Intensive damage of Lilioceris chodjaii on Fritillaria imperialis in Kohgiluyeh va Boyerahmad province, Iran

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**ABSTRACT**

During 2011 to 2013, Intensive damage of unknown beetle pest was seen in Kohgiluyeh va Boyerahmad Province, Iran, on Crown imperial (Fritillaria imperialis L.), an invasive wild flower of Iran. Damages on leaves, stem, buds, seeds as well as flowers and rapidly destroying of the host plant were seen by the pest, extensively. Present investigation was done by the need to identify the pest on *F. imperialis*. This plant is growing well in Zagros mountain of Iran, especially in Kohgiluyeh va Boyerahmad Province which is located at the southwest of Iran. The insect was identified as Lilioceris chodjaii (Berti & Rapilly) based on a synopsis of the Oriental Lilioceris species, review of the Lilioceris species group and key provided for their identification. Larvae of the *L. chodjaii* did feed extensively and indiscriminately from different areal parts of the host plant. Adults of the pest were found as overwinter and dormancy phase of the pest in the soil beneath the Fritillaries plant during winter. The adult elytra (harder forewings) were bright scarlet and shiny, adult insect having black long legs, antennae and big eyes. Due to importance of *F. imperialis* as well as broad spectrum of the pest, pest monitoring and pest management programs should be taken in order to reduce pest damages in the future.

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**INTRODUCTION**

*Fritillaria imperialis* (Crown imperial or Kaiser's crown) belong to the genus *Fritillaria*, family Liliaceae, is called as Laleh-e-Vajhgoon (reverse tulip) and or gol-e-ashk (tear flower) in Iran. This genus includes 110 species, of which 14 species are native to Iran [8,10]. It grows to about 70 cm in height. Two economical important species of Fertilaria are; *F. persica* and *F. imperialis*. *F. persica* is native to Syria, Lebanon, Iraq, Iran, Jordon Cyprus and Southern Turkey and *Fritillaria imperialis* is found in Iran, Northern Iraq, Afganistan, Pakistan and Kashmir [3].

This beautiful and economically plant bears lance-shaped, glossy leaves at intervals along the stem and a prominent whorl of downward facing flowers at the top of the stem [8]. Numerous cultivars have been developed for garden use, of which the yellow-flowered 'Maximea lutea' has gained the Royal Horticultural Society's Award of Garden Merit [1,79]. The bulbs of various Fritillaria species are traditionally used as an important antitussive, expectorant, and antihypertensive drug in Turkish, Chinese, Japanese, Pakistani and southeastern Asian folk medicines [17].

Like other members of the lily family, *F. imperialis* is susceptible to depredation by the lily beetle [19]. The *Lilioceris* spp. belongs to the order Coleoptera, and the family Chrysomelidae, are known as plant pests that may eat and damaged all aerial parts of host plats, fritillaries and other members of the family Liliaceae. *Lilioceris lilii* and *Lilioceris chodjaii* are now pests in most temperate climates where lilies are cultivated [16]. The most reliable characters for discrimination of *Lilioceris* species are those of the internal sac of the aedeagus. In *Criocerinae*, these characters were used previously for separation of *Lilioceris* species from Iran and *Oulema* species related to *Oulema melanopus* L. [4].

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The genus *Lilioceris* is a large genus with the largest concentration of species found in China [20] and approximately six species found in Europe [12]. *Lilioceris lili* is now thought to be native to Asia and introduced into Europe about 400 years ago, possibly with ornamental lilies [14].

Present investigation was done by the need to identify a beetle that was feeding extensively on *Fritillaria imperialis* L. in Kohgiluyeh va Boyerahmad province, Iran.

**MATERIAL AND METHODS**

**Sampling:**
Sampling was done within a year by surveying on the mountain regions of the yasouj city which is capital of Kohgiluyeh va Boyerahmad province. This city is classified as temperate region with snowy winter [13]. During the survey, numbers of sampling was done by harvesting of different infected parts of the plants. Samples were transformed to the laboratory for morphological studies on larvae and adults of the insect, eggs numbers and shape, as well as other information about the insect in the natural condition.

**Plant and insect identifications:**
Identification of the pest species was done with the help of literature [19], internet web sites (eg. http://www.biol.uni.wroc.pl/cassidae/European, Chrysomelidae) and comparing the specimens with the *Lilioceris chodjaii* determined by Dr. I.K. Lopatin kept at Hayek Mirzayans Insect Museum.

The life cycle of the pest (from immature stage to adult beetle) was studied inside the laboratory by incubation at light color plastic vessels and feed them by fresh *fertilaria* leaves at room temperature, about 25 °C [15].

Plant species was identified with the help of plant herbarium of Agricultural and Natural Resources Research and Education Center, Kohgilouyeh and Boyerahmad province, Yasouj, Iran, as well as literature, voucher number: 7035.

**RESULTS AND DISCUSSIONS**

**Plant identification:**
Plant species was identified as *Fritillaria imperialis* L. with the help of plant herbarium of Agricultural and Natural Resources Research and Education Center, Kohgilouyeh and Boyerahmad province, Yasouj, Iran, as well as literature.

*Fritillaria imperialis* is a species of flowering plant of the genus *Fritillaria*, family Liliaceae, native to a wide stretch from Anatolia and Iraq across the plateau of Iran (Fig 1: G and H) to Afghanistan, Pakistan and the Himalayan foothills. It is also widely cultivated as an ornamental and reportedly naturalized in Austria. The common names and also the epithet "imperialis" refer to the large circle of golden flowers, reminiscent of an emperor's crown. [8,1].

Economic importance of *Fritillaria* are such extracts which are used in traditional Chinese medicine under the name *chuan bei mu*, and in Latin, *bulbus fritillariae cirrhosae*. Species such as *F. cirrhosa* and *F. verticillata* are used in cough remedies.

Most fritillaries contain poisonous alkaloids such as imperialin; some may even be deadly if ingested in quantity. But the bulbs of a few species, such as *F. affinis*, *F. camschatcensis*, and *F. pudica*, are edible if prepared carefully. They were commonly eaten by indigenous peoples of the Pacific Northwest coast [18].

The emblematic and often unusually-colored fritillaries are commonly used as floral emblems. *F. meleagris* (snake's head fritillary) is the county flower of Oxfordshire, UK, and the provincial flower of Uppland, Sweden, where it is known as *kunggängsblüta* ("Kungsängen lily"). In Croatia this species is known as *kokavica*, and the checkerboard pattern of its flowers may have inspired the *šahovnica* pattern on the nation's coat of arms. *F. camschatcensis* (Kamchatka fritillary) is the floral emblem of Ishikawa Prefecture and Obihiro City in Japan. Its Japanese name is *kuroyuri*, meaning "dark lily". *F. tenella* is the floral emblem of Giardino Botanico Alpino di Pietra Corva, a botanical garden in Italy [1].

**Pest identification:**

The pest was identified as *Lilioceris chodjaii* [4] with the help of literature [19], internet web sites (eg. http://www.biol.uni.wroc.pl/cassidae/European Chrysomelidae) and comparing the specimens with the *Lilioceris chodjaii* determined by Dr. I.K. Lopatin kept at Hayek Mirzayans Insect Museum.

*L. chodjaii* was first time reported by Berti and Rapilly [4] from Iran. The genus *Lilioceris* contains 142 species, of which 35 are found in the holarctic region, 60 are Oriental, 16 Australian, 20 Ethiopian, three neotropical, and the remaining eight species are of unknown distribution [4]. Among the European species, *Lilioceris lili* (Scopoli) 1863, appears to be the most widely distributed, with specimens recorded from as far north as Siberia and south through North Africa [12].
Pest life cycle and damage:

Adults of *Lilioceris chodjaii* were found as overwinter and dormancy phase of the pest in the soil beneath the Fritillaries plant during winter. In spring (May) adults were emerged and feed on young *Fritillaria imperialis* leaves. Eggs of the pest were seen soon of around 6 reddish-orange on and under the host plant leaves in irregular lines. The eggs length was around 1mm and protected by a thick, sticky brown coating. In lab condition, eggs hatched after nine days. The larvae were brownish with large black heads (Fig 1: A). The larvae were clearly disgusting due to covered by slimy brown shield. They were similar to bird droppings. Larvae did feed extensively and indiscriminately from different areal parts of the host plant when they were more mature (Fig 1: B and C). Pest life cycle was consisting of 5 larvae stages. At the end of feeding, maturated larvae creep down the plant, seeking soil and produced waterproof cocoon around their bodies. Pupa transform from larva to adult beetle occurred about 20 days inside the cocoon in lab condition. The new adult beetle have been feeding on lilies until early fall, overwinter and then emerged in the next spring. In our cases, *L. chodjaii* produced only a single generation per year. However, records show that up to three generations can be produced in a single breeding season and that females may survive to reproduce in two successive years [5].

The adult elytra (harder forewings) were bright scarlet and shiny, adult insect having black long legs, antennae and big eyes.

All parts of *F. imperialis* plants such as the leaves, stem, flower, buds and seeds were feed by the different larval stages within growth seasons (Fig 1: A - F). Invasion occurs shortly after the new plants emerge from the soil, particularly if there are nearby *Fritillaria* which emerge earlier.

It is only one report of *Lilioceris chodjaii* in the world by Berti and Rapilly, [4]. However, life cycle and biology of other *Lilioceris* species have been studied well. *Lilioceris lilii* lays its eggs most often on *Lilium* and *Fritillaria* species. In the absence of *Lilium* and *Fritillaria* species, there are fewer eggs laid and the survival rate of eggs and larvae is reduced [6]. The adult of *L. lilii* is about 6 to 9 mm in length, with relatively long legs and antennae. Its elytra (harder forewings) are bright scarlet and shiny. Its underside, legs, eyes, antennae and head are all black. It has large eyes, a slim thorax, and a wide abdomen [11].

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**Fig 1:** A-E (Different parts of *Fritillaria imperialis* infected by *Lilioceris chodjaii*, F (Larvae of *Lilioceris chodjaii*)), G and H (Healthy *Fritillaria imperialis*).

**REFERENCES**


