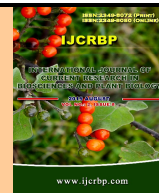




# International Journal of Current Research in Biosciences and Plant Biology

ISSN: 2349-8080 Volume 2 Number 8 (August-2015) pp. 7-11

[www.ijcrbp.com](http://www.ijcrbp.com)



## Original Research Article

### The Systematics of the Genus *Phlomis* L. (Lamiaceae) in Jordan

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A b s t r a c t	K e y w o r d s
<p>The genus <i>Phlomis</i> (Lamiaceae) in Jordan has been revised and the <b>taxonomic status</b> of <i>Phlomis</i> taxa has been reevaluated. Plant specimen collected from Jordan and deposited at the herbarium in the Biological Sciences, University of Jordan were studied; specimens for <i>Phlomis</i> taxa from the herbarium at Kew Royal Botanic Gardens as well as taxa for herbarium specimens from Edinburgh Botanic Gardens were also consulted. Virtual herbaria of Vienna, natural history museum, IPNI, MNhn, Kew and others were revised; Missouri Botanic Gardens database Tropicos was checked, plant list of the world also consulted as well as the flora of the related area were used in this study. The morphological characters were described; a new key for the different taxa has been constructed, and a number of 6 species of <i>Phlomis</i> has been decided as good species based on the new revised specimens collected and recorded from Jordan.</p>	<p>Lamiaceae <i>Phlomis</i> Systematics</p>

#### Introduction

The genus *Phlomis* belongs to the family Lamiaceae is with about a number of 100 species all over the world; the different species are herbs, shrubs or sub-shrubs; the genus is native to the Mediterranean region across central Asia to China. The taxonomic classification for the genus is the following:

Kingdom : Plantae (Unranked) Angiosperms  
 Order : Lamiales  
 Family : Lamiaceae  
 Genus : *Phlomis*  
 Species : 100+

#### The morphological characteristics of the genus *Phlomis*

The genus *Phlomis* is perennial herbs, chamaephytes or shrubs, woolly or fealty. Leaves undivided, rugose, verticillasters-many-flowered dense, bracteoles ovate to oblanceolate, lanceolate-linear, subulate to absent. Flowers sessile. Calyx tubular or tubular-campanulate, 5-10, veined striate, often folded; teeth 5, acute or obtuse, sometimes retuse, the two anterior (lower) ones often longer; corolla 2-labiate, mostly yellow, more purple, lilac or white; tube included or slightly exerted, mostly hairy – ringed inside below middle, about as long as limb or shorter; upper lip densely hairy, helmet-shaped, laterally compressed, sometimes falcate; lower lip spreading with lateral lobes varying in shape.

Stamens 4, ascending under the upper lip, didynamous; the anterior pair longer; filaments of posterior stamens often appendiculate at base; style branched subulate, unequal, the posterior ones usually very short. Nutlets ovoid-triquetrous, obtuse, glabrous, rarely, slightly hairy, posterior, usually very short (Post, 1933; Davis, 1984; Feinbrun, 1986; Al-Eisawi, 1998; Al-Eisawi, 2013).

### **Phlomis L. diversity in Jordan**

The genus *Phlomis* has not been taxonomically revised in Jordan, or other members of the family Lamiaceae, the genus *Salvia*, which has been biosystematically assessed for Jordan and the neighboring countries by (Oran 1991). A taxonomic study for the genus *Salvia* in Jordan and the neighboring countries was published by (Oran, 1997). A number of 8 taxa were recorded by (Post, 1933) in Flora of Syria, Palestine and Sinai; the recorded species were *Phlomis platystegia*, *P. pungens*, *P. syriaca*, *P. viscosa*, *P. orientalis*, *P. herbaventi*, *P. brachyodon*, *P. nissolii* and *P. cordifolia*

A number of 6 species of *Phlomis* were recorded by (Feinbrun, 1986), these taxa are: *Phlomis syriaca*, *P. kurdica*, *P. brachyodon*, *P. platystegia*, *P. viscosa* and *P. pungens*. In the "Field guide to wild flowers of Jordan and neighboring countries" (Al-Eisawi 1998), described 4 species, *Phlomis kurdica*, *P. pungens*, *P. syriaca* and *P. viscosa*. In Flora of Jordan, Checklist, revised, (Al-Eisawi, 2013) listed a number of 10 species of *Phlomis*: *P. aurea*, *P. bicolor*, *P. brachyodon*, *P. fruticosa*, *P. kurdica*, *P. nissolii*, *P. platystegia*, *P. pungens*, *P. syriaca* and *P. viscosa*. This current study revealed a number of 6 taxa: *Phlomis herba-venti* subsp. *pungens*, *P. syriaca*, *P. platystegia*, *P. viscosa*, *P. kurdica* and *P. brachyodon*.

### **Materials and methods**

#### **Methodological approach for the identification and characterization**

In this study a revision for the genus **Phlomis** is carried out using the following approaches:

1. Herbarium specimens at the herbarium of the **University** of Jordan (AMM), were examined (table1), herbarium plant specimens from **Kew** herbarium (Royal Botanic Garden, London) and herbarium specimens from the herbarium of Royal

Botanic Gardens of Edinburgh (E) were also examined for studying the morphological character, as well as images produced by the herbarium at Edinburgh Botanical garden were examined for the taxa of *Phlomis* for specimen collected from Jordan and the **Barcode** and the **link** of each photo of every specimen examined were given in the citation of specimen in the morphological description of taxa.

2. Herbarium specimen was also studied for *Phlomis* taxa, collected from Jordan/Trans Jordan and Palestine from the herbarium at Edinburgh botanic garden (E) as cited in the taxon description.
3. The valid names were checked out using the online **Tropicos** data base.
4. **Virtual herbaria** were consulted like Vienna, natural history museum, IPNI, NYBG, MNhn, Kew and others.
5. Missouri Botanic Garden **MBG** data base was also consulted.
6. The related **flora** of the area was also checked out for the genus *Phlomis*.
7. Measurements for the morphological vegetative and reproductive characters were studied as revealed in the taxa description.
8. The online of the **plant list of the world (Kew)** was also consulted to determine the taxonomic status of each recorded taxon of the genus *Phlomis*.
9. Citation for all studied taxa from the different herbaria of Amman, Kew and Edinburgh was shown in the taxa morphological description.

The taxonomic description of plant species is provided using taxonomic terminology as used in the Flora texts of the area and the region.

### **Results and discussion**

In this study the taxonomic status of the genus *Phlomis* in Jordan revealed a number of 6 taxa, *Phlomis brachyodon*, *P. platystegia*, *P. herba-venti* subsp. *pungens*, *P. syriaca*, *P. kurdica*, and *P. viscosa*.

The following taxa are considered as good (accepted) taxa: *Phlomis brachyodon* (Boiss.) Zohary ex Rech.f. *Phlomis brachyodon* subsp. *damascena* (Bornm.) Sam, *Phlomis herba-venti* L. subsp. *pungens* (Willd.) Maire

ex DeFilipps, *Phlomis kurdica* Rech.f. *Phlomis syriaca* Boiss., and *P. viscosa*; *Phlomis damascene* has been considered as a synonym. A new key is constructed for the taxa of *Phlomis* in Jordan.

### Key to taxa of *Phlomis* recorded in Jordan.

1. Corolla lilac purple, up to 12 mm. Bracteoles filiform, as long as calyx.....  
..... *P. herba-venti* (Willd.) Maire ex DeFilipps subsp. *pungens*
1. Corolla yellow, more than 12 mm long. Bracteoles present or absent, not like above.
2. Bracteoles 3-5 mm, as long as calyx or absent, cauline leaves with cordate base, lower cauline leaves less than twice as long as broad, calyx teeth subulate from a dilated base..... *P. syriaca*
2. Bracteoles as above up to 1 cm long or more, about as long as calyx.
3. Bracteoles ovate to oblanceolate, flat 2-8- mm broad, desert plant..... *P. platystegia*
- 3 Bracteoles lanceolate-subulate, usually canaliculated, incurved, 1-2.5 broad ..... *P. viscosa*
- 4 Basal lower cauline leaves cordate at base; lower cauline leaves less than twice as long as broad, calyx teeth subulate from a dilated base ..... *P. kurdica*
4. Basal lower cauline leaves at base at least twice as broad, calyx teeth triangular-lanceolate..... *P. brachyodon*

### Morphological description of the *Phlomis* taxa recorded in Jordan

*Phlomis brachyodon* (Boiss.) Zohary, palest. Jour. Bot. Jerusalem ser., 2: 181-182 (1941) subsp. *brachyodon*; fil., Osterr. Bot. Zeischr. 89:290 (1940). *P. orientalis* Mill. var. *brachyodon* (Boiss.) Boiss., Fl. 4: 782 (1879); Post, Fl. 2: 394. *P. armeniaca* Willd. Var. *brachyodon* Boiss., Diagn. Ser. 1, 12: 88 (1853).

The length of the plant ranges from 25-50 cm long, yellowish trichomes of the type stellate hairs, usually glabrescent below. Stems few, erect, simple or branched. Leaves with petioles up to 8mm, obtuse, cordate at base, ovate-oblong to oblong lanceolate, 4-10x 5-3.8 cm, obscurely crenulate, basal and lower cauline leaves thick; floral leaves ovate, sometimes as long as the verticillasters. Verticillasters 4-8 flowered; bracteoles few, lanceolate-subulate, 3-6 mm. Calyx tubular, slightly broadened above folded-ribbed, densely stellate-hairy, 10-16 mm; teeth triangular-lanceolate to ovate. Corolla yellow; about twice as long as the calyx, upper lip shorter than the lower lip.

**Flowering time:** April- June

**Geographical distribution:** Upper and lower Jordan valley, Dead Sea area, WadiAraba, Salt, Amman, south of Jordan: Karak, Tafila and Shubak.

**Specimen citation** (studied) : Wadi Al-Sheta, collection number 2004JOR46-1, Kew!, Siwaga, on Maan road, 2291, Kew!, WadiAseikim, below JabalAseikim,

65/350, Kew!, Qasr al Kharana, E. of the Castle, 65/365, Kew!; yajouz, s.n., AMM!, Dana Reserve, 182, AMM!; Eastern desert, 18209, AMM!; QasrAmra, 5373, AMM!; Tafila, 6076, AMM!, Al-Adasia, 96, AMM! SW of Bayir Police Station, 8670, AMM!; Yajouz, s.n., 8670, AMM!; Ras Al-Naqab, 8553, AMM!, collection number: s.n., Jordan, 163 km from Amman to Syrian desert (H5), 27, 5, 1937, <http://data.rbge.org.uk/herb/E00733008E!>, country of origin: Jordan, Track between Qasr el Karana and Al-Mwaqer, 24, 4, 1955, reference number 123, collector P.H. Davis, <http://data.rbge.org.uk/herb/E00733009E!>, country of origin: Jordan from Zarka, 26, 4, 45, collector P.H. Davis, reference number 9387, <http://data.rbge.org.uk/herb/E00733010E!>, country of origin: Jordan, WadiHeidan (Moab), 26, 4, 1945, collector P. H. Davis, reference number 9564 <http://data.rbge.org.uk/herb/E00733011E!>, Jordan in Zarka Main, 24, 4, 1945, collector P. H. Davis, reference number 632A, <http://data.rbge.org.uk/herb/E00733012E!>.

*Phlomis kurdica* Rech. Fil., Osterr. Bot. Zeischr. 89:274 (1940). *P. orientalis* Mill. var. *cordifolia* Nabelek, IterTurc.-Pers. 3, Publ. Fl. 2: 394. *P. orientalis* auct. cf. Boiss., Fl. 4: 781.

The length of the plant 20-80 cm long, wooly, with stellate hairs, then it turns into glabrescent. Stem ascending, simple branched. Leaves petiolate, broadly ovate, obtuse to cordate at base, crenate to nearly entire; floral leaves cordate to cuneate at base, short-petiolate; upper leaves acute, shorter than the verticillasters. Verticillasters numerous, 8-10 flowered, the upper ones

close together; bracteoles few; 3-5 mm, sometimes absent. Calyx tomentose and glandular, about 15-15.7 mm, tubular, ribbed; teeth subulate, about one third as long as tube. Corolla pale yellow, twice as long as the calyx or longer; upper lip nearly as long as the lower.

**Flowering time:** June-July

**Geographical distribution:** Amman, Eastern Desert, Ajloun, Jarash.

**Specimen citations:** eastern desert, s.n., **AMM!** Ajloun, s.n., **AMM!**, Dibben forest, s.n., **AMM!**; Ishtafaina, 2211, **AMM!**; Ajloun, 3838, **AMM!**, Amman, 4, 7, 1941, collector P. H. Davis, reference number 3773, <http://data.rbge.org.uk/herb/E00733013E!>,

*Phlomis platystegia* Post in Post & Autran, Bull. Herb. Boiss. 1: 407 (1893); Post, Fl. 2: 396.

The plant is 30-120cm long, perennials woolly with stellate hairs, becoming glabrescent. Stems numerous; woody, branched. Leaves oblong to ovate-oblong, 2-9 x 1-3cm, crenate; cauline leaves petiolate, obtuse, cuneate to cordate at base, green on upperface, canescent on lower; floral leaves sessile, longer than the verticillasters. Verticillasters 3-6, remote, many-flowered, head-like; bracteoles numerous, 2-10 mm broad, nearly as long as the calyx, flat, ovate to oblanceolate, acute, pinnately veined. Calyx 12-15 mm in flower, golden, with stellate hairy, glabrescent at maturity, tubular-campanulate, truncate. Corolla golden-yellow, twice as long as the calyx.

**Flowering time:** March-June

**Geographical distribution:** Tafila, Dana reserve (Tafila), Dead Sea, Amman, Moab, Edom.

**Specimen citation:** Dana reserve, s. n.; **AMM!**, Tafila, 5889, **AMM!**; maaita, 419, **Kew!**; Dana reserve (Tafila), BOTERA 16 **Kew!**; Petra, 86/26, **Kew!**, ErRuseis above Gharandal, Hunting Aero survey, reference number 67a, <http://data.rbge.org.uk/herb/E00733014E!>, limestone slopes Maqita, 1, 5, 1955, Hunting Aero survey, <http://data.rbge.org.uk/herb/E00733015E!>,

*Phlomis herba-venti* subsp. *pungens* (Willd.) Maire ex DeFilipps Willd., Pl. 3: 121 (1800); Post, Fl. 2: 398. *P. herba-venti* L. var. *tomentosa* Boiss. Fl. 4: 791 (1879).

Perennial herb, 30-65 cm long. With short stellate-tomentose and some long hairs. Stems erect paniculate. Leaves elliptic to oblong-lanceolate, canescent with prominent veins on lower face; cauline leaves crenate, 3-10 x 2-4 cm, the petiolate; floral leaves entire, longer than verticillasters. Verticillasters 2-5, flowers sessile; bracteoles filiform-subulate, as long as calyx or sometimes longer. Calyx about 10-10.5 mm, stellate-tomentose, grooved; teeth ovate-lanceolate at base, subulate-articulate at tip, stiff, erect –spreading. Corolla pale-lilac, about one and half times as long as the calyx.

**Flowering times:** May-June.

**Geographical distribution:** Amman, Moav, Al-Shara Mountain (Edom), Wadi Rum, Karak, Tafilah.

**Specimen citation:** Wadi Rum, s.n., **AMM!** Karak, 1549, **AMM!**, no, 420, **K!**; from desert road to Karak, way to M'ohta University, opposite the military aircraft station, 2005Jor 30-4, **K!**, Amman Salt road, 11, 6, 1954, M. K. K. Jronght, <http://data.rbge.org.uk/herb/E00733226E!>,

*Phlomis syriaca* Boiss. Diagn. ser. 1, 12: 89 (1853); Post, Fl. 2: 394. *P. nissolii* L. var. *leptorrhacvos* Boiss, Fl. 4: 781 (1879).

It is 50-78 cm long, chaemophytes, usually yellowish, densely short stellate hairs, later becomes glabrescent. Stems slender, simple or branched above, pale brown when glabrescent; internodes long. Leaves petiolate; cauline leaves oblong to lanceolate, cuneate at base, 3-10 x 1.7-4cm; basal leaves truncate at base, very thick when young; floral leaves as long as verticillasters or longer. Verticillasters few, 4-6 flowered; bracteoles few, subulate, 3-7mm. Calyx 10-16 mm, tubular or tubular-campanulate, ribbed; teeth ovate. Corolla yellow, twice as long as calyx; orbicular to semi-orbicular.

**Flowering time:** May-June

**Geographical distribution:** Salt, Moab, Edom, Shoubak, Jarash, Dibben forest, Yajouz, Al-Adaseia.

**Specimen citation:** Shoubak, 7333, **AMM!**, Dibben forest, 492, **AMM!**, Yajouz, 110, **AMM!**, Al-Adaseia, 53, **AMM!**, Al-Adaseia, 54, **AMM!** Shoubak, Ajloun, s.n., **AMM!**, eastern of Jordan, 1873, **K!**.

*Phlomis viscosa* Poir. In Lam., Meth.Bot. 5: 271 (1804); Boiss. Fl. 4: 788; Post, Fl. 2: 397.

Shrub 70-180 cm, with thin stellate tomentose to glandular hairy; flowering shoots elongate. Leaves 3-16 cm, petiolate, ovate to triangular, crenate or serrate, cordate or rounded at base, green to somewhat canescent on upper face, canescent on the lower; floral leaves petiolate, acute to acuminate, much longer than verticillasters. Verticillasters few, very remote, many-flowered; flowers short-pedicellate; bracteoles numerous, usually 2-3 or three about as long as the calyx, one and a half-3 mm broad, subulate, somewhat sharp-pointed, incurved and usually canaliculated, ciliate. Calyx about 20 mm in flower, green, stellate-hispid and glandular-hairy, grooved, teeth unequal, subulate-acuminate from an ovate base, the two longer teeth about 3-7.5mm. Corolla yellow, longer than the calyx as twice as much.

**Flowering time:** March-June.

**Geographical distribution:** Amman, Salt, Ajloun, Ishtafaina Moab.

**Specimen citation:** Ajloun, s.n. AMM! Zarqa River, Amman-Jarash road, 89, AMM!; Ishtafaina, 6643, AMM!, Ajloun, 111, AMM!; Dibben forest, 34, AMM!. 2km north of Sakeby towards Ainjana on Jarash-Ajloun road, JOR1, K! Ajloun, 9699, K!, Jerash, 3, 5, 1945, P.H. Davis, reference number 9699, <http://data.rbge.org.uk/herb/E00733016E!>, Baniyas?, 11, 5, 1911, Fred S. Meyers et J. E. Dinsmore, <http://data.rbge.org.uk/herb/E00733007E!>.

This current study revealed a number of 6 taxa: *Phlomis herba-venti* subsp. *pungens*, *P. syriaca*, *P. platystegia*, *P. viscosa*, *P. kurdica* and *P. brachyodon*. The species of *Phlomis damascene* is considered here as synonym, *Phlomis pungens* is recognized as *Phlomis herba-venti* L. subsp. *pungens*, *Phlomis nisolii* is excluded from this new treatment, *Phlomis syriaca* and *P. kurdica* are also accepted as good species as well as *P. brachyodon*, *P. platystegia* and *P. viscosa*. The good species and the synonymy were checked for in accordance with the "World Checklist of Selected Plant Families", Royal Botanic Gardens, (K) and Tropicos.

## Acknowledgement

I am indebted to the University of Jordan for the financial support during my sabbatical year 2014-2015 at Missouri Botanical Garden and Washington University in St. Louis, USA 2014-2015. Thanks are also due to Royal Botanic Gardens (Kew) in London, UK for the loan of *Phlomis* specimen sent to me to Missouri Botanical Garden, and also to the herbarium at Edinburgh Royal Botanic Gardens (E) for the loan sent to me and the imaged photos sent to Missouri Botanical Garden to check the *Phlomis* specimen collected from Jordan.

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