Wild Golden Iris (*Iris aurantica*) in Syria

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Abstract

*Iris aurantica* is a rhizomatous perennial, from the south mountain of Syria (Jabal Al Drouze), it has a compact rhizome and falcate leaves. It has a slender stem with flowers golden yellow to coppery-brown. The golden iris in Syria is becoming rare due to destruction of their natural habit. In this paper, plant classification, botanical description, morphological, geographical, chemical composition, *in vitro* propagation and conservation, and cryopreservation of *Iris aurantica* are investigated.

Keywords: Morphological; Botanical description; Micro propagation; Conservation; Chemical composition

Abbreviations: MS: Murashige and Skoog; HF-MS: Hormon Free Murashige and Skoog; PVS2: Plant Vitrification Solution 2; LN: Liquid Nitrogen

Introduction

Syrian flora has 3247 species [1]. There are many of endemic species, some of which belong to genus Lilium, Crocus, Tulips and Iris. Iris is the largest and most complicated genus of iridaceae, which includes over 300 species [2]. This includes some of the world most popular and varied garden flowers that are originated in both Japan and the Mediterranean [3].

In Syria, *Iris* is considered as a wild perennial herbaceous plant that subjected to strict protection, though Iris grows naturally in many regions of Syria. It presents some 30 species grown in Syria [1]. There are five subgenus found in the world. Aponog, Pogonias, Xiphion, Guno and oncocyclus which includes most of the Syrian species, that are considered as rare endemic plants, characterized by special, beautiful forms that have a great importance in applied studies for genetic biodiversity, such as *Iris aurantiaca* Dinsm.

*Iris aurantica*, of Syria was first discovered by Dinsmor on the Tell Quleib in Syria. Mouterde found it in several other places in Djebl Druze, Tell Qouleib, Kafer, Tell Jaffna, Mayamas, Sahwe-EI-Khodr [1] and Distribution in the Djebl Druze at about 1600m [4]. Dr. Werkmeister, Professor of Botany at the Botanical Institute, Geisenheim am Rhein, Germany which had the opportunity to collecting the golden iris in 1961, and cultured it in his garden. The golden Iris flowered in Europe in June one month later than in their natural habit in Syria [5].

Iris plants in Syria are becoming rare due to both ongoing destruction of their natural habit, as well as over harvesting of wild species and the influencing of modernization, i.e., urbanization, migration, deterioral climatic and environmental changes, adding the huge destruction of plant biodiversity by the hard war since 5 years [6].

In this paper, Plant classification, botanical description, morphological, geographical, chemical composition, genetic variability, *in vitro* propagation and conservation, and cryopreservation of *Iris aurantica* were investigated.

Scientific Classification

*Iris aurantica* L is one of the important species that belongs to the family Iridaceae, endemic to Jabal Al’Arab, rhizomatous (with thick, creeping underground stems) [7].

A. Kingdom: Plantae.
B. Unranked: Angiosperm, Monocots. Order Asparagales.
C. Family: Iridaceae. Subfamily: Iridoideae, Tribe: irideae.
D. Genus: Iris, Subgenus: Oncocyclus. Species: *Iris aurantiaca*.

Description of *Iris aurantica*

*Iris aurantica* is a perennial plant, growing from compact rhizome that reaches up to 10-14 cm long. Rhizome develops from axillary buds, it allows new shoots to grow upwards. The golden iris rhizomes planted underground about 5-10cm in rocky soils (Figure 1). It uses rhizomes to store nutrients like proteins, starches and lipids, these nutrients become useful for the plant when new shoots will be formed in early spring.
Golden Iris Propagation

The propagation of *Iris* species is usually accomplished vegetatively through bulbs or splitting of rhizomes (*rhizomatous Iris*). In *rhizomatous Iris*, splitting the rhizomes gives a maximum of 10 plants per year per rhizome [8]. Furthermore, the propagation of *Iris* species through seedlings is known to be difficult due to a poor fruit set and a very low germination rate.

Plant tissue culture is a powerful alternative technique for propagation and conservation of plants, especially for those that are rare and difficult to propagate by conventional methods. Therefore, a new trend has evolved to propagate these species through tissue culture technique in order to preserve it from deterioration and to study the possibility of using them as a medical or ornamental plant.

Micro propagation is the aseptic culture of cells, pieces of tissue, or organs. It is possible to regenerate new plants from small pieces of plant tissue identical to the plant from which it was derived.

The process of micro propagation can be divided into four stages:

A. **Initiation stage:** The objective of this stage is to achieve an aseptic culture. An aseptic culture is one without contaminating bacteria or fungi. Base of leaves and shoot tips of rhizomes in *Iris aurantica* (after surface disinfection by chlorox 3%) were cultured on solidified MS medium containing 30g/l sucrose, and supplemented with 2mg/l BAP and 0.2mg/l IBA (Abouzedan and Al-Batal 2015). Results showed, after one month of culture, that using shoot tips of rhizomes resulted in the highest growth percentage (35.76%) in initial stage [9].

B. **Multiplication stage:** A growing ex plant can be induced to produce vegetative shoots by including a cytokinin in the medium and different media. In *Iris aurantica*, the highest average number of shoots per ex plant was found (3.43) under BAP at a concentration of 3.0mg/l (Figure 4), and MS media resulted in the highest multiplication rate and shoot length with significant difference compared with Heller media. Subculture of the plantlets on the same medium resulted in increasing multiplication rate and shoot length in *Iris aurantica* [9] the
treatment of high concentrations of cytokinins (5 and 10mg/lBAP) consist of appearance of vitrification.

C. Rooting stage: Growing shoots can be induced to produce adventitious roots by including an auxin in the medium. In iris aurantica, the highest root percentage (88.5%) was obtained on medium containing 3mg/lIBA (Figure 5). The highest root number (4.25) was recorded when using the concentration 0.5mg/lIBA [9] (Table 1).

D. Acclimatization: A growing, rooted shoot can be removed from tissue culture and placed in soil. When this is done, the humidity must be gradually reduced over time because tissue-cultured plants are extremely susceptible to wilting. The acclimatization in vivo was achieved easily with high percentage of success (86.95%) in iris aurantica (Figure 6). Two months later, plantlets were cultured in greenhouse and the average length of shoots were 23.25 cm [10].

**In Vitro Conservation**

Conservation is a very simple in vitro technique that permits conservation plants material for periods ranging from 6 months to 5-7 years, depending on species [11]. This technique is based on reducing the growth rates of the tissue cultured plant and yet increasing the intervals between subcultures [12]. Research was conducted, to develop an in vitro technique for short-term conservation and relieve of growth and increase the period of time between transfers of Iris aurantica. The best osmotic agents for in vitro conservation was sucrose compared with (mannitol and sorbitol) and the best medium concentration was 1/10 MS [10] in iris aurantica the cultured stored at (3 °C) gave the highest survival (93.33%) and lengthening the time period between transfers up to 6 months [10]. ABA was found to regulate expression of many genes that are responsible for the syntheses of proteins needed for osmotic adjustment in the cell, such as, membrane stabilization proteins, and the LEA proteins that would modify water state in the cell to cope with osmotic stress [13]. Some researchers reported that ABA is responsible for low temperature tolerance capacity of plant tissues [14]. In our research Iris aurantica micro shoots were conserved for more than nine months at normal growth room conditions in the media supplemented with 0.5 to 3.0mg/lABA, also ABA significantly decreases growth of shoots in medium when compared with control.

Results showed that the best survival after three, six and nine month were obtained in media supplemented with 2 and 3mg/l ABA with significant difference compared to the control at 3 °C and normal growth room conditions. The best treatments on germ plasm conservation were in 3mg/l ABA at 3 °C, in these treatments the survival rate was 60%.

**Long - Term Conservation (Cryopreservation)**

The principle of cryopreservation is the storage of plant material at ultra low temperature (-196 °C) that takes a place in a cryogenic condition which is liquid nitrogen [15]. At this
were excised which has antifungal properties [31]. The other is very difficult to cultivate. It can be encapsulated, and 19 in [29]. The major compound in these essential oils was Myristic acid (61.42%, 70.67%) in Iris germanica, and Iris aurantica respectively with no significant differences [29]. The findings here agreed with those obtained [30] which noted that the myristic acid was the major compound of the oil of the fresh and naturally aged rhizomes in Iris pallida which has antifungal properties [31]. The other sub major compounds obtained were Lauric acid, Decanoic acid (Capric acid), Palmitic acid methyl ester, Octadecanoic acid, methyl ester, Elaidic acid methyl ester (9-Octadecenoic acid methyl ester (E) and Palmitic acid [29].

The highest percentage of Lauric acid was obtained (6.97%) in I. aurantica, with no significant differences comparing with Iris germanica (5.69%), these findings give us the possibility to investigate the use of Iris aurantica for medical purposes [29].

Iris Cultivation

Wild Iris aurantica is very difficult to cultivate. It can withstand the cold and the heat as long as it is dry. Golden iris needs well drained soil and at least 6-8 hours sunlight. If the soils are heavy, sand or humus may be added to improve drainage. The ideal pH is less than 7, slightly acidic. Iris should be planted preferably to be divided and planted at least six weeks before the first frost in any area.

The rhizomes produce more rhizomes, which in turn lead to more leaves and flowers. One rhizome of golden iris can give more than ten flowers. When the bloom production slows and the climatic conditions (Figure 7). It is preferable to give deep watering at long interval is better than shallow watering.

Gas chromatography–mass spectrometry (GC-MS) analyses of the essential oil have indicated the presence of 23 compounds in Iris germanica, and 19 in Iris aurantica [29]. The major compound in these essential oils was Myristic acid (61.42%, 70.67%) in Iris germanica, and Iris aurantica respectively with no significant differences [29]. The findings here agreed with those obtained [30] which noted that the myristic acid was the major compound of the oil of the fresh and naturally aged rhizomes in Iris pallida which has antifungal properties [31]. The other sub major compounds obtained were Lauric acid, Decanoic acid (Capric acid), Palmitic acid methyl ester, Octadecanoic acid methyl ester, Elaidic acid methyl ester (9-Octadecenoic acid methyl ester (E) and Palmitic acid [29].
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