

Early feasibility study on Capparis production and processing in Hamedan province in Iran

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Abstract—*Capparis spinosa* is one of the most widely consumed aromatic and medicinal plants in Iran whose local name is “shapaleh”. The aim of the present study was to evaluate whether the production and processing of Capparis in Asadabad Township in Hamedan province is suitable and sustainable. The food processing industry is one of the basic industries operating in Iran and is divided into several sections. Iran is the second largest economy in the Middle East and North Africa, Iran annually produces 12 million tones of fresh fruits and 23 million tons vegetables. In this situation, it is necessary to select kind of crop, technology tools and apply methods to improve them. Today in Iran, there are three industrial companies which are engaged in industrial processing of Capparis. One of the mentioned industries is situated in Hamedan province with name “Sahar Food Industries Company”. It is concluded that, if local authorities are honest about their needs, Stakeholders will be able to give feedback, receive information and be informed of major decisions made.

Index Terms— Asadabad, shapaleh, Hamedan, Iran, *Capparis spinosa*, food

I. INTRODUCTION

Capparis is a widely grown plant in various regions of the world. The first evidence of human consumption dating back to around 16000 B.C. Capers were useful in medicine and cosmetics as around 500 B.C. Hippocrates wrote about the medicinal properties of Capparis based on personal experience.

The plant is very multi beneficial and has a wide range of health benefits and uses such as antioxidants properties. Different parts of the plant such as edible buds, berries and leaves are used to treat various disorders. Means; Capparis contains minerals necessary for a healthy body as well as a tasty addition to meal plans and Content. Also Capparis flowers are incredibly beautiful [1].

Genus *Capparis*, belonging to family Capparaceae and comprises 39 genera and 650 species [2]. Caper (*Capparis spinosa*) is a shrubby plant and grown widely

in tropical and sub tropical areas such as Mediterranean region, West and Middle Asia and at least parts of Iran [3]. Indeed, Iran with about 1.65 million square kilometers surface area is one of the richest countries in plant diversity in the Middle East [4].

A field study was carried out on *Capparis spinosa* in China by Yin et al. in order to evaluate the nutritional and medical value of Capparis [5]. The results of the mentioned study revealed that More than 8 fatty acids, 4 acid esters, 6 esters, 8 olefins, 19 alkanes and some other compounds were identified in fruit of Capparis. The study have confirmed that many of its chemical constituents have anti-oxidative, antimicrobial and many others properties. Ji et al. reported that, *Capparis spinosa* L. contains various active components such as glucose isothiocyanates, volatile oil, sugar ligands and alkaloid compounds that is used for controlling and treating diseases such as hypertension and rheumatoid arthritis [6].

There are many studies revealed that Capparis is used as an anti-oxidative, anti-inflammatory, anti-bacterial, anti-diabetic, anti-hepatotoxic, and anti-proliferative agent. Also, it is demonstrated that Capparis has anti-arthritis, anti-hyperglycemic and anti-obesity effects and can inhibits the growth of tumor cells [7].

Capparis is a staple plant in the study area. Due to an increasing demand for plant based nutrition as Capparis and a lack of availability of food, a gradual shift related to producing and processing of Capparis will be required in the near future. On this basis, the aim of the present study was to evaluate whether the production and processing of Capparis in Asadabad Township in Hamedan province is suitable and sustainable or there is necessary to improve the efficient use of resources to become more suitable and more sustainable.

II. MATERIALS AND METHODS

This research was conducted during 2017 in Hamedan province (Asadabad Township) in Iran to identify the habitat of Capparis plant species through documentary, extensive field visits and also direct field observations during the year of study. Through the period, using the map, Global Positioning System (GPS) and in some cases through afoot surveying or using car, the geographical location of the study area was identified. To evaluate the

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climatology status of the area, data of meteorology organization was used. For general identification of the area, digital maps and Geographic Information System (GIS) were used and on this basis, the topological status of the area was identified. The software used was Arc View (version 3.2a) with the Universal Transverse Mercator (UTM) projection and scale was 1/50,000 [8]. Applied results presented in this study are based on the valid audit reports from experts in various times and locations in the studied area.

The morphological characterization and identification of *Capparis* was based on available literature and covered the following traits: general shape of the plant, leaf shape, leaf color, leaf surface, fruit shape (round or elongated), pulp color and stem color [9],[10].

III. RESULTS AND DISCUSSION

A. Study area

Hamadan province with a long history and record in traditional medicine was shown as one of the main centers of production and supply of herbal plants in Iran. The tomb of eminent Iranian scientist and medicine, Avicenna (Ibn Sina), is located in the heart of Hamadan city. The province covering 19,493 square kilometers and is located in the west of Iran, 320 km far from Tehran with a population of 1.7 million, has varied pastures and natural resources [11]. Based on the available information, the flora of Hamadan province includes 6000 species of which 315 species related to 71 families and 209 genuses are valuable plant drug, of which 159 species have traditional usage in the province and 156 species are out of traditional and indigenous use but they are called medicinal plants in drug resources [10]. Also, demand for traditional food plants has increased significantly over recent years, particularly so over the past decade. Many species of traditional food plants have been utilized by native people of the world. Hamadan province with a range of these plant species has the potential to provide a valuable source of Traditional food plants in the area. These traditional vegetables have the potential to provide a valuable source of nutrition in areas with hot or dry climates.

Asadabad Township is situated in Hamadan province. It is located between 34° and 35° to 34° and 58′ northern latitude and between 47° and 50° to 48° and 18′ eastern longitude. Its elevation from sea level is 1607 meters and its surface area is 1196 square kilometers [12]. The location of the study area is presented in Fig. 1. Asadabad Township is one of the major agricultural centers of the province which its economy is based on agricultural activities. Average precipitation reaches 332 mm per year and the annual temperature is 11^{0c}.

A. *Capparis* Production

Capers are cultivated in some countries as Spain, Turkey, Morocco, Italy, Tunisia, Iran, Algeria, and the coastal areas of the Black Sea. Cultivation of caper started around 1970 in Spain and Italy, and later in

Morocco, with a maximum of about 4000, 1000, and 2500 ha in cultivation, respectively [13].

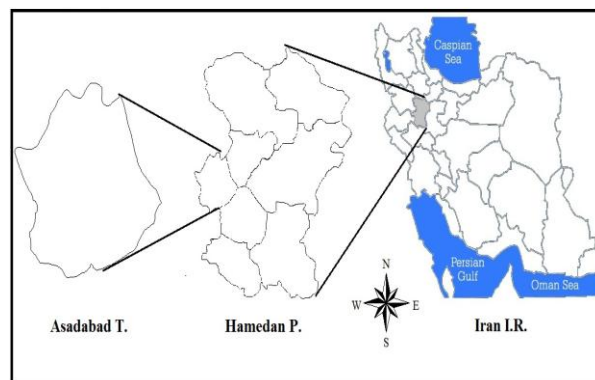


Figure 1. Location of Asadabad Township in Hamadan Province, Iran

At various regions of the world, different organs of capers species are profited for several purposes. Young shoot, flower bud, fruit and seed is used for nutrition. The most of researches connected with capers were made on bud composition and pickling products. The seeds of different a capers species grown in India contained 30% oil. It was reported that, mainly fatty acids of capers seed oil were 21% palmitic, 57% oleic and 11% linoleic [14].

Capparis spinosa is one of the most widely consumed aromatic and medicinal plants in Iran whose local names are “Kabar, cebir, curak, shapaleh, Capparis”. The fruits and root of *Capparis spinosa* have been used in gout remedies and also as tonics, diuretics and astringents in traditional medicine in Iran [15]. Table 1 refers to the native names of this plant in different countries [16].

The plant is an environmental friendly has already grown wildly in several regions in Asadabad Township such as Bohraz, Khak-riz and other near villages. *Capparis* harvested from different regions of Asadabad Township by Nomads/ indigenous people. Local population starts cutting *Capparis* from June to august. The fresh aerial parts, including the flower buds and fruit, are preserved and stored in brine or vinegar until ready delicious for use and eat as pickled shapaleh. Although *Capparis* are used primarily for their desirable flavor and odor, they may play other important roles in the food systems.

The finding indicated that *Caper* plant is able to grow well in poor soils as it has an ability to maximize the uptake of nutrients. Based on recent reports, *Caper* production requires a semiarid climate with adequate water supply during the early stage of growth. It requires a well-drained and fertile sandy to sandy-loam soil with a pH value of 6.1 to 8.5. The ideal temperature for its growth is 14°C. It requires 200-680 mm annual rainfall. A rainy spring and long, hot, dry summer are important for production. It can be said that the plant responded well to high temperatures and to little water. Means, the caper bush can tolerate temperatures of over 40°C in summer and able to withstand low winter temperatures of -10°C. They appear to have no specific topographical

preferences although a moderate slope may assist drainage [1].

TABLE 1. COMMON NAMES OF CAPPARIS, USED IN SEVERAL COUNTRIES

Turkey	Kapari, kebere, gebere
Syria	kaber
Spain	Alcaparra, caparra, alcaparron, tapaná, taparera
Russia	Kapersovyi, kapersy, kust
Portugal	alcaparra
Malta	Caper, cappar, cappara, capparo, cappero
Italy	Capparo, cappero, capperone
Iran	Kabar, cebir, curak, shapaleh, Capparis
Greece	kappari
German literature	Kaper, capern, kapernstrauch, kapernbaum,
France	Caprier, capres, taperier, tapenier
English literature	Caper, caperberry, caperbush
Egypt	lussef
Arab Literature	Kaber, kabur, kabbar, azuf
Cyprus	Kaper, kapara

Food Processing Industries is one of the most important and powerful thing for development as it has effectively and efficiently linked the economy, industry and agriculture. The linking of these three bases has synergized the development process and promoted the growth of the country to a great content. The food processing industry is one of the basic industries operating in Iran and is divided into several sections. Government sector of Iran has identified food processing industries as one of the major issues of development. Iran is the second largest economy in the Middle East and North Africa, Iran annually produces 12 million tones of fresh fruits and 23 million tons vegetables [17]. In this situation, it is necessary to select kind of crop, technology tools and apply methods to improve them.

Capparis is manufactured and processed in both industrial and traditional form in Iran. Traditional production of Capparis is important to economic development in rural communities of Asadabad and its villages as well as to maximize employment generation, economic productivity and industrial growth, private sector and the industry needs to develop and be the principal actor in carrying out industrial activities. Accordingly, in recent years, industrial production of Capparis has considerably increased from almost nothing in recent years. Today in Iran, there are three industrial companies which are engaged in industrial processing of

Capparis. One of the mentioned industries is situated in Hamedan province with name “Sahar Food Industries Company”.

Sahar Food Industries Company was established in Hamedan province in the west of Iran. The company was founded as a private company in 1990 and has gradually increased the number of employees. Sahar Food Industries Company has expanded and improved the size of its production facilities by adding various divisions and departments and now has more than 900 employees. Sahar Food Industries Company is a company manufacturing a wide range of different food products such as hot Pickles, Sweet Pickles, compote, tomato paste, canned, Jam and Pickled Capparis. Sahar Food Industries Company is one of the largest food industries in Iran with modern facilities used in processing and packaging of a wide variety of products. The factory was built, designed and equipped to meet all national standards within the food industry with a highly trained operating staff and careful investigation of products by a team of highly skilled quality control staff, the factory has achieved a sustained level of quality performance in the processing of its products over the years. In 2001 it was one of the first companies in the country to be certified with ISO 9001, which represents achievements in quality performance in the processing and packaging of products. In recent years in addition of major exports to European countries including the UK, Germany and Russia, this company has exports to other country such as Australia, Canada, Turkmenistan and Iraq. Also, during negotiations and agreements with buyers from Africa, Asia and other Persian Gulf states, the exports to these areas are on the agenda. Sahar Food Industries Company is one of the foremost companies specializing in Capparis collecting, processing and marketing services in Hamedan province.

B. Capparis Marketing

It is estimated about 60 countries engaged in Capparis exporting and importing. The annual growth rate of Capparis trade is about 6%. Major exporting countries are Turkey, Lebanon, Morocco, Uzbekistan, Kyrgyzstan, Syria and Iran. The price of one kg caper ready for consumption in Moscow and USA markets are about 7.7 and 25 USD respectively [18]. The European Union countries are the best markets for Capparis. They need high quality caper flower buds. Based on all available information, the EU rejected imports from some North African countries recently because of the toxic residue found in the products [19].

The average annual production of Capparis in the world is estimated 10000 tones, while in Turkey, Morocco, Spain, and other countries are 3500–4500, 3000, 500-1000 and 1000-2000 respectively [13].

In Iran, the average annual production of Capparis is estimated to be around 1000 tones. But more of all Capparis consumed in the country; means, only a small amount of Capparis is exported. Based on statistical information, the world price of one kg of Capparis preserved temporarily was approximately US\$ 2.3 in 2013. While in the same year, price of international

export of one kg of Capparis preserved temporarily by Iran was US\$ 1.5.

IV. CONCLUSION

Iran is characterized with a diversity of wild plant and climatic conditions and Capparis is among the wild plants spread widely in Iran. Results from this study indicate that Capparis have a wide range of applications in the traditional medicine. Recently, the pharmacology and chemistry of this plant have been extensively studied. Chemical studies of the different parts of Capparis, both fermented and non-fermented, have shown the presence of many beneficial compounds.

It should be noted that, its cultivation benefits are significant too. For example, each hectare would produce an estimated 15 jobs (over 3 months) and 1-3 permanent jobs; the jobs would be in harvesting and processing activities [1].

It is concluded that, if local authorities are honest about their needs and if they plan on that basis, Stakeholders will be able to give feedback, receive information and be informed of major decisions made. Based on multiple information sources, Iran is able to export amounts of Capparis products, particularly caper preserved temporarily but not ready for immediate consumption. Means, the national exporter has been losing the value added resulted from Capparis process.

It seems that, some countries were importing Iranian Capparis to re-export the product after repackaging and redesigning with a new product outlook. But, there could be economic feasibility for exporting caper as is ready-for-consumption produce.

Recommendations

It is important to bring together all parts involved in caper production such as producers, processors and marketers, and unify their efforts in the framework of specialized organizations that should be connected with their counterparts in other countries, besides international organizations like FAO. This would abolish caper monopolizing by some traders, as well as pre-defining its prices and consequently the workers' wages prejudicially.

Caper producers and processors should see themselves as one sub sector, and their efforts should contribute for the good of the sub-sector entirely. Problems encountered should be solved mutually and production trends should be defined in an atmosphere of cooperation and participatory.

When caper is exported raw, export markets must be defined beforehand and then targeted; and margins must not be lost through mediation. For example, it was noticed that Morocco imports caper preserved temporarily from Syria and re-export it as it is (without process or additives) with a profit margin of 50% of the product value. On the other hand, caper importation for the purpose of processing and re-exportation is an initiative that should be revitalized and encouraged, along with local caper' exports.

It is important to continue scientific researches on caper plantation, and researches on examining the possibility of growing more productive species adopting genetic improvement. It is also recommended to mechanize sorting and grading caper buds to increase margins instead of using manual sorting (by sieve) or exporting caper buds without sorting and grading, which reduce their prices.

Exerting efforts to establish "integrated pest-management system", and determine nutrition and irrigation needs to achieve the highest productivity of caper, as well as spotting the opportunities to diversify caper products as demanded by international market. Also, it is important that scientific research centers to invent techniques to facilitate and reduce the costs of capparis harvest.

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