

**PRUNUS LONGISPINOSA (ROSACEAE): A NEW SPECIES FROM KURDISTAN-IRAQ**SHAMIRAN SALIH ABDULRAHMAN<sup>1</sup> AND SALEEM ESMAEL SHAHBAZ<sup>2\*</sup><sup>1</sup>College of Science, University of Zakho, Duhok, Kurdistan – Iraq<sup>2</sup>College of Agriculture, University of Duhok, Duhok, Kurdistan – Iraq\*Corresponding author's email: [saleem.shahbaz@uod.ac](mailto:saleem.shahbaz@uod.ac)**Abstract**

*Prunus longispinosa* S.E. Shahbaz and S.S. Abdulrahman (Rosaceae), a new species from Kurdistan-Iraq, is described and illustrated. It differs from all Iraqi taxa of the subgenus *Amygdalus* by the dark reddish color of their one-year-old twigs and the very whitish thorny branches. The new species is closely related to *P. spinosissima* but can be easily separated by its green drupes vs. reddish drupes from one side and green from the other. The new species also shows close resemblance to *Prunus lycioides* but the later differs from it in having one reddish side and pale green side of their one-year-old twigs and glabrous drupes vs. dark reddish color of their one-year-old twigs and pubescent drupes for the new species.

**Key words:** *Prunus spinosissima*, *Prunus lycioides*, *Prunus carduchorum*, Subgenus *Amygdalus*, New species, Drupe, endocarp.

**Introduction**

While treating the woody plants of Rosaceae family, Schneider (1906) distinguished three genera, namely, *Prunus*, *Padus*, and *Laurocerasus*. He also recognized within *Prunus* the three subgenera: *Euprunus*, *Cerasus*, and *Amygdalus*. Five subgenera: *Amygdalus*, *Prunus*, *Cerasus*, *Padus*, and *Laurocerasus* were identified by Rehder (1940); while Okie (2003) recognized six subgenera when *Lithocerasus* was added to the 5 subgenera of Rehder. Some other workers recognized six to ten genera (De Tournefort, 1700; Roemer, 1847; Yu *et al.*, 1986; Takhtajan, 1997) within the generic concept of *Prunus* s.l.

In Iraq, Townsend & Guest (1966) recognized the single genus *Prunus* within the subfamily Prunoideae Focke, and subdivided it on the basis of reproductive and vegetative morphological characters into subgenera *Prunus* L. *Amygdalus* (L) Focke, and *Cerasus* Pers.

The Plant List version 1(2010) accepts 88 out of 482 specific names for the genus *Prunus*, in addition to the 213 infra-specific taxa for the same genus, all are spreading throughout the northern temperate regions of the world.

According to the treatment used, Browicz (1969), Yazbek & Oh (2013), Vafadar *et al.*, (2014) accepted 24 to 45 almond species. For Zhukovshy (1971), Browicz & Zohary (1996), Gradziel (2010), and Vafadar *et al.*, (2010), the highest diversity of subg. *Amygdalus* species occurs in southwestern and central Asia, and in the Irano-Turanian phytogeographic region of which northern Iraq is part.

Based on morphological characters, De Tournefort (1700) recognized *Prunus* and *Amygdalus*, as separate genera. Some botanists inclined to split *Prunus* s.l. into numerous genera (Yu *et al.*, 1986; Takhtajan, 1997; Lu & Bartholomew, 2003), while others preferred to maintain the unity of *Prunus* s.l. and only identifying sectional or sub-generic groups (Chin *et al.*, 2010; Shi *et al.*, 2013; Eisenman, 2015).

Recent phylogenetic analyses of molecular data have shown *Prunus* s.l. to be monophyletic (Bortiri *et al.*, 2001). Moreover, in a recently presented monograph using morphological and molecular sequence data, Yazbek (2010) concluded that phylogenetic relationships of *Prunus* subg. *Amygdalus* is best circumscribed to include almonds and peaches.

Flora of Iraq is rich in *Prunus* taxa, 5 wild species of the subgenus *Amygdalus* are present ((*P. arabica* (Oliv.) Meikle, *P. webbii* (Spach) Vierh. *P. argentea* (Lam.) Rehd, *P. kotschyi* (Boiss. et Hoh.) Meikle, and *P. carduchorum* (Bornm) Meikle)) together with several other ill-defined infra-specific taxa((*P. argentea* var. *elaegnifolia* (Spach) Meikle, and *P. carduchorum* var. *glabra* (Bornm) Meikle)) which form the bulk of food source for honey bees at the time of flowers scarcity in Winter and in very early Springtime.

Members of the subgenus *Amygdalus*: *Prunus persica* (L.) Batsch. and *P. dulcis* are extensively cultivated in orchards and vineyards throughout Iraq, but all other taxa are growing naturally in the mountainous region at the upper forest zone, timber-line and even in the thorn-cushion zone, usually at high altitudes up to 1800m. Two species; namely, *P. argentea* and *P. arabica* are normally found in the lower forest zone. Moreover, *P. arabica* is growing in the steppe and sub-desert regions of Iraq down to 150m above sea level.

**Material and Methods**

Field trips were conducted in Sulaymani province/ Kurdistan region with the aim of collecting *Prunus* plants. Trips started September 25/2016, continued at April to June 2017. Authors collected specimens belonging to *Prunus* subgenus *Amygdalus* from Hanaqol Mountain east of Khormal town, near Iranian border facing Mariwan city, revisited in March 20/2017 to collect flowers and then in May 25/2017 to collect fruits.

The specimens were compared with all *Prunus* specimens in Iraqi herbaria including National Herbarium of Iraq/Baghdad (BAG), Sulaymani University Agriculture Herbarium (SUAH), and Kurdistan Botanical Foundation Herbarium (KBFH) in Sulaymani. Moreover, the specimen photos were sent to Herbarium of the Hebrew University of Jerusalem (HUJ), Central Herbarium of Tehran University (TUH). Records in the literature (Shaw, 2005; Sangtae & Jun, 2001; Yazbek, 2010) were checked. Flora of Iraq (Townsend & Guest, 1966) and the neighboring countries: Flora of Turkey (Davis, 1965-1988) and flora of Iran (Rechinger, 1963-2005) were consulted.

The unknown *Prunus* is found only in one location, an effort to find more locations in the vicinity where this novel plant may be located was unsuccessful.

Morphological measurements for the description of the taxa were obtained from observation of living material in the field and occasionally from herbaria. 12 herbarium specimens were prepared from similar number of the new species and deposited in DPUH (Duhok Province University Herbarium).

**Results and Discussion**

*Prunus longispinosa* S.E. Shahbaz, and S.S. Abdulrahman, Species Nova. Type: Iraq, Kurdistan, Sulaimani province, 2.5-3km east Khormal city, the south-east facing of Hanaqol Mountain, Hanaqol village,

spreading in an area of about 2.4 x 0.6 km, in a steep rocky slope, altitude 1095m, latitude 35.31995°N, longitude 46.06223°E. Sept, May 25/2017. Saleem Esmael Shahbaz (University of Duhok), Shamiran Salih Abdulrahman (University of Zakho), 2017-3630. Holotype: DPUH, Isotype: KBFH (Kurdistan Botanical Foundation Herbarium), (Table 1; Fig. 1).

**Diagnosis:** Plants are shrubs characterized by thorny branches; thorns whitish, very sharp, 1.6-5.8cm long; one-year-old twigs deep-reddish, older grey whitish. Leaves are mostly falcate or curved. Hypanthium tube is long, up to 9mm length. Drupes are very small, 8.5-16mm length x 6-10.5mm width x 5.2-7mm thickness; endocarp pits absent; furrows start from the base becoming shallower towards the apex.

**Table 1. Additional specimens studied.**

Place	Date	Specimen number	Herbarium deposited	Altitude m, above sea level	Collector	Growth stage
1. Iraq/ Sulaymani/ Hanaqol	Mar.17/2016	3046	DPUH	1095	Shamiran	Flowering
2. Iraq/ Sulaymani/ Hanaqol	Mar.17/2016	3645	DPUH	1102	Shamiran	Flowering
3. Iraq/ Sulaymani/ Hanaqol	May.2/2016,	3695	DPUH	1105	Shamiran & Saleem	Fruiting
4. Iraq/ Sulaymani/ Hanaqol	July 19/ 2016	3056	DPUH	1097	Shamiran & Saleem	Fruiting
5. Iraq/ Sulaymani/ Hanaqol	Sept, 25/2016	3057	DPUH	1106	Shamiran	Fruiting
6. Iraq/ Sulaymani/ Hanaqol	April 4/ 2017	3677	DPUH	1109	Shamiran	Flowering
7. Iraq/ Sulaymani/ Hanaqol	April 4/ 2017	3678	DPUH	1384	Shamiran	Flowering
8. Iraq/ Sulaymani/ Hanaqol	April 4/ 2017	3679	DPUH	1137	Shamiran	Flowering
9. Iraq/ Sulaymani/ Hanaqol	Sep. 10/2017	3680	DPUH	1121	Shamiran	Fruiting
10. Iraq/ Sulaymani/ Hanaqol	Sep.10/2017	3681	DPUH	1272	Shamiran	Fruiting

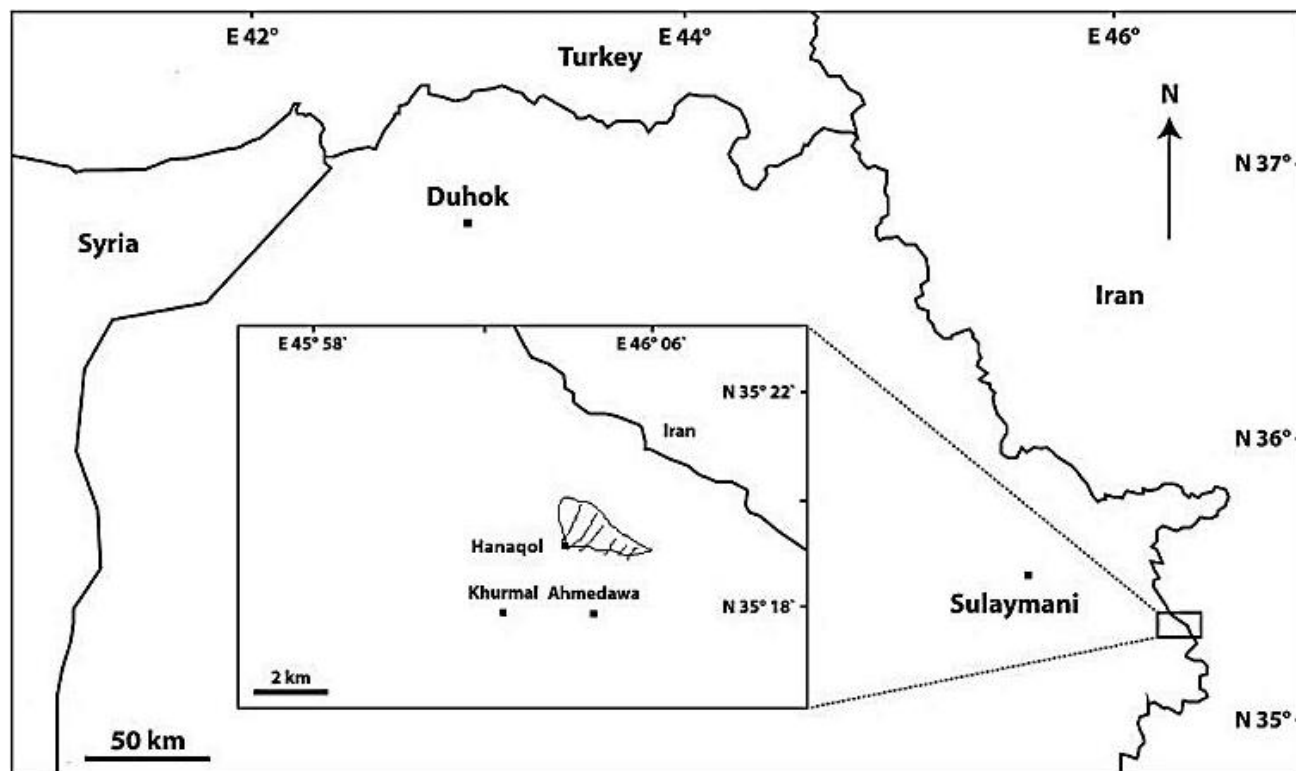


Fig. 1. Map of northern Iraq showing the location of *Prunus longispinosa*.

**Species description:** Shrubs are 0.65-1.22 m tall, with spreading crown. Bark grey, with black lenticels, upper parts grey whitish. Branches very thorny, some ascending, others trailing; thorns whitish, 1.6-5.8cm long; one-year-old twigs deep-reddish, glabrous. Axillary buds with scale margin entire, glabrous, apex rounded, base cuneate. Leaves mainly born on new growths, few on old twigs, mostly present as short shoots of 1.7-7 mm long, fascicled, 6-25mm long, 2-4.5mm width; blade shape mostly falcate or curved; lanceolate to oblanceolate, narrow-elliptic; apex acute to acuminate; base cuneate to more or less rounded, glabrous; margins obscurely serrate, more towards apex, 7-9teeth per cm, each with a single gland; petiole very short 1-2mm; stipules caduceous. Inflorescences fascicled on short shoots; pedicel 0-1,5mm long, flowers with hypanthium red-purple, cylindrical, inflated at the base. 4.5-9mm long, 0.5-2mm wide with 6-10 longitudinal dark colored striations, glabrous; sepals reddish from outside and inside, margins entire, ciliated, 1.6-2mm long, 1.2-1.7mm wide, apex acute; petals pink to pale pink, oblong, or wedge-shaped, apex emarginated to acute, base cuneate or

tapering, 6.5-8mm long, 3.5-4.5mm width; stamens 9 -18, 0.8-5mm long; style longer than stamens. 4.5-7mm long, densely long-hairy at the style lower part, often persistent in fruit; ovary ovate pubescent, 1.5-3.5mm long, 1.2-2.9mm width. Fruits with pedicel 0.7-1.2 mm long, hairy, drupe green often asymmetrical, compressed or slightly so, 8.5-16mm long, 6-10.5mm wide, 5.2-7mm thick, ovate in cross-section; base round, sometimes slightly asymmetric; apex acute to round, surface pubescent; mesocarp splitting at complete or over maturity; endocarp brown to light brown, more or less asymmetric, ovate in cross-section, compressed, 8.5-13mm long, 5.5-9.6mm wide, 4.2-6.2mm thick, base round, sometimes slightly asymmetric, apex acute to round, surface pits absent, ventral suture with obtuse keel, furrow start from the base becoming shallower towards apex, sometimes reticulate furrows in patches or all over, could be deep or shallow. Seeds are with whitish pulp, 5-10mm long, and 3-4mm wide, and 1.4-3mm deep, ovate to oblong-ovate, base round asymmetric, apex acute or acute-mucronate; testa slightly sulcate, light brown (Figs. 2, 3, 4 and Table 3).



Fig. 2. *Prunus longispinosa*: a. Habit and habitat, b. One-year-old twigs, c. Stems, d. Fruiting branches with thorns.

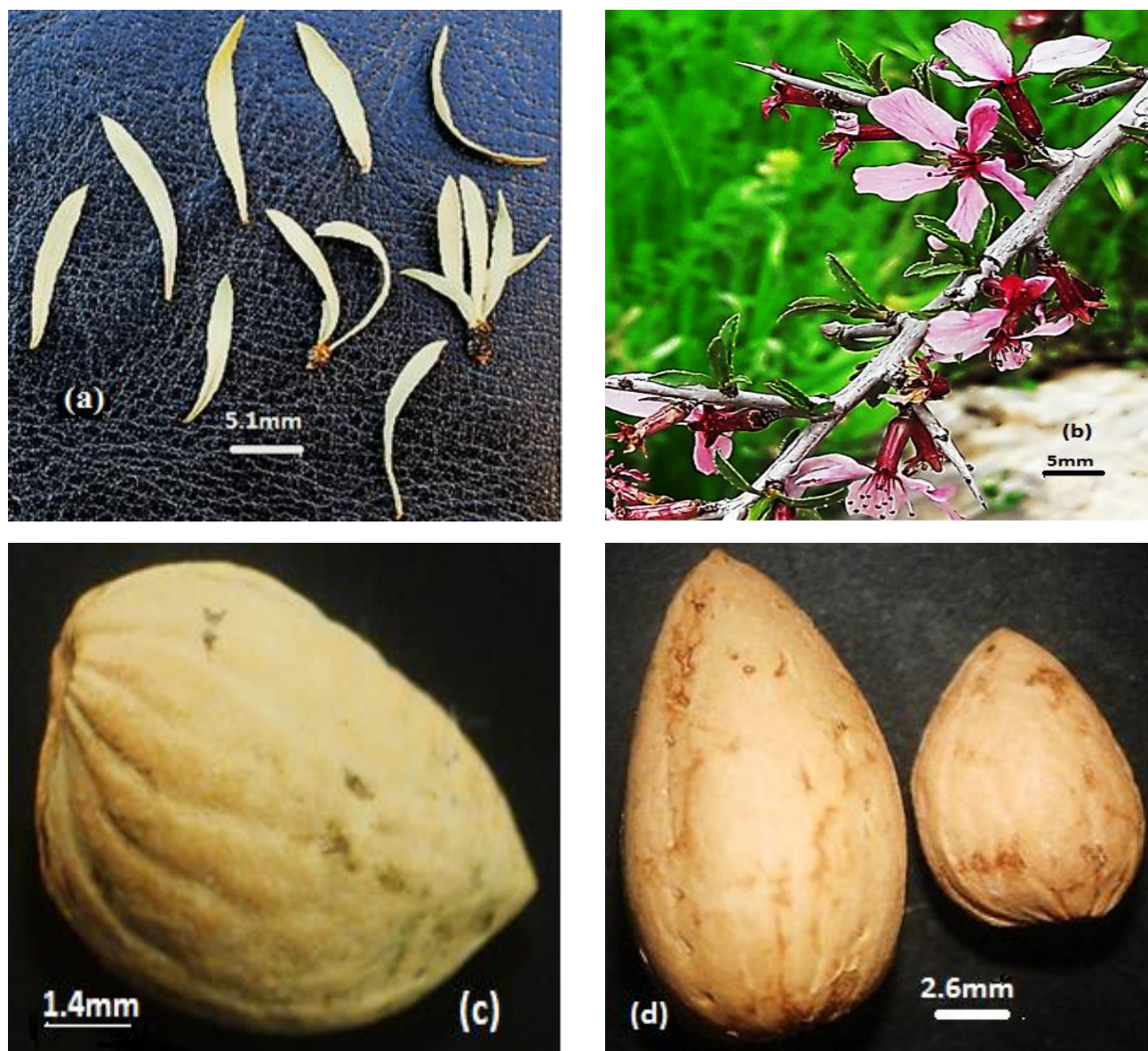


Fig. 3. *Prunus longispinosa*: a. leaves, b. flowering twig showing long hypanthium tube and leaves with marginal glands, c. Endocarp with distinct furrows at the base, d. Endocarp: comparison between *P. carduchorum* (left) and *P. longispinosa* (right).

**Distribution and conservation status:** Distribution is known only in Hanaqol Mountain/ Sulaimani province, a restricted area near the Iranian border (Fig. 1). The new species is found to form a population of low density, above 1095m altitude. The area is denuded from the normal arborescent cover of *Quercus* and *Pistacia* (*Pistacia eurycarpa* Yal. and *P. khinuk* Stocks) which are normal in lower elevations. Very few perennials could be observed in the region, like *Rhus coriaria* L., *P. carduchorum*, number of Compositae as *Onopordon* sp. *Silybum marianum* (L.) Gaertn., *Echinops ritro* L., *Centaurea* sp., and *Lactuca serriola* L. A great number of annuals from Poaceae like *Hordeum* spp., *Avena* spp., and *Bromus* spp. are to be found covering the site. Some members of Apiaceae like *Tordylium cordatum* (Jacq.) Poir. are also common in the region.

*Prunus longispinosa* seems to face some degradation in its habitat due to intensive grazing and gathering of firewood by the local villagers, in addition to fires that break out from time to time in the region during the long

dry summer season. The spread of groups of individuals at the very high altitude of the limited area of distribution and the very steep rocky slope of some sites may cause reduction of threats to this species. Since necessary information regarding population size, number of mature individuals, reproduction status, and exact quality of habitats are not known, the IUCN Red List category (Anon., 2001) for this species remains uncertain and could currently be assessed as Data Deficient (DD).

**Related Taxa:** Only *P. longispinosa* and *P. carduchorum* coexist at the same habitat and overlap at their area of distribution. Both show similar habit and possess mesocarp that is splitting at complete maturity and endocarp surface with no pits, but *P. carduchorum* branches are thorn-less and the one-year-old twigs are greenish-brown (Fig. 5). All available taxa in Iraq are thorn-less except *P. argentea* and the one-year-old twigs of them are not red in color at all with the exception of the new species (Table 2; Fig. 5).

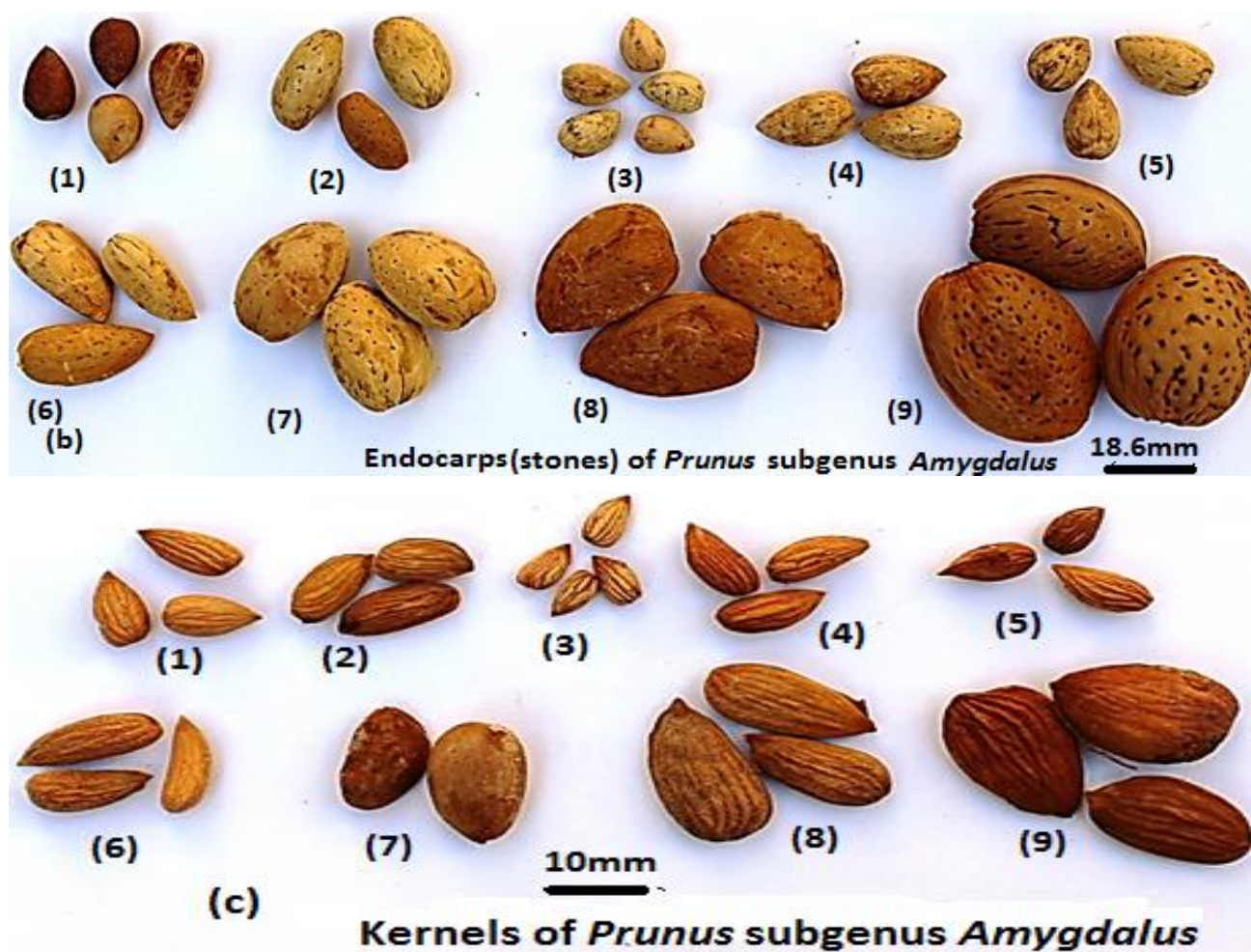


Fig. 4. Drupes, endocarps, and Kernels of *Prunus* subgenus *Amygdalus* growing in Iraq: 1. *P. kotschyi*, 2. *P. arabica*, 3. *P. longispinosa*, 4. *P. carduchorum* var. *carduchorum*, 5. *P. carduchorum* var. *glabra*, 6. *P. argentea* var. *argentea*, 7. *P. argentea* var. *elaegnifolia*, 8. *P. webbii*, 9. *P. dulcis*.

Table 2. Characteristics used to differentiate *Prunus longispinosa* from the two closely related species *P. spinosissima* (Bunge) Franch and *Prunus lycioides* (Spach) C.K. Schneid (Yazbek, 2010) (Fig. 5).

Characters	<i>P. longispinosa</i>	<i>P. spinosissima</i>	<i>P. lycioides</i>
Shoot	One-year-old twigs deep reddish, older twigs grey-whitish, with black lenticels. glabrous	One-year-old twigs deep reddish, older twigs brown-grey to white-grey, glabrous	One-year-old twigs reddish side and pale green side, older twigs grey, glabrous
Leaves	Falcate or curved, lanceolate to oblanceolate, narrowly elliptic, 6-25 x 2-4.5mm	Spathulate, obovate, elliptic lanceolate, (11)18- 28(30) x 3 - 9mm	Linear, linear- lanceolate, or linear-oblanceolate, 9-32 x 1- 4 (7) mm
Hypanthium	Hypanthium red-purple, inflated at the base. 4.5-9 mm long, 0.5-2mm wide with 6-10 longitudinal dark colored striations, glabrous	Hypanthium reddish, cylindrical, inflated at base, 3-8 mm long, 1-3 mm wide, glabrous	Hypanthium deep-red to purple, cylindrical, inflated at base, 3-7 mm long, 1-3 mm wide, glabrous
Style	Densely long-hairy at its lower part	Not recorded	Not recorded
Drupe	Green, 8.5-16mm long, 6-10.5mm wide, 5.2-7mm thick, surface pubescent	Reddish from one side and green from the other, 9-15 mm long, 9-16 mm wide, 8-10 mm thick, surface pubescent	Green, 10-17 mm long, 7-14 mm wide, 5-10 mm thick, surface glabrous
Endocarp	ovate, compressed, 8.5-13mm x 5.5-9.6mm x 4.2-6.2mm, surface pits absent, furrow start from the base becoming shallower towards the apex, sometimes reticulate furrows in patches or all over	Ovate, strongly compressed, 13-14mm x 9-17mm x 7-9mm, surface pits absent, shallow furrows start from base becoming shallower towards the apex, or disappear towards the apex, or reticulate furrows all over	ovate or broadly ovate, strongly compressed, 10-16 mm x 8-13 mm x 10 mm, surface pits absent, furrows start from the base becoming reticulate towards the apex, could be deep or shallow
Phenology	Flowering early March to Late April, fruiting: early May to Late July	Flowering: Late Feb to Late April; fruiting: Early May – Mid Aug.	Flowering: Late Jan to Early May; fruiting: Late Mar – Mid July
Habitat	In semi-arid to semi-humid region, in steep rocky mountain slope, elevation above 1095m	In semi-arid regions, rocky mountain slopes. elevations between 700 – 1900 m.	In dry and semiarid regions, rocky slopes and hillsides. Sometimes near rivers, elevation 450-2200m



Fig. 5. Closely related species. *P. spinosissima*: a. Fruiting branch, b. leaves (Yazbek, 2010); *Prunus lycioides*: c. and d, fruiting branches, e. Foliage branches with red one-year-old twigs (Yazbek, 2010); *P. carduchorum*: f. Fruiting branches, g. Foliage branches with green one-year-old twigs.

## References

- Anonymous. 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- Bortiri, E., S.H. Oh, J.G. Jiang, S. Baggett, A. Granger, C. Week M. Buckingham, D. Potter and D.E. Parfitt. 2001. Phylogeny and systematics of *Prunus* (Rosaceae) as determined by sequence analysis of ITS and the chloroplast trnL-trnF spacer DNA. *Sys. Bot.*, 26: (4) 797-807.
- Browicz, K. 1969. *Amygdalus* L. In: Rechinger, K.H. (Eds.) *Flora Iranica*, Vol. 66. Akademische Druck und Verlagsanstalt, Graz, pp. 166-187.
- Browicz, K. and D. Zohary. 1996. The genus *Amygdalus* L (Rosaceae): species relationships, distribution, and evolution under domestication. *Gen. Resour. & Crop Evol.*, 43: 229-247. <http://dx.doi.org/10.1007/BF00123275>.
- Chin, S.W., J. Wen, G. Johnson and D. Potter. 2010. Merging *Maddenia* with the morphologically diverse *Prunus* (Rosaceae). *Bot. J. Linn. Soc.*, 163: 236-245.
- Davis, P.H. (Eds.). 1965-1988. *Flora of Turkey and the East Aegean Islands*, 10 vols.– Edinburgh: University Press.
- De Tournefort, J.P. 1700. *Institutiones rei herbariae*, 1st ed. Paris, France.
- Eisenman, S.W. 2015. Some nomenclatural adjustments and typifications for almond species in the genus *Prunus* sensu lato (Rosaceae). *Phytotaxa* 222(3): 185-198. <http://dx.doi.org/10.11646/phytotaxa.222.3.2>.
- Gradziel, T.M. 2010. Origin and dissemination of almond. In: Janick, J. (Ed.) *Horticultural Reviews*, Vol. 38. John Wiley and Sons, Inc., Hoboken, pp. 23-81. <http://dx.doi.org/10.1002/9780470872376.ch2>.
- Lu, L.T. and B. Bartholomew. 2003. *Amygdalus*. In: (Eds.): Wu, Z.Y., P.H. Raven and D.Y., Hong. *Flora of China*, Vol. 9.

- Science Press, Beijing: and Missouri Botanical Garden, St. Louis, pp. 391-395. *Prunus sensu lato* (Rosaceae). *Phytotaxa*, 222(3): 185-198. <http://dx.doi.org/10.11646/phytotaxa.222.3.2>.
- Okie, W. July. 2003. Stone Fruits. In Janick, J.; Paulii, R.E. Encyclopedia of Fruits and Nuts. C A B Intl (published 2008).
- Rechinger, KH. (Eds.).1963-2005. Flora Iranica, No. 1-176. Akad. Druck-u. Verlagsanstalt, Graz.
- Rehder, A. 1940. Manual of cultivated trees and shrubs hardy in North America, exclusive of the subtropical and warmer temperate regions, 2nd revised and enlarged edition. Macmillan, New York, New York, USA.
- Roemer, M.J. 1847. Familiarum naturalium regni vegetabilis synopses mon-ographicae 4. Weima.
- Sangtae, L. and W. Jun. 2001. A phylogenetic analysis of *Prunus* and the Amygdaloideae (Rosaceae) using ITS sequences of nuclear ribosomal DNA. *Amer. J. Bot.*, 88(1): (Jan. 2001), pp. 150-160.
- Schneider, C.K. 1906. Illustriertes Handbuch der Laubholzkunde. Verlag von Gustav Fischer, Jena, 810 pp. Available from: <http://www.biodiversitylibrary.org/item/68287#page/722/mode>.
- Shaw, J.T. 2005. Systematics of the North American Plums (*Prunus* subgenus *Prunus* section *Prunocerasus*; Rosaceae). Ph.D. diss., University of Tennessee, 2005. [http://trace.tennessee.edu/utk\\_graddiss/2326](http://trace.tennessee.edu/utk_graddiss/2326).
- Shi, S., J. Li, J. Sun, J. Yu and S. Zhou. 2013. Phylogeny and classification of *Prunus sensu lato* (Rosaceae). *J. Integr. Plant Biol.*, 55: 1069-1079. <http://dx.doi.org/10.1111/jipb.12095>.
- Takhtajan, A.L. 1997. Diversity and classification of flowering plants. Columbia University Press, New York, New York, USA.
- The Plant List Version 1. 2010. Published on the Internet; <http://www.theplantlist.org/> (accessed 1st January).
- Townsend, C.C. and E. Guest (Eds.). 1966. Flora of Iraq. Volume Two, Pages 153-171. Published by Ministry of Agriculture, Baghdad-Iraq, 1966.
- Vafadar, M., F. Attar and H. Maroofi. 2010. Trichome micromorphology in drupe of *Amygdalus* L. (Rosaceae) from Iran. *Acta Botanica Croatica* 69: 93-105.
- Vafadar, M., S.K. Osaloo and F. Attar. 2014. Molecular phylogeny of the genus *Amygdalus* (Rosaceae) based on nrDNA ITS and cpDNA trnS-trnG sequences. *Turk. J. Bot.*, 38: 439-452. <http://dx.doi.org/10.3906/bot-1303-46>.
- Yazbek, M.M. 2010. Systematics of *Prunus* Subgenus *Amygdalus* Monograph and Phylogeny. A Dissertation Presented to the Faculty of the Graduate School of Cornell University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy.
- Yazbek, M.M. and S.H. Oh. 2013. Peaches and almonds: phylogeny of *Prunus* subg. *Amygdalus* (Rosaceae) based on DNA sequence and morphology. *Plant Sys. & Evol.*, 299: 1403-1418. <http://dx.doi.org/10.1007/s00606-013-0802-1>.
- Yu, T.T, L.T. Lu, T.C. Ku, C.L. Li and S.X. Chen. 1986. Rosaceae (3), Amygdaloideae. Flora Reipublicae Popularis Sinicae, vol. 38. *Science Press*, Beijing, China.
- Zhukovsky, P.M. 1971. Kulturnye Rasteniya i ikh Sorodichi [Cultivated Plant Species and Their Relatives]. 3rd Ed. Kolos, Leningrad, 752 pp.

(Received for publication 23 August 2018)