

Review

A viewpoint toward farm management and importance of barberry in sustainable rural livelihood in desert regions in east of Iran

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Barberry (*Berberis vulgaris*) is one of the most important minor fruits especially in arid and semi-arid regions in east of Iran. Most production of this valuable fruit, produce in south - Khorasan Province (about 98%) in extent of 5000 ha, that produce 10,000 ton annually, and generate incomes of 15,000 household, that in conditions of subsistence agriculture, are dependent to this production. Most important relative advantages of this fruit we can point to, are the high revenue of barberry in comparison to pistachio (*Pistachia vera*) in two folds, and highest efficiency and performance of water utilization in comparison to other fruits in the region, and resistance to salinity and high pH, that caused this tree lived during 10 years last-period of drought in the region. This tree also has a high degree of resistance to frostbite in the spring season. Nowadays, because of export of this fruit to other countries, barberry has the highest rate of economic growth in comparison to other fruits in the region such as Pomegranate, Pistachio and Jujube (tree) etc. Barberry has various usages in local foods, traditional medicines, preparing alcoholic and non alcoholics' drinks in different countries, protection of soil and prevention of erosion. Average production per ha, of this valuable fruit in Iran is 5,500 kg/ha. In recent years, in spite of fast increasing in extent of cultivating, performance per ha has not increased, because of various causes such as long drought periods, non-scientific and commercial agriculture and etc. Barberry has a high situation in entrepreneurship in the region. In this article, we try to explain major problems and aspects of cultivation, economics, marketing and etc. of barberry in east-of-Iran especially in south- Khorasan Province as a major pole and axis of this valuable fruit.

Key words: Barberry, economics, rural, sustainability, Iran.

INTRODUCTION

Barberry is a thorny shrub with yellow to brown colored bark which turns into brown in autumn. The plant has obviate leaves, bearing pendulous yellow flowers in spring succeeded by oval shaped red colored fruit when it ripens. The fruit is edible, and rich in vitamin C, though with a very sharp flavor. In Iran, the dried fruit, known as zereshk, is more extensively used, imparting a tart (torsh in Persian) flavor to the meals. A garden of zereshk is called zereshk-estan.

About 500 kinds of seeded barberries grow in various

parts of the world, but Iran is the main producer of this cherished berry. Moreover, the quality of Iranian barberry is considered to be the best in the world (Maskooki, 2002). Zereshk in Iran is more than two hundred years old in Eastern part of Iran called Southern Khorasan Province. More than 5,000 tones of barberries are produced each year (FAO, 2005).

Normal or seedless barberry (*Berberis vulgaris*) is the fruit of a shrub which is 3 to 6 m high with reddish thorny fragile branches that tend brown. It has leathery leaves that are egg-shaped and little red fruits in the form of clusters hanging from the branches (Zargari, 1983; Amin, 1991). Bright yellow flowers bloom between the months of April and June. In the middle of August the fruit begins changing its color first from green into milky, then after

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some weeks into pink and at last into red color in the middle of fall. Seedless Zereshk can be reproduced by pajoosh- a small shrub which starts growing from the root as a separate branch from the trunk. Planting pajoosh can start from the middle of fall to the middle of winter (Puyan, 2008).

The plant has well adapted itself to the arid weather and other severe ecological conditions in the area. It grows well both in low flat areas and in high mountainous areas of the province. The plant which has numerous applications and low sensitivities resists well against hot and dry winds, the extreme changes of daily and yearly temperatures, and shortage of rain or watering (Minimum and maximum temperature are -38, +41°C in Ghayen and -15, +44°C in Birjand). Compared to the other plants, it is also resistant against various pests and sicknesses.

With regard to the fact that we are exposed to abundant consumption of chemical drugs, ecological pollutions, ample use of ant pests, toxic substances and insecticides, all of which have harmful effects on the body especially our liver. Thus considering the healing properties of barberry on liver disorders, it seems essential to introduce this native product of Iran together with its unique properties to the whole world.

Various parts of this plant including its root, stem, leaves and fruit of the plant is used in medicine, food, industry, etc. Some medicine like those used as anti addiction drugs, those responsible for reducing blood's cholesterol, is made of barberry. It is used in the treatment of intestinal wounds, blood pressure, for the regulation of Flora-microbe of the body after receiving antibiotics. In Iran people drink barberry juice and use its fruit in nectar, marmalade, jelly, jam, pickles, syrups, round flat candy, dried barberry concentrate, and Sohan Asali (a traditional Iranian sweet). It is also used in preparing food and making liquor. Despite all these usefulness, up to now few academic or basic research has been done on this valuable plant. All these potentials prove that barberry deserves the effort to be introduced to the markets both inside and outside the country.

At present, barberry cultivation in Khorasan is concentrated in Southern Khorasan Province, especially in most areas around Birjand and Ghayen, where environmental conditions that is, hot weather, low relative humidity (Mean yearly precipitation is 190.3 and 173.5 mm in Ghayen and Birjand, respectively), water shortage and soil condition are unfavorable for the growing of other horticultural crops, while the same conditions seem to be most favorable for the extensive production of the seedless barberry. This causes Southern Khorasan Province to be the leading producer of barberry not only in Iran, but throughout the world.

About 13,898 acres of the land is planted with barberry. This great achievement has been made possible the support and activities of Jihad agriculture in the province. The organization has done impressive efforts in processing of this important economic product. The

whole productive land is about 11,561 acres which can produce 13,256 tones of barberry in a fruitful year. The number of people involved in barberry production is 50,000 people. So for every acre of land, there will be a job for one person. The number of whole families which make their living though barberry production is about 5,500 ones. According to the recent statistics in the year 2007 as many as 251163 subsidizing shrubs have been distributed among the farmers in Southern Khorasan Province. Thus the extended area would be about 251 acres. Within the same year 162 acres of the gardens were revived, 82 acres were completely removed and replaced with new saplings (Figures 1 and 2). Since 2003 governmental organizations have provided farmers with some long term or in some cases interest free loans and other facilities in order to encourage them to grow more and higher quality crops. Moreover, 14 packaging companies have been established among which three units are particularly designed for barberry packaging.

Barberry is also known as *Berberis vulgaris*, berberridge, jaundice berry, sow berry, mountain grape, Oregon grape, trailing mahonia, berberis, woodsour, and sour-spine(www.drugs.com).

Barberry belongs to daily petals. These plants are a great subcategory of flowered plants within which many types exist- about seven times as many as petal less plants, or more than 1.5 times larger than continuous petal plants. One of their distinctive characteristics is that they flowers with double coverings comprising of bowl and corolla. Thus you can rarely find types with simple covering. Or if you happened to find such a case, it is probably because of the gradual destruction of one of the covering rings of the flower as a result the petals seem to be free and separated from each other (Figure 3).

THE MEDICAL PROPERTIES OF BARBERRY

This plant is well known in Iran and has been used extensively as a medicinal plant in traditional medicine. Barberry contains organic acids and phenol compounds that contain anthocyanin and carotenoid pigments as well as phenols, poly phenols and glycosidase enzymes.

In Iranian traditional medicine, several properties such as, antibacterial, antipyretic, anti parasitic and anti arrhythmic activities for different parts of *Berberis vulgaris* have been reported with unknown mechanisms of actions (Zargari, 1983). According to traditional physicians barberry is considered to have "Cold and Dry" nature: The fruit is astringent. Doctors advised drinking barberry juice for treating fever, thirst, and inflammation. It is known for its anti arrhythmic and sedative effects in Iranian traditional medicine. Besides, it has a strengthening effect on liver and stomach. The fruit is helpful in preventing chronic bleeding. It is used for mucus secretion and also for stopping the Hemorrhoids bleeding. The fruit is useful in refining the blood and it is commonly used for



Figure 1. Women that work in barberry packing factory in East of Iran.



Figure 2. A garden of barberry in East of Iran.

decreasing blood glucose, lowering blood cholesterol, and especially LDL-cholesterol, as a means of curtailing the high rates of heart attack and stroke. It is very beneficial for the patients suffering from blood pressure and it is very efficient against parasites of the liver

(Puyan, 2004). The stem, root bark, and fruit of barberry contain alkaloids, the most prominent of which is berberine. Laboratory studies in test tubes and animals suggest that berberine has antimicrobial (killing bacteria and parasites), anti-inflammatory, hypotensive (causing



Figure 3. A cluster of barberry fruit in East of Iran.

a lowering of blood pressure), sedative, and anticonvulsant effects. Berberine may also stimulate the immune system. It also acts on the smooth muscles which line the intestines. This last effect may help improve digestion and reduce gastrointestinal pain (Aynehchi, 1986; Nafissi, 1990; Zargari, 1983). In spite of extensive applications and numerous properties, the mechanism of action is not exactly clear. Some of these properties may occur due to antihistaminic or anti cholinergic effects. Taking the fruit is also prescribed for regulating floromicrobe after receiving antibiotics. It is also good for bladder and lungs infections, sore throat, malaria, chess pain. The fruit is also applied to remove mucus secretion (Puyan, 2004).

THE MATERIAL AND CHEMICAL COMBINATIONS OF BARBERRY

Barberry is widely used as food additive and its juice is suggested to cure cholecystitis (Zargari, 1983). It has been shown that the crude extract of barberry has antihistaminic and anti cholinergic activities (Shamsa et al., 1999). In traditional folk medicine, barberry has been used to treat diarrhea, reduce fever, improve appetite, relieve upset stomach, and promote vigor as well as a sense of well-being. Today, it is one of the best remedies for correcting liver function and promoting the flow of bile. It is indicated when there is an inflammation of the gall bladder or in the presence of gall stones.

The most important material and chemical combinations in these plants are Berberine Alkoids, Oxyancthanines, and Berbamines. Berberine is isolated as a main alkaloid from the roots and bark of *Berberis vulgaris*. The amount of Berberine in the root's skin of this plant is about 6.1%, while that in the root's wood is about

4%. In barberry's flowers more Oxyancthanines Alkoids are observed. In the fruit, there is 4% sugar, 6% malice, and tartaric acid, and a little gum. If 6 Kg of barberry were analyzed, the following ingredients would result:

- (A) Oxyancthanines 5.1 g
- (B) Berbamine, 1.8 g
- (C) Berberine oxide, 0.2 g
- (D) Isotetranrine, 0.3 g
- (E) Jatorhizine, 0.7 g
- (F) Magnoflorine picrate, 2.4 g

In other types of barberry with seeds, the analysis of the fruit and leaves is as follows: Berberine, Berberine oxide, Jatorhizine, colombamine, Berbamine, Oxyancthanines, Shobakumine (Rabbani et al., 1987). Berberine's formula is as follows: $C_{19}H_{14}NO_4$ an dOxyancthanine's is: $C_{37}H_{40}N_2O_6$.

FOOD APPLICATION OF BARBERRY

In preparing some food, the fruit has been used as spice or as decoration. This has been broadly accepted because of its unique taste and appealing color (Kafi and Balandari, 2002). It is most generally used in "Chelo morgh" or "zareshk polo"-a type of food made from cooked rice and chicken (it goes without saying that barberry has the capability to be used in any food which is served with rice). It is also used in many other foods such as "Dolmeh", a type of food made from rice, meat, peas, fragrant vegetables, spices and barberry wrapped in a leaf of ivy wine; Kuku, a dish made from vegetables, eggs and barberry, different soups, etc. Seedless barberry is used in candies like "Poolaki" and "Sohan

Asali". Other uses include chocolate, nectar, marmalade, sauce, jelly beans, essence, beverage, candy bars, food coloring powder, and so on. In soft drink industry research should be done regarding replacing barberry essence with other imported ones. A very popular product of barberry in Southern Khorasan is barberry jam which has a tempting color and fantastic taste, especially if it is served together with butter for breakfast. Barberry syrup is another product. In so doing all you have to do is mix 150 g of fresh barberry with 750 g sugar and then add some water as you like. Let it cool down and then try the tasty syrup.

THE APPLICATION OF BARBERRY IN LANDSCAPES AND GREEN SPACES

These spiny small shrubs can be noticed both as evergreen and as a plant which loses its leaves through autumn. They vary from short small trees to tall trees. The highest tree may reach 2.5 m in height. With the yellow flowers, long clusters and beautiful fancy red fruit they are the most suitable and attractive plants for green spaces, edges of parks, rock area, gardens, and bumpy parks. There are lots of varieties of this plant in terms of color and shape of the leaves and fruit. It does not need much irrigation and it is highly resistant to hot and dry weather conditions. Moreover, it is not so sensitive to the kind of soil and water. These three features make the plant very advantageous in comparison to the other plants in order to be planted in green spaces. The Japanese barberry is planted in the form of borderlines around a place, or sometimes used as decorative trees. Several kinds of barberry are popular garden shrubs, grown for their ornamental leaves, yellow flowers, and red or blue-black berries. They are also valued for keeping thieves and intruders away; being very dense, viciously spiny shrubs, they make very effective barriers impenetrable to burglars. For this reason they are often planted below potentially vulnerable windows, and used as hedges and other barriers. Many varieties of barberry with yellow or white colors are used in the design of green spaces. The Japanese one is the most widely used plant in the green spaces. It has high adaptability with weather and soil. Sixteen kinds of this plant were introduced which are listed in two groups (A) red leaves (B) Green leaves. The former are called *Atropurea* (Kafi and Balandari, 2002).

USING BARBERRY IN ORDER TO EXTRACT NATURAL COLOR

The barberry fruit can be used in coloring the clothes, tananto leather and also for coloring silk, cotton and wool fibers. Barberry itself can make red color on the fibers. Mixing it with alum results in a pure yellow color. The root

of the plant can be used to color the leather. The essence of barberry with the yellow alum make purple and yellow colors which are widely used in carpet industry in Iran. The native of Northwest in Pacific Ocean used to color their baskets using the roots of barberry. The color derived from the fruit can also be a good and cheaper replacement for Hematocsiline in pigmenting the organs in pathology laboratories (Kafi and Balandari, 2002). In order to produce a perfect and economic barberry on time irrigation and using proper fertilizer are of high importance during growth season. Since the plant naturally prone to growing new branches, one of the essential and effective operations is pruning. Due to the fact that the plant has thorny stems, harvesting the fruit gets difficult. Because of the same reason the process of harvesting is costly and time consuming. We should notice that the way of harvesting has a pivotal effect on the quality of the finished product. If the plants are raised in natural way, they will grow as well shaped shrubs and as a result will not need much regular pruning. But if we would like to have shrubs with high stems, it is necessary to cut some of the additional low stems on the original trunk. This causes the remaining branches to produce longer stems compared to the former way. One of the advantages of the latter is that harvesting the fruit is much easier and less expensive this way, because the branches are long and wide apart. Usually after some years, the plant becomes a multi trunk shrub. This lessens the space among the shrubs and subsequently causes various difficulties while harvesting the fruit. Moreover, the fruit on the middle top branches fall down while harvesting by beating and thus unreachable and being useless (Balandari, 1995). As a rule the shrubs must be planted with the distance of 4 × 4 m, 5 × 5 m or even 7 × 7 m. In some exceptional conditions where land is not spacious 3 × 3 is also possible (Anbarani, 1991).

TRADITIONAL WAYS OF HARVESTING

At the present time most of the barberry in the market is prepared in the traditional way of drying. The thorny shrubs make harvesting them difficult. So care and patience must be taken when harvesting the fruit. As a rule barberry is harvested in three methods:

- (A) Picking the clusters by hands.
- (B) Striking on the branches
- (C) Cutting the branches carrying clusters.

Some research has been done on harvesting barberry using thinning materials and also by means of vacuum machine. The latter helps removing the foreign objects stuck to the barberry dried in the first two ways. But such ways have not been applied so widely. In the first two ways, the harvested barberry is collected and piled inside special bags, cartons, or boxes. Later on, they are

conveyed to a place usually far from the habitat. Most of farmers make use of their roofs, usually made of clay or asphalt. Some unfold roles of plastic or cloth and then spread the barberry on them. It goes without saying that the later is much cleaner and healthier than the former. Because in this way barberry is not in contact with the ground which might carry unhealthy objects or materials including sand, dust or stones or other waste particles. Usually it takes about 10 to 15 days for the barberry to dry under the sun. Of course, because of the fact that barberry ripens in autumn, there is a probability of raining which threatens the favorable quality of dried barberry. The dried product goes through sifting and cleaning processes by manual or sometimes half manual and half mechanical ways. Then it is packed in boxes or bags and sold to the market as a whole sale product. The quality of the barberry picked and gathered by hand is by far better than the one which is gathered by beating the shrub. This is because during gathering with second type of harvesting the barberry fruit is crushed and as a result makes it liable to decay.

In the third way of harvesting - cutting the branches carrying clusters, the branches are carried to the drying place. Usually, this type of barberry is dried in a roofed area or stockpile. These type of stockpiles are equipped with metal or wooden frameworks. Sometimes parallel rows of wires are used as a simple framework so that the branches are laid on them and the room is ventilated by powerful fans which provides continues air stream from 4 sides. Within fourteen to twenty five days the fruit is well dried. The barberry dried this way is of higher quality than the ones dried in the other ways provided that it is not infected with fungus, ferment or other destructive agents. Moreover, there is no possibility of rotting as a result of raining. After the barberries are dried they are being separated from the branches either manually by shaking of by a machine and then passed through a vacuum machine to remove foreign objects. Then, it is collected and packed later on. In order to improve, method of drying also needs more research. May be new ways should be introduced. Recently, a new study on the way of drying thin-layer drying of barberry fruits has been done by Aghbashlo et al. (2000)

BARBERRY'S MARKET

The current markets for barberry are:

- (A) Trading the product in the garden
- (B) Retail dealing
- (C) Wholesale dealing.

In Khorsan province 43, 20 and 37% of the product is sold through the third, second, and first ways respectively. The product available there, is puffy type and ready to use. Sometimes, there is a high demand for

fresh barberry. In that case, the branches are cut, packaged and sent for sale. The only point to have in mind is that it should not be transported to distant places, nor remain piled up for along time. In garden markets are limited to garden location. The farmers are the sellers. And buyers can be wholesale customers, wholesale agencies, dealers, local consumers, etc who directly buy the stuff. Since the government has no fixed policy in supporting and buying the product in time, sometimes certain opportunist dealers make abusive use of the occasion and buy the product at the lowest price.

If the farmer does not want his product to be sold this way, he may present it to the market himself. Therefore he must undergo the price for transporting it to the wholesale market. This way, he may be able to sell the product at a higher and more reasonable price. Most wholesale markets are at the vicinity of the producing cities, or the big cities or capitals of the provinces (such as Birjand, Mashad, Tehran, Isfahan and etc). A number of farmers may prefer to sell their product in retail dealing which yield a more reasonable price, so they pay for transportation and bring the barberry to the stores or daily markets, but it is not so common now a days. Studies show that the most influential people in the barberry markets are local customers, non native commission agents, wholesale agents, and dealers. The same studies show that governmental organizations and cooperatives have a low role in balancing and controlling the market. This causes the farmer to gain low benefit of his back breaking job.

THE PROCESS OF TRANSFERRING BARBERRY TO THE MARKET

The process of transferring barberry to the market includes the following stages: Transportation, classification, grading, packaging, standardizing, storing and processing.

Transportation is one of the physical activities which have a profound effect on barberry's marketing. The process usually begins in the garden and continues to the consumers or target markets. Transportation is commonly done by van, truck, on the linking roads. There is no special vehicle designed for the job.

The process of grading, packaging and storing are usually done by traders or wholesalers, or by the other people who are directly involved in the trade. The fact that each of the abovementioned processes has a great effect on the final cost of the product comes from lacking enough required knowledge and insufficient investment. Therefore, the operations are not done appropriately causing increased damage, and low quality of the product.

Apparently the low rate of barberry export has two reasons. The first is unfamiliarity of the foreigners with this valuable product. The second is because of the

problems regarding the storing and low quality of packaging which causes barberry to get dark and unfavorable. Thus, in order to get to a higher quality, fundamental measures need to be taken with regard to improvement of the finished product.

As it can be observed from the Table 1, as the age of the shrub increases, the level of barberry production also increases till it gets its climax. Then it decreases. So by knowing the table, one can approximately estimate the barberry production rate. On the average, out of four kilogram of fresh barberry fruit, only one kilogram dried barberry can be obtained. It also should be noted that the production rate of barberry depends to many factors such as: irrigation, fertilization, salinity of soil and water, harvesting method, etc. the numbers shown in Table 1 are considered for ideal conditions. From the economical point of view, the useful life of a shrub is different from its biological life. The useful life of a shrub continues as far as efficient management is rendered. This means that, the income resulting from the selling of the product should be at least equal to the expenses of investment in planting, maintenance and harvesting. The cost of investment and the cost of efficiency may differ from one garden to the next. In a stationary analysis, assuming the costs to be fixed, one can estimate the duration of useful life of the barberry. Establishing a new garden necessitates primary investment fee at the starting point. After that the harvesting is not so economical up to the fourth year. What a farmer gains during the first four years equals to the cost of maintenance. By the fifth year the yield gets more economical. Then new costs emerge that is the costs for maintenance and harvesting. As the age of the shrub increases, so do the costs. In the fourteenth and sixteenth years, a shrub gets to its highest production rate. From this point on, as the age increases, the yield and as a result the efficiency decreases.

SUGGESTED PROCEDURES FOR BARBERRY

1. Paying enough attention to the demands and tastes of the local and foreign users and applying attractive and marketable packages. This can be done through marketing research.
2. Substituting the traditional method of planting, harvesting, drying, processing and storing barberry with the scientific and more advanced internationally accepted methods.
3. Care must be taken to sanitation and precise food preparation standards.
4. Performing purposeful and comprehensive researches by universities and other research institutions.
5. Making sanitation licenses obligatory for all active units in the field of barberry production and processing. Cooperating with the organizations responsible for investigation and control of quality of the products including sanitation organizations and the likes, so that all the product

presented to the market enjoy the acceptable sanitation and quality.

6. Setting up a stock market for agricultural products in the locality and increasing the financial power of the wholesale exporters and buyers along with that of the farmers.
7. Planning and building specialized units by focusing on scientific planning for maintaining and storing barberry.
8. In order to prevent any damage or loss of the product, it is advisable to avoid traditional way of drying and storing. The place where drying is done should be high enough and away from any dust, dirt or soil. It also should be out of reach of pets or other domesticated animals, a roofed area with a cemented or asphalted floor is more preferable.
9. The mass of the product should not be piled up more than three centimeters on the drying floor.
10. In order to reach a favorable product, industrial dryers can also be used if possible.
11. Establishing barberry departments in trade organizations of the country especially in Southern Khorasan Province.
12. Setting up and expanding barberry research centers and allocating research budget for barberry (suggested research methods will be discussed in the next part).
13. Encouraging and supporting the youths who are inclined to agricultural affairs, especially toward barberry.
14. Providing farmers with interest free, low interest rate and long term loans.
15. Proper and scientific based pruning in order to decrease randomness of production.
16. Making the producers aware of national and international standards that they are supposed to meet in order to have their product sold in the markets. If there is no standard yet, one way is to provide the basis for setting up a standard with the cooperation of standard and industrial research institution along with the other related organizations.

Suggested research methods:

1. Analyzing the proper way of multiplying seedless barberry with regard to the limitations of the current methods.
2. Considering the particular way of fertilization and irrigation so that by applying the new ways a higher yield would result (knowing that although we have increased the farming area in recent years, we could not achieve the expected results).
3. Investigating and determining the most effective ways for the fruit formation, development and quality.
4. Determining the best way of harvesting and possibly mechanization of that process.
5. Making the best use of the pruned branches. We know that lots of pruned branches are piled up in one corner of the garden without any proper use or sometimes is used

Table 1. The amount of dried barberry production from each shrub in a fruitful year.

Production (Kg)	Age (year)
0.1	3
0.4	4
1	5
4	6
8	8
15	10
20	14
20	16
18	18

**Figure 4.** A ready to harvesting garden of barberry in semi arid region in East of Iran.

in place of fire wood or as protection on the walls of gardens, while their skin is of great medicinal value if transformed into powder and be prepared for the market.

6. Since the barberry itself cannot be kept for a long time with the original shape, color and quality, it is advisable to expand production of its by-products in the forms of chocolate, nectar, powder, marmalade, sauce, jelly beans, essence, beverage, candy and the like.

POLICIES REGARDING BARBERRY

1. Encouraging the youths to agricultural affairs, especially toward barberry.
2. Familiarizing the public with the nutritional and medicinal values of barberry and with its by-products as well, and also offering the possible ways to introduce these values and by-products to the international markets.
3. Providing direct contact with the wholesale buyers and

consumers through active participation in national and international exhibitions.

4. Getting familiar with the export system and encouraging the exporters to export not only the barberry itself, but also its by-products. This can be made possible through the expansion of its related industries.

5. Holding particular annual festivals for barberry together with introducing and rewarding the successful farmers.

Commercial programs

This includes production and distributing different advertisements to be broadcast on television and radio or be printed in magazines and newspapers. The same program can be translated into different languages and be sent to foreign countries in order to gain international market. Producing and distributing CDs and bulletins are advisable as well.

Holding particular annual festivals for barberry inside the country, together with international seminars abroad especially in European countries

At the present the market for barberry is not so profitable. It is used only in the traditional ways. The packaging, distribution and transportation are done only through the traditional ways. No new alternatives have been developed in this regard even in the capital cities. Considering the international market, the situation is even worse. One main reason is that barberry has not been introduced to the international market as it should be. That is why it has a very limited market, that is, Iranian immigrants, or travelers to the foreign countries (Figure 4).

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