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On the Concept of *Rhinanthus angustifolius* and *Rhynchochorys elephas* (*Scrophulariaceae*) in Iran

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Abstract: In order to provide a revision on the subfamily *Rhinanthoideae* (*Scrophulariaceae*) in Iran an exact herbarium and field study has been conducted. The major findings of this study are: 1- *Rhynchochorys maxima* should be reduced under synonymy of *R. elephas*, due to priority of the publication of the basionym of the latter; 2- *Rhinanthus vernalis* is a synonym of *Rh. angustifolius* subsp. *grandiflorus*, because of overlapping of morphological characters applied previously in separating these names.

Key words: *Rhinanthus angustifolius*, *Rhynchochorys elephas*, *Rhinanthoideae*, Iran

INTRODUCTION

The subfamily *Rhinanthoideae* belongs to *Scrophulariaceae*. This subfamily comprises 14 genera in Iran (Rechinger, 1981), among which the most important ones are *Veronica* (60 species), *Pedicularis* (9 species), *Euphrasia* (4 species), *Rhynchochorys* (2 species), *Odontites* (3 species), *Parentucellia* (2 species), *Lagotis*, *Digitalis*, *Bellardia*, *Rhinanthus*, *Melampyrum*, *Leptorhabdos*, *Bungea* and *Lathraea* (each with only one species). Recently, the hemiparasitic Rhinanthoids e.g., *Rhinanthus*, *Rhynchochorys* and other genera have been suggested to be transferred into Orobanchaceae on the basis of molecular data (Olmstead and Reeves, 1995; Olmstead *et al.*, 2001).

As the recent taxonomic works (Mozaffarian, 1994; Saeidi *et al.*, 2001; Hamdi *et al.*, 2005; Saeidi, 2006) on different genera of *Scrophulariaceae* resulted in changing the concept of several species, describing new taxa and synonymy of some names. In this study it was decided to use standard morphological and taxonomical methods for solving the problems existing in subfamily *Rhinanthoideae*. The most important problems in subfamily *Rhinanthoideae* in Iran are: 1) polymorphic nature of some species, so that the borders between taxa is sometimes indistinct, 2) different opinions of the authors on systematic position of certain taxa and 3) deficiency of detailed taxonomic revisions on several genera. For example the position of *Rhinanthus vernalis* within this subfamily was problematic since long time. Soó and Webb (1972) placed *Rh. vernalis* in synonymy under *Rh. alectorolophus* (Scop.) Pollich. While Galubakova (1994) *Rh. vernalis* placed in synonymy under *Alectorolophus major* (L.) Reichenb.

In the framework of preparing a Farsi version of the Flora of Iran (Assadi, 1989) for the genera *Rhinanthus* and *Rhynchochorys* and finding new evidences for delimiting taxa in these genera, a detailed taxonomic study was conducted.

MATERIALS AND METHODS

All the morphological observations are based on Steromicroscope M5. The materials used in this study are kept in the Herbarium of the Research Institute of Forests and Rangelands (TARI) of Iran. Furthermore herbarium materials were also examined from the following herbaria: IRAN, KW, M and MW (abbreviations according to Holmgren *et al.*, 1990). Measurement were made from a lot sample for description of each specimen. This study was conducted during 2004-2005.

RESULTS AND DISCUSSION

The genus *Rhinanthus* in Iran: Under the name *Rh. vernalis*, Rechinger cited the specimen by Terme, 14175-E (herbarium Iran). Several new collections in the main herbaria of Iran, TARI and IRAN, match this plant in all morphological aspects. The above named specimens were compared with syntype of *Rh. angustifolius* in the herbarium of MW and one specimen determined as *Rh. angustifolius* was available to us from Turkey: B9 Agri: Taslicay to Diyadin, 47 km from Agri, stream banks, in *Salix* sp. scrub, 1850 m, 1 vi 1966, Davis 44003 (TARI: ex E). All studied specimens fit the description of *Rh. vernalis* in the "Flora Iranica" in all aspects (Rechinger, 1981). Therefore the synonymy of *Rh. vernalis* under *Rh. angustifolius* subsp. *grandiflorus* seems to be reasonable.

Rhinanthus angustifolius subsp. *grandiflorus* (Wallr.) D.A. Webb [1972, *Bot. J. Linn. Soc.*, 65 : 269] (Fig. 1). Syn: *Rh. vernalis* (ZING.) Schischk. and Serg., Fl. Zapat. Sibiria 10: 2530 (1939); *Alectorolophus angustifolius* Heynh. Nomencl. Bot. 1: 28 (1840); *Alectorolophus grandiflorus* Wallr., Sched.Crit. Fl. Hal. 316 (1822).

Stems to 60 cm tall, covered by glandular hairs or villous. Leaves narrowly oblong-lanceolate, upper ones sessile, crenate-dentate at margins. Bracts leaf-like, distinctly longer than the flowers. Calyx 20-23 mm long and 10-15 mm wide at fruiting time; lobes with 2 triangular acuminate at tip. Corolla yellow, hood mauvish, 18-20 mm long. Capsule subglobose in outline; style 23-25 mm long. Seeds flat, ovate, the wing ca. 1 mm wide.

Rhinanthus minor and *Rh. angustifolius* are known to hybridize in mixed populations in nature (Ducarme and Wesselingh, 2005). *Rh. angustifolius* differs from *Rh. minor* (to which it is closely related) by having longer style (23-25 mm against 18-20 mm in *Rh. minor*), longer corolla (18-20 mm against 12-15 mm in *Rh. minor*) and longer calyx at fruiting time (20-23 mm against 12-16 mm in *Rh. minor*).

Specimens examined. Iran, Prov. Azarbaijan: Khoy, Razi (border of Turkey), 2050 m, 9 vii 1991, Mozaffarian 69961 (TARI); Arasbaran protected area, road of Toupkhaneh, 1600-1700 m, 5 vi 1998, Hamzeh and Asri 81876 (TARI); C. 50 km NW of Khoy lake, above village Ghezelja, 2300 m, 26 vii 1990, Assadi and Olfat 68733 (TARI); W slope of Doghroon mountain, c. 2300 m, 25 viii 1976, Runemark and Assadi 22010 (TARI); Between Khoy and Siahcheshme, Mahlamlu, boundary of Turkey, 1950 m, 10 vii 1991, Mozaffarian 70001 (TARI); Doghroon and Khalan mountain, Khalan guard station towards Savalan Naveh, 2200-2550 m, Jamzad and Zehzad 70362 (TARI); c. 30 km NE Marand, Kueh-Kamar village, 2000-2600 m, 17 vi 1988, Assadi and Shahsavari 65634 (TARI); Hassanow near to Ahar, 2600 m, Terme 14175-E (IRAN).

The genus *Rhynchochorys* in Iran: The species of *Rhynchochorys* have been reported for the area of Flora Iranica by Rechinger (1981). *Rhynchochorys kurdica* Nab. is distributed in W Iran and is well characterized by alternate leaf phyllotaxy and length of rostellum of the corolla, but both species, i.e., *R. elephas* and *R. maxima* are very closely related to each other and the borders between them have not been clearly defined. The latter species should be recognized from each other based on differences in the width of lower labellum of the corolla

and length of pedicel. However, based on examined specimens there is no sharp delimitations in these characters. Comparison was also made with some specimens distributed in European countries (the complete list not given) and deposited in M and KW. The materials determined by Akhani (No. 10603) and Rechinger (No. 39637) as *R. maxima* in herbarium of M also show no sharp differences with which of *R. elephas* (No. 5903). The *R. elephas* has been introduced as Euro-Siberian element from Europe, Caucasia and N and C of Iran in several references as for example Hedge (1978). This species is considered to be widely distributed in the world including Iran. *Rhynchochorys maxima* was described based on specimen collected from Pirbazar (Rasht, Guilan Province). *Rhynchochorys elephas* has not been reported in the flora Iranica (Rechinger, 1981), however *R. maxima* had been recorded from Azarbaijan and Alborz mountain range. Based on several specimens studied in the present work, since specimens collected from the type locality of *R. maxima* and the comparison of these specimens with samples identified as *R. elephas* in some European herbaria. The result showed that the variation range of morphological characters among specimens is attributed to *R. elephas* and also *R. maxima*, therefore *R. maxima* is reduced under synonymy of *R. elephas*.

Rhynchochorys elephas (L.) Griseb. Sp. Fl. Rumel. 2: 12 (1844) [Kubat and Chr. Weber (1987)]. Syn: *Rhynchochorys maxima* C. Richter, Denkschr. Akad. Wiss. Wien Math.-Nat. Kl. 50: 25 (1825); *Rhinanthus elephas* L. sp. Pl. 603 (1753) (Fig. 2).

Stems 20-40 cm tall, covered by glandular hairs or pubescent. Leaves ovate, obtuse, dentate at margins. Bracts shorter than leaves, elliptic. Calyx to 16 mm long at fruiting time; lobes unequal; lower lip longer. Corolla yellow, 3-7 mm long; tube to 5 mm long. Capsule globose in outline; style to 22 mm long. Seeds subglobose, blackish.

Specimens examined. Iran, Prov. Ardabil: 6 km from Germi to Ani, West of Easemar village, 900-1200 m, 23 vi 1980, Mozaffarian and Nowrozi 34912 (TARI); Mazandaran: Ramsar, Salimac village, 450 m, 4 vii 1996, Assadi 75743 (TARI); Noshahr, Khire-roud kenar forest, 2000 m, 16 iv 1980, Assadi 33446 (TARI); Pol-Sefid to Sangdeh, Caleh, 2500 m, 22 v 1995, Assadi 73211 (TARI); Guilan: Lahijan, between Dayleman and Siahkal, before Bar-e-sar, 1400 m, 4 v 1987, Assadi and Shah-mohamadi 60126 (TARI); Assalam to Khalkhal, 800-1000 m, 29 v 1978, Wendelbo and Assadi 27731 (TARI); Tehran: Dar-band Sar, 2600-2750 m, 18 vii 1980, Mozaffarian 33874 (TARI).

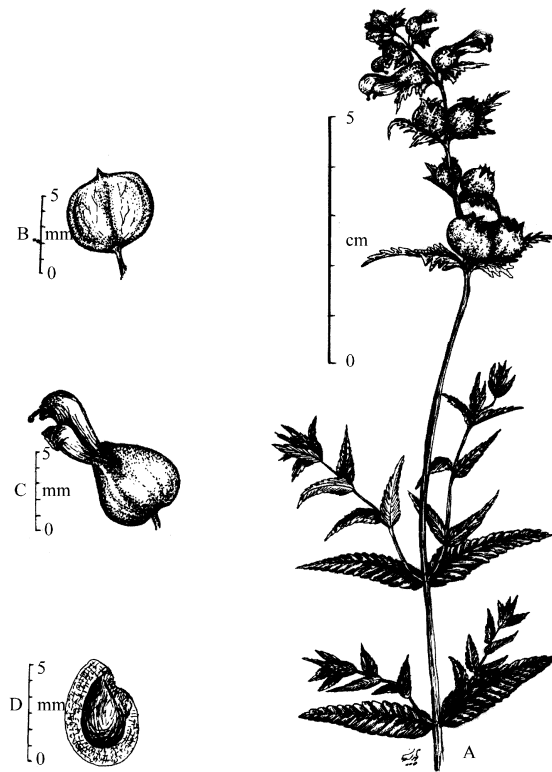


Fig 1: *Rhinanthus angustifolius* subsp. *grandiflorus* (Wallr.) D.A. Webb. (A) Habit, $\times 1.5$, (B) Fruit, $\times 5$, (C) Flower, $\times 5$ and (D) Seed, $\times 6$



Fig 2: Specimen of *Rhynchocorys elephas* in Munich herbarium

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