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Check for updates

Taxonomic revision and checklist of the family (Lamiaceae) in Iraq

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Abstract

The Lamiaceae L. family grows and widely distributed in Iraq. The study aimed to enumerate the species that has been preserved in several botanical herbariums: National Herbarium of Iraq- Ministry of Agriculture (BAG), University of Baghdad Herbarium (BUH), Iraq Natural History Research Center& Museum- University of Baghdad Herbarium (BUNH), College of Agricultural Engineering- University of Baghdad Herbarium (BUG), College of Agricultural Engineering Sciences- Duhok Province University Herbarium (DPUH) and College of Science - Salahddin University Herbarium (SUH). This family has not yet been registered in the Flora of Iraq. After examining more than 1000 herbarium specimens, the study found 139 species belonging to 33 genera have been reported in these herbariums. Upon compering these taxa on https://www.worldfloraonline.org/ , the study discovered that some genera and species were reported as synonyms, while other species were reported as unchecked and waiting taxonomic scrutiny in WFO org. database. Therefore, the remaining103 species were reported as accepted species. The taxonomic status and distribution of Lamiaceae plants were also provided.

Keywords: Checklist; Herbarium; Iraq; Lamiaceae; Taxonomic status

1. Introduction

Lamiaceae belongs to the order Lamiales, it is a major group in Angiosperms and was first published as an accepted name in Tekhno- Bot. Solvar 355, 1820 (3 Aug. 1820) with 232 subordinate taxa [1], while [2] reported that Lamiaceae included 225 accepted genera. [3] mentioned that there are 31 general and more than 150 species growing in Iraq. Most of these genera distributed in the northern districts of Iraq, [4]. The researchers in Iraq have shown considerable interest in this family due to the wild distribution and the medical and ornamental (aesthetic) characteristics of its plants, as mentioned in some of these studies in the references [5, 6, 7,8 ,9 ,10 ,11, 12, 13, 14, 15, 16]. The study also provides an update on the taxonomic status and distribution of Lamiaceae plants.

2. Material and methods

The study examined all the specimens of Lamiaceae plants that collected over years and preserved in different herbariums in Baghdad and other provinces. The examination included: National Herbarium of Iraq- Ministry of Agriculture (BAG), University of Baghdad Herbarium (BUH), Iraq Natural History Research Center& Museum- University of Baghdad Herbarium (BUNH), College of Agricultural Engineering- University of Baghdad Herbarium (BUG), College of Agricultural Engineering Sciences- Duhok Province University Herbarium (DPUH) and College of Science - Salahddin University Herbarium (SUH). Then the scientific names were checked with the https://worldfloraonline.org/ over three years; (21 October 2022), (23 Dec 2023) and (10 October 2024) following the updating of the taxonomic status as much as it possible and the distribution of the genera was determined from the herbarium specimens.

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3. Results

The plants of the Lamiaceae family grow in different district of Iraq; some are found in a single district, while others are distributed across multiple districts. *Coleus* Benth., *Cyclotrichium* Manden. &Scheng., *Hymenocrater* Fisch. & C.A.Mey., *Lagochilus* Bunge ex Benth. and *Peutapleura* Hand. - Mazz. have been found in one different district but plants of *Salvia* L. were collected from 14 different districts. The herbarium specimens of *Teucrium* L. included plants from 13 different districts. *Vetix* L. and *Ziziphora* L. were distributed across 10 districts. The plants of Lamiaceae thrive in areas with good humidity and low temperature, which is why most of the genera were collected near water and under trees in neglected area in the North of Iraq, as indicated in the labels of the herbarium specimens. The study found that some districts are rich in Lamiaceae plants, while others are not. There were 29 genera distributed in the MRO district and 28 genera in the MAM district within the Mountain region, while only two genera were collected from the LSM district within the Desert plateau region and four genera from the LBA district within the lower Mesopotamia region. The remaining genera fall within these distributions. (table 1), (map 1).

Table 1 The geographical distribution of the genera in Iraq

Genus	**Districts of plant distribution in Iraq***
Ajuga L.	MAM, MRO, MSU, MJS, DWD, LEA
Ballota L.	MRO, MSU, DWD
Calamintha Mill.	MAM, MRO, MJS
Clinopodium L.	MAM, MRO, MSU, MJS
Coleus Lour.	LCA
Cyclotrichium (Boiss.) Manden. & sceng.	MAM, MRO, MSU, MJS
Eremostachys Bunge	MAM, MRO, MSU, FKI, DWD
Hymenocrater Fisch. & C.A.Mey.	MSU
Lagochilus Bunge ex Benth.	MSU
Lallemantia Fisch. & C.A.Mey.	MAM, MRO, MSU, MJS, FUJ, FNI, DLJ, DWD, DSD, LCA
Lamium L.	MAM, MRO, MSU, MJS, FUJ, FNI, DWD, LCA, LEA
Lycopus L.	MAM, MRO, MSU, FNI, FPF, LSM
Marrubium L.	MAM, MRO, MSU, MJS, FUJ, FKI, FPF, DGA, DWD, DSD, LCA
Melissa L.	MAM, MRO, FPF, LEA, LCA
Mentha L.	MAM, MRO, MSU, FUJ, FNI, FPF, LEA, LCA, LSM, LBA
Micromeria Benth.	MAM, MRO, MSU, FNI
Moluccella L.	MAM, MRO, MSU, MJS, FUJ, FNI, DWD
Nepeta L.	MAM, MRO, MSU, MJS
Ocimum L.	MRO, FUJ, LCA, LBA
Origanum L.	MAM, MRO, LCA
Pentapleura Hand.- Mazz.	MAM
Phlomis L.	MAM, MRO, MSU, MJS, FUJ, FNI, FAR, FKI, FPF
Prunella L.	MAM, MRO, MSU
Salvia L.	MAM, MRO, MSU, MJS, FUJ, FNI, FKI, FPF, DLJ, DGA, DWD, DSD, LEA, LCA
Sideritis L.	MAM, MRO, MJS
Satureja L.	MAM, MRO

Scutellaria L.	MAM, MRO, MSU, MJS
Stachys L.	MAM, MRO, MSU, MJS, FUJ, FNI, LCA
Teucrium L.	MAM, MRO, MSU, FNI, FKI, FPF, DLJ, DGA, DWD, DSD, LEA, LCA, LBA
Tapeinanthus Herb.	DGA, DWD
Thymus L.	MAM, MRO, FNI, FAR
Thymbra Mill.	MAM, MRO, MSU, DWD, DSD
Vetix L.	MAM, MRO, MSU, FUJ, FKI, FPF, DWD, DSD, LCA, LBA
Ziziphora L.	MAM, MRO, MSU, MJS, FUJ, FAR, FKI, FPF, DLJ, DWD

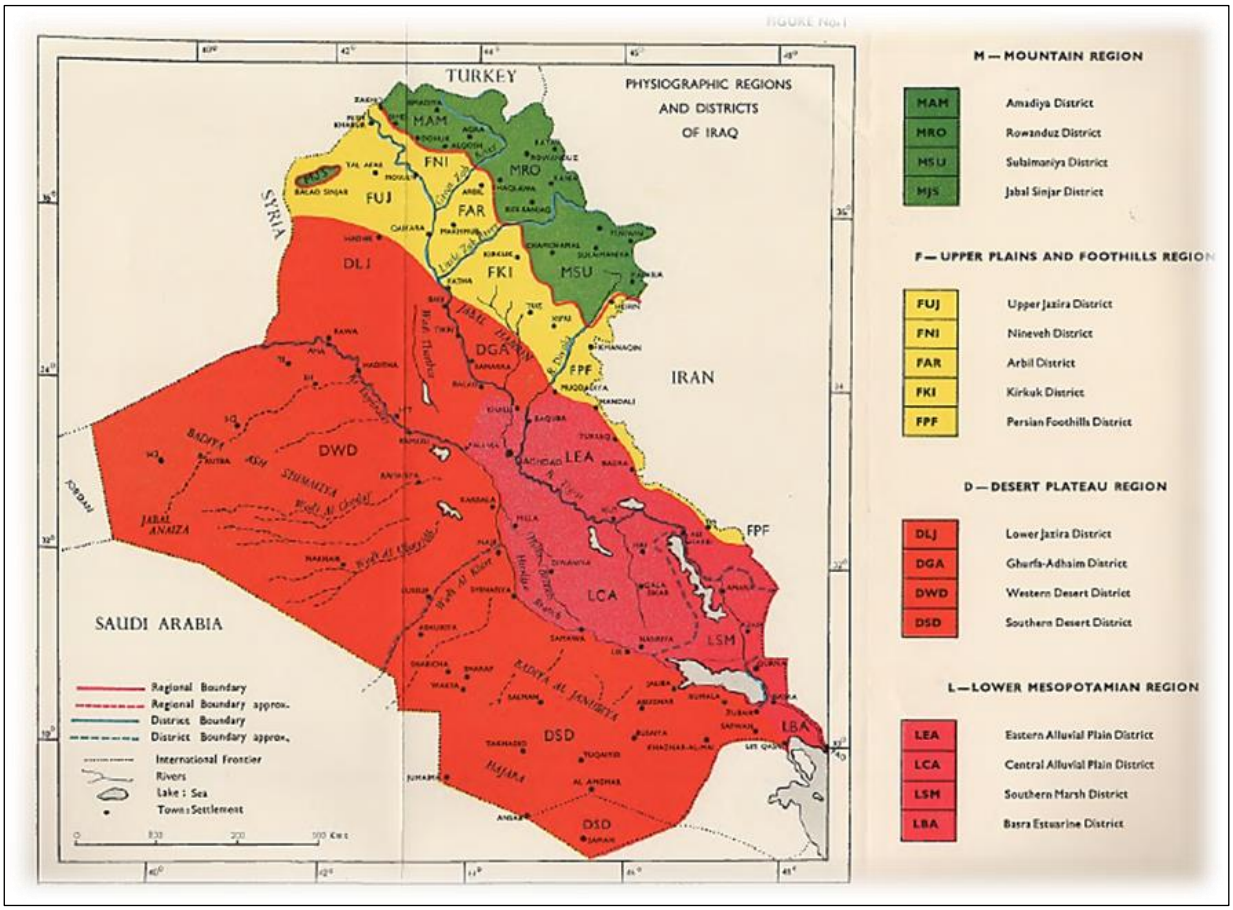

Figure 1 Physiological regions and districts of Iraq at [4]

The plants preserved in the mentioned herbariums represented 33 genera, including 149 species. After checking the herbarium specimens and the scientific names with World Flora Online (WFO), the study found that the genus *Coleus* L. has 21 synonyms and *Salvia* L. has 58 synonyms. However, most of the genera have synonyms ranged from 1 to 17, while four genera reported as synonyms; *Calamintha* Mill., *Eremostachys* Bunge and *Tapeinanthus* Herb and *Thymbra* Mill. therfore, their species were not confirmed by WFO as accepted scientific names. (table 2)

Table 2 Taxonomic status the species that reserved in some herbariums in Iraq

The genera	Link of Taxonomic status of the genera	Taxonomic status on WFO
Ajuga L.	https://list.worldfloraonline.org/wfo-4000001061	Accepted (7 synonyms)
Ballota L.	https://list.worldfloraonline.org/wfo-4000003972	Accepted (no synonyms)
Calamintha Mill.	https://list.worldfloraonline.org/wfo-4000005943	Synonym of Clinopodium L.
Clinopodium L.	https://list.worldfloraonline.org/wfo-0000893668	Accepted (14 synonyms)
Coleus Lour.	https://list.worldfloraonline.org/wfo-4000008914	Accepted (21 synonyms)
Cyclotrichium (Boiss.) Manden. & sceng.	https://list.worldfloraonline.org/wfo-4000010295	Accepted (no synonyms)
Eremostachys Bunge	https://list.worldfloraonline.org/wfo-4000013745	Synonym of Phlomoides Moench
Hymenocrater Fisch. & C.A.Mey.	https://list.worldfloraonline.org/wfo-4000018659	Accepted (1 synonyms)
Lagochilus Bunge ex Benth.	https://list.worldfloraonline.org/wfo-4000020447	Accepted (3 synonyms)
Lallemantia Fisch. & C.A.Mey.	https://list.worldfloraonline.org/wfo-4000020476	Accepted (1 synonyms)
Lamium L.	https://list.worldfloraonline.org/wfo-4000020496	Accepted (8 synonyms)
Lycopus L.	https://list.worldfloraonline.org/wfo-4000022514	Accepted (no synonyms)
Marrubium L.	https://list.worldfloraonline.org/wfo-4000023200	Accepted (1synonyms)
Melissa L.	https://list.worldfloraonline.org/wfo-4000023662	Accepted (1 synonyms)
Mentha L.	https://list.worldfloraonline.org/wfo-4000023748	Accepted (5 synonyms)
Micromeria Benth.	https://list.worldfloraonline.org/wfo-4000024153	Accepted (7 synonyms)
Moluccella L.	https://list.worldfloraonline.org/wfo-4000024596	Accepted (5 synonyms)
Nepeta L.	https://list.worldfloraonline.org/wfo-4000025901	Accepted (11 synonyms)
Ocimum L.	https://list.worldfloraonline.org/wfo-4000026511	Accepted (4 synonyms)
Pentapleura Hand. - Mazz.	https://list.worldfloraonline.org/wfo-4000028619	Accepted (no synonyms)
Phlomis L.	https://list.worldfloraonline.org/wfo-4000029282	Accepted (4 synonyms)

Prunella L.	https://list.worldfloraonline.org/wfo-4000031279	Accepted (2 synonyms)
Salvia L.	https://list.worldfloraonline.org/wfo-4000033888	Accepted (58 synonyms)
Sideritis L.	https://list.worldfloraonline.org/wfo-4000035314	Accepted (9 synonyms)
Satureja L.	https://list.worldfloraonline.org/wfo-4000034152	Accepted (4 synonyms)
Scutellaria L.	https://list.worldfloraonline.org/wfo-4000034856	Accepted (8 synonyms)
Stachys L.	https://list.worldfloraonline.org/wfo-4000036243	Accepted (15 synonyms)
Teucrium L.	https://list.worldfloraonline.org/wfo-4000038030	Accepted (17 synonyms)
Tapeinanthus Herb.	https://list.worldfloraonline.org/wfo-4000037547	Synonym of Narcissus L.
Thymus L.	https://list.worldfloraonline.org/wfo-4000038335	Accepted (3 synonyms)
Thymbra Mill.	https://list.worldfloraonline.org/wfo-1200040137	Synonym of Satureja L.
Vetix L.	https://list.worldfloraonline.org/wfo-4000040364	Accepted (21 synonyms)
Ziziphora L.	https://list.worldfloraonline.org/wfo-4000041243	Accepted (2 synonyms)

All links were accessed on: (21 October 2022), (23 Dec 2023) and (10 October 2024).

Mentha longifolia, Salvia splendens and *Stachys tenuifolia* were reported as unchecked and waiting scrutiny till last the time of checking in this study (10 Oct 2024), the study marked them with yellow highlight color in table 3. While *Stachys alopecuroides, Mentha longifolia* var. *mollivima, Mentha silvestris, Ocimum vulgare* var. *viride, Ocimum vulgare, Ocimum majorana, Satreja bornmulleri, Scutellaria ballalodes, Scutellaria kochgam, Scutellaria katschyi* and *Stachys alopecuroides* were not recorded in WFO and the study marked them with green highlight color in table 3. The species *Mentha piperita* was not recorded in WFO, but there was an accepted hybrid species named *Mentha* x *piperita* L. and another named *Mentha piperella* (Lej.) opiz ex Lej. & Courtois. (marked with blue highlight color in table 3) the specimens of its need to be examined again in BUH to identify this specimen correctly. According to [17] the genus *Vitex* L. is placed within the family Lamiaceae and the study found that there are 21 synonyms reported for it in WFO. (table 3)

Table 3 Taxonomic status of the species that reserved in some herbariums in Iraq

Genus	Species	Taxonomic status
Ajuga	*chamaepitys*	Accepted
	oblongata	Accepted
	orientalis	Accepted
	tridactylites	Accepted
	vetita	Accepted
	aucheri	Accepted
Ballota	*nigra*	Accepted
Calamintha	*rodundifolius*	The genus is a synonym (table 2)

	exigua	
	florida	
	staminum	
Clinopodium	*vulgare*	Accepted
Coleus	*blumei*	Synonym of Coleus scutellariodes (L.) Benth. https://list.worldfloraonline.org/wfo-0000913643
Cyclotrichium	*stamineum*	Accepted
Eremostachys	*laciniata*	The genus is a synonym (table 2)
	macrophylla	
Hymenocrater	*bituminosus*	Accepted
	longiflorus	Accepted
Lagochilus	*kotschyanus*	Accepted
Lallemantia	*iberica*	Accepted
	peltata	Accepted
	royleana	Accepted
lamium	*amplexicaule*	Accepted
	crinitum	Synonym of Lamium album subsp. crinitum (Montbret& ABenth.) Mennema https://list.worldfloraonline.org/wfo-0000222480
	iranicum	Unchecked and waiting taxonomic scrutiny https://list.worldfloraonline.org/wfo-0000222559
	stiatum	Synonym of Lamium garganicum subsp. stiatum (Sm.) Hayek. https://list.worldfloraonline.org/wfo-0000222674
Lycopus	*europeus*	Accepted
Marrubium	*astracanicum*	Accepted
	crassidens	Accepted
	cuneatum	Accepted
	cuneatum var. spinulosum	Synonym of Marrubium cuneatum Banks & Sol. https://list.worldfloraonline.org/wfo-0000811479
	polyodont	Synonym of Marrubium ceatum Banks & Sol. https://list.worldfloraonline.org/wfo-0000236670
	vulgare	Accepted
Melissa	*officinalis*	Accepted
Mentha	*longifolia var. incana*	Synonym of Mentha longifolia subsp. Longifolia https://list.worldfloraonline.org/wfo-0000240950
	longifolia var. mollivima	Not reported in WFO
	longifolia	Unchecked and waiting taxonomic scrutiny https://list.worldfloraonline.org/wfo-0000240918
	spicata	Accepted

	arvensis	Accepted
	alopecuroides	Synonym of Mentha x villosa Huds. https://list.worldfloraonline.org/wfo-0000241184
	silvestris	Not reported in WFO
	piperita	Rported as Mentha x piperita L. as an accepted name. https://list.worldfloraonline.org/wfo-0000241184 or it is Mentha piperella (Lej.) opiz ex Lej. & Courtois. https://list.worldfloraonline.org/wfo-0000241183
Micromeria	*mollis*	Synonym of Clinopodium molle (Benth.) Kuntze https://list.worldfloraonline.org/wfo-0000243361
	juliana	Accepted
Moluceella	*laevis*	Accepted
Nepeta	*glandulosa*	Synunym of Nepeta macrosiphon Bioss. https://list.worldfloraonline.org/wfo-0000250960
	betonicifolia	Accepted
	hussknechtii bornm.	Synonym of Nepeta Racemosa subsp. haussknechtii (Bornm.) A. L. Budantesv https://list.worldfloraonline.org/wfo-0000250996
	kurdica	Accepted
	humilis	Accepted
	iodantha	Synonym of Nepeta lamijifolia Willd. https://list.worldfloraonline.org/wfo-0000251032
	italica	Accepted
	kurdica	Accepted
	elymaitica	Accepted
	trachonitica	Accepted
Ocimum	*basilicum*	Accepted
	majorana	Not reported in WFO
	vulgare var. viride	Not reported in WFO
	vulgare	Not reported in WFO
Pentapleura	*subulifera*	Accepted
Phlomis	*armeniaca*	Accepted
	bruguieri	Accepted
	herba-venti	Accepted
	kudica	Accepted
	olivieri	Accepted
	praetervisa	Accepted
	rigida	Accepted
	lanceolata	Accepted
Prunella	*valgaris*	Accepted

Salvia	*aegyptiaca*	Accepted
	amasiaca	Synonym of Salvia verticillate sbsp. Amasiaca (freyn& Bornm.) Bornm. https://list.worldfloraonline.org/wfo-0000302603
	arabica	Accepted
	bracteate	Accepted
	candidissima	Accepted
	ceratophylla	Accepted
	compressa	Accepted
	centraversa	Accepted
	indica	Accepted
	kurdica	Accepted
	lanigera	Accepted
	multicaulis	Accepted
	montbretii	Accepted
	nemorosa	Accepted
	palaestina	Accepted
	poculata	Accepted
	russellii	Accepted
	sclarea	Accepted
	reuterana	Accepted
	macrosiphon	Accepted
	spinosa	Synonym of Salvia nilotica Juss. Ex Jacq. https://list.worldfloraonline.org/wfo-0000302355
	splendens	Unchecked and waiting taxonomic scrutiny http://www.worldfloraonline.org/taxon/wfo-0000302359.
	suffruticosa	Accepted
	syriaca	Accepted
	trichoclada	Accepted
	viridis	Accepted
	poculata	Accepted
Sideritis	*kurdica*	Synonym of Sideritis libanotica subsp. kurdica (Bornm.) Hub. - Mor. https://list.worldfloraonline.org/wfo-0000310208
	montana	Accepted
Satureja	*cuneifolia*	Accepted
	macrantha	Accepted
	bornmulleri	Not reported in WFO
Scutellaria	*bornmulleri*	Accepted
	condensata	Synonym of Scutellaria albida subsp. condensate (Rech.f.) J.R.Edm. https://list.worldfloraonline.org/wfo-0000307733

	fruticosa	Synonym of Scutellaria tomentosa Bertol. https://list.worldfloraonline.org/wfo-0000307826
	megalaspis	Acceped
	ballaloides	Not reported in WFO
	kochgam	Not reported in WFO
	katschyi	Not reported in WFO
27.Stachys	*megalodonta*	Accepted
	tenuifolia	Unchecked and waiting taxonomic scrutiny http://www.worldfloraonline.org/taxon/wfo-0000314676.
	cretica	Accepted
	kurdica	Accepted
	setifera	Accepted
	melampyroides	Accepted
	spectabilis	Accepted
	arvensis	Accepted
	alopecuroides	Not reported in WFO
	ballotiformis	Synonym of Stachys kurdica subsp. Kurdica https://list.worldfloraonline.org/wfo-0000313751
	burgsdorffiodes	Accepted
	fragillima	Accepted
	graveolens	Accepted
	inflate	Accepted
	lanigera	Accepted
	iberica	Accepted
	pubescens	Synonym of Stachys annua subsp. annua https://list.worldfloraonline.org/wfo-0000314454
	kotschyi	Accepted
	lavandulifolia	Accepted
Tapeinanthus	*persicus*	The genus is synonym (table 2)
Teucrium	*chamaedrys*	Accepted
	divaricatum	Accepted
	oliverianum	Accepted
	polium	Accepted
	parviflorum	Accepted
	melissoides	Accepted
	rigidum	Accepted
	procerum	Accepted
	scordium	Accepted
Thymus	*kotschyanus*	Accepted

	syriacus	Accepted
Thymbra	*sintenisii*	The genus is synonym (table 2)
	spicata	
	bovei	
Vetix	*agnus*	Synonym of Vitex agnus- castus L. https://list.worldfloraonline.org/wfo-0000332915
	pseudo	Not reported in WFO
	pseudonegudo	Synonym of Vitex agnus- castus L. https://list.worldfloraonline.org/wfo-0000333382
Ziziphora	*acutifolia*	Synonym of Ziziphora tenuior L. https://list.worldfloraonline.org/wfo-0000335451
	capitata	Accepted
	clinopodioides	Accepted
	tenuior	Accepted

(Links were accessed on 10 Oct 2024 and the links of the acceptance names are the same of the genera in table 2)

4. Conclusion

The plant family Lamiaceae in Iraq include 139 species belonging to 33 genera. The study recommended that some of the plant specimens preserved in the herbarium mentioned in this study need to be re-identified in order to establish their taxonomic position correctly.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors have no conflicts of interest to declare.

References

[1] WFO a, World flora online, retrieved on: 18 dec. 2023. Available on: www.worldfloraonline.org/taxon/wfo-700000318.

[2] POWO, Plants of the world online, retrieved on: 18 Dec, 2023. Available on: https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:30000097-2#children

[3] A-Rawi, A. Wild Plants of Iraq with their distribution. Ministry of Agriculture, Government press 1964. Tech. Bull.14. 232Pp.

[4] Guest & Al-Rawi. Flora of Iraq, Introduction. Ministry of Agriculture Republic of Iraq. Baghdad. 1966. Vol. 1. Pp 213.

[5] Ahmad, Saman. A. Salvia ali-askaryi (Lamiaceae), a New Species from Kurdistan, Iraq. Journal Harvard papers in Botany. 2106. Vol. 21, Issue 2: 227-229.

[6] Al-Bayati M. and Haloob A. A New Taxa from Iraq to the Genus Scutellaria L. (Labiatae) With Key for it is Spp. Ibn Al-Haytham Journal For Pure And Applied Science. 2011. 24(3): 14-28.

[7] Al-Bayati M. and Haloob A. A Comparative Anatomical Study of Petioles to Thirteen Taxa for Scutellaria L. (Labiatae) in Iraq. Ibn Al-Haytham Journal for Pure and Applied Science. 2012. 25(1): 65-73.

[8] Ali, Zainab Abid Aun and Haloob, Ali. A New Species of Genus *Stachys* L. (Lamiaceae) in Iraq. Plant Archives. 2020. Vol. 20, Supplement 2: 1131-1134.

[9] AL-Musawi, A. H. E. & AL-Mousawi A. H. Pollen Morphology of Wild *Salvia* L. ssp. Journal of Babylon University. 1977. 2(3): 1- 15.

[10] Al-Musawi, A. H. E. Key to *Salvia* spp. of Iraq with 5 New Ones. Biological Sciences researches. 1988, 19(2): 239-337.

[11] Haloob, A. A New Record of *Ziziphora* Species (Lamiaceae) for Iraq. Bulletin of Iraqi Natural History Museium. 2016. 14(2): 179-184.

[12] Hama, S. Y. and Ahmad, Saman A. *Salvia sclareopsis* (Lamiaceae) A New Record for Iraq. Iranian Journal of Botany. 2019. Vol. 25: 120-122.

[13] Hassan, Khulod Ibraheem; Al-Zubaidy, Adel Mohan Aday and Jabbari, Basoz Sadiq. Assessment of Taxonomic Relationship Between Some Taxa of *Clinopodium*, *Hymenocrater* and *Melissa* of Lamiaceae in Iraqi Kurdistan Region using RAPD Marker. Diyala Journal for Pure Sciences. 2016. Vol. 12 No. 2: 59-71.

[14] Jabbari, Basozsadiq; Al-Zubaidy, Adel Mohan Aday and Hassan, Khulod Ibrahim. A Comparative Morphological Systematic Study of the Genus *Clinopodium* L. (Lamiaceae) in Iraq Kurdistan Region with Three Taxa which first New Recorded from Iraq. Plant Archives. 2018. Vol. 18 No. 2: 2693-2704.

[15] Khal, Lanja Hewa Mustafa; Khalid Faiq Darweesh and Russul Sa'ad Hamshkan. A New Record of *Cyclotrichium* species (lamiaceae) for Flora of Iraq. Journal Tikrit University for Agricultural. Scienses 2017. Volume 17, No. (3) –ISSN-1813-1646.

[16] Palani, Kh. F. D. M. A Comparative Biological Study of Some Species of the Genus Salvia L. (Lamiaceae) in Mid and North Cities of Iraq" Ph. D. Thesis, College of Education, University of Tikrit, Iraq. 2013.

[17] The Angiosperm Phylogeny Group, M. W. Chase, M. J. M. Christenhusz, M. F. Fay, J. W. Byng, W. S. Judd, D. E. Soltis, D. J. Mabberley, A. N. Sennikov, P. S. Soltis and P. F. Stevens. An update of the angiosperm phylogeny group classification for the order and families of flowering plants: APG IV. Botanical Journal of the Linnean Society. 2016. Vol.181, Issue 1, May, p 1-20.