

# The Industrial-Therapeutic Impact of Ferula in Sustainable Development: A Case Study in Leזור Village (Firuzkuh, Iran)

## Research Article

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### Abstract

Today, despite valuable properties of these vegetables, revenue generation, employment creation, and prevention of emigration and difficult social and environmental conditions (main components of sustainable rural development), scant attention is devoted to improved growth of this plant and its proper use in different industries including pharmacy and it is exported to other countries by an unreasonable sale price without sufficient knowledge gaining of its properties. Improvement in its growth and its increasing use can exert significant socioeconomic and environmental impacts in rural regions. This study attempts to examine appropriate methods to prevent damages against ferula and reduction of production as well as the related problems of farmers in Firuzkuh (Iran).

**Keywords:** Ferula, cultivation and production method, local knowledge, sustainable development.

### Introduction

Plants are main sources of producing the required food, medicine, and energy of humans' survival. Ferula is one of medicinal plants, which is produced and maintained by ferula-producing villagers due to its experience- and knowledge- gaining. Nevertheless, because of lack of knowledge sharing from one generation to the next, method of producing and maintaining this plant has been forgotten. On the other hand, exotic opportunists employ unprincipled methods for production and endanger biologic life of this species. Meanwhile, greater focus of attention on traditional cultivation of medicinal and industrial plants can make contributions to medicinal and industrial self-sufficiency. Today, despite valuable properties of these vegetables, revenue generation, employment creation, and prevention of emigration and difficult social and environmental conditions (main components of sustainable rural development), scant attention is devoted to improved growth of this plant and its proper use in different industries including pharmacy and it is exported to other countries by an unreasonable sale price without sufficient knowledge gaining of its properties. These plants are transformed to intermediate and/or ultimate products in some countries and are exported again. Accordingly, most of exporting countries purchase intermediate and/or ultimate products. This economic course took place from a long time ago especially in recent decades in Iran (4). Sap of ferula is mainly exported to European countries and is

sold to West Block countries by the lowest price and the subsequent perfumes and high-grade adhesives are sold to Iran, Arabian countries, etc. (Interview with Grassland Experts of Natural Resources Organization, 2010). Improvement in its growth and its increasing use can exert significant socioeconomic and environmental impacts in rural regions and in national level. Also, destruction of high-grade local plants is of significant among animals as regards environmental impacts. As the result, plants of pastures should be protected, improved, and developed. On the other hand, devastating impacts of chemical medicines and the existing capacity of productions of medicinal plants in Iran is of significant.

Appropriate use of medicinal plants is significantly affected by gathering precisely scientific information to which unreal data have been added (4). Local knowledge (or other national resources and assets) of nations are gained with regard to their economic and political priorities and access to these resources is not the same (15).

System attitude of scholars towards local knowledge and its use in sustainable development entails research into the whole rural regions and their socioeconomic and cultural interactions with the outside world rather than into one product or one method (15). Today, one of crucial objectives of authorities is rural development planning, which is of great significance due to specific socioeconomic properties of Iran including its large rural population. Rural development involves appropriate and optimal use of scientific findings and attention to local knowledge use as a valuable national asset (6). This article intends to examine appropriate methods of ferula growth, its use, and existing difficulties of its development in Lazor village as well as its role in sustainable rural development.

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## Theoretical Viewpoints

Local knowledge of nations is of their national capital, which consists of their beliefs, values, and their life tools. This knowledge has been adopted by the world nations during centuries for making clothes, having habitations, training children, and maintaining their health and their animals' health. Local knowledge helps local inhabitants meet their needs from local resources without any destruction. Therefore, local knowledge of world is a valuable combination of methods and tools tested over times, which can be used for sustainable development of all societies (15).

Sustainable development is a sustainable process for socioeconomic, cultural, and environmental changes for increase of long-term welfare and prosperity in the whole society. In the other words, it is a multi-dimensional process which is sustainably seeks for integrity of socioeconomic, cultural, and environmental objectives (21). Indeed, by changing attitudes from development in any price towards sustainable development, attempts to gather local knowledge from local communities of world are increased. And, local knowledge use are multiplied as regards development including maintenance of natural resources and participation of local inhabitants. With regard to the current condition of the world, local knowledge and formal knowledge can be combined. The related problems can be appropriately identified and effective relationships can be created with local inhabitants through local knowledge (15).

Indeed, sustainable development is environmentally non-destructive, technically appropriate, and socially acceptable (3). Generally, properties making local knowledge essential for sustainable development are compatibility with large number of labors, low demand for capital, dynamicity, complete local compatibility, acceptance of varied manufacturing systems, emphasis on survival of resources, avoidance of risk-taking, reasonable decision making, flexible strategies for emergencies (e.g. drought and famine), a simple and smart farming system for concurrent growth of multiple products, and appropriate and optimal use of scientific findings (6).

## History of Ferula

Umbelliferous species have been investigated in terms of paleontology. The found fossils are small in number. What have been found yet are fossil seeds which are of *Cherophyllum*. This fossil discovered in East Germany reveals that this species traces back third millennium. Some other fossils belong to seeds of this species plant grown in lands of Pleistocene (2).

Ferula plant consists of below species:

<i>F. galbaniflua</i>	Boissier
<i>Ferula gummosa</i>	Boissier
<i>Gentiana rubricaulis</i>	Boissier
<i>Ferula schair</i>	Boissier

One of crucially economic species is *Ferula L*, which is called lovage in ancient books and is known by

Iranians from ancient times. According to International scientific resources, ferula was discovered by Bushe (2). Ferula was mentioned in *Ghanoon Book* written by Abo Ali Sina (13). In medical encyclopedia of Ibn-Sina, Arabic names of ferula are mentioned: *Haltit*, *Haktit Mentan*, *Haltit Tayed*, *Samghol-ajdan*. Other names such as *Anghoozeh*, *Koma*, etc. are also used (5).

## Literature of Ferula Plant

Ferula is of monoclinous, perennial (4-7 years old), Herbaceous or shrub-type plants with tuberous root, thick stems, 1-2-meter height, and multiple resin canal. Its leaves are about 30cm-length with deep divisions, and colored in greyish green and covered with short and fine fibers. Its yellow five-leaf umbelliferous flowers cover the stem, bearing long oval-shaped samara fruits. In the very beginning of life, ferula has basal leaves and produces flower and fruit in the last year. The more frequent rain fall occurs, the more seeds are observed. Seeds grow in June-July. Roots are decayed and destroyed. Seeds sprout in spring, needing 0-5C temperature (i.e. the normal cold). Its seeds can grow before precipitation. Regeneration of this plant occurs with seeds and tissue planting. Local inhabitants know the related pests and fight against them by employing conventional methods immediately after collection of seeds in warehouses (12). Ferula consists of resin (%63.5), gum (%27), and essence (% 9.5). Quality of ferula is determined by examining its ash: It should not exceed %10. Local inhabitants call the ferula output produced due to scratch or break as *Gom*. This output is soluble in water and insoluble in alcohol and ether. The more the insoluble materials are found in 90-degree alcohol, the less the ferula quality is (12). The ferula secretion is tear-shaped or honey-shaped. Both of them especially the tear-shaped one are secreted from stem and leaves due to insects' bite or scratch. The tear-shaped one is yellowish-white, greenish yellow, and reddish yellow. As regards size, it is as big as peas and cherry. The second one consists of irregular tear pieces, in which impurities such as small pieces of stem and leaf. The existing resin in market is produced by scratching ferula artificially. Sap of ferula is mainly exported to European countries and is sold to West Block countries by the lowest price and the subsequent perfumes and high-grade adhesives are sold to Iran, Arabian countries, etc. (Interview with Grassland Experts of Natural Resources Organization, 2010).

## Different Methods for Ferula Planting

### I. Latitudinal Method

In this method, the ferula crown is cleaned and then the upper part is taken by cutting latitudinal area. In the cut area, a hole is created for collecting the latex. Despite feasibility of this method and greater harvest, the ferula cannot grow again.

### II. Flowering Stem Cut Method

Since the ferula produces reproduces organs only in the ending year of life, the ending-year ferula base and ending-year extraction of latex are called male-base and male cutting respectively. Top of ferula is cut and the latex is collected. Again, 5cm of the lower area is

cut and the latex is collected. This is replicated until all latexes are collected. This method destructs the plant and therefore it is scarcely employed.

### III- Longitudinal method

In this method, soil surrounding the plant collar is removed in order to yield a pure crop after cutting; thereupon, a slight cut is made by a sharp tool in the size of a small coin, and the day after, collecting sap will be started. One another thin cut will be made for collecting more latex, and four to five more times the sap will be collected. Afterwards, the collected sap will be turn into honey color in air exposure. Regarding the mentioned methods, it can be concluded that the longitudinal method is more suggested due to the possibility of plant survival which it can provide (12). The number of scarify times for each of the bush's node is 2 to 5 times. The amount of latex in primary scarifying is small and it is gradually increased and in final scarifying it will decreased. The local *Ferula gummosa* breeders discussed that scarifying should be avoided when the curve of latex amount is starting to decrease due to preserve the bush. It is better to cut in multi- steps and the cutting should not be deep for preventing the plant damage. Bushes are allowed to be utilized which are at least at the age of 3 years and or the diameters of their vascular tissues are approximately 15 centimeters. The number of years that it takes for the plant to reach this level is affected by the environmental factors.

### Therapeutic Attributes and Pharmaceutical forms

*Ferula gummosa* possesses energetic, anti-catarrr and anticonvulsants effects and it is applied for stomach pain and its roots are used to treat joint's pain and it is also used to eliminate neurological disorders. *Ferula gummosa* contains compounds named Rone Ombellifé in its resin which is used in lotions' production to prevent sunstroke and it is also used in some of cosmetic and skin care creams. If the latex of *Ferula gummosa* is combined with Iris oil and its drops will be poured in the ear, it will soothe the ear pain. Rubbing the mixture of *Ferula gummosa* with Iris oil is effective for Tetanus treatment and its poultice for revealing flank and waist pain and healing abscesses. *Ferula gummosa* is harmful for hot- natured people and it is not prescribed in regions with hot seasons and in case of necessary consumption, it should be consumed with violet and camphor oil. The amount of *Ferula gummosa*'s edible latex is 2-3 grams and 15 grams for fatal toxic excretion (10).

In pharmaceutical encyclopedia of Avicenna it is stated that *Ferula gummosa* is beneficial for skin, hair, digestion, nerves strengthening, jaundice, hemorrhoid, muscle rupture, toothache, hoarseness, parched throat, cough, tetanus, and scorpion stinging(5).

*Ferula gummosa* latex is applied in pharmacy, similar to its peer the opium poppy sap; especially, in treatment of livestock infected with different inner parasites, they can be cured by feeding a type of *Ferula gummosa*. According to the elderly and shepherds' statements, *Ferula gummosa* latex with sheep's rump is helpful for joint pains. The mixture of *Ferula gummosa*

latex and flour contained bran is used as a pill for eliminating parasite's diseases in human and livestock.

Farmers put the stem of *Ferula gummosa* in headwaters during irrigation to ward off worms and plants' pests that it leads to prevent the pests' damages to the plants; especially, bean and chick pea (cutworms).

### Forage Production

A type of *Ferula gummosa* mixed with grassland species are used as palatable forage for domesticated livestock and wildlife. There is a good appetite for Livestock in two time periods: 1- Plant's seeding time, 2 - When the plant is dried. In some villages, *Ferula gummosa* plant is collected and dried in order to use as a nutritious and warming food for cattle in winter.

Pastoralists, whose occupation is ranching, prevent extracting the *Ferula gummosa* latex and they preserve the breeding regions of *Ferula gummosa* for sheep's mating until autumn (September month) to keep livestock in the preserved region and to be fed of nutritious forage. In their beliefs, this action causes infertility and lamb abortion to be decreased; and consequently, growing sheep and lamb will be immune to diseases.

### Industrial Applications

Global trade of *Ferula gummosa* has been the monopoly of Jewish people until recently and up to the present and it is used as a stabilizer the scent of perfume in cologne and perfume industry. Famous American and European companies such as Christian Dior and Bauer and etc. are among desirous of this product. A type of colorless and expensive special glue is extracted from *Ferula gummosa* which is used in jewelry making for adhering precious stones such like diamond and etc. Eight portions of fish glue is solved in water to produce this glue, equivalent to this product, a solution which is made by one portion alcohol, one portion *Ferula gummosa* and a portion of ammonia is added to this product. *Ferula gummosa* possesses diverse applications in print, textiles, painting and pharmacy industries (12).

### Geographical and Climatic Dispersion

*Ferula gummosa* possesses extensive habitats with different conditions in Iran. *Ferula gummosa* can be seen in North of Iran and different parts of Alborz, for instance; in North (Mazandaran, Haraz valley), Khorasan province, Firuzkuh, Lar and Zanzan province, Qazvin, Tehran province and Damavand, Isfahan province; Semirom (Ab Malakh), Khansar (Golestankuh) Golpayegan, Kashan (Maraq, Neshlaj, Eshaqabad, Viduja), North East of Semnan province, Kopet Dag located between Quchan and Lotfabad, Fars province and Markazi province (12). The highest utilization rate is done from Khorasan and Tehran provinces and most of the users are Abade residents in Fars. Hence, workers who extract the latex of *Ferula gummosa* are known as Shirazi (Fars residents) that they migrate to the extracting areas for two, three months annually (2).

### Lazur Village Coordinates

Firuzkuh holds 253000 hectares of pastureland and 11000 hectares forest land and owns 212 exploitation plots of *Ferula gummosa* plant. Among villages of Firuzkuh (50 villages), Lazur village possesses the most vastness of space (about 20000 hectares) and the most dense population and contains 14000 hectares pastureland where approximately its 12 hectares are scattered as a proper habitat for cultivation and exploitation of this plant and other pasturelands are covered with thymus, Sekaleh Milkvetch, peppermint, Hypericum perforatum, dill, coriander, pennyroyal, Mugworts, Myrtus and forage. This village holds three allotments as follows: Mishine Marg, Sah and Khularz that there are plenty of pasturelands in these three allotments where the most breeding areas of *Ferula gummosa* are as follows; Kaboudno mountain, Tarinza mountain, Sefidlou mountain and regions with local names as Kharv, Khas Bareh, Chogan (Firuzkuh Natural Resources Organization, 2010).

This village is a part of Farah Rud where this unit contains Lazur, Ahnaz, Shad Mehan villages in itself. Vastness of this village is 166/33 square kilometers at a longitude of 52°, 27', 04" to 52°, 39', 10" and at a latitude of 35°, 48', 6" to 35°, 57', 11" and at the minimum altitude of 2070 meters and at the maximum altitude of 3990 meters (18).

### Research Methodology

According to the research objective and the field study, it was decided to use qualitative method. Therefore, various data collection techniques were used in this method including observation, focus group interview and in-depth interview.

### Observation

In all the social science studies, including qualitative and quantitative, observation is considered as the first and the most important method in data collection. Occasionally, (regarding subject of the study) it is used as a research methodology. Nevertheless, the researcher will be capable of discovering the complex relations in social and real contexts through observation. This method plays an essential role even in in-depth interviews. In field study, compared to direct observation, no method can create a close relation with studied phenomena for the researcher and or it can provide the demanded data in exploratory studies (14).

### Interview

#### Focus group interview

Discussion method and focus group interview is known as one of the data collection methods by some scholars and some other know it as one of the qualitative researches. In any case, Focus group interview is an interview which is carried out in a semi-organized group, under the leadership of a certain person in an informal condition that the group dynamics enhance the quality and quantity of data (1).

Patton believes that focus group interview is a greatly effective method in qualitative data collection and it can provide the possibility of controlling the

accuracy of collected data. Applicants of group discussion can control each other precisely and mitigate wrong attitudes to reach a consensus (22).

Indeed, in this method, applicants interact with each other through presence and their reactions to what others express. Since none of the applicants shares the same opinions or experiences- due to difference in age, gender, education, access to resources and other factors- plenty of diverse attitudes are stated by applicants. In addition, unconventional experiences and personal opinions can also be attained (Although obtaining this type of data is more prevalent in personal interviews) (20).

### In Depth Interview

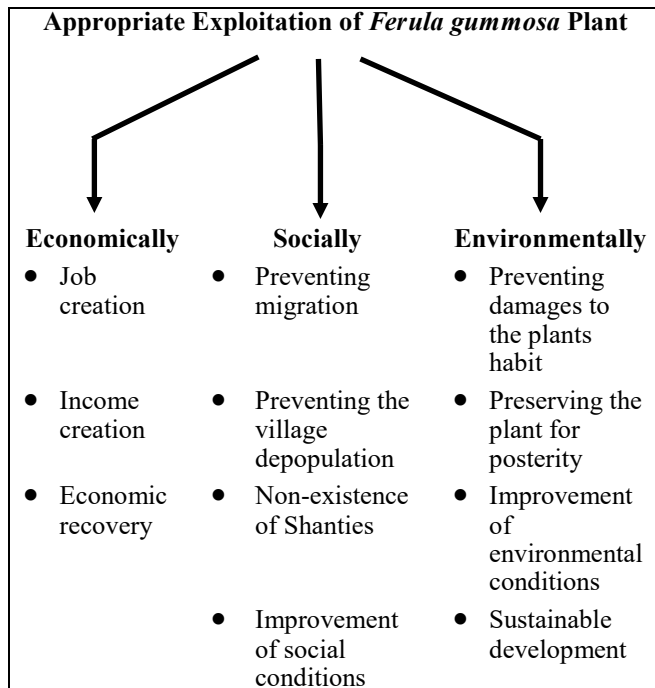
In- depth interviews or non- structured is one of the main methods of data collection which is used in qualitative research. In this approach, interviewers use open questions and investigating the applicants' responses to their questions is their major responsibility (23).

Finding the quality and depth of issue is intended in this interview and not the quantity. In this method, the researcher investigates about each of the interested point via his successive questions and follows its depth to the extent that seems it is necessary. The order of questions or points can be altered based on the researcher's opinion or desire and different questions can be asked from everyone who is aware (9). In- depth interview, (non- structured) is derived from the idea that people are the most qualified reference in expressing their experiences and in relation to the events and phenomena and various attitudes will be compiled if different people were interviewed about an event or a phenomenon (19). Indeed, in- depth interview is a valuable tool for awareness of people thoughts and feelings about a special phenomenon or topic (7).

In this study, focus group and in- depth interview were carried out with 30 men and women who are residents of Lazur village, authorities of Firuzkuh Province Natural Resources Organization, members of Islamic Council and the manager of Alborz Riz Barg Cooperative Company. Additionally, the habitat and pastureland of *Ferula gummosa* was inspected in order to perceive better the issue and the damages to *Ferula gummosa* plant's node caused by inappropriate exploitation.

### Conceptual Framework

Since the beneficiaries of *Ferula gummosa* use the local people of the village (as workers), it leads to income and job creation especially for women; consequently, it will prevent irregular migrations to large cities because it seems that the migration factor, more than any other reasons, is the result of population rapid growth in the village while the available resources in the village or accessible ones to villagers are not as developed and enhanced as the population is grown (17).



### Findings

*Ferula gummosa* is seen in the region as shrub, in terms of stem's age (older or masculine) and sessile (young and feminine). The aged pediculate type is called seeding and the young sessile type is called latescent. *Ferula gummosa* plant goes through a period of dormancy since late October until early May in this region and regarding the reserves in the underground node of the plant, the biological activity begins and 6 - 7 years age base ripens in the mid- growth, and it will be seeded afterwards and due to palatability of *Ferula gummosa* seed, it is used by domesticated livestock and wildlife. Seeds are prepared for collecting in September of the same year and once the seed reaches its final growth, it will be shed on the ground by the wind flow or cattle and the natural cultivation will be started via animals' hoof. Since the aged bases of *Ferula gummosa* plant is seeded denotes its life to the new cultivated seeds and Perennial plant will be disappeared. Young bushes of *Ferula gummosa* are exploited within the age of 4 to 7 years (before seeding) and latex of *Ferula gummosa* is extracted from young bases. Regarding climate of the region, latex exudation, from the plant's base, starts since the mid- June and it will be continued until late September of the same year. In addition, in regions where the exploitation is authorized and after exploitation, beneficiaries of *Ferula gummosa* species are required to revive the pastureland species and seeds of *Ferula gummosa* in the extracted places in fields via hill drop planting and seeding methods. Pits around the node should be filled beforehand that nodes will not be dried and damaged.

In Lazur village *Ferula gummosa* plant is exploited every four years. Local people called the region where *Ferula gummosa* is cultivated as Homashoun. In this place, villagers spends approximately 15 days removing the soil surrounded the plant (surrounding the node) (and in terms of node's

mass and root of each bushes or bases, holes are drilled to a depth of 12 to 18 cm at the bottom of the plant). Thereupon, within 10 days, three times scarifying will be done in the sunlight direction on this plant's node and its sap will be collected. On average, 5 grams pure sap is extracted from each of the bushes aged more than three years. Longitudinal scarifying is the best method of scarifying which possesses the least damage to the plant. Since methods that are called Shirazi method imposes serious damage to the plant's node by forming deep cuts. Afterwards, this sap will be collected in 18 kg tin containers and will be prepared for transferring to foreign countries. However, supervisors of the Natural Resources Organization oversee the process of collecting sap.

In this region, at first some exploitation plans of *Ferula gummosa* were prepared and issued to the province by Firuzkuh Natural Resources Organization. The province will issue an annual authorization for exploitation based on the deigned plans of Natural Resources Organization. Indeed, villagers of other parts of the country can participate in the auction of Natural Resources Organization. According to the villagers' statements, Shirazi beneficiaries often are successful in the auction and allocate the exploitation right to themselves that they have damaged to this valuable plant, due to inappropriate exploitation method that removing the whole root of the plant (node) can be addressed which can cause disturbances to the soil moisture and the plant's breeding procedure.

Generally, *Ferula gummosa* is one of the valuable and beneficial plants which the villagers of *Ferula gummosa* breeding regions were aware of the plant's multiple and multi- faceted attributes for many years and they have preserved this herbal species by expanding the local knowledge and compiling experiences and they exploited it in traditional and medical industries for people, trading and the village self- sufficiency. A the results of phenomena such like urban attractions, altering the culture of young people and etc., speed of transferring knowledge relevant to this plant from previous generation to the next generations is declined to the extent in which it reached to zero; and consequently, the traditional efficient method of exploitation and preserving this herbal species compassionately was eliminated and neglected from the village context. The next stage is the vacancy for non- native people in order to exploit this plant by improper methods in which the natural process of the plant's life had encountered serious problems that led to relevant fading indigenous knowledge; and as a consequence, it followed the slowing trend of the village traditional sustainable development. It is concluded that the scholars' systematic approach to the topic of indigenous knowledge and its application in sustainable development of the village require that research activities should consider the whole village, indigenous knowledge and its social, economic and cultural relations with the outer world, rather than starting from a "commodity" or a "method".

In recent years, due to decrease in precipitation, which can affect the plant's cultivation and exploitation,

exploitation of this plant has been neglected and it was not affordable for villagers that they could accept the uncertainty to the amount of *Ferula gummosa* exploitation and undertake the increasing expenses of workers.

Valuable exudation of the plant's node is not used inside the country due to lack of relevant industries to pharmaceutical and industrial attributes and its exports are declined in recent years (since 1991). The reason of decline in exports is announced as some of beneficiaries due to blending the plant's root or potato and mixing it with valuable exudations of this plant, they made it (exudations) impure and exported it to foreign countries which led to some problems and decrease the amount of exports remarkably.

Unfortunately, most of the native people (young people) do not know much about the appropriate exploitation method and the elderly who know about the proper method are very scarce that they are not capable of addressing to this issue. Therefore, Beneficiaries of pastureland who own the authorization of exploitation, in case of tendency to exploit this plant, they are forced to use other regions' beneficiaries (Shiraz and Semnan often); hence, they have to pay approximately 15% of the income derived from exploitation to them. In addition, due to the susceptibility of this plant and the special attention of government to the plant's exploitation, villagers are in charge of depositing about 1/5 of the price of extracted sap from *Ferula gummosa* node to the government's treasury and they should cope with the remained income. Meanwhile, since Natural Resources Organization requires beneficiaries abide by three years preserving the pastureland for conservation of water, soil and *Ferula gummosa* after extracting the plant's sap, it is not affordable for the beneficiary to rent other grassland to feed their livestock for three years.

Lack of a proper market for this plant. Since the government tends constantly to buy strategic products such as wheat, farmers prefer to produce these products which hold a more reliable market. Because many villagers lack the marketing power and Natural Resources Organization does not intervene much in this issue and all the necessary costs are undertaken by beneficiary himself (including seeding, hill drop planting, preserving the grassland, renting another pastureland for feeding livestock and etc.); hence, although many beneficiaries hold the tendency, they are not able to carry out this operation.

Existence of ranching culture is one of the other major issues involved the unwillingness of exploiting this plant. Many beneficiaries of this pasturage, who hold exploitation authorization document, refuse to leave and limit their job due to their ancestral occupation and unfortunately, most of them imposed major damages to the plant's habitat and since their exploitation authorization is joint, each beneficiary endeavor to use the most of the pastureland which creates problem.

Presence of about 50 beneficiaries in each pastureland and their integration, economic and social issues caused by joint exploitation prevent

encouragement and their willingness to exploit this valuable plant.

### Conclusion

Unfortunately, despite that *Ferula gummosa* is the main base of gum and latex production in Iran, it is not used properly due to lack of sufficient knowledge about its latex compounds, but the importance of this valuable species has been founded in foreign countries and it is used superlatively in pharmacy and industry. This plant as an export commodity not, at its actual expense, is transferred to foreign countries. It should be noted that the amount of each bush's yield is in the ratio of at least 50 grams to maximum rate of 150 grams which holds a direct relation with the number of scarifying times, strength of the plant and type of extraction. Therefore, significant amount of latex can be attained by appropriate cultivation; and thereby, increase of income and improvement of villagers' conditions (especially women) can be achieved and also pharmacy and industry can be at advantage of this valuable plant and precipitous export can be avoided at its unrealistic price. In this way, irregular migrations of the villagers to large cities can be prevented by creating job and income.

### Suggestions and Guidelines

Improper exploitation of this plant by human caused great damage to its breeding and environmental conditions which negate the rural sustainable development. Hence, its exploitation requires carrying out comprehensive studies with scientific and technical accurate planning.

Unfortunately, allocated time for preserving the pastureland is not followed by the beneficiaries and it causes damages to the plant's habitat in which the necessary control from the Natural Resources Organization and be highly effective.

Regarding the importance of this plant in economy of the country and its role in various industries, the plant's habitat should be preserved and its destruction by human and livestock should be avoided.

The scarify point is on nodes and root and it should be noted that no damage would be done on secondary roots and root hairs. Diameter of three times scarifying should not be more than one centimeter.

After the scarifying action, a rock should be provided on each of the pit or bush as a shelter in order to prevent the entrance of dust and shavings and their mixing with sap (no impurity of the sap).

Sap extraction should not be done of flowering bushes, seed and bushes aged less than three years.

Proper exploitation method of this plant is a rotational method in which the first year is allocated to exploitation and the second, third and fourth years refer to relaxation and the fifth year exploitation will be done, repeatedly. This could lead to regeneration, revitalization, natural seeding and etc.

After the end of exploitation, pits which were excavated should be filled that the nodes of *Ferula gummosa* not to become dried, and hill drop planting should be done adjacent to the same pastureland species bush.

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