites) and dominated by *Chenopodium murale*, while the indicator species include *Conyza bonariensis*. The other important species was *Cynodon dactylon*. Group B included four sites, this group was dominated by *Melilotus indicus* and indicated by *Coronopus didymus;* the other preferential species were *Cakile maritime* and *Cynodon dactylon*. Group C involves three sites, this group is dominated by *Pseudognaphalium luteo-album* and indicated by

Cynodon dactylon The most important species are *Paspalum distichum* and *Solanum nigrum*. The dominants and associated species reflect their habitats.

Chenopodium murale showed a close relationship with soil clay, porosity, moisture content and total phosphorous and a reverse correlation with electric conductivity, total dissolved salts, sodium and sulphate. Moreover, *C. murale* recorded as nutrients collector such as nitrogen, phosphorous, potassium and magnesium (Maliwal and Gupta, 1988; Qasem, 1992).

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دراسة بيئية على نبات السنتار بدلتا النيل بمصر

سامية على هارون ، غادة عبد الله الشربينى و ريام صبيح جاسم الشمرى

قسم النبات - كلية العلوم - جامعة المنصورة

هذه الدراسة تقدم وصف للكساء النباتي لعشيرة نبات السنتار (الزربيح) و تقيم العلاقة بين النبات وعوامل التربة أوضح تحليل التصنيف ثنائي الاتجاه (TWINSPAN) أن هناك ٣مجموعات : مجموعة A وكان يسوها نبات السنتار مجموعة B وكان يسودها نبات الحندقوق ومجموعة C وكان يسودها صابونه العفريت ٠ بتحليل التطابق الكنسي(CCA)اتضح أن نبات السنتار كان له علاقة طردية مع التربة الطينية والمسامية والرطوبة والفسفور وعلاقة عكسية من التوصيل الكهربى والأملاح الكلية الذائبة والصوديوم والفوسفات ٠

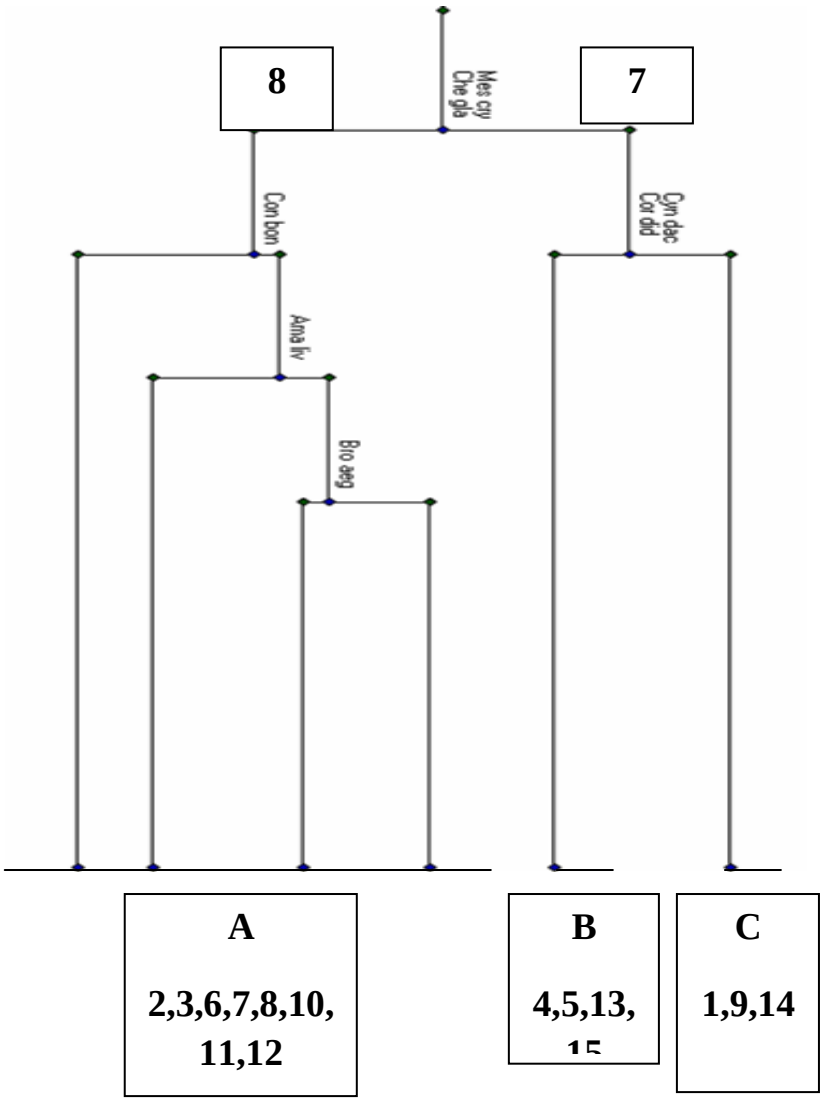

Figure (1): TWINSPAN analysis of the 15 sites based on frequency Indicator species are abbreviate to the first three letters of the genus and the first three letters of species name respectively see Table 1.