Horticulture in Iran Can Be an Alternative to Petroleum and a Major Source of International Business with Unique Potential and Challenges

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Abstract. The art and science of horticulture and horticultural crops are integral parts of Iranian's rich and ancient culture and modern economy. Many deciduous fruit, flowers, and vegetables are native to Iran (Persia), and from there, they were distributed to the rest of the world through the Silk Road established by the Achaemenid, the Royal Pars Dynasty. Variations in climate and presence of numerous mountains, lakes, rivers, and natural springs have created a unique country capable of producing all types of fruits, vegetables, and flowers. Apples and other deciduous fruits are commercially produced in mountain ranges of Alborz and Zagros and in many central provinces of Iran. The Caspian Sea area in the north of Iran is one of the most unique regions in the world where mild Mediterranean climate meshed with the adjacent Alborz mountain ranges has created a home to numerous species of edible horticultural plants, ranging from tea to cherries and pomegranates. Pistachio, olive, citrus, banana, and date are produced in Kerman, Fars, and Khuzestan regions. However, the Iranian horticultural industry faces many challenges, including global and regional political issues. Although some attempt has been made to preserve invaluable germplasm, a large number of native fruits, vegetables, and flowers are becoming extinct. Postharvest transportation and storage of horticultural crops is one of the most important issues facing Iranian horticulture. The future of horticulture in Iran can potentially be bright, and horticultural products have the potential to replace the oil income after reserves disappear, particularly if peace prevails in the region.

INTRODUCTION AND OBJECTIVES

Iran is strategically considered as the most important country in south-west Asia. The importance of this country is not only geopolitical, but also geographical and agricultural. The objective of this article is to briefly review the highlights of Iranian history and geography with a major emphasize on its horticultural industry.

IRANIAN HORTICULTURAL GEOGRAPHY

Iran consists of a major portion of what was once the Persian Empire. Geographically, Iran is located in south-western Asia between 25 to 40° North latitude and 45 to 63° East longitude (Fig. 1). It borders three Commonwealth of Independent States (the Republics of Armenia, Azerbaijan, and Turkmenistan), as well as the Caspian Sea to the north, Turkey and Iraq to the west, the Persian Gulf and the Gulf of Oman to the south, and Pakistan and Afghanistan to the east. Because of its vast land area and variation in rainfall, Iran's climate ranges from arid in the south to the rain forests in the north. Variations in climate and presence of numerous mountains, lakes, rivers, and natural springs have created a unique country capable of producing all types of fruits, vegetables, flowers, and agronomic

crops. The Caspian Sea area in the north of Iran is one of the most unique regions in the world where mild Mediterranean climate meshes with the adjacent Alborz mountain ranges, creating a home to numerous species of edible plants, including wild and domestic apples, medlars, cherries, pomegranates, citrus, quinces, olives, kiwi, tea, rice, and melons. In addition to apples and grapes, quinces and pomegranates are produced in Isfahan and other central provinces. Pistachio, olive, citrus, banana, and date are produced in many of the southern provinces such as Kerman, Fars, and Khuzestan. Pistachio and many of the deciduous fruit species are native to Iran and are believed to have been distributed to China and Europe, and from there to the rest of the world through the Silk Road established by Darius the Great of the Achaemenian Dynasty. Apples and other deciduous fruits are commercially produced in mountain ranges of Alborz and Zagros and in many areas of Iran, including regions near Tehran (particularly Damavand, Taleghan, Karaj, and Qazvin), Azarbaijan, Khorasan, Kordestan, and Isfahan.

INGENUITY AND ART IN HORTICULTURE

Horticulture and horticultural crops are an integral part of Iranian's rich and ancient culture. This fact is well documented in Persian Cuneiform, heliography, art, poetry, and historical documents (Khojandi and Yeganeh, 2008). For example, the word "Paradise" which refers to a group of dwarf apple rootstocks (Hatton, 1917) is derived from the Persian word "Pairidaeza" or "Pardise" meaning garden or park or heaven (Tukey, 1964). This word is frequently used in the European literatures during 17th and 18th centuries. Today's Malling 9 is among the group

of "Paradise" rootstocks. Dwarf trees and dwarf horses were very popular in ancient Persia, and Paradise was used for dwarfing apple trees.

The long history of horticulture in Iran has made Iranian growers creative in the efficient use of limited resources such as water and in controlling pest and diseases under adverse conditions. For example, there is evidence that drip irrigation was used in the desert region of "Yazd" in central Iran, to save precious water some 3000 years ago. Storing rainwater in the reservoirs and structuring berms and hills to avoid salt injury during irrigation are examples of growers' ingenuity of the ancient and modern Persia.

Organic production of horticultural crops has been the traditional method of production, and this method is still practiced despite the wide use of modern cultural practices. Cyrus the Great was one of the most skillful horticulturists in the history of world. Cyrus had great skills in many horticultural practices such as grafting, pruning, and breeding fruits. Pre- and post-Islamic Persia has an undisputed share in the advancement of knowledge of horticulture. In numerous Zoroastrian traditions, fruits, flowers, and herbs have a major significance, and many of those traditions were completely preserved, combined, or modified after Islamic era and are still practiced in Iran. Numerous decorations and ceremonial arrangements of herbs, fruits, and flowers during Nouroz (Persian new year, March 21st) tradition are clear testimonies to the presence of intertwining relationship between horticulture and the Persian culture.

Iran is the native land to many flowers such as tulip, poppy, narcissus, and hyacinth, and many of the mountain ranges and plains of Iran are often covered with these wild flowers in the spring. Numerous Persian

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Fig. 1. Map of Iran (Iran Political Map, 2017).

poets have poetically and elegantly described breathtaking scenery and majestic view of these flowers in Persia before and after Islamic era, namely Khayyam, Rahi Moayeri, Hafez, Sadie, Roodaki, and Farookhi Sistani.

POTENTIAL AND CHALLENGES

Iran has a unique potential for production of horticultural crops, because of its rich and diverse climatic conditions and creative and talented growers. Based on FAO (2017) statistics, Iran ranks first in fruit and second in vegetable production in the Middle East. Consumption of fruit, flowers, and vegetables in Iran is high. In addition to the domestic market, Iran has a major share of export for many of the major fruits and vegetables in the global market. In an extensive research project, it was reported that Iran has hundreds of native apples and pears in different

provinces, and various pomological characteristics of these native gene banks were described (author's unpublished investigation between 1972 and 1975). The commercial flower industry has significantly advanced in Iran in the recent decades. Flowers are used for all occasions; domestically as well as for the export market.

Iranian horticulturists are educated either in Iran, Europe, United States, New Zealand, Australia, or other countries. This diversity of horticultural education has given strength to Iranian horticulture. Numerous universities and research institutions in Iran are actively pursuing to improve the quality and quantity of food produced and to increase growers' income. The Internet has been a tremendous source of information for Iranian horticulturists. Ingenuity of some horticulturists in Iran is impressive as they mesh the traditional and modern technology and science of horticulture to become more efficient in the production

system. A typical example of this ingenuity can be seen at Fadak Farm near Qum, Iran. In this 100-ha olive orchard, a uniquely structured chimney is built to convert the hot wind in the desert to a cooling system by going through a water misting spray for storing olives, without any electricity or other sources of power. At this farm as well as many other orchards, the magnificent architecture at the entrance to the orchard highlights the everlasting passion of Iranian growers with horticulture. Examples of modern techniques for fruit production can be seen at the Sorkhdasht Fruit Orchards in Damavand and Arzhang Kooh Research Center in Taleghan, Iran.

Large domestic consumption and proximity to the Persian Gulf and European markets are among the positive factors for the Iranian horticultural industry. However, Iranian horticulture faces major challenges and requires substantial improvements. Although some

attempt has been made to preserve hundreds of invaluable germplasm in Iran, numerous native varieties of apples walnuts, plums, and pears are becoming extinct. A substantial number of valuable date palms were destroyed during the 8-year Iran–Iraq war. Postharvest transportation and storage of horticultural crops is one of the most important issues facing Iranian horticulture. Iranians prefer to consume their fruits when they are almost ripe. Thus, harvesting at an earlier stage of maturity is not very popular in Iran. This issue, combined with lack of sufficient storage facilities, lead to a very high percentage of culls in fruits, vegetables, and flowers. Packing facilities and containers are poor. Fruits and vegetables are often packed in small and fragile wooden boxes and wrapped in shredded paper and are transported in non-refrigerated units. Although

some modern packinghouses are built in various regions, they are insufficient to meet the demand. Although the cut flower industry is thriving in all regions, particularly close to large cities, storage and transportation of flowers is a major issue and requires new technology. Extension horticultural services in Iran also need major improvement, particularly for remote areas.

In general, the future of horticulture in Iran could be bright and horticultural products have the potential to replace the oil income after reserves disappear. This is only possible if peace prevails in the region. Recent lifting of the multinational sanctions against Iran has partially opened the doors to numerous horticultural business opportunities with Iranian scientists, private sectors, consultants, and distributors. However, all

these activities need to be conducted with the framework of laws to prevent any international dispute or introduction of exotic pest and diseases.

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