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Autecology and Economic Importance of Weed Flora of the Nile Delta: *Capsella bursa – pastoris* L.

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ABSTRACT

The present study was conducted to investigate the morphology, anatomy, karyotype, palynology, biogeography and seed germination of *Capsella bursa – pastoris*. Also, the ecological characteristics and metabolic products were examined. *C. bursa – pastoris* (shepherd's purse) is annual cruciferous herb shows considerably variety of habit form. It is a serious weed responsible for yield loss of many crops. The stem shows the typical dicot characters, with intervascular cambium gives few secondary tissues and has wide parenchymatous pith. The leaf has adaxial epidermal cells of midrib are large and projecting from the blade. The root shows normal secondary thickening and the ruptured epidermis covered by multilayered periderm. The chromosomes are 2n = 16. Pollen grains are spheroidal isopolar, tricolpate with sinuaperturate. The highest rate of seeds germination attained at 30 - 35º C, low salinity (0 – 0.2 M NaCl) and 25 – 30 mm rainfall. *Capsella* community comprised 25 species belonging to 15 families. *Cynodon dactylon, Urtica urens, Rumex dentatus* and *Lamium amplexicaule* were the common associates. The major life – forms were therophytes, hemicryptophytes and geophytes. The assemblage of this community belongs to six chorotypes with predominance of Mediterranean and Irano – Turanian. *Capsella* flourished in wet, loose, non – saline soil. The nutritive value was 69.29 cal./ 100g. The residues of the different extracts of leaves, stems and roots were 15.64, 11. 97 and 8.30 %, respectively. The polyphenols and flavonoids were detected in ethyl alcohol, chloroform and acetone extracts. These extracts exhibited antioxidant and antimicrobial spectrum only against. *Bacillus cereus, Staphyloccus aureus, Klebsiella pneumoniae, Pseudomonas aeruginosa.*

***Keywords*: *Capsella*, Ecology, Karyotype, Palynology, Phytochemistry.**

INTRODUCTION

Capsella bursa – pastoris is a cosmopolitan species, characterized by strong colonizing ability and success in man – made habitats. It is a common weed in the Nile Delta and Isthmic desert Tackholm (1974), grows best in moist, well – drained, low fertile, slightly alkaline soil in full sun.

Literature reviews indicated that, wide variety of metabolic compounds have been reported from *Capsella bursa – pastoris* which confirm its traditional application (Alizadeh *et al.*, 2012; Grosso *et al.*, 2011; Jahangir *et al.*, 2009 and Song *et al.*, 2007). Shepherd's purse is native to Eastern Europe (Aksoy *et al.*, 1998) and considered a common weed in winter cereals, vegetable and fruit gardens, tilled crops and fodder grasses (Aksoy *et al.*, 1998). The methanol extract of the aerial parts of *Capsella bursa-pastoris* yielded fourteen bioactive compounds. These compounds were methyl-1-thio-β-D-glucopyranosyl disulfide, 10-methylsulphinyl-decanenitrile (Song *et al.*, 2007), 11-methyl-sulphinyl-undecanenitrile, 1-O-(lauroyl) glycerol (Selenu *et al.*, 2005), phytene-1,2-diol (Park *et al.*, 2000), 5,6-epoxy-3-hydroxy-7-megastigmen, loliolide (Kuroda *et al.*, 1975), *β*-sitosterol (Cha *et al.*, 2017), 3-hydroxy-1-propanone, 1-feruloyl-β-D-glucopyranoside, pinoresinol -4-O-β-D-glucopyranoside, luteolin, quercetin -3-O-β-D-glucopyranoside, and luteolin 6-C-β-glucopyranoside. Several biological studies were made on *C. bursa – pastoris* such as Bosbach *et al.*, (1982), Green and Sweet (1972), Hurka and Haase (1982), Legizamon *et al.*, (1980), Hurka *et al.*, (1976) and Neuffer and Hurka (1986). The present study is an attempt to throw further light on the biological aspects, autecology, nutritive value, phenols and flavonoids content, the antioxidant and antimicrobial properties of *C. bursa – pastoris.*

MATERIALS AND METHODS

Ecological characters

a.Vegetation Analysis

Twenty stands dominated by *Capsella bursa – pastoris* were studied in detail including total coverage, a list of species, families, life – span, life – forms, chorotype, phenological aspects and cover – abundance estimate of each species. Identification and nomenclature of the species were followed Boulos (1999 – 2005). Techniques of floristic analysis based on the methods given by Kent and Cocker (1992) and Muller – Dombois & Ellenberg (1974).

b. Habitat Conditions

Soil samples were collected from each stand at a depth of 20 Cm, air dried and sieved through a 2 mm sieve to remove gravel and debris. The procedure followed for estimating the physical and chemical variables were according to the methods recommended by Carter and Gregorich (2008), Margesin and Schinner (2005) and Baruah & Barthakur (1997).

Morphological characters were examined using fresh specimens of *C. bursa – pastoris* according to Foster and Gifford, 1974; Heywood, 1987.

Anatomical characters were investigated using cross – sections of stem, leaf and root were made as described by

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Peacock and Bradbury (1973), then examined using light microscope and photographed. (Snow, 1963), then smeared in 45% acetic acid.

Pollen grains were prepared for light microscopy according to Erdtman, (1960). Germination experiments were conducted to fined out the effect of salinity, light and dark, temperature and amount of rainfall on the rate of seeds germination as described in Masoud (2004).

Phytochemical Investigation

The mean values of primary metabolites were investigated according to Harborne (1973), AOAC (1990) and Sadasivam & Manickam (2008). Air – dried samples of leaves, stems and roots of C. bursa – pastoris extracted with successive organic solvents in a soxhlet apparatus using Pet. Ether, ether, chloroform, acetone, ethyl alcohol and the residues weights determined.

The polyphenols content was determined using the method described by Sadasivam and Manickam (2008). The flavonoids were extracted and subjected to column chromatograph according to Kujala *et al*., (2000). The antioxidant activity was investigated using free radical scavenging method (DPPH) as described by Liyana – Pathirana and Shahidi, (2005). The antimicrobial activity of ethanol, chloroform and acetone extracts of Capsella aerial parts was examined by filter paper disc assay (Murray *et al*., 1998) using inculums of 106 bacterial and fungal cells/ml.

RESULTS AND DISCUSSION

Morphology

Capsella is a small genus within the mustard family (Brassicaceae) and represented by a single species in Egypt C. bursa - pastoris (L.) Medik, Plate 1. It is known by its common name shepherd's purse because of its triangular flat fruit which are purse – like (Plate 2). Capsella shows various morphological variation. It has normal non – tuberous, much branched tap root (Plate 3).

Plate 1. Capsella bursa – psstoris plant with the lower pinnate partite foliage in rosette form and ascending branch Carring smaller leaves and white flowers. Capsella seedling in the left side.

Plate 2. Silicula (simple dry dehiscent fruit) of Capsella bursa – pastoris.

Plate 3. Root system of Capsella bursa – pastoris plant.

Stem is herbaceous, erect, rounded or slightly angled, bluish green, solid, 20 – 60 Cm long, and produces few long branches near the base. The two cotyledonary leaves are cordate, emarginate, glabrous and petiolate. The first three pairs of leaves are ovate of rosette form (seedling stage). The 4th leaf pair stage has the first appearance of dissected pinnate partite foliage leaves. After about 8 weeks from germination, the plant blossomed. The plant forms basal rosette of large deeply lobed leaves with scattered hairs. The peduncles carried sessile, sagitate, alternate, less lobed and half stem – embracing leaves. Flowers have 4 free petals, white, pale yellow or lilac and borne in loose elongated racemes. Fruit is simple dry dehiscent silicula 5 – 10 x 4 – 8 mm, obcordate – triangular, laterally compressed and beaked. Seeds are brown ellipsoid and wingless. The symptoms of the end of the life cycle begins four weeks after flowering and the dead parts attained yellowish colour. C. bursa – pastoris shows extensive variation in flowering time depending on how plants adapted localy, Hui – Run *et al*. (2012).

Anatomy

The transverse section of Capsella stem shows that, it is circular in outline with single row of epidermal cells covered by a thin cuticle and 2 – layered collenchyma cells beneath the epidermis. The cortex of 4 – 6 layers of parenchyma cells surrounds the central cylinder and is delimited by easily distinguishable endodermis. The vascular bundles are open collateral and the intravascular cambium provides little secondary tissues, like most dicot herbs. The pith consists of polygonal parenchymatous cells (Plate 4a).

The leaf is bifacial type and has prominent midrib zone gives projection at the adaxial surface (Plate 4b). The cross section of the root reveals that, has normal secondary thickening, characterized by ruptured epidermis and covered by multilayered periderm. A complete cylinder of secondary xylem is formed under the cambium ring. The root is diarch and has very narrow pith (Plate 4c). These results are coincide with Akosy *et al*., 1999.

Karyotype

Chromosomes investigation in the root tips revealed no abnormalities and has 2n = 16 (Plate 5). This confirms the earlier reports of Svensson, (1983).

Palynology

Pollen grains of C. bursa – pastoris are isopolar, trizonocolpate, radiosymmetrical, subprolate with sinuapeturate (Plate 6). This in accordance with Svensson (1983).

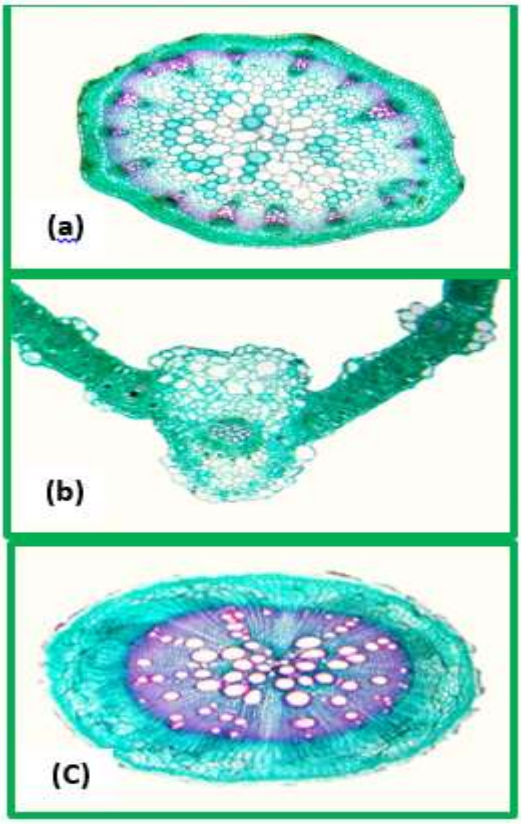

Plate 4. Light microscopy of transverse sections in C. bursa-pastoris stem(a), Leaf (b) and root (C).

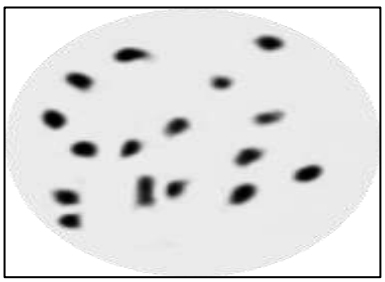

Plate 5. Chromosomes of C. bursa – pastoris 2n = 16.

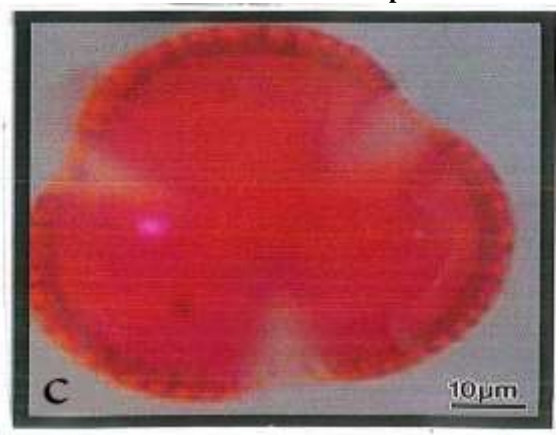

Plate 6. Macrophotographs of Pollen grains of C. bursa – pastoris.

Taxonomy

Taxonomically, according to Angiosperm phylogeny group (APG, 2009 and Al-Shehbaz *et al*. 2006).

Brassicaceae comprised eight tribes and C. bursa – pastoris has the following systematic position:

Kingdom	Plantae – plantes
Subkingdom	Viridiplantae – green plants
Infrakingdom	Streptophyta – land plants
Superdivision	Embryophyta – Embryonic plants
Division	Tracheophyta – vascular plants
Subdivision	Spermatophyta –seed plants, phanerogames
Class	Magnoliopsida
Superorder	Rosanae
Order	Brassicales
Family	Brassicaceae-mustards, crucifers
Tribe	Camelineae
Genus	*Capsella*
Species	*Capsella bursa – pastoris* (L.) Medik

Biogeography

C. bursa – pastoris is native to eastern Europe and Considered a common weed in cold climates, where it is regarded as an archaeophyte in north America, China and north Africa. Being found in a broad range of conditions and mostly confined to man – made habitats and characterized by strong colonizing ability (Koch and Kiefer, 2006; Williamson, 1997 and Holm *et al*., 1979). It was included in list of economically important weeds in Bulgaria, Neuffer (1989). (In Egypt, it is common winter – spring annual weed in Nile Delta and Isthamic Desert (Fig. 1).

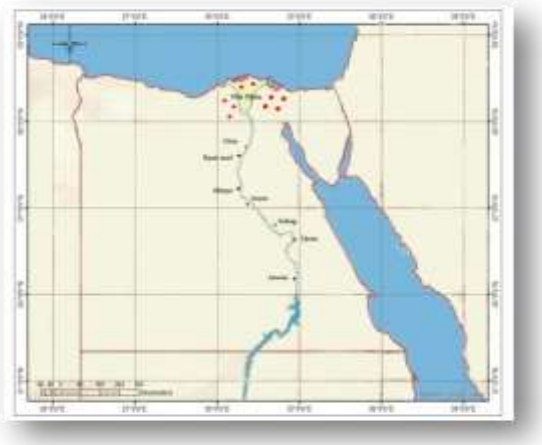

Fig. 1. Map of Egypt showing the phytogeographical distribution of Capsella bursa - pastoris (●).

Autecology

Vegetation

a) Analytical characters

One stand dominated by *C. bursa – pastoris* was studied in detail on 13 March 2019 at Mit Ghamr, South – West of El Dakahlyia. It is a waste previousty cultivated land and traversed by a water ditch that creats wet conditions. Table (1) gives the data collected from ten quadrats, 1 x 1 m each. *Capsella bursa – pastoris* is the most abundant species and has importance value of 116.75. The total cover of its growth is 4.23 m² (57.52 %). *Sonchus oleraceus*, *Chenopodium ambrosioides* and *Euphorbia peplus* are the most common associates have IV estimates of 45.59, 26.11 and 15.25, respectively. Other twelve associates are recorded having IV ranged between 2.37 and 14.66. The minimal area of this stand was 5m² (Fig. 2).

Table 1. Analytical characters of vegetation within a stand of *Capsella bursa - pastoris* L. community type in El Dakahlia Governorate.(10 quadrats, 1x1 m²),.

Species	Quadrates																				RD %	RC %	RF %	IV
	1		2		3		4		5		6		7		8		9		10					
	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A	N	A				
Capsella bursa –pastoris L.	32	1.31	36	1.22	40	1.37	46	1.72	47	1.42	42	1.46	27	1.17	40	1.36	35	1.32	22	0.88	42.57	57.52	16.66	116.75
Sonchus oleraceus L.	-	-	180	1.10	36	0.29	-	-	-	-	68	0.37	-	-	-	-	-	-	-	-	32.94	7.65	5.0	45.59
Chenopodium ambrosioidies L.	2	0.21	-	-	1	0.07	2	0.24	8	0.35	3	0.23	2	0.19	2	0.20	2	0.22	3	0.18	2.90	8.21	15.0	26.11
Euphorbia peplus L.	-	-	-	-	25	0.10	5	0.02	-	-	24	0.12	-	-	-	-	10	0.04	-	-	7.42	1.21	6.66	15.25
Melilotus indicus L.	-	-	-	-	-	-	3	0.29	2	0.27	1	0.16	2	0.18	-	-	-	-	5	0.28	1.50	5.13	8.33	14.66
Polypogon monspeliensis L.	4	0.12	-	-	-	-	-	-	4	0.14	-	-	5	0.15	2	0.07	-	-	3	0.09	2.08	2.47	8.33	12.88
Anagallis arvensis L.	-	-	10	0.39	-	-	-	-	-	-	20	0.49	-	-	-	-	-	-	-	-	3.48	3.82	3.33	10.63
Poa annua L.	-	-	-	-	2	0.04	3	0.05	-	-	3	0.09	11	0.14	-	-	-	-	-	-	2.20	1.39	6.66	10.25
Barassica tournefortii Gouan L.	-	-	-	-	4	0.05	3	0.07	-	-	-	-	4	0.06	-	-	-	-	2	0.07	1.50	1.08	6.66	9.24
Cynodon dactylon L.	2	0.39	-	-	1	0.17	-	-	1	0.13	-	-	-	-	-	-	-	-	-	-	0.46	3.0	5.0	8.46
Coronopus squamatus L.	2	0.30	-	-	-	-	-	-	-	-	-	0.07	-	0.25	-	-	-	-	-	-	-	2.69	5.0	7.69
Conyolvulus arvensis L.	3	0.22	-	-	-	-	-	-	-	-	-	-	-	-	5	0.29	-	-	-	-	0.92	2.21	3.33	6.46
Rumex dentatus L.	-	-	2	0.21	-	-	-	-	-	-	-	-	-	-	-	-	5	0.22	-	-	0.92	1.86	3.33	6.11
Mediago intertexta L.	-	-	3	0.06	-	-	-	-	-	-	-	-	2	0.07	-	-	-	-	-	-	0.58	0.56	3.33	4.47
Solanum nigrum L.	-	-	-	-	-	-	-	-	3	0.12	-	-	-	-	-	-	-	-	-	-	0.34	0.52	1.66	2.52
Beta vulgaris L.	-	-	-	-	1	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.11	0.60	1.66	2.37

N = Number of individuals A = area in m² A = area, RD =Relative Density, RC=Relative Cover, RF = Relative Frequency, IV = importance value

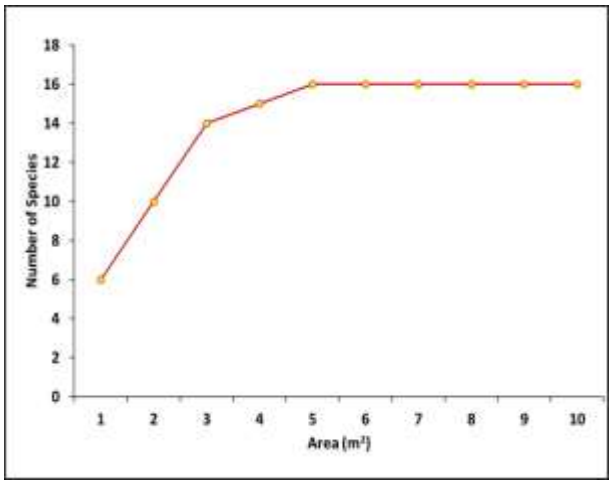

Fig. 2. Species: area curve of a representative stand of C. bursa – pastoris community type.

Table (2) gives the floristic composition of twenty representative stands of *C. bursa – pastoris* community in El Dakahlyia district. The total plant cover ranged between 40 and 80 %. The plant cover is contributed mainly by *Capsella*, which is the only species recorded in all the stands (P = 100 %) and has the highest cover – abundance estimate. The species population of this community is formed mainly of herbaceous weeds and comprised 25 plant species (18 annuals, two biennials and 5 perennials). Of these species 20 are dicots and 5 are monocots. *Cynodon dactylon* (P = 90 %), *Urtica urens*, *Rumex dentatus* and *Lamium amplexicaule* (P = 80 %) are the most abundant associates. *Convolvulus arvensis, Brassica tournefortii, Poa annua* and *Euphorbia peplus* are common associates having presence estimates of 60 – 70 %. Less common associates include *Polypogon monspeliensis, Anagallis arvensis* and *Solanum nigram* (P = 30 – 50 %). Another 11 species having P = 5 – 25 %.

b) Synthetic characters

Table 2. Floristic composition in twenty representative stands of *Capsella bursa – pastoris* community type in EL-Dakahlia Governorate. Cover- abundance estimate is according to a modified (1- 5) Domin scale. Aspect of growth:

Species	Families	Life span	Life form	Floristic categoris	Stands																			P %
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Capsella bursa-pastoris L.	Brassicaceae	Ann	Th	COSM	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	5r	100
Cynodon dactylon L.	Poaceae	Per	G	PAN	-	3g	4g	3gr	3g	3g	3g	2g	2g	2g	2g	3g	3g	3g	3g	2g	2g	3g	3g	-	90
Urtica urens L.	Urticaceae	Ann	Th	ME+IR-TR+ER-SR	4f	-	-	3f	-	3f	4f	4f	4f	4f	3f	3f	3f	3f	3f	-	3f	3f	3f	3f	80
Rumex dentatus L.	Polygonaceae	Ann	Th	ME+IR-TR+ER-SR	3g	4g	3g	4g	-	2g	4g	4g	3g	4g	4g	2g	2g	-	3g	-	-	3g	3g	3g	80
Lamium amplexicaule L.	Lamiaceae	Ann	Th	ME+IR-TR+ER-SR	3f	4f	3f	3f	-	3f	-	4f	3f	2f	2f	2f	3f	3f	3f	-	2f	-	3f	3f	80
Convolvulus arvensis L.	Convolulaceae	Per	H	COSM	3g	4f	4f	3g	3g	4g	-	-	-	2g	2g	1g	-	2g	-	3g	4f	3g	3f	-	70
Brassica tournefortii Gouan	Brassicaceae	Ann	Th	ME+IR-TR+SA-SI	4r	3r	-	-	4r	4r	-	3f	3r	-	3f	-	-	-	-	4r	3r	3r	3f	4r	60
Poa annua L.	Poaceae	Ann	Th	COSM	2f	2f	-	-	-	-	2f	-	-	3f	3f	3f	2f	2f	3f	-	-	2f	2f	1f	60
Euphorbia peplus L.	Euphorbiaceae	Ann	Th	ME+IR-TR+ER-SR	-	1g	1g	1g	-	-	-	-	2g	1g	2g	2g	3g	3g	1g	-	2g	-	2g	--	60
Polypogon monspeliensis L.	Poaceae	Ann	Th	COSM	1g	2g	-	-	-	-	1g	-	-	1g	1g	1g	1g	2g	-	-	-	2g	-	2g	50
Chenopodium ambrosioides L.	Chenopodiaceae	Bi	Th	COSM	4f	3f	1g	-	1f	1f	-	-	1f	-	-	-	-	-	-	1f	-	2f	2f	2f	45
Anagallis arvensis L.	Primulaceae	Ann	Th	COSM	3f	-	-	-	-	-	1f	-	-	-	1f	1f	-	-	3f	-	-	2f	-	1f	35
Sonchus oleraceus L.	Asteraceae	Ann	Th	COSM	-	2f	-	-	-	-	2g	-	1f	1f	1f	-	-	1f	-	-	-	-	-	-	30
Solanum nigrum L.	Solanaceae	Ann	Th	COSM	-	2g	-	-	-	-	-	1f	1f	1f	-	-	-	-	-	-	-	1f	1f	-	30
Beta vulgaris L.	Chenopodiaceae	Bi	Th	ME+IR-TR+ER-SR	-	-	-	1f	2f	1g	-	-	-	-	-	-	-	-	-	-	1f	-	1f	1f	25
Melilotus indicus L.	Fabaceae	Ann	Th	ME+IR-TR+SA-SI	-	-	-	-	-	-	1f	-	1f	-	-	-	-	-	-	-	1f	-	1f	-	25
Sisymbrium irio L.	Brassicaceae	Ann	Th	ME+IR-TR+ER-SR	-	-	-	-	-	-	-	-	-	1g	1g	3g	2g	-	-	-	-	-	-	-	20
Cichorium pumilum L.	Asteraceae	Ann	Th	ME+IR-TR	-	-	1g	1g	1g	1g	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
Oxalis corniculata L.	Oxalidaceae	Per	H	COSM	-	-	-	-	-	-	-	-	1f	-	1f	1f	-	-	-	-	-	-	-	-	15
Vicia monantha L.	Fabaceae	Ann	Th	ME+ER-SR	-	-	-	-	-	-	-	-	1f	-	-	1g	-	1f	-	-	-	-	-	-	15
Senecio aegyptius L.	Asteraceae	Ann	Th	ME+IR-TR+ER-SR	-	-	-	-	-	-	-	-	-	1f	-	-	-	1f	-	-	-	-	1f	-	15
Imperata cylindrica L.	Poaceae	Per	H	ME+PAL	-	-	-	-	1f	-	-	1g	-	-	-	-	-	-	-	-	-	-	-	-	10
Coronopus squamatus L.	Brassicaceae	Ann	Th	ER-SR+IR-TR+ME	1g	-	-	-	-	-	-	-	-	-	-	-	1g	-	-	-	-	-	-	-	10
Cyperus rotundus L.	Cyperaceae	Per	G	PAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1g	-	-	-	-	5
Ammi majus L.	Apiaceae	Ann	Th	ME+IR-TR+ER-SR	-	-	-	-	-	-	-	-	-	1g	-	-	-	-	-	-	-	-	-		5

g =in follage, F = flowering, r = fruiting, P = presence (%). Life span: Ann. = annual, Bi= biennial, per = perennial. Life forms: Th= therophytes, H = hemicryptophtes , G = geophytes , P= parasites . Floristic categories: COSM = cosmopolitan, PAL = palaeotropical , PAN =pantropical , ME= Mediterranean, ER-SR =Euro-Siberian, SA-SI= Saharo- sindian , IR-TR = Irano- Turanian and S-Z = Sudano- Zambezian .

The assemblage of this community belonging to 15 families, Brassicaceae and Poaceaea represented by four species each, followed by Asteraceae (3 species). Each of Chenopodiaceae and Fabaceae comprised 2 species. Another nine families were represented by single species. The floristic components belong to three life – forms: therophytes (81 %), geophytes (11 %) and hemicryptophytes (8 %) and related to six chorotypes with the majority of Mediterranean and Irano – Turanian (14 and 12 species, respectively).

Habitat conditions

It is clear in Table (2) that, the soil supporting *C. bursa – pastoris* mostly alluvial soil built by the Nile. The fine and very fine sand particles constituted the highest fraction (63.45 %). The silt fraction was relatively high (mean = 25.24 %) and clay value (1.02 – 2.20 %). *Capsella* grows best in well-drained, moist soil, with low fertility, slightly alkaline with pH 7.1 – 8.8. Although it grows best in full sun, Also can grows in moderate shade.

Seed Germination

The highest rate of seed germinati'on (94 % and 92 %) were achieved with distilled water (the control) and 0.02 M NaCl. The percentage of germination decline with increase of salinity level. The results give indication that Capsella is sensitive to salinity (Fig. 3). The seeds of Capsella had the capacity to germinate between 25 - 40º C. The optimum temperature for germination was 35º C, at which the percentage was 49% (Fig. 4). The maximum percentage of germination being 90 % in continuous light but comparable percentages were recorded in continuous darkness and alternating light and dark become 65 and 70 %, respectively (Fig. 5). It is notable that, germination started at 10 mm rainfall (34%). Germination rate varied from 48 to 56 % as the amount of rainfall increased from 15 to 30 mm (Fig. 6).

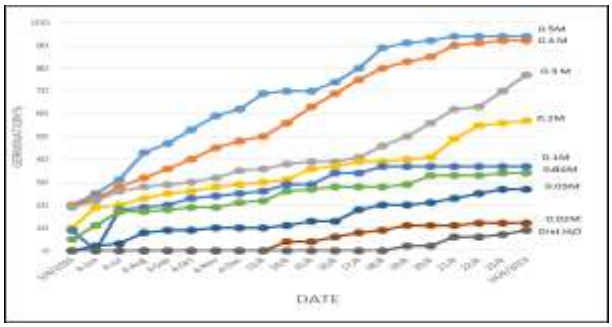

Figure 3. Seed germination of *C. bursa-pastoris* under different levels of salinity (5/4/2019-24/4/2019).

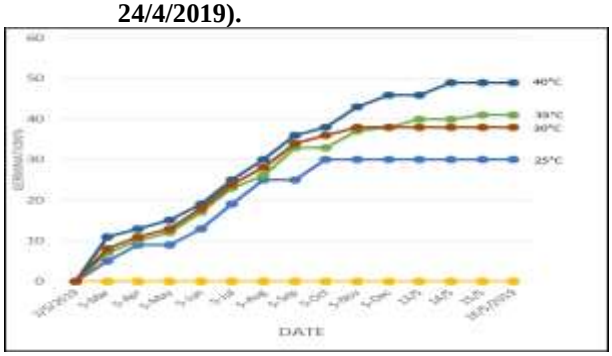

Figure 4. Seed germination of C. bursa-pastoris under different levels of temperature (2/5/2019-16/5/2019).

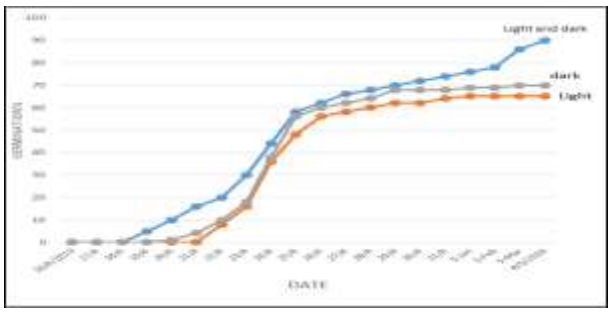

Figure 5. Seed germination of C. bursa-pastoris under different levels of light (16/4/2019-4/5/2019).

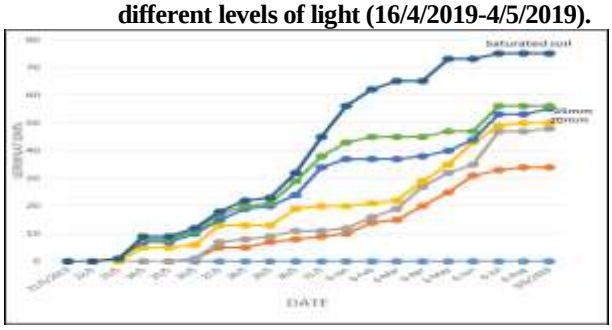

Figure 6. Seed germination of C. bursa-pastoris under different levels of rainfall (21/5/2019-9/6/2019).

The obtained results are coincide with those reported by Hurka and Haase (1982) and Neuffer and Bartelheim (1989) found that, germination behavior showed no relationship to the place of origin. *Capsella* has germination strategy includes broad temperature tolerance. and remain viable in soil for 10 or more year. The seeds coat maintain their germinability up to 20 % passing through the digestive system of animals.

Phytochemical Analysis

Primary metabolites

The proximate metabolic constituents of *C. bursa – pastoris* in Table (4). The moisture content, total ash, water soluble ash, fiber, crude protein, total lipid, total carbohydrate and total soluble sugars were 7.98, 5.67, 5.27, 12.55, 12.84, 1.67, 0.73 and 0.17 %, respectively. In turn the nutritive value of leaves was 99.05 Cal./100g.

Secondary metabolites

The data in Table (5) revealed that the phenolic content of the stem was higher in ethyl alcohol, chloroform and acetone extracts (396.887, 80.221 and 69.244 mg/100g, respectively) than in the same extracts of the leaves (17.547, 24.095 and 36.230 mg /100g, respectively). The water extract leaves records higher phenols content (544.592 mg/100g) than the stem (361.9 mg/100g). Flavonoids content exhibit the same trend as phenols. The stem extracts contained 56.05, 14.87, 10.64 and 18.79 mg/100g, while leaves extracts records 3.13, 6.01, 8.94 and 46.13 mg/100g.

Antioxidant activity

The extracts of *C. bursa – pastoris* showed variable degrees of antioxidant activity. The ethyl alcohol, chloroform and acetone extracts of the leaves ($IC_{50\%}$ = 0.53, 2.72 and 4.87) were higher than in stems (IC = 0.02, 0.45 and 2.66, respectively). The water extract of stems has ($IC_{50\%}$ = 2.85) higher than leaves extract ($IC_{50\%}$ = 0.09), Table (5).

Antimicrobial Activity

Table (6) revealed that, ethanol extracts of both stems and leaves showed inhibition effect against *Bacillus cereus.* Chloroform extract of the leaves inhibited *Klebsiella pneumoniae* while acetone extract exhibits activity against *Pseudomonas aeruginosa* and *Bacillus cereus.*

Capsella bursa – pastoris exerted antimicrobial, anti–inflammatory, antioxidant, cardinovascular, anticancer, hepatoprotective and sedative activity (Al-Snafi, 2015). It is one of the plants commonly used in the traditional medicine for many purposes: (Gimenez-Martinez and Torijia – Isasa, 1999). The aerial parts contained a wide range of chemicals including flavonoids, polypepties, choline, histamine, tryamine, sterols, suforaphane and vitamins. The antimicrobial peptides (shepherin, phytoalexin and athionin isolates from the root of shepherd's purse.

In conclusion, *C. bursa-pastoris* that growing naturally at different habitats in the Nile Delta possesses a good nutritional value as food or fodder. In addition it has good phytochemical conistituents with medicinal importance.

Table 3. Analysis of soil samples collected, from ten representative stands of *Capsella bursa-pastoris* community type at El Dakahlia Governorate.

Samples No.	Physical characteristic												Chemical chrematistic					
	Mechanical analysis												Analysis of 1 : 5 Water extract					
	Particles size mm (%)							M.C. %	Por. %	W.H.C %	Org.C %	CaCO3 %	T.S.S %	Cl^- %	SO_4^- %	CO_3^- %	HCO_3^- %	PH
	> 2.057	2.057-1.003	1.003-0.500	0.500-0.211	0.211-0.104	0.104-0.053	< 0.053											
1.	0.65	1.34	6.35	25.10	36.15	27.18	1.33	9.84	42.23	49.42	0.08	3.50	0.40	0.01	0.24	0.0	0.122	8.3
2.	0.85	2.04	5.23	26.54	37.59	24.11	2.15	8.06	41.38	45.89	0.05	4.20	0.20	0.04	0.12	0.0	0.152	8.2
3.	0.68	1.86	5.27	24.90	38.08	25.34	2.20	2.39	45.50	47.66	0.07	4.65	0.30	0.03	0.16	0.0	0.272	7.1
4.	0.43	1.47	5.60	23.71	39.65	26.60	1.27	5.55	47.06	43.25	1.02	5.60	0.30	0.03	0.20	0.0	0.122	7.3
5.	0.95	1.22	6.55	25.18	39.14	24.33	1.60	6.56	44.83	43.27	0.04	4.55	0.30	0.02	0.23	0.0	0.152	7.1
6.	0.98	2.06	5.78	24.34	37.58	26.76	1.02	7.43	48.20	46.11	0.08	3.50	0.10	0.01	0.16	0.0	0.091	7.6
7.	0.55	1.20	6.31	23.62	38.22	26.29	2.12	5.74	46.28	48.18	0.09	7.21	0.30	0.01	0.20	0.0	0.183	8.2
8.	0.80	1.27	5.55	26.12	39.45	24.11	1.88	4.25	42.95	44.35	1.03	3.12	0.40	0.03	0.28	0.0	0.244	8.4
9.	0.91	1.89	6.25	27.17	39.35	22.14	1.18	2.82	43.80	49.12	0.99	4.75	0.30	0.01	0.12	0.0	0.213	8.5
10.	0.35	1.97	6.15	26.13	36.53	25.62	1.28	6.96	45.76	47.65	0.06	4.80	0.20	0.04	0.16	0.0	0.061	8.8
Mean	0.71	1.63	5.60	25.28	38.17	25.24	1.60	5.96	44.79	46.19	0.35	4.58	0.28	0.02	0.18	0.0	0.161	7.8
S.E.	0.70	0.115	0.151	0.378	0.389	0.496	0.142	0.736	0.691	0.910	0.145	0.375	0.29	0.04	0.17	0.0	0.021	0.196

M.C. = moisture Content, Por. = porosity, W.H.C. =water –holding capacity, Org. C. =organic carbon and T.S.S. = total soluble salt.

Table 4. The proximate primary metabolites of *Capsella bursa – pastoris.*

	Primary metabolites %							
	Moisture	Total ash	Water soluble Ash	Fiber	Protein	Lipids	Carbohydrate	Energy (Cal./100g)
Leaves	8.60	6.50	5.79	13.33	17.25	3.00	0.76	99.05
Stems	7.85	4.50	4.22	12.66	13.69	1.00	0.59	66.15
Root	7.50	6.00	5.80	11.65	7.58	1.00	0.84	42.69

Table 5. The estimated secondary metabolites of *Capsella bursa-pastoris.*

Extracts	Plant parts					
	Stems			Leaves		
	Phenols	Flavonoids	Antioxidant (IC_{50})	Phenols	Flavonoids	Antioxidant (IC_{50} %)
Ethanol	396.88	56.05	0.022	17.54	3.13	0.529
Chloroform	80.22	14.87	0.451	24.09	6.01	2.724
Acetone	69.24	10.64	2.661	36.23	8.93	4.870
Water	361.90	18.79	2.850	544.59	46.13	0.089

Table 6. The inhibitory activity of different extracts of the plant parts against pathogens (inhibition zones in mm).

Pathogens	Extracts					
	Ethanol		Chloroform		Acetone	
	Stem	Leaf	Stem	Leaf	Stem	Leaf
Pseudomonas aeruginosa	-ve	-ve	-ve	-ve	7 mm	-ve
Bacillus cereus	7 mm	7 mm	-ve	-ve	7 mm	7 mm
Escherichia coli	-ve	-ve	-ve	-ve	-ve	-ve
Staphylococcus aureus	-ve	7mm	-ve	-ve	-ve	-ve
Salmonella typhimurium	-ve	-ve	-ve	-ve	-ve	-ve
klebsiella pneumoniae	-ve	-ve	-ve	6.5mm	-ve	-ve
Listeria monocytogenes	-ve	-ve	-ve	-ve	-ve	-ve
Staphylococcus epidermidis	-ve	-ve	-ve	-ve	-ve	-ve
Enterobacter cloacae	-ve	-ve	-ve	-ve	-ve	-ve
Candida albicans	-ve	-ve	-ve	-ve	-ve	-ve

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البيئة الذاتية والأهمية الأقتصادية للفلورا العشبية بدلتا النيل – نبات كيس الراعي

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شملت الدراسة التعرف على السمات الظاهرية والتشريحية والبنية الكروموسومية وحبوب اللقاح والخصائص البيئية (الصفات الكمية والوصفية لعشيرة نبات كيس الراعي) والظروف البيئية كذلك قياس نسبة التواجد (المدى الاجتماعي) والوفرة والصور الحياتية والمجموعات الفلورية.خصص جزء لتقدير الثوابت الأيضية والقيمة الغذائية والفينولات والفلافونيدات والكشف عن فاعلية المستخلص الكحولي والأسيتوني والكلوروفورم كمضادات أكسدة وميكروبية. خلصت الدراسة ان نبات كيس الراعي واسع الانتشار بدلتا النيل وله صورتان للحياة في الأولى يكون مفترشا وفي الثانية يكون قائما. يتميز الساق والجذر تشريحيا بالنمو الثانوي العادي والنسيج المتوسط بالورقة مميز جزء عمادي وأخر أسفنجي، ضم التركيب النوعي لعشيرة كيس الراعي خمس وعشرون نوعا نباتيا منها (18 نبات حولي، نباتان ثنائي الحول، خمسة نباتات معمرة) وكان نبات الحريق والحميض وفم السمكة أوفر النباتات المرافقة. وأيضاً النباتات قصيرة الاجل والأرضيات والسطحيات أكثر صور الحياة إنتشارا. وينتمي معظم النباتات لإقليمي البحر المتوسط وإيران – الأناضول. أسفر المسح الكيميائي أن القيمة الغذائية للأوراق 99,05 سعر حراري/ 100 جم. وأن مستخلصات الايثانول والكلوروفورم والأستون للسيقان أعلى تركيز للفينولات والفلافونيدات منها بالأوراق. كما أظهرت كفائتها كمضادات للأكسدة والميكروبات.