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ECOLOGY AND PHYTOCHEMISTRY OF *LAMIUM AMPLEXICAULE* L.

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ABSTRACT

The ecological and phytochemical characteristics of Lamium amplexicaule L., the most frequently occurring weedy invasive species in the fields of winter crops area studied in El-Dakahliya Governorate.

Vegetation analysis showed that, most of the associated species were annual weeds which are almost related to wet sandy loam, well-drained, fertile, non-saline and slightly alkaline soils. The total plant cover of twenty representative stands of Lamium community ranged between 50-80%.

Phytochemically, the mean values of primary metabolites were detected. The GC-MS analyses of essential oil and investigation of vitamins content were also carried out. The nutritive value of L. amplexicaule leaves was 370.4 Cal. /100g.

Key words : *Ecology, phytochemistry, Lamium amplexicaule.*

INTRODUCTION

The medicinal plants in Egypt represent a new promising resource as there is a relatively high representation of medicinal species in the native flora (Batanouny, 1999; Abu Ziada *et al.,* 2008 and Sadek, 2013).

It is already seen the need to shed light on some medicinal plants because of their significance. Labiatae is well represented in Egypt by 22 genera and 56 species (Bolous, 2002).

Lamium amplexicaule L. was selected for the present study. It grows widely in El- Dakahlyia governorate and has been reported to possess application in traditional and modern medicine (Bisset, 1994; Bianco,2003 and Ito *et al.,* 2006).

Lamium is considered useful remedies in variety of diseases in some parts of Europe and China (Bremness, 1995 and Ozaydin *et al.,* 2006). and traditionally used as food (Flamini *et al.,* 2005). In addition it is deemed ornamental and well situated to a variety of growing conditions (Rudy, 2004). There are evidences indicating various activities such as anti- inflammatory, antioxidant and free radical scavenging properties for *Lamium* plant (Yalcin *et al.,* 2007). L. *amplexicaule* is an annual weedy invasive species and can present substantial problems to natural ecosystems as well as crop lands (Pimentel *et al.,* 2000). It has been shown to reduce the yield of wheat (Conley and Bradley, 2005). The allelopathic effect of this plant is due to the phytochemical constituents and the biological activities of

the volatile oils (Jones *et al.,* 2012).

Several researches on the genus *Lamium* had been published including: taxonomic revision of the genus made by Mennema (1989), floral forms (Lord, 1982), chromosomes number (Gill, 1983), systematic implication of pollen morphology (Moore *et al.,* 1991 and Punt *et al.,* 2007) and types of glandular hairs (Baran and Ozdmir, 2006 and Celep *et al.,* 2011).

The present study aims at investigation of morphological, anatomical, biogeographical and ecological characteristics as well as determination of metabolic constituents,vitamins content and the essential oil components of *L. amplexicaule* plant.

MATERIALS AND METHODS

To illustrate the morphological characteristics of *Lamium amplexicaule*, fresh samples were described according to Foster & Gifford (1974), Heywood (1978) and Hickey (1979).

For anatomical investigation, thin sections of stem, leaf and root were prepared according to Peacock and Bradbury (1973), then examined by light microscope and photographed.

Lamium amplexicaule was surveyed in El Dakahlyia governorate. One selected stand of *Lamium* community was studied to detect the analytical characters using the quadrat method while twenty stands were chosen to lock at the floristic components. Each species was assigned by tow figures (Cover- abundance estimate and phonological aspect) as described by Kent and Coker (1992). Nomenclature of the species follows Boulos (1999-2005). Soil samples representing the habitat types of *L. amplexicaule* community were collected, air dried and analysed as described by Kute, 1986; Margesin & Schinner, 2005; Pansu &Gautheyrous, 2006; Carter &Gregorich, 2008 Abu Ziada *et al.,* 2013). Determination of Ca^{+2}, Mg^{+2}, Na^{+} and K^{+} using acid digestion method and atomic absorption spectrophotometer as described by Allen *et al.* (1986).

Concerning the phytochemical analysis, the plant samples were handly cleaned, air-dried and ground to fine powder. The qualitative and quantitative analysis of the essential oil were performed using GC and GC-MS (Adams, 2007). The vitamins components were determined by the method adopted by Maynard (1970). The mean values of primary metabolites were investigated according to Handel (1968), Harborne (1973), Trease & Evans (1989); Sofowara (1993) and Sada sivam & Manickam (2008).

RESULTS

1. Morphology

Lamium amplexicaule as shown in (plate1) is a short-lived annual winter weed, 12 inches tall, square in cross section, ascending, branched freely from the base. Leaves cauline, opposite decussate, exstipulate, lower leaves are petiolate and the upper most leaves are sessile and clasping. Lamina is cymbal-like in appearance, reniform shaped. Inflorescence is verticillate, the verticillasters are 2-7 flowered. Flowers are pollinated by bees. *Lamium* blooms so early in the spring and bees use the nectar and pollens to build their stores early in the season. Calyx tubular, five-teethed, shorter than the corolla tube. Petals bilabiate, rose-pink, the lower lobed lip with

purple strips. Stamens are epipetalous, didynamous and included within the corolla tube. Ovary superior, syncarpous, bilocular when young and becomes quadrilocular at maturity, style is gynobasic and stigma is bifid. Fruit is simple dry schizocarpic of 1-4 one- seeded nutlets. Seeds are endospermic, with hairs at the helium, that attractive to ants and may aid seed dispersal.

2. Anatomy

The stem transverse section is quadrangular with single layered epidermis,outer cortex of angular collenchyma and the inner cortex of isodiametric rectangular parenchyma cells. Vascular bundles at the corners are larger than those between them. Xylem and phloem are confined to collateral vascular bundles. The cambium is hardly distinguishable and the pith is wide and composed of hexagonal parenchyma cells (plate 2).

The leaf cross-section showed that, *Lamium* leaf is of the bifacial type. The mesophyll is composed of 1-layered palisade chlorenchyma and isodiametric spongy parenchyma cells. Both abaxial and adaxial epidermis consist of oval-rectangular cells and have thin cuticle. The midrib vascular bundle is shallow and xylem vessels are found in rows separated by xylem parenchyma(Plate 3).

The root is circular in cross section, covered by multilayered periderm, followed by a 5-7 layered cortex of parenchyma cells. Complete cylinder of secondary xylem is found under the cambium ring and a cylinder of secondary phloem is found above the vascular cambium. The primary phloem strands are forced outward. The pith is narrow and has parenchymatous ovoidal cells (plate 4).

3. Biogeography

The genus *Lamium* is composed of nearly 40 species distributed extensively in Europe, Eastern Asia and Northern Africa. Its diversity center lies in the Irano -Turanian and Mediterranean phytogeographical regions (Mennema, 1989). Celep *et al.,* (2011) pointed out, that *Lamium* is a Mediterranean floral element grows in the Eastern part of the Mediterranean region of Turkey, Syria and Palaestina and recorded in Saudi Arabia (El Husseini *et al.,* 2008). Jones *et al.* (2012). reported that *L. amplexicaule* is a weedy invasive species in North America. Henbit is a cool season annual weed native in Eurasia. In Egypt, *L. amplexicaule* is a very common weed in Nile Delta, Oases, Western Mediterranean Coastal strip and Sinai (Boulos, 2002).

Plate (1): *Lamium amplixcaule* flowering branch

Plate (2): Transverse section *Lamium amplixcaule* stem

Plate (3): Transverse section *Lamium amplixcaule* leaf

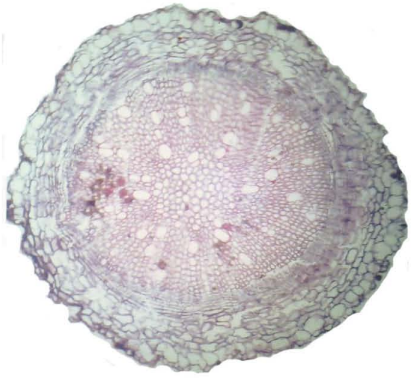

Plate (4): Transverse section *Lamium amplixcaule* root

4. Ecology

Both analytical and synthetic characters of *L. amplexicaule* community type were studied in detail. The data collected from five quadrats set in representing stand (Table 1) revealed that, *Lamium* attained the maximum relative density (18.87%), relative cover of 31.14%, relative biomass of 18.34%, relative frequency of 7.58% and importance value of 75.93. *Convolvulus arvensis* was the most abundant associate, has 61.83% IV value. *Sonchus oleraceus, Euphorbia peplus* and *E. helioscopia* come next and have IV of 30.11, 28.23 and 26.94, respectively. *Stellaria pallida* and *Capsella bursa-* pastoris are common associates having IV=25.64 and 20.35, respectively. Other thirteen associates were recorded with IV=2.53- 19.76.

Fig. (1) shows the frequency histogram. the results show that frequency class I includes 7 species, 4 species in class II, IV and V and a single species is included in class III.

The floristic composition of 20 representative stands of *L. amplexicaule* community is given in Table 2. The species population of these stands comprised 40 species (30 dicots and 10 monocots) belong to 21 families. The total plant cover ranged between 50 and 80%. *L. amplexicaule* is present in all of the stands (P = 100%) and consistently is the most abundant, *Chenopodium murale, Rumex dentatus, Capsella bursa- pastoris* and *Euphorbia peplis* are the most common annual associates, attained presence percentages of 90, 80,75 and 70, respectively. *Convolvulus arvensis, Cyperus rotundus* and *Cynodon dactylon* are perennial associates possess presence values of 65, 55 and 45%, respectively. *Stellaria pallida* is recorded in 60% of the stands. Also, 34 annuals, one biennial and four perennials associate were recorded.

Fig. (2) shows the presence histogram of this community. two species in each of the presence classes II and V, 7 in class III and 4 in class IV. Thirty four species are included in presence class I . The form of this histogram is near the normal j- shaped form.

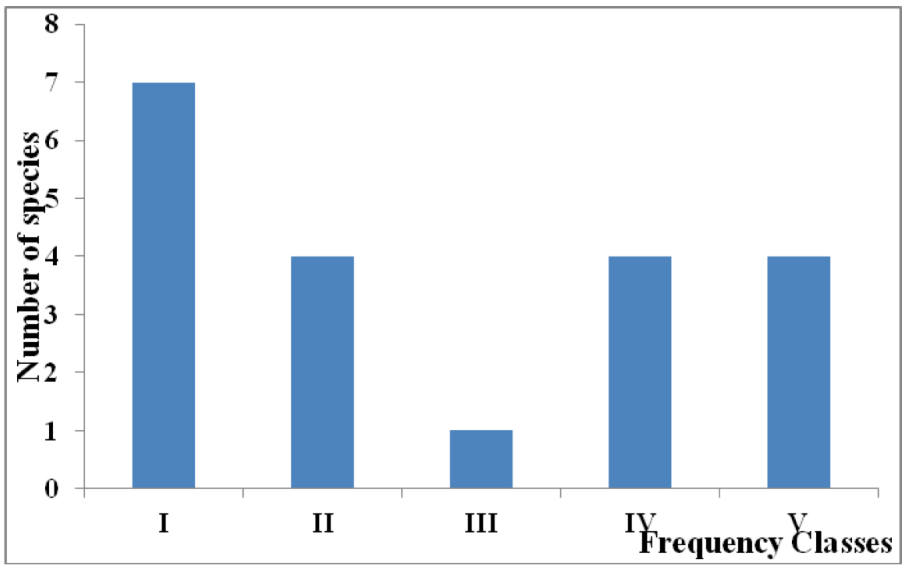

Fig. (1) : Frequency histogram of *Lamium amplexicaule* community type.

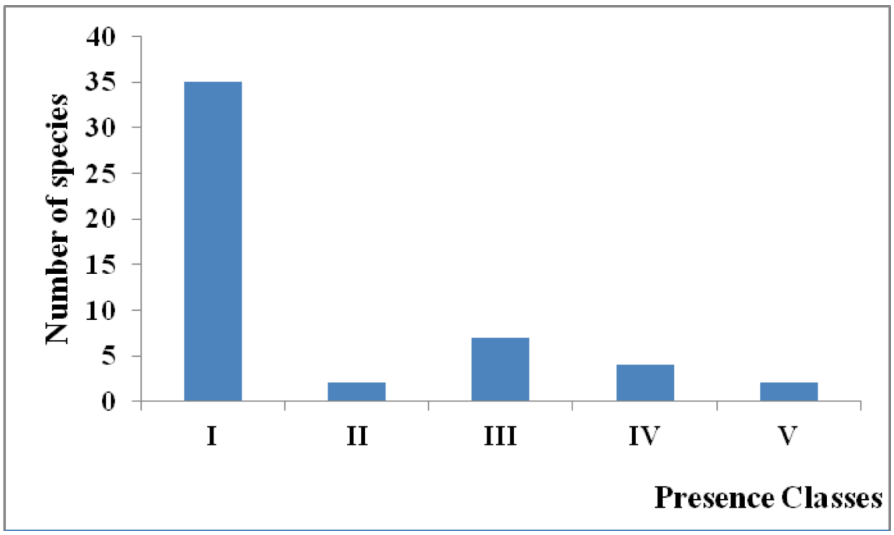

Fig. (2) : Presence histogram of *Lamium amplexicaule* community type

Table (1) : Analysis of 5 quadrates (1*1m each) set within a stand of *Lamium amplexicaule* L. community type. N=number of individuals, A=area, in m^2, B=biomass, F=frequency (%), RD=relative density, RC= relative cover, RB=relative biomass, RF=relative frequency, IV= importance value (out of 400).

Species	Quadrats																			
	1			2			3			4			5			RD	RA	RB	RF	IV
	N	A	B	N	A	B	N	A	B	N	A	B	N	A	B	%	%	%	%	
Lamium amplexicaule L.	15	0.21	4.74	8	0.26	7.76	24	0.82	21.8	13	0.39	9.62	44	0.97	40.99	18.87	31.14	18.34	7.58	75.93
Convolvulus arvensis L.	7	0.04	1.13	13	0.18	10.18	37	0.59	37.86	12	0.02	12.86	28	0.37	42.41	17.60	14.10	22.55	7.58	61.83
Sonchus oleraceus L.	6	0.03	0.91	3	0.02	0.39	18	0.28	17.33	10	0.26	20.09	1	0.02	0.54	6.90	7.16	8.48	7.58	30.11
Euphorbia peplus L.	1	0.01	0.31	8	0.03	1.3	19	0.27	8.89	17	0.1	15.72	6	0.07	0.37	9.26	5.66	5.74	7.58	28.23
Euphorbia helioscopia L.	5	0.02	1.2	6	0.02	1.56	10	0.1	8.55	9	0.38	11.74	4	0.08	5.31	6.17	7.07	6.12	7.58	26.94
Stellaria pallida (Dumort) Pire.	17	0.38	32.93	7	0.08	0.98	6	0.05	0.4	3		0.67				5.99	6.03	7.55	6.06	25.64
Capsella bursa pastoris (L.) Medic	2	0.02	2.54				12	0.16	7.76	7	0.18	17.81	1	0.002		3.99	4.23	6.07	6.06	20.35
Poa annua L.	3	0.01	0.49	9	0.13	3.23	13	0.22	1.65	8	0.03	8.85				5.99	4.64	3.07	6.06	19.76
Chenopodium murale L.	3	0.02	0.52	1	0.01	0.8	6	0.06	3.89	4		1.59	15	0.16	8.23	5.26	2.97	3.25	7.58	19.05
Coronopus squamatus (Forssk.) Asch							19	0.21	17.89	7	0.16	3.4				4.72	4.34	4.60	3.03	16.69
Anagallis arvensis L.				1	0.01	0.1	3	0.01	0.29	8	0.12	17.66	1	0.01	0.26	2.36	1.68	3.95	6.06	14.05
Rumex dentatus L.	4	0.01	0.36	2	0.01	0.15	1	0.004	0.4	5	0.04	0.88	2	0.01	1.21	2.54	0.82	0.65	7.58	11.59
Cyperus rotundus L.							5	0.03	0.91	11	0.11	6.17	3	0.03	0.16	3.45	2.00	1.56	4.55	11.55
Setaria verticillata (L.) P. Beauv.							4	0.04	10.15	6	0.06	3.82				1.81	1.17	3.02	3.03	9.04
Torilis arvensis (Huds.) Link.	9	0.05	1.93	7	0.02	0.61										2.90	0.83	0.55	3.03	7.32
Solanum nigrum L.				1	0.13	16.93										0.18	1.53	3.66	1.52	6.88
Cynodon dactylon (L.) Pers.										3	0.04	0.88	1	0.01	0.2	0.73	0.59	0.23	3.03	4.58
Eclipta alba (L.) Hassk.	4		0.26								0.17					0.73	2.00	0.06	1.52	4.29
Bidens pilosa L.	1	0.01	0.62								0.15					0.18	1.83	0.13	1.52	3.66
Apium leptophyllum (Pers.) F.Muell.exBenth.							2	0.02	1.93							0.36	0.23	0.42	1.52	2.53

Table (2) : Floristic composition of twenty-five stands representing *Lamium amplexicaule* L. community type. Cover-abundance estimate is according a modified (1-10) domin scale. Aspect of growth: g: in foliage, F: Flowering, Fruiting, d: dry. P: presence (%). per. perennial. Ann;annual. Bi; binnial

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	P%
	60	80	80	70	70	80	80	50	70	80	80	70	70	80	70	70	50	60	60	60	
Dominant species																					
Lamium amplexicaule L.	5f	5f	7f	5f	5f	6f	5f	5f	6g	7g	7g	5g	5g	6f	5g	6r	5r	5r	5r	5r	100
Associate species																					
Perennials																					
Convolvulus arvensis L.		1g							2g	1g	3f	2f	3f	2g	3g	1f	2g	4f	2f	1g	65
Cyperus rotundus L.		1g							3g	2g			2g	3g	3g	1g	1g	1g	3g	1g	55
*Cynodon dactylon (*L.*)* Pres.			3g	3g	3g				3g			1g			3g	1g			2g	2g	45
Leronica anagallis - aquatical	3f	3f	4r	3f																	20
*Persicaria salicifolia (*L*)* Gray									3f					3f	3f						15
*Polypogon viridis (*Gouan*)* Breistr.				2f	2f																10
Biennials																					
Beta vulgaris L.			3g			3f		1f													15
Annuals																					
Chenopodium murale L.	3f	1r	2r		1f	1f	3f	1f	2f	3g	3f	3f	3f		3f	3f	3r	2r	3f	3f	90
Rumex dentatus L		2g	1g	2r	3r	1g			2f	2f	2g	1g	1f	3f	3f	1r	3g	4g		3r	80
*Capsella bursa-pastoris (*L.*)* Medik	1r	1r	1r	3r	2r		1f	1f		1r		2r	3r	3f	3r	1r	1f	1d			75
Euphorbia peplis L.	1f					1f	1g		3f	2f	2f	3f		2f	4f	3r	4f	2f	3f	1f	70
*Stellaria pallida (*Dumort.*)* Murb.	2f	3f	3f			1f		3f	3f	3f		1f	1f	4f		2r	1f				60
Anagallis arvensis L.		3g				3r			3r	3r	3f	3r	2r	3f	3r	1r				3f	55
Euphorbia helioscopia L.								3f	1f	2f	3r	3f	2f		3r	3r		3r	3f	2r	55
*Apium leptophyllum (*Pers.*)* F. Muell. ExBenth.									3f	3f			1r	3f	3f	1f	1f	1f	3f	1f	50
Bromus catharticus Vahl										3f		4f	3f	3f	4f	1r	1r	3r		3r	45
Anthemis cotula L.											1f	4f	2f		3f		3f		3f	1f	35
*Pennisetum glaucum (*L.*)* R. Br., Prodr.										2f	2f							1f	1f	3f	25
Sonchus oleraceus L.	3f	1f	2f						1f												20
Portulaca oleracea L.		2g	1g						2g										1g		20
Solanum nigrum L.				3f	3f					1f	4f										20
Trifolium resupinatum L.				2r		1f		1f													15
Phalaris minor Retz.					3f	2f	2f														15
*Echinochloa colonum (*L.*)* Link															1g		1g	1g			15
Chenopodium glaucum L.	2r	1r																			10
Medicago polymorpha L.	1g		2g																		10
*Bassia indica (*Wight*)* A. J. Scott							2g				1f										10
Urtica urens L.										2f										3r	10
Ammi majus L.										1f										2f	10
Vicia stiva L.	2g																				5
Ranunlleulus sceleratus L.		2r																			5
Rorrpia palustris L. Besser, Enum. Pl. Volhun.		1g																			5
Poa annua L.				3f																	5
Eruca sativa Mill.					2f																5
*Medicago intertexta (*L.*)* Mill.						2f															5
Lolium multiflorum Lam.							3f														5
*Echinochloa crus-galli (*L.*)* P. Beauv.									2g												5
Euphorbia heterophylla L.																	1g				5
Ranunlleulus sceleratus L.		2r																			5

Habitat Condition

L. amplexicaule abounds in a variety of habitats ranging from moderately wet compact loam sandy soil of the fields of winter crops to fine sandy soil of irrigating canal banks.

Table (3) contains the results of analysis of twenty soil samples supporting *Lamium* plant. The soil mainly of fine sand and very fine sand, classes 0.500- 0.211 and 0.211- 0.104mm diameter. With mean values of 50.56 ± 0.28 and 26.01 ± 0.39%, respectively. The percentage of silt particles was relatively higher (mean value = 8.93 ± 0.2%) than that of clay particles (mean value = 4.83 ± 0.13%). The soil pore- spaces and water- holding capacity mean values were 43.08 ± 0.71 and 46.60± 0.64%, respectively. The moisture content is relatively high with mean value of 18.60 ± 0.94%. Calcium carbonate content ranged between 16 and 24%, with mean value of 20.6 ± 0.39%. The organic carbon content varied from 0.27-1.17%, with mean value of 0.69 ± 0.06%. The total soluble salts content was relatively low having mean value = 0.26 ± 0.03 %. The anions were mainly HCO^{-}_{3}, CL^{-} and SO^{-2}_{4} while the main cations were Na^{+} and Ca^{+2}. The soil reaction is slightly alkaline to moderately alkaline and the mean value of pH was 7.98±0.04.

Phytochemistry

1.Essential Oil

Date presented in Table (4) showed that 37 components were detected and distinguished into13 oxygenated compounds (34.2%) and 24 non-oxygenated compounds (65.8%). The main constituents of *Lamium* leaves essential oil were isophytol (14.84%); 9,12,15- ocadecanoic acid methyl ester (19.19%); 6, 10, 14- trimethyl-2- pentadecanone (7.98%); dibutyl phathalate (6.1%); nonacosane (5.46%) ; hexadecanoic acid (3.43%) and nonyl phenol (3.2%). The concentration of the other components ranged between 0.09 and 2.88%.

2.Vitamins content

Investigation of vitamins in *Lamium* leaves revealed that; thiamin, riboflavin and ascorbic acid were detected with mean values= 414.39, 3.9 and 143.5 µg/100g, respectively (Table 5).

3.The primary metabolites

The Investigation of primary metabolic products of *L. amplexicaule* aerial parts showed that, the most important primary metabolites were total Carbohydrates (52.7 %), Lipids (12.4%) and Proteins (12.0 %) as shown in Table 6 the total ash and moisture contents were 10.1 and 8.6%, respectively. The crude fiber content was 4.2% while total soluble sugars content was 2.35% .The nutritive value of *Lamium* leaves was 370.4 Cal/100g.

Table (3) : Analysis of soil samples collected from twenty representative stands of *Lamium amplexicaule* (L) Dunalcommunity type (Por. = porosity, W.H.C. = water holding capacity, Org.= organic carbon., T.S.S=total soluble salts, E.C.= electrical conductivity.).

Stand No.	Physical analysis											Chemical Characteristics											
	Mechanical Analysis							Por.	WHC	Moisture content	CaCO3	Org.	Analysis of 1:5 water extract										
	Particles Size mm (%)											(%)											
	2.057	2.057-1.003	1.003-0.500	0.500-0.211	0.211-0.104	0.104-0.053	< 0.053	(%)	(%)	(%)	(%)		T.S.S %	pH	EC µmhos/cm	Anions (%)				Cations mg /100 dry soil			
																Cl^-	$SO4^{--}$	$CO3^{--}$	$HCO3^-$	Na^+	K^+	Ca^{2+}	Mg^{2+}
1	0.0	0.0	10.63	52.14	25.50	7.87	3.83	47.96	45.80	22.87	22	0.87	0.1	8.04	354	0.013	0.030	0	0.114	269.3	46.26	100	60
2	0.0	0.0	16.99	46.90	21.80	7.82	5.87	39.96	43.20	24.76	19	0.87	0.2	8.03	316	0.015	0.040	0	0.144	297.3	42.82	60	84
3	0.0	0.0	7.55	51.56	27.26	8.29	4.33	46.12	49.60	21.68	24	0.57	0.2	8.24	252	0.018	0.010	0	0.153	342.3	47.17	80	84
4	0.0	0.0	6.61	47.89	28.53	11.56	4.75	38.08	40.30	22.01	23	0.27	0.4	8.29	427	0.012	0.012	0	0.183	263.3	42.59	100	69
5	0.0	0.0	9.08	49.73	28.15	7.93	4.55	35.12	39.10	21.41	18	0.27	0.3	7.9	349	0.017	0.040	0	0.175	666.3	37.31	80	132
6	0.0	0.0	6.85	48.81	28.34	10.75	4.55	42.16	49.40	22.15	22	1.17	0.1	8.2	429	0.017	0.016	0	0.183	342.3	31.35	100	108
7	0.0	0.0	6.97	49.27	27.96	10.34	4.45	41.64	46.90	25.12	19	1.17	0.1	7.74	453	0.012	0.024	0	0.145	275.3	32.72	40	72
8	0.0	0.0	8.72	49.34	26.01	10.26	5.56	47.32	48.70	23.62	20	0.57	0.3	7.85	415	0.017	0.012	0	0.183	302.3	32.72	80	36
9	0.0	0.0	10.36	52.15	25.51	7.88	3.84	49.36	44.80	21.78	23	1.17	0.3	7.74	459	0.032	0.030	0	0.153	444.3	112.3	140	36
10	0.0	0.0	9.54	50.75	25.76	9.07	4.70	42.96	52.40	19.37	21	0.27	0.4	8.05	627	0.020	0.040	0	0.092	442.3	46.72	60	132
11	0.0	0.0	8.31	50.24	26.96	9.23	4.63	46.96	47.50	14.81	19	0.57	0.1	7.95	688	0.020	0.090	0	0.122	385.3	45.11	120	108
12	0.0	0.0	8.52	49.79	26.49	9.75	5.10	45.56	49.80	20.19	22	1.17	0.2	7.89	297	0.017	0.012	0	0.092	237.3	36.62	80	96
13	0.0	0.0	7.28	51.69	22.16	8.63	5.26	43.12	51.17	25.56	17	0.57	0.4	8.01	365	0.020	0.041	0	0.175	1642	61.16	100	24
14	0.0	0.0	8.33	51.31	22.63	9.33	6.16	46.76	49.40	13.43	22	0.27	0.2	8.41	485	0.013	0.020	0	0.122	195.3	34.56	60	72
15	0.0	0.0	9.76	50.88	28.58	8.70	3.98	45.04	43.50	9.55	21	0.87	0.5	7.65	442	0.013	0.041	0	0.153	240.3	34.79	80	84
16	0.0	0.0	8.15	50.94	29.03	7.98	4.22	37.96	46.70	11.62	22	0.87	0.3	8.23	328	0.018	0.080	0	0.092	181.3	29.51	140	36
17	0.0	0.0	10.32	51.87	24.86	8.29	5.03	43.76	44.10	13.01	16	0.87	0.2	7.87	486	0.017	0.040	0	0.192	197.3	38.00	80	48
18	0.0	0.0	9.62	50.19	26.87	9.23	5.84	44.88	49.34	9.79	21	0.57	0.1	7.85	523	0.013	0.090	0	0.122	292.3	37.54	100	60
19	0.0	0.0	11.53	53.26	23.84	7.67	4.012	40.16	47.90	14.56	23	0.57	0.6	7.82	563	0.012	0.050	0	0.153	203.3	34.79	60	96
20	0.0	0.0	10.13	52.44	23.89	7.94	6.01	36.76	42.38	14.66	18	0.27	0.2	7.91	483	0.012	0.033	0	0.183	292.3	41.21	100	96
Mean	0.00	0.00	9.26	50.56	26.01	8.93	4.83	43.08	46.60	18.60	20.60	0.69	0.26	7.98	437.05	0.02	0.04	0.00	0.15	375.59	43.26	88.00	76.65
SE	0.00	0.00	0.40	0.28	0.39	0.20	0.13	0.71	0.64	0.94	0.39	0.06	0.03	0.04	19.47	0.00	0.00	0.00	0.01	56.28	3.15	4.64	5.53

Table (4) : Results of GC/MS analysis of the volatile oil constituents of *Lamium amplexicaule*.

No.	Compounds	%	No.	Compounds	%
1	Undecane	0.21	19	6,10,14-Trimethyl-2-pentadecanone	7.98
			20	Nonadecane	2.45
2	Dodecane	0.39	21	Hexadecanoic acid	3.43
3	Cumin aldehyde	0.52	22	Dibutyl phathalate	6.10
4	Piperitone	0.44	23	17-ethyloctadecane	0.83
5	Piperitone oxide	2.84	24	9,12,15-ocadecanoic acid methyl ester	9.19
6	Thymol	2.28	25	Isophytol	14.84
7	Iso Longigilene	0.58	26	9,12,15-octadecanoic acid ethyl ester	0.64
8	B.Cederene	0.09	27	Eicosane	0.32
9	Muurola-4(14),5diene	0.85	28	Tricosane	1.13
10	Gama Muurola	0.67	29	Tetracosane	0.94
11	Guaiene	0.59	30	Pentacosane	2.11
12	Dodecene	0.28	31	Bis(2ethylhexyl) phthalate	0.20
13	-Ionone	1.11	32	Hexacosane	0.23
14	Tridecene	0.29	33	Heptacosane	2.88
15	Hexadecane	0.23	34	Octacosane	0.28
16	Selina-3,7(11)-diene	1.28	35	Squalene	0.09
17	Cyclo tetradecane	0.86	36	Nonacosane	5.46
18	Nonyl phenol	3.20	37	Hentricontane	0.61
Total oxygenated compounds = 13 Total non-oxygenated compounds = 24					

Table (5) : Vitamins content of *Lamium amplexicaule* leaves in µg/100g.

Vitamins	*Lamium* leaves
Thiamin B_1	414.39
Riboflavin B_2	3.90
Ascorbic acid C	143.5

Table (6) : Mean values of metabolic constituents of the aerial part of L. amplexicaule.

Parameters (g/100g)	*Lamium* Aerial Parts
Moisture	8.60
Ash	10.10
Crude fiber	4.20
Lipids	12.40
Proteins(Nx6.25)	12.00
Total soluble sugar	2.35
Carbohydrate	52.70
Nutritive value	370.4 Cal./100g

DISCUSSION

Labiatae is a family of the major source of culinary, vegetables and medicinal plants all-over the world. Several members of this family have been surely used by humans since pre-historic time (Naghibi *et al.,* 2005). The chosen species (*L. amplexicaule*) is abundant in El Dakahlyia.

Morphologically, *Lamium* is herbaceous weed, stem is square in cross- section and branched freely from the base, leaves are clearly reinform shaped and arranged in opposite decussate configuration, lower leaves are petiolate while the upper ones are sessile and clasping. Flowers are trumpet-shaped, pink colored and arranged in whorls. Fruits schizocarp. These results are agree with those in the flora of Turkey (Mill, 1982). and flora of Egypt (Tackholm, 1974).

Microscopic examination of the of the cross- section in plant organs revealed that, *Lamium* has the general anatomical features of dicotyledons (Metcalf, 1987). The leaf is of the bifacial type. At the midrib, the adaxil surface is concave and the abaxil surface is convex. The stem is quadrangular, underneath the epidermis, particularly at the corners the outer cortex of angular collenchymatous cells and inner cortex of parenchymatic cells. The stem has normal secondary thickness. The root showed secondary thickening, covered by multilayered periderm, the cortical cells are 5-7 layered and pith is narrow. The anatomical analysis given in this work provides the first detailed description of *L. amplexicaule*, which is comparable with findings of some other investigated Lamiaceae members (Ozdemir & Senel, 2001; Baran & Ozdemir, 2006 and Celep *et al.,* 2011).

Phytogeographically, the genus Lamium distributed extensively in Europe, Eastern Asia and North Africa and originally from Eurasia (Mennema,1989). *L. amplexicaule* is a Mediterranean element and now becomes Cosmopolitan (Celep *et al.,* 2011 and El Husseini *et al.,* 2008). In Egypt henbit (*Lamium*) is a very common weed in Nile Delta (Boulos, 2002).

The floristic components of *L. amplexicaule* community were 7 perennials, one biennial and 39 annuals. These species are related to 21 families. It is clear that, the species population of this community formed of herbaceous weeds with shallow roots capable of exploiting the available water of the soil surface layer. The observations give indication that, *Lamium* is a short- day plant and this explain why it flourish at late autumn and early winter. *Lamium* prefers moist, light, well-drained and fertile soil. Soil fertility encourages the vegetative growth of the plant and this explains why *Lamium* was successfully naturalized and thriving within wheat and Legumenous crops fields in El- Mansoura district.

Lamiaceae are the best known plants for the presence of many biologically active compounds. The presence of some short chain terpenoids in the essantial oils are responsible for odor and taste in these plants. Rich chemical contents of Lamiaceae species have been investigated by many researchers (Matkowsi & Piotrowska, 2006) .

The overall goal of the present phytochemical investigation was to detect the essential

oils, vitamins and metabolic products. Analysis of the essential oils by GC-MS. indicated that, the oil is particularly rich in isophytol, octadecanoic acid methyl ester, trimethyl pentadecanone, dibutlyl phathalate, nonacosane, nonyl phenol, heptacosane, pipertone oxide, thymol,..etc. There is evidence in literatures that, the essential oils of the Italian *L. amplexicaule* were dominated by caryphyllene, monoterpene, α- penine (Jones *et al.,* 2012).

Investigation of the vitamins in leaves of *L. amplexicaule* revealed the presence of thiamin (Vitamin B1) , riboflavin (Vitamin B2) and ascorbic acid (Vitamin C).The nutritive value of *L. amplexicaule* equal to 370.4 Cal/100g. On the basis of the above results, it is worthy to note that, *Lamium amplexicaule* is promising weed as a renewable natural resource for forage and pharmaceutical purposes.

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الملخص العربى

دراسة بيئية وفيتوكيميائية على نبات فم السمكة

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قسم الأحياء – كلية العلوم – جامعة السابع من أكتوبر – ليبيا

يهدف هدا البحث الى دراسة الخصائص الظاهرية والتشريحية والتوزيع الجغرافى لنبات فم السمكة وهو احد الاعشاب البرية والحولية ، يتبع الفصيلة الشفوية، سجل النبات بواسطة عدد من الباحثين فى مناطق مختلفة من العالم وفى دلتا النيل بمصر.

أجريت دراسة تحليلية ووصفية للكساء الخضرى الطبيعى فى عدة مواقع يسودها النبات بمحافظة الدقهلية وسجلت النباتات المصاحبة له وعددها وتغطيتها وترددها وايضا التركيب الفلورى لعشيرة نبات فم السمكة.

وقد اثبت تحليل الزيوت الاساسية وتقدير النواتج الايضية الاولية والفيتامينات ان الزيوت العطريه لنبات فم السمكة تحتوى على ٣٧ مركب منها ١٣مؤكسد و٢٤ غير مؤكسد، وان المجموع الخضرى للنبات يحتوى على كربوهيدرات (٥٦,٧٪) ودهون (١٣,٤٪) وبروتين (١٣٪) كما يحتوى على التيامين والرايبوفلافين وحمض الاسكوربيك.

JOESE 5

ECOLOGY AND PHYTOCHEMISTRY OF *LAMIUM AMPLEXICAULE* L.

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