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Recognition of Isoclimate Potentials for Planting of Avocado Tree in East Gilan, Iran

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ABSRACT

Different geographical areas and their talent identification and mapping them are the major goals of environmentalist geographers. Identifying environmental potential with the objectives of food production and employment is a priority in spatial planning and the share of industrial plant Avocado in this section can be very valuable. This paper aims to identify optimum geographical areas for fruit production of Avocados from the perspective of isoclimate and maps of areas prone it. In this study, the climatic factors and physiological properties of this plant have been assessed and the results are presented as map.Research methods are applied method, using description data and analysis of them with the field study with regard to natural geography science. Results has showed that in terms of climate, almost all regions of the East Gilan plains are prone to grow Avocados but since this plant, prefer not to water logging and due to water logging of the coastal soils, these areas are unsuitable for growing Avocados.

Keywords: Avocados, Gilan, Environmental potential, Agricultural isoclimate.

INTRODUCTION

Avocado is a fruit native to Mexico and it is special to humid and subtropical areas and grows well in areas with mild winters. Avocado is used and reproduces for two intentions, one to plant in the villas green space and parks and other to produce fruit. Avocado oil extraction from Avocado flesh contains various vitamins (A, C, E, D, K, B, and H) and various amino acids and reduces blood cholesterol. Vitamins B5 found in Avocados helps accelerate healing of ulcers, especially after surgery.

The medicinal properties of Avocado is blood making and can be treated anemia. It treats stomach and intestine. It is anti-arthritis and is useful for treating jaundice (Maghsoudi, 2010). These fruit are used for industrial use and food factories, cannery, production of medicine, health creams and extraction oil industry and economically to help the farmers in this area. Given the high rate of sales, this fruit was good and affordable for the cultivation and its use in industry, creates employment and help to unemployment in the region and build new factories and it is a step to promote economic growth in province. Therefore, studying the culture of this plant seems to be indispensable in the plains of East Gilan. Given the ecological conditions for plant growth and development for this region, the area prone to Avocado plants cultivated in the plains of East Gilan is studying.

Avocado tree with a common name of Aligator, Agoacate and Paltace pear, is belonging to the sweet bay family, contains about 47 genera with 2000-2500 species. The plants in various ecological conditions, ranging from the tropics around latitude 30 degrees North and South is compatible. This widespread distribution may result from extremely genetic differences of three crop race (Guatemalan, Mexican and Western Hindi) (Berg, 1976). In this among, The Mexican race due to being more resistant than the two other breeds and more adapted of these breeds to Gilan climate, Avocado plant physiological characteristics will be dealt with based on this race.

Optimal growth temperature of Avocado is 20 to 25 C^0. But higher temperatures will lead to cessation of photosynthesis. This amounts are resistant to a temperature of -4^0 to -5^0 without damage of wood and shoots, but the flowers will be damages (Sharifani, Islamian, 2010).

This plant in the growth period is needed between 1200 to 1750 mm average annual rainfalls. Of course, all areas of cultivated Avocado have dry and wet periods, and thus require somewhat more supplementary irrigation (Nakason, Powel, 2008).

Avocado plants are hygroscopic and are grown in wet areas. In general, high humidity, more than 50 percent especially during flowering and early stages of the fruit is good (Hatoon & Rider, 1972).

In the need for soil, the plants are grown in a wide variety of soils. Deep soils with volcanic origin, sandy loam soils, lime and other soil types are suitable for the development of its. Since Avocados are susceptible to root rot, proper drainage is essential and high water table is inappropriate for it (Vaili & et al. 1988).

The purpose of this article, due to the importance of Avocado oil in various industrial applications, pharmaceutical, food, etc, determining the appropriate scope of Avocados grown in the East area of Gilan is in the isoclimate perspective.

In this regard, while determining the appropriate range of planting this plant; more land can be

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cultivated under cultivation in the province to take this product which have special place in the world and in this way, while employing the unemployed in this sector, either in the areas of product or converting it into other applications, can take step in to solve the unemployment problem and also helped to increase the income of rural households.

With regards to present study, a comprehensive study has not ever conducted in the province. Of course, the research has been done with subject nearly to all research in the province, for example, the climate and the agriculture of central plains of Gilan in order to plant crops of canola (Shahnazari,2003) and to study the soybean crops in the plains of Gilan (Hashemnia,2003). In isoclimate studies, regions where have suitable climatic conditions for cultivation of certain plants, are characterized and thus the potential of the land with actual and potential power will be determined and thus increase the quality and quantity performance of the product (Shakoor, 2002). Among the elements of the climate, the temperature regime has the greatest impact on plant growth, because of the physiological development of plants is dependent on temperature (Radmehr, 1997). Hashemi and colleagues (Quoted by Ramezani), using Torenth White method, were identified isoclimate regions and consider isoclimate the Northern parts of Iran with Southern part of Japan and West of Iran with some regions of the United States of America and some parts of Spain. Kamali and Koochaki (1994) also found talent of bioclimatology needs of cotton in Khorasan, with the maps depict the same history of the thermal threshold and determine the appropriate period of growth through the distance between the histories to cross the mentioned threshold to the first day on frost and on the set of maps. Nantsen and Siliyaninef (Quoted by Kamali, Koocheki, 1998), were the first researchers in the areas of isoclimate point in agriculture. They evaluated Day-degrees and phototermal units. Nild (1975) using a Growthing degree day-G.D.D method consider temperature of 5 C^0 as the minimum threshold in terms of cold wheat and millet and 10 C^0 for corn ,soybean,sugar beet,grain sorghum and peanuts. Ramezani(2006) determine the isoclimate area of Gilan plain to develop peanut cultivation and presented the areas prone the cultivation of this plant on map.

Kazemirad (2010) determined the isoclimate of the plains of East Gilan for the Moso bamboo planting and provided the areas prone to cultivation of this plant is areas on map.

Sheikhi (2005) had been studied Avocado plant in botany, ecology and etc. KhoshKhooy, Sheibani, Rouhani and Tafazzoli (2010) described the plant Avocado and have been examined the physiological properties of this plant.

DATA AND RESEARCH METHOD

East Gilan plain is located from 49' 45" to 50' 37" of east longitude and from 36' 50" to 37' 28" of North latitude (figure 1). This region is an alluvial area between the northern slopes of the Alborz Mountains and southern coast of the Caspian Sea and these area of alluvium, the rivers are flowing from the Alborz to the Caspian Sea has created. The latitude of these plains in the east is 2/5 km and in the west, that is in the lower basin of Polroud and Shalmanroud (North - South) is 15 km (Eslah Arabani, 1995).

Figure 1: Geographical situation map of the plains of East Gilan

In order to doing research, statistics and meteorological data from four climatological and evaporimetery stations within the study area and two synoptic stations of Ramsar and Rasht and outside the area,along with observations and field operations and data analysis were used .The characteristics of selected meteorological stations are presented in Table 1.

Table (1): The characteristics of selected meteorological stations.

Station name	Longitude	longitude	Station type	Height	Statistic period
Rasht	39^0 - 49	37^0 -12	Synoptic	36/7m	1980-2000
Astaneh	49^0 -56	37^0 -16	Rain gauge	-10m	1980-2000
Lahijan	50^0- 00	37^0 -11	Climatology	-2m	1980-2000
Dastac Amirabad	50^0 - 10	37^0-22	Rain gauge	-25m	1980-2000
Ramsar	50^0 - 40	36^0-54	Synoptic	-20m	1980-2000
Derazlat(Roudsar)	50^0 -17	36^0-59	Rain gauge	155m	1980-2000

In this research, at first the study area was found on topographic maps.
Then, using collected climate data and station locations, climate map of the area was prepared. Then, according to county soil maps, areas suitable for growing Avocado plant, in terms of potential productivity of the soil for this plant, was determined in the study area (East plain of Gilan). Finally, through the overlapping maps (Given the limitations of paper plates, maps were removed) using GIS, the isoclimatic area (desirable, semi-desirable and undesirable) of plant Avocados was determined on map in the East plain of Gilan.

RESULTS

The average total rainfall in the whole plains of East Gilan is between 1200 (Ramsar) and 1430 (Lahijan) mm which located in the range suitable for the cultivation of Avocados.
The relative humidity of this area is ranging from 75% (Ramsar) to 88 / 2 percent (dastac Amirabad) which is suitable for growing Avocado plant.

The average annual maximum temperature in the total study area is a range between 19 / 6 (Ramsar) to 22 / 4 (Drazlat) C^0 and the average annual minimum temperatures are between 6 / 8 (Drazlat) to 13 / 2 (Ramsar) C^0 which is suitable for Avocado plant cultivation.
Since there is no map that represents the soil texture and all the data available in the soil, is incomplete, so analysis to determine the appropriate scope for the cultivation of Avocado plant from the soil was had done approximately and due to soil map published by the Ministry of Agriculture (Deputy of Budget and Planning) and use of geology experts. With surveys, determined that the lands bordering the Caspian Sea, due to an elevation below sea level have a saline soil with poor drainage and high water table levels and is not suitable for Avocado plant cultivation. But in other parts of East Gilan plain, there is no limitation to grow Avocado plant. Findings and data obtained from the survey results, presented in Table 2.

Table 2- Findings and the results of research data.

Elements of climate and soil	East plain of Gilan	Avocado	desirable	undesirable
Temperature	6/8 to 22/4 C^0	5 – 25 C^0	×	--------
Rainfall	1200 to 1430 mm	1200-1750mm	With regard to supplemental irrigation	--------
Humidity	75% to 88/2%	> %50	×	---------
Soil	The coastal sector are saline soil and poor drainage	Water logging and poor soil drainage are not prefer	Offshore soil with good drainage	Coastal areas with poor soil drainage

Conclusion

The isoparametric study of maps and compare them with Avocado climate needs show that whole range of the studied area (East plain of Gilan) in parameters of climate is susceptible to cultivate this plant. But according to the Avocado tree that prefer not to water logging soil and also due to water logging of the coastal part, these areas are unsuitable for cultivation it. In order to determine areas susceptible to growing Avocados due to the requirements specification of Avocados and properties in the studied area (East Gilan plain) with overlap to several maps (Given the limitations of paper plates, maps were removed), the maps of area prone to Avocado plants cultivation in the plains of East Gilan is presented in three groups (desirable, semi-desirable and undesirable). As can be seen in figure 2, Avocado plants grown in areas favorable areas around Rasht area, Lahijan, Rudsar, Ramsar and semi-desirable area of it is surrounding around Astaneh (fig 2).

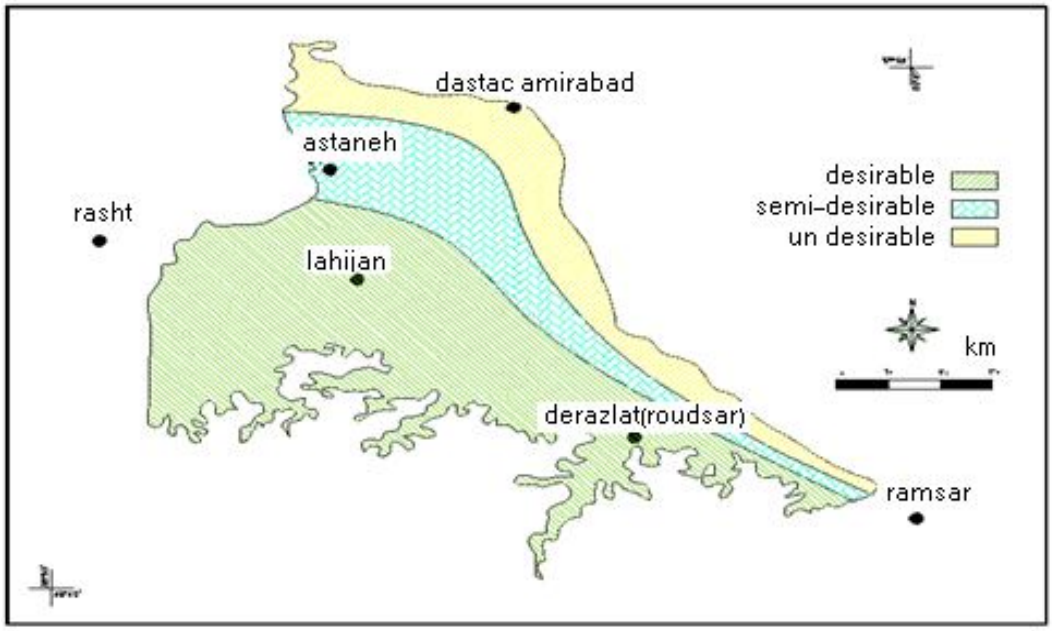

Figure2- The area prone to Avocado plant cultivation in the plains of East Gilan

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