Global marketing of Persian clover (*Trifolium resupinatum* L.) accsessions based on eco-geographical distribiution

Abstract

Iran is considered one of the important centers of diversity of the Persian clover. In order to introduce the best populations for their marketing and sales, 48 accessions were collected from various parts of country and relationship between geographical distribution with ecological factors were studied. The results showed that the distribution of populations is mainly in the north, northwest and the center of country. Altitude and rainfall are two important environmental factors in the distribution of this species. Also it can grow on a wide range of soils but does better on fertile heavy moist clays. It is suggested that the accessions of Persian clover that are grow and cultivated in the north and northwest of the country are more important in marketing in terms of favorable geographical conditions, which should be considered by marketers.

Keywords: Marketing, Persian clover, Ecological factors, Iran

INTRODUCTION

Persia clover (*Trifolium resupinatum* L.) is an annual plant. It is native to Asia Minor, Iran, Egypt and Mediterranean countries [1]. This plant is considered in terms of fodder production and annual pasture construction, and it is also planted to prepare green manure, improve and increase soil fertility. Persian clover is used with great desire by birds and domestic animals. This plant is cultivated and used either pure or mixed with all kinds of Poaceae family plants [2,3].

Fodder obtained from Iranian clover is used by livestock in late winter and early spring, when no other plants have started to grow [4].

Iran is one of the centers of diversity of this species. In Iran, this species has many native cultivars, the name of each cultivar is derived from the name of its planting region.

Persian clover has adapted to most of the cold and semi-cold regions of the country and is resistant to cold. Its main growth is during the winter season and it grows lying on the ground. Its cultivation is recommended in many provinces of the country, including Hamedan, Chaharmahal Bakhtiari, Zanjan, Kohkiloyeh and Boyer Ahmad, Kermanshah, East and West Azerbaijan, Central Province, Fars, Khorasan and Karaj. Attar is the first modified cultivar of Iranian multi-fold and medium clay clover that was introduced in

2017[5,6]. Ecological factors such as climate, altitude, edaphic factors and geographical location, unique farming systems, and competent growers have provided the key elements that have caused our country as the leading exponent in the world supply of Persian clover.

The challenge ahead of our industry is to maintain this competitive edge in an ever changing market place. From a global perspective, Persian clover would rate on volume basis as the world's key pasture legume, well behind alfalfa white clover and red clover. Considering the variety of climatic conditions in Iran country, in this study, it has been tried to introduce the best wild accessions for cultivation and marketing by analyzing the eco-geographical factors of this species in different regions of the country.

MATERIAL AND METHDS

Taking into account the climatic regions of the country, collecting from the southern provinces, including Fars and Khuzestan provinces, and towards the western and northern parts of the country, including the provinces of Lorestan, Kermanshah, West Azerbaijan, East Azerbaijan, Golestan, Mazandaran, Gilan, Qazvin and Tehran. done.

The collection areas included meadows, grasslands, open plains, foothills, highlands, forests, river banks, desert and mountainous areas, and salt marshes, as well as fields and fields. Based on the collected points, the geographic length and width of each point as well as each germplasm or plant sample was calculated on the map. Soil texture in the first horizon and soil pH were determined based on piezometric method. Also, based on the reports of the Meteorological Organization of the country, the average annual temperature during a twenty-year period, as well as the average amount of rainfall in each collection point and for each collected mass were determined. Multivariate statistical analysis was performed based on the ranking of environmental factors including altitude, temperature, rainfall, soil texture, soil pH and vegetation area of the collected masses according to Table 1 and using the Minitab program. A frequency distribution table was made in order to divide the populations based on each of the environmental factors. Also, factor analysis was done in order to determine the most important sources of changes.

Analysis into main components was also done by Single linkage method on the data obtained from the ranking of 6 traits (Table 2).

RESULTS AD DISCUSSION

A total of 48 accessions were collected from the vegetation areas of the country. which were spread at an altitude of 10 to 3850 meters.

They are located at 900-1500 meters. In general, 96.4% of the samples are located at altitudes higher than sea level and lower than 2750 meters.

It seems that higher altitudes (mountains) are not suitable for the growth of plants.

91.7 percent of all the samples were present in areas where the average rainfall is from 100 to 1000 mm per year. On the other hand, only 3.8% of all samples are in the rainy areas more than 1000 mm per year.

The average annual temperature is 5-20°C, while 13.7% of the samples are located in areas with temperatures over 20°C.

The possibility of this presence is considered due to the amount of presence and compatibility in areas with relatively high temperature. 89.8% of the samples are located in areas where the soil is sand and loamy sand or sandy loam or relatively heavy soils, and only 10.2% of the samples are located in fine-textured soils including clay and silty clay soils.

It shows that, Persian clover can grow on a wide range of soils but does better on fertile heavy moist clays. Another hand, it seems that this species reduces nitrogen requirements and increases grain yield in specialized irrigated hybrid rice system, so *Trifolium resupinatum* is an exception as it is a promising species due to its adaptation to waterlogged soils [7].

Therefore, the populations related to the north and northwest of the country have a higher potential for investment, both for the amount of the product and for helping to cultivate other species, especially rice. 46.7% of samples are located in soils with alkaline pH. 8.2% of the samples were distributed in acidic soils, 5.9% in relatively acidic to neutral soils, and 16.6% in soils with a pH higher than eight. In general, 78.9% of the samples were placed in soils with pH less than eight.

It seems that it is tolerant of alkaline soils with pH up to 9 but prefers a pH of about 5. Persian clover is also tolerant of salinity and withstands some waterlogging conditions [2, 8,9].

Table1. Effective eco-geographical characteristics in distribution of Persian clover

character	score
Altitude(m)	0= <0 ,1= 0-300, 2= 300- 900, 3= 900-1500, 4= 1500-2150, 5=2150-2750 m
Rainfall(mm)	0= <0, 1= 100- 200, 2= 200- 300, 3= 300- 400, 4= 400- 500, 5= 500-600, 6= 600- 800, 7= 800- 1000, 8= 1000- 1400, 9= >1400
Temperature	0 = 5- 10, 1= 10- 15, 2= 15- 20, 3= 20- 25, 4= >25
Vegetation area	1= Hyrcanian Temperate& very Cold, 2= Hyrcanian Temperate, 3= Mountainous & very Cold, 4= Mountainous & Cold, 5= Mediteranean with Spring Rainfall, 6= editeranean, 7= Semi-Desert & Cold, 8= Semi- Desert & Hot, 9= Desert & Dry, 10= Desert & Hot & Dry, 11= Costal & Hot & Dry, 12= Costal & Dry
Soil texture	0= Loamy sand, 1= Loam y, 2= Silty Clay Loam or Clay Loam, 3= Clay or Silty Clay, 4= Silty
Soil pH	0= 6- 6.9, 1= 7- 7.9, 2= 8- 9

Factor analysis showed that altitude and rainfall are two important environmental factors in the distribution of species. As the altitude increases, the rainfall also increases. These two factors, along with soil pH factor, are the most important factors in dispersion (Table 2).

Table 2 Contribution of each component to eco-geographical characteristics

Component	Ratio	Plural percent
1	0.323	0.324
2	0.198	0.521
3	0.183	0.700
4	0.157	0.861
5	0.086	0.947
6	0.055	1.000

Based on our results, the best soil for the growth of the species are medium textured soils of sandy loam, loamy soils and relatively heavy soils containing sandy clay loam, clay loam and clay loam.

Also, the suitable pH for the growth of species is mainly alkaline soils with a pH between 7-8, rarely the masses are distributed in acidic pH or very alkaline pH higher than 8.

The results of this study showed that the most diversity and distribution of Persian clover is mainly in the north, northwest and central parts of the country and along the best vegetation area of this plant are Hyrcanian temperate, Mediteranean with Spring Rainfall, Mediterranean and Semi-Desert and cold climate.

Based on this, the eastern provinces of the country have very little diversity in terms of the distribution of populations of this species.

Due to the fact that in the marketing of agricultural products, the ripening time and the amount of fodder production are very important, therefore it is suggested that the accessions of Persian clover that are grow in the south and northwest of the country are more important. These are the best regions with have favorable geographical conditions, which should be considered by marketers.

CONCLUSION

In general, it can be said that due to the wide climates where this species grows, there are very good materials of Persian clover for breeders and marketers in Iran which should be noticed by the breeders and marketers of this plant.

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