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Study of Lands Covered by Border Rivers of Kermanshah Province to Present the Pattern of Industrial Fruit Trees Cultivation

Rahmatollah Gholami^{*1}⁽⁰⁾, Mohyeddin Pirkhezri²⁽⁰⁾, Mohammad Gerdakaneh¹⁽⁰⁾, Seyed Morteza Zahedi³⁽⁰⁾

¹Crop and Horticultural Science Research Department, Kermanshah Agricultural and Natural Resources Research and Education Center, AREEO, Kermanshah, Iran

²Temperate Fruits Research Center Horticultural Sciences Research Institute, Karaj, Iran ³Department of Horticultural Science, Faculty of Agriculture, University of Maragheh, Maragheh, Iran

ARTICLE INFO	ABSTRACT
Original paper	To study the lands covered by the border rivers of Kermanshah province to provide the pattern of fruit
Article history: Received: 4 Oct 2022 Revised: 21 Nov 2022 Accepted: 25 Dec 2022	tree cultivation from 2017 to 2019 based on field studies of the target areas and the review of meteorological information, soil science, the history of fruit tree cultivation in the study areas, the pattern of tree cultivation of fruit was determined in these areas. Climatic zoning and providing a regiona cultivation model is one of the duties of those in charge of production to reduce the damage to producers due to climatic factors and to control the amount of production, which helps regulate the market
<i>Keywords:</i> Boundary river Environmental conditions Species selection Fruit cultivation	Presenting a regional cultivation model in line with production policy and preventing production surplus, which by completing the production chain can overcome the problems of the past few decades in the country's fruit industry. The purpose of this project is to study and analyze the climatic, soil, and social conditions of land covered by border rivers in different parts of Kermanshah provinces that have different climates and microclimates. Also, field studies are the history of cultivation of horticultural products, and finally, the suitable species of each region and the bases appropriate to the soil conditions of those regions are suggested.

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1. Introduction

Iran is one of the most important countries in the world with about 2.8 million hectares under cultivation and annual production of 20 million tons of tree products. The average per capita fruit production in the country is three times the world average. For this reason, the selling price is very low at certain times of the harvest season and due to the lack of processing and storage systems, causes great economic losses to gardeners and the country (F.A.O., 2020). However, for various reasons, such as comparative advantage, reduction of water resources (Gholami, 2012), being more economical than other crops, etc., the annual development of gardens in the country takes place (Caprio and Quamme, 2006). Many gardeners, through trial and error, obtain species and cultivars that are

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appropriate to the conditions of their region, which imposes a great cost on producers and ultimately a great financial burden on the country's economy. The studies of Pirkhezri (2019) to determine the cultivation pattern in Kurdistan and Ilam province showed that cultivation priority is based on the environmental conditions prevailing in the Ziviye area (Kamiaran-Kurdistan). Due to the existence of special microclimates and the variability of new cultivars and species, it is recommended that new cultivars and especially cultivars that have not been cultivated be evaluated for local compatibility, and all susceptible species were recommended for each region according to suitability with climatic conditions, and then based on economic value and other indicators such as shelf life, market

Corresponding author.

E-mail addresses: gholami.rahmat@yahoo.com

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elasticity, etc., three priority species were presented with appropriate numbers and foundations.

Determining a suitable cultivation pattern requires that the study area be divided according to the hydrological areas and units in that area and based on the potentials and the general situation of each area, a cultivation pattern appropriate to the conditions of that hydrological unit is presented. The aim of this research was studying the lands covered by the border rivers to provide the pattern of fruit tree cultivation based on field studies.

2. Materials and methods

2.1. Location of study areas

During the three years of the implementation of this project, after field visits to the studied areas, and analyze the climatic, soil, and social conditions of land covered by border rivers in different parts of Kermanshah provinces that have different climates and microclimates, the cultivation pattern was determined. The regions of Kermanshah province include three different temperate and cold climatic regions of Jamishan (Miyan Rahan Songhar) and Zamkan (Gahvare), the subtropical region of Salas-e-Babajani (Ezgeleh) and Sarpol-e Zahab (Dasht-e Zahab Shomali, Dasht-e Zahab Jonubi, Ghale Shahin and Bashiveh). The third region is the tropical region of Qasr-e Shirin and Sumar, Jegarloo, Sharafshah and Sumar 1, Sharafshah and Sumar 2. Each region has its cultivation pattern.

2.1.1. Jamishan

The total area of the projected gardens is 383 hectares and due to the lack of native soil maps, a model map has been provided. Walnuts, almonds, and pears are suggested as a typical temperate region.

2.1.2. Zamkan 2

The study area is located in Kermanshah province and in the suburbs of Gahvare, which is its center, to Islamabad-e Gharb, which is located in the south, is about 40 km. A total area of 700 hectares and 270 hectares of gardens is predicted.

2.1.3. Ezgeleh

The study area is 909 hectares located in Kermanshah province and the city of Salas-e Babajani and adjacent to the Iraqi border, which includes three areas of Ezgeleh, Jagiran, and Sarqaleh. The projected garden area is 160 hectares.

2.1.4. Sarpol-e-Zahab

The study area includes land located in the subtropical basin of Kermanshah province with an area of 13592 hectares located in Sarpol-e-Zahab city, including Dasht-e Zahab Shomali, Dasht-e Zahab Jonubi, Ghale Shahin and Bashiveh. The total area of the projected gardens is very low and 484 hectares.

2.1.5. Qasr-e Shirin and Sumar

South Jegarloo has 1054 hectares of total land and 138 hectares of gardens and Sumar 1 and 2, 1735 hectares of total and a total of 40 hectares of gardens are predicted.

2.1.5.1. First priority

Walnut late leaves 10, Chandler, Pedro, Hartley cultivars with Franket and Ronde De Montignac and altitudes above 1600 to 1700 native cultivars of Jamal and Damavand.

2.1.5.2. Second priority

late flowering almonds - Recommended base: Peach hybrids Almonds (such as GN-GF677 series bases - bitter almonds, etc.).

Suggested cultivars: Shahroud 12 and 7, Shokoofeh, Sahand - Spanish A200 - Tono, Supernova, Araz, Eskandar, Aydin, Saba.

2.1.5.3. Third priority

Pear - Suggested rootstock: Pyrodwarf - Suggested cultivars: Dargzi - Kochia - Louisban - Espadona -Siberia - Beiruti.

The area and location of the lands allocated to each species in each area require detailed maps and detailed soil studies. Because it depends a lot on the characteristics of soil texture and soil depth in different parts of the field. Therefore, it is strongly recommended to cultivate parts of the field that have heavy and deep soil texture for pear cultivation and parts that have light and stony or shallow soil for late flowering almond cultivation. In terms of altitude layers, it is recommended to cultivate almonds in the upper elevations and pears in the lower elevations. In the pear planting system, according to the Pyrodwarf base and density of about 800 to 1000, the cultivation canal system is removed by digging canals in rows to a depth of one meter and a width of 60 cm and modifying the soil of the dug canal. Due to the rapid return on investment, this method is quite economical.

The Gahvare area has been the center of rose cultivation since ancient times and gardeners are completely familiar with this product, the local cultivar of the Gahvare apple has been the origin of this region.

However, it is possible to cultivate other mild fruit species in this area (Gholami, 2012). Considering the relatively uniform environmental conditions in the whole field and the importance of centralized cultivation and facilitating the management of orchards, it is better to limit the number of proposed species to the above three species. Dried European plums are also suitable in terms of climate, but the culture of cultivation, especially the culture of processing and preparing nuts can determine the cultivation. Cherry cultivation may also be recommended in areas of the design area that do not have calcareous spots.

2.1.6. Salas-e Babajani

2.1.6.1. The first priority of figs

Monjifi cultivars of Islamabad-e Gharb for the production of dried figs (flour).

2.1.6.2. Second priority

Grapes of early and middle cultivars such as Yaghouti, Perlete, Superior and Redfilm.

2.1.6.3. Third priority

Seeded fruits such as Plum, Nugget Apricot and Beauty Plums.

2.1.7. Sarpol-e Zahab

2.1.7.1. First priority

Seeded fruits such as Plum and Apricot.

2.1.7.2. Second priority grapes.

2.1.7.3. Third priority

According to the climatic and soil needs of the three crops of olives, figs and pomegranates then it is possible to cultivate olives in the northern regions of Qasr-e Shirin, and to cultivate olives and figs in Salase Babajani. Olives, pomegranates and figs can be grown in Sarpol-e Zahab and olives, pomegranates and figs can be grown in the western regions of Dalahu.

Due to the tolerance range of some Pecan cultivars and tolerance of temperatures up to -8, these cultivars should be adapted in the test area.

** Strict recommendation: Due to the existence of special microclimates and variability of new cultivars and species, it is recommended that new cultivars, especially cultivars that have no cultivation history, be evaluated for local adaptation.

3. Results

The economic value of the species that can be developed includes: walnuts, olive (Gholami, 2015) almonds, pistachios (Spiegel, 1985), date palm (Shabani et al., 2014), hazelnuts and pear and cherry (Anderson, 2002) products due to the good elasticity of the domestic market and also plums, especially (European) dried plums are among the species that can be developed in the country (Caprio and Quamme, 2006). Pistachio has very complicated conditions in the country, on the other hand, the country's production has decreased significantly. Until 2011, Iran was the world's largest producer and exporter, but since 2012, the United States has been ahead of Iran in the production and export of this product. In 2015, with more than 120,000 ha and an average yield of 2.6 tons/ha, its production will reach more than 300,000 tons. Increasing the area under cultivation poses a great challenge to Iran's pistachio exports in the future. In a country with an area under cultivation of 320,000 ha, we produce about 225,000 tons. This means that Iran's average performance is less than one-third of that of the United States, which means that our production costs are three times that of the United States, which means that we are not able to compete on price. The unstudied expansion of pistachios in recent years in more than 25 provinces of the country and also the surplus of global production due to US production can be predicted that in 2025 a major crisis will enter the country's pistachio production and exports. To deal with this crisis, it is now necessary to pay sufficient attention to the large potential markets that the United States is penetrating, such as China and India, which, while maintaining the current European and American markets, had a share of this large market. In this study, many areas covered by border rivers are prone to pistachio development. But

for the above reasons as well as an expansion it is less recommended by the people except in special cases. It was recommended for each region according to the climatic conditions of all species. Then, based on economic value and other indicators such as sustainability, market elasticity, etc., three priority species were presented with cultivars (Tables 1 and 2).

Table 1. Priority of cultivation based on environmental conditions prevailing in Zamkan and Jamishan regions (Gahvare, Mian Rahan, Kermanshah)

Tree garden products	Suitable species	Economic species in order of priority	Suggested cultivars **		
Dried fruits	Walnuts, almonds, pistachios	1- Walnut *	Available cultivars: Chandler, Pedro, Ronde De Montignac, Hartley, Franckt,		
2- A		2- Almonds	Stone: Fransis, Fradville, Supernova, Sahand A200 and A230.		
			Semi-stone: Shahroud 21.		
			Paper: Shokoofeh, Araz, Eskandar on GF677, GN bases and for poorer soils and calcareous and rocky slopes bitter almond seed base		
Stone fruits	Peaches and Nectarines (industrial), Cherries (late	6-European plums	Two purposes (dried and fresh) Ante, President / Seed base.		
	cultivars), Sour cherry (industrial), European plums		Compatibility should be assessed on a Sent Julien basis for a semi- dense system.		
	(dried fruits)	5- Cherries	Sumbers ****, samba, single seed, etc. on the base of Ghezila 6		
		7-Sour cherry ***	Sigani, 59KB, Buttermo		
Seeded fruits	Apple *, pear	3- Pear	Beiruti, Koshia, Luisbon, Abt Vettel, Melina, Pakams, Espadona,		
		4- Apples	Dargazi, etc. on the basis of Pyro Dovarf in a semi-dense system with canal planting		

Small fruits Grapes, Strawberries

* Combined with peach and nectarine (industrial cultivars)

** Strict recommendation: Due to the existence of special microclimates and variability of new cultivars and species, it is recommended that new cultivars, especially cultivars that have no cultivation history, be evaluated for local adaptation.

Table 2. Proposed model of subtropical and tropical Kermanshah (**)

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	Olive: Local genotypes of	Grapes of early cultivars such as					Dried and semi-
	Olive Ban Avareh	Yaghouti, Perlete,	Figs	Pecan*	Citrus	Seeded fruits	combined dates of
	3 and 6 as well as	Superior,					citrus
	Deiren cultivar	Redfilm.					
Ghale Shahin	*	*	*	*	* Portugal Lemon Orca		
Bashiveh	*	*	*	*			
Dasht-e Zahab Shomali	*	*	*	*			
Dasht-e Zahab Jonubi	*	*	*				
Ezgeleh	*	*	*	*		*	
Sharafshah and		*			*		
Sumar							
Jegarloo Jonubi					*	*	*
			Monjifi	Cold tolerant cultivars	Sweet lemons (rocky soils), light soils of lemons: Pearl Tanjelo, Orlando Tanjelo, Lemon Mayer, Lisbon Lemon, Beers Lime Tangerine Cinno on sour orange base	Heat-tolerant apricots such as Nugget and Goldis, Plum Beauty, Plum of different cultivars	Suggested cultivars: dried and semi-dried dates Ashreshi, Zahedi, Majol, Diri, Pyarm, Esteemaran

4. Discussion

In the field visits made to the orchard in the border cities of the province including Qasr-e Shirin, Sarpol-e Zahab, Salas-e Babajani and Dallaho cities, the orchard in these cities includes mostly old gardens and in some cities new orchard. Old orchards that are more than 60 years old and contain different varieties of fruit in different cities, which were mentioned separately in each city above, are usually irrigated by the method of irrigation or flooding. The new orchards, which have been cultivated and built in recent years by observing the technical points in regular rows, are often planted with date trees, citrus fruits and early grape varieties, olives with regular intervals and more scientific and principled cultivation in Qasr-e Shirin city (Pars Pivand Biston Company) and Sarpol-e Zahab, the irrigation in these orchards is a drip irrigation system. The area of the old and new orchards in different areas of this project has changed, so that in Sarpol-e Zahab city, today, orchards are planting early grape varieties, especially Yaqouti grapes, at planting intervals of 2 x 3 meters (between rows of 3 meters and on rows of 2 meters). In Qasr-e Shirin city, the cultivation of dates, citrus fruits and early grape cultivars, and in Dallaho city, walnut and apple cultivars are also being cultivated. Considering the beginning of fruiting in these orchards, especially grape, apple, and walnut cultivars, it seems that the necessary measures should be taken regarding the marketing of garden products, the construction of a cold store and a workshop for processing and conversion industries in order to prevent fruit waste during production and the orchard of the region in the future, they will not face the serious problem of price drop when the product is released to the market. If there is a drop in the price of grapes and that is due to the existence of an intermediary during the ripening of the ruby grapes. In this regard, Pirkhezri (2019) observations in Kurdistan and Kermanshah provinces showed that cultivation priority is based on the environmental conditions prevailing in the Ziviye area (Kamiaran-Kurdistan). Due to the existence of special microclimates and the variability of new cultivars and species, it is recommended that new cultivars and especially cultivars that have not been cultivated be evaluated for local compatibility and all susceptible species were recommended for each region according to suitability with climatic conditions and then based on economic value and other indicators such as shelf life, market elasticity, etc., three priority species were presented with appropriate numbers and foundations. In this study, it was recommended for each region according to the climatic conditions of all species.

5. Conclusion

In general, from this research, it can be concluded that the proximity to the country of Iraq, which has created a good potential for the export of garden products, as well as the presence of the permanent and abundant Sirwan River and the channel of the tropical system, the possibility of developing garden areas due to the presence of suitable and susceptible lands. It provides gardening around it.

Conflict of Interests

All authors declare no conflict of interest.

Ethics approval and consent to participate

No human or animals were used in the present research.

Consent for publications

All authors read and approved the final manuscript for publication.

Availability of data and material

All the data are embedded in the manuscript.

Authors' contributions

All authors had an equal role in study design, work, statistical analysis and manuscript writing.

Informed Consent

The authors declare not to use any patients in this research.

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