

NOTES ON THE *ONOBRYCHIS CRISTA-GALLI* (L.) LAM. (FABACEAE) IN IRAN

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A taxonomic status of the *Onobrychis crista-galli* was reviewed in Iran. Morphological characteristics, chromosome number and ploidy level were studied in 30 populations of this species collected from natural habitats. The results showed that the populations of *O. crista-galli* with 16 or 32 chromosomes are diploid or tetraploid respectively. Diploid populations had 3-seeded pods with a spinulose first row of spines, while tetraploid populations had 2-seeded pods with the first row of spines simple. Thus, *O. crista-galli* have 2 varieties in Iran namely *crista-galli* and *trilophocarpa* (Sirj.) Townsend, that var. *trilophocarpa* is recorded as a new report to the flora of Iran.

Key words. Iran, new record, *Onobrychis crista-galli*, Fabaceae.

بازنگری تاکسونومیک گونه *Onobrychis crista-galli* (L.) Lam. در ایران

فرنگیس قنواتی، استادیار موسسه تحقیقات اصلاح و تهیه نهال و بذر.

موقعیت تاکسونومیک گونه *Onobrychis crista-galli* در ایران مورد بازنگری قرار گرفت. ویژگی‌های ریخت‌شناسی، شمارش کروموزومی و سطح پلوئیدی ۳۰ جمعیت از این گونه که از مناطق مختلف کشور جمع‌آوری شده است مطالعه گردید. نتایج نشان داد جمعیت‌های موجود در ایران با داشتن ۱۶ یا ۳۲ کروموزوم دیپلوئید یا تتراپلوئید می‌باشند. جمعیت‌های دیپلوئید نیام سه دانه‌ای و خارهای منشعب در اولین ردیف بعد از کاکل دارند در حالیکه، جمعیت‌های تتراپلوئید دارای نیام‌های دو دانه‌ای با خارهای ساده در اولین ردیف بعد از کاکل هستند. بر این اساس *Onobrychis crista-galli* (L.) Lam. در ایران دارای دو واریته *crista-galli* و *trilophocarpa* (Sirj.) Townsend می‌باشد که var. *trilophocarpa* برای اولین بار از ایران گزارش می‌گردد.

INTRODUCTION

Onobrychis Miller with more than 130 annual and perennial species is mainly distributed from the Mediterranean region to Central Asia. The majority of the species are restricted to south-west Asia, especially Iran and Anatolia, making this area the main center of genetic diversity of the genus (Yildiz et al. 1999). According to Flora Iranica, this genus is divided into two subgenera namely subgen. *Onobrychis* (with four sections) and subgen. *Sisyrosema* (with five sections) based on morphological features and geographical origins (Rechinger 1984). The taxonomy of the genus continues to be subject of much confusion, mainly because of the different approaches to species delimitation, resulting in varying numbers of recognized species (Boissier 1872; Sirjaeve 1925; Hedge 1970; Ball 1978; Duman & Vural 1990; Aktoklu 2001). Recently some new taxa of the genus have been described from Iran (Ranjbar et al., 2004 & 2007; Amirabadi-zadeh et al., 2007 & 2009; Amirabadi-zadeh, 2011). Iran has 63 species of the genus

Onobrychis including 13 annual and 50 perennial species. *Onobrychis crista-galli* is an annual species belongs to section *Lophobrychis* and it is distributed in Aegaea, Rhodes, Cyprus, Syria, Lebanon, Palestine, Jordan. Lower Egypt, Turkey, Iraq, Iran and N. Africa.

Several systematic studies have already been done on *Onobrychis crista-galli*. Coss. and Dur. (1854) described *O. trilophocarpa* but Sirjaeve (1925) recognized two forms *ligulifera* and *trilophocarpa* based on number of seeds in pod. Sirjaeve's *trilophocarpa* form again was as subspecies for *Onobrychis crista-galli* by Maire and Quezel in 1962 and finally, Townsend (1974) changed into variety and introduced two varieties for this species namely var. *crista-galli* and var. *trilophocarpa* for Iraq.

There is a great diversity between and within species based on morphology and karyology thus; the chromosomes can be very useful to classify plants which can help to solve problems of classical taxonomy. Several chromosomal studies have been done on *O. crista-galli*. The first study performed

Table1. Voucher specimen, ploidy level, number of chromosomes, number of seeds and spine type in the *Onobrychis crista-galli* populations.

Row	Voucher specimen	Habitat	Ploidy level	Number of chromosomes	Number of seeds	Spine type
1	185 TN	Kermanshah, Salas and Babajani, Pich Koor village	4n	32	2	simple
2	187 TN	Kermanshah, Salas and Babajani, Phiyat village	4n	32	2	simple
3	188 TN	Kermanshah, Sare Pole Zahab, Zahab village, Goordner village	4n	32	2	simple
4	189 TN	Kermanshah, Salas and Babajani, Diokeh village	4n	32	2	simple
5	191 TN	Kermanshah, Sare Pole Zahab, Tahmasb village	4n	32	2	simple
6	192 TN	Kermanshah, Ghasre Shirin, toward Gilane Gharb	2n	16	3	spinulose
7	232 TN	Lorestan, Khoram abad, Markazi village, Toong Shabikhon village	4n	32	2	simple
8	233 TN	Lorestan, Pole Dokhtar, Gari talmak village, Vali Asr village	4n	32	2	simple
9	339 TN	Khozestan, Behbahan	4n	32	2	simple
10	340 TN	Khozestan, Masjed Soleyman, 15 km to the road of Masjed Soleyman, Roomy	4n	32	2	simple
11	365 TN	Booshehr, Ganaveh, Chahar Roostaei village	4n	32	2	simple
12	386 TN	Lorestan, Mahdasht, Olad Ghobad village, Koor village	4n	32	2	simple
13	387 TN	Lorestan, Koohdasht, Darivash village, Abkhoran village	4n	32	2	simple
14	640 TN	Lorestan, Koohdasht, Darivash village, Abkhoran village	2n	16	3	spinulose
15	399 TN	Kermanshah, Gilan Gharb, Kale Job Esfandiari village	4n	32	2	simple
16	641 TN	Kermanshah, Gilan Garb, Kale Job Esfandiari village	2n	16	3	spinulose
17	403 TN	Kermanshah, Eslam Abad, Rijab village, Ghoulgholeh village	2n	16	3	spinulose
18	642 TN	Kermanshah, Eslam Abad, Rijab village, Ghoulgholeh village	4n	32	2	simple
19	544 TN	Lorestan, Khoram Abad	4n	32	2	simple
20	545 TN	Lorestan, Khoram Abad	2n	16	3	spinulose
21	546 TN	Lorestan, Khoram Abad	4n	32	2	simple
22	559 TN	Fars, Noorabad, Jadeh Boan village	4n	32	2	simple
23	165 TN	Ilam	4n	32	2	simple
24	194 TN	Kermanshah, Eslam abad, Kerand, Soorkkeh Danireh village	4n	32	2	simple
25	389 TN	Fars, Firooz abad, Kangar Zanjanah village	4n	32	2	simple
26	400 TN	Kermanshah, Gilan Gharb, Vishnan village, Khazal village	2n	16	3	spinulose
27	407 TN	Kermanshah, Gilan Ghrab, Heydariyeh village, Babarostam village	4n	32	2	simple
28	642 TN	Kermanshah, Gilan Ghrab, Heydariyeh village, Babarostam village	2n	16	3	spinulose
29	6796MRCH	Bushehr: after Borazjan, between Saad-abad & Palangi, 50m.	4n	32	2	simple
30	6756MRCH	Khozestan: 47 km from Behbahan to Gachsaran, 680 m.	2n	16	3	spinulose

TN: Number of genotypes in National Plant Gene Bank of Iran.

during 1931 reported 14 chromosomes while in another study in 1938, 16 chromosomes were cited (Darlington & Wylie 1955). A number of researchers worked between 1977- 1997 on this species separately and they reported that $2n=16$ (Al-Mayah and Al-Shehbaz 1977; Baykabilov 1977; Diaz Lifante et al. 1992; Goldblatt and Johnson 1993; Oberprieler & Vogt 1996; Mohamed 1997). But in another study which performed by Goldblatt and Johnson (1994) the chromosomal number of the same species was reported as $2n=32$. Chromosome numbers of six species of *Onobrychis*,

including the Egyptian species and most representatives of section *Lophobrychis* was studied (Abou-El-Enain 2002). One of these species was *O. crista-galli* with having 32 chromosomes which was considered as tetraploid. In a recent publication the number of chromosomes in the Iranian specimens was reported to be 16 (Hesamzadeh Hejazi & Ziaei Nasab, 2010). Here we report the chromosome number of populations of *O. crista-galli* and its significance in their taxonomic relationships in Iran.



Fig. 1. Various pods and their spines in first row below the crest in *Onobrychis crista-galli* var. *crista galli* (right) and var. *trilophocarpa* (left) ($\times 10$).



Fig. 2. Mitotic metaphases of tetraploid (left) and diploid (right) populations of *Onobrychis crista-galli* ($\times 1000$).

MATERIALS AND METHODS

In this study, several locations in Iran have been visited and specimens were collected and reserved in the National Plant Gene Bank of Iran (NPGBI) which showed by TN. Therefore, herbarium specimens of NPGBI together with Khorassan Razavi Research Center of Agricultural and Natural Resources (MRCH) have been studied. The studied populations and their localities are listed in Table 1. Morphological characters, chromosome numbers and ploidy level examined based on Aghayev (1998). Chromosome number was determined in five plants per population.

RESULTS AND DISCUSSION

Onobrychis crista-galli (L.) Lam. occurring in Iran on slopes, degraded steppe land, roadsides, borders of field sand on conglomerate, gravel, gypsy, sandy and eroded clay with 20 to 1020 m altitudes. It is an annual herb, with many branches growing from the base. Ovary has 2-3 ovules. Pods in some populations had 2-seeds and first row of spines below the crest was simple. The others had 3-seeds and first row of spines below the crest was commonly laterally spinulose (Fig.1 and Table 1). Also the results shows that the *O. crista-galli* populations in Iran with two seeds are tetraploid and

have 32 chromosomes, but three seeds populations are diploid and have 16 chromosomes. Diploidity and tetraploidity of this species had been noted by Heyn (1962). In addition to that, tetraploid populations had simple spines, but diploid populations had spinulose spines. This study demonstrated that tetraploid populations with two seeds were more distributed across Iran, probably due to the tolerance of these genotypes to harsh environments. Presence of two populations with 2 and 3 seeds in one location proves that we can consider them as two varieties of this species, as already mentioned by Townsend (1974). The karyotypes of diploid and tetraploid populations are illustrated in Fig. 2 and important data of them are presented in Table 1. In addition, a short diagnosis of the varieties are presented.

Onobrychis crista-galli (L.) Lam.

-- var. **crista-galli**

Ovules usually 2, large. Pod shorter in proportion to its width; first row of spines below the crest simple.

Tetraploid plant.

--var. **trilophocarpa** (Sirj.) Townsend

O. trilophocarpa Coss. et Dur., Ann. Sci. Nat. Ser. 4, 1: 223 (1854), nomen nudum; *O. crista-galli* f.

trilophocarpa Sirj., Publ. Fac. Sci. Univ. Masaryk 56: 47 (1925); *O. crista-galli* (non L.) Heyn in Bull. Res. Counc. Isr. 11D, Bot.: 177-182(1962); *O. crista-galli* subsp. *trilophocarpa* Maire ex Quezel et Santa, Nouv. Fl. Alg. 1: 542 (1962), nomen illegit.

Ovules 3, smaller. Pod longer in proportion to its width; first row of spines below the crest commonly laterally spinulose. Diploid plant.

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