

FSL 3: Recent achievements of the introduction and improvement of native medicinal plants in Iran

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Abstract

Iran is the country of different climates and rich gene pool of different medicinal herbs. Both climate variation and available genetic resources, make possible the introduction and improvement of new plant varieties into agriculture. *Artemisia dracunculus* has been cultivated in different parts of Iran since unknown time. *Satureja rechingeri* is a wild endemic species growing in desert area of south west of Iran with annual rainfall of less than 250mm while, *Solidago virgaurea* and *Equisetum arvense* are native to north and northwest of Iran with more than 700 mm annual rainfall. Several experiments were conducted to introduce new varieties of these plants for economic and high quality plant material production in agricultural systems. Here some of the results are presented.

Keywords: Medicinal plants, Introduction, Tarragon, Wild Savory, Horsetail, Goldenrod

Introduction

In order to supply the demands of food and pharmaceutical industries with high quality plant material, improvement of *Artemisia dracunculus* and introduction of *Satureja rechingeri*, *Solidago virgaurea* and *Equisetum arvense* were performed.

Iran is the country of different climates with

French tarragon (*A. dracunculus* L.)

A. dracunculus, an important spice plant, is considered for its aromatic values in different food preparations or as a functional food or dietary supplement (RIBNICKY et al., 2004). French tarragon is cultivated in different parts of Iran since unknown time for production of fresh herb, dried leaves or essential oils. An experiment was carried out during 2010-2015 to detect variability of morphological and volatile oil characters, rust resistance and DNA typing, and tolerance to salinity and drought stresses of cultivated accessions of Iranian *A. dracunculus*.

Wild Savory

Satureja rechingeri, an endemic herb of Iran, is characterized as a rich source of carvacrol and rosmarinic acid. In the framework of a domestication program, study of natural habitats, evaluation and selection of different genotypes and progeny testing of elite ones for general combining abilities of important traits were performed.

Goldenrod (*Solidago virgaurea*) and Horsetail (*Equisetum arvense*)

Goldenrod, an herbaceous perennial plant, is widespread across Europe, North Africa and Asia. Herbal drugs of Goldenrod have been used to increase the amount of urine and as adjuvant in treatment of minor urinary complaints. Morphological features and phytochemical quality of some Iranian natural populations of *S. virgaurea* were studied and compared with those of bred European cultivars.

Horsetail (*Equisetum arvense*)

Equisetum arvense, is a herbaceous perennial plant, native throughout the arctic and temperate regions of the northern hemisphere. Vegetative parts of *E. arvense* have been used in several cos-

metics and pharmaceutical preparations. Several *Equisetum* species are growing wild in Iran, of them *E. arvense* is normally growing in higher altitudes in north and northwest of Iran. Agromorphological and phytochemical characteristics of some *E. arvense* Iranian populations were studied as a part of an introduction program.

Materials and Methods

Tarragon

Morphological, phytochemical, DNA (ISSR and SRAP) diversity and rust resistance of cultivated accessions of *A. dracunculoides* was investigated.

Wild Savory (*Satureja rechingeri*)

A total of 85 samples of *S. rechingeri* were collected from seven natural populations in Iran and analyzed for morphological and phytochemical characters. Then, all populations were grown in the same environment, of them 58 tolerant and well established genotypes were selected and cloned. Half-sib (HS) progenies of the 58 parent clones were obtained by polycross and were evaluated in a randomized complete block design (RCBD) with six replications in order to select the parents of a synthetic variety based on general combining abilities (GCA).

Goldenrod and Horstail

Different populations of *S. virgaurea* and *E. arvense* were identified in the north of Iran and several individual plants were sampled to study their agro-morphological traits and accumulation of flavonoids and polyphenolic acids. Besides, two European varieties of *S. virgaurea* were prepared and grown in the field to study their adaptation and quality.

Results

Tarragon

High variability was recorded in plant height (37.22–59.62 cm), plant diameter (34.00 – 64.61 cm) and leaf area (0.39 – 1.78 cm²). Leaf dry weight ranged between 7.93 g (for Qom2) and 27.19 g (in Yazd). The essential oil content ranged from 1.42 to 2.53 v/w. Analysis of the essential oil showed methyl chavicol (68.21 – 81.11 %), limonene (7.18 – 16.73 %) and terpinolene (0.01 – 7.68 %) as the main components. Both ISSR and SRAP methods were suitable for discriminating among accessions and the SRAP markers were more efficient and preferable. The results of multiple regression analysis revealed statistically significant association between rust resistance and some molecular markers that they can provide clues for identification of the individuals with higher rust resistance. Results showed that all accessions of Abadeh, Neyshabour, Zarand, Esfahan1, Shahr-Rey, Yazd, Unknown2, Estahbanat, Ardestan, Tabriz, Dezful, Torbat-Heydarye and Shiraz did not show any infection. Total leaves, healthy leaves and infected leaves were numbered for each susceptible accession and then infected leaf percentage was estimated. Among susceptible accessions, Esfahan2 individual had the lowest infected leaf percentage (11.38 %) while Kermanshah showed the highest (74.79 %). Tarragon accession also showed different susceptibility to both salinity and drought stresses.

Wild Savory (*S. rechingeri*)

Satureja rechingeri is growing in tropical and subtropical areas in the province of Khuzistan and Ilam, within longitude of 32 to 33 and latitude of 46 to 49 and altitude of 350 to 1100 m. It has been fully grown on rocky limestone and tissues. The highest coefficient of variation among all populations was obtained 43.01 % for leaf area. Lowest coefficient of variation was determined for

length and diameter sepal (16.93 % and 19.44 % respectively). Essential oil content was varied between 0.93 % to 6.2 % among populations. The essential oil composition was homogeneous as the main chemical component in oils of all the studied populations was carvacrol (89.2 – 96.2 %). Rosmarinic acid content of methanolic extracts had considerable variation varying from 0.54 to 7.29 % (w/w) of the dry matters based on qualitative and quantitative TLC analysis.

Evaluation of half-sib (HS) progenies of the 58 parent clones showed that highest narrow sense heritability was belonged to plant diameter, plant height and main branches number while lowest value was obtained for the number of lateral branches. Additive variance was significant for main branch number, fresh weight, and dry weight, weight of leaves and flowers and plant height. By selection of 20 percent of the half-sib families, based on general combining ability for essential oil yield, families of F₂₇, Z₁₂, Z₃₇, F₁₄, E₅₉, E₃₇, Z₂₆, Z₂₈, K₅₆ and G₂₇ clones can be selected as parents of a synthetic variety.

Goldenrod and Horstail

It was possible to identify natural population of Goldenrod both in the jungles and in the rocky rangelands in the north of Iran. The growing sites were within altitude of 1300 to 1750 m. The plants were highly variable for their agromorphological traits. Plant height and dry weight were variable within 12 to 51 cm and 0.4 to 9.44 g/ plant, respectively. Flavonoids and polyphenolic acids were also variable among natural sites.

Populations of Horstail are growing within altitude of 600 - 2300 m. Height of horstail plants was variable from 15-39cm while plant dry weight was different between 0.32 - 0.85 g/plant. Total phenolics, total flavonoids, Isoquercitroside content and silica percentage of different populations were also variable giving the opportunity for selection.

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