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# Investigation Challenges, Importance, Functional Aspects and Compounds of the Medicinal Plant *Prangos Frulacea* in Kohgiluyeh-Boyerahmad Province

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**ABSTRACT**

Due to its special geographical location, Kohgiluyeh-Boyerahmad province has 2100 plant species, which includes 28% of the country's plant species. Of these, 425 species are medicinal plants, but in recent years, a significant part of these species have been endangered due to various reasons. In this review, investigation challenges, importance, functional aspects, and compounds of the medicinal plant *Prangos frulacea* (L.) Lindl. in Kohgiluyeh-Boyerahmad province were studied. In this review, the author searched the main related keywords of medicinal plants in main biological data centers e.g. Science Direct, Pubmed, and Google Scholar. According to the results of the researchers, among the species of medicinal plants exposed to damage and extinction in this province, the medicinal plant of *P. frulacea* is one of the best pasture plants in Iran. Coumarins, flavonoids and phenols, and essential oil (α-pinene, β-pinene, and β-phlandrene) are among the identified components of *the P. frulacea* plant. The amount of rainfall in different growth points of *P. frulacea* varies between 500 and 900 mm. The germination time of *P. frulacea* seeds is 7-25 days and the suitable temperature for germination is 18-25 degrees Celsius, the planting depth of this plant is one centimeter, and with a planting distance between and on the row of 50 x 50 cm. *P. frulacea* plant has antimicrobial properties and is known as a strong detoxifier. For this reason, it is used in traditional medicine to treat kidney diseases, the nervous system, joint pain, bone tissue repair, epilepsy, bleeding, etc.

**Keywords:** α-pinene, Coumarins, Essential oil, Extinction, Phenols, *Prangos frulacea*

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## INTRODUCTION

The climatic diversity in Iran has caused the creation of diverse habitats for various types of plants [10]. The emergence of environmental crises (climate changes, unoriginal exploitations, changes of uses, etc.), has put valuable plant species at risk of extinction [19]. Medicinal plants have had a special place in the traditional agricultural system of Iran for a long time, and the use of these plants as medicine for the prevention and treatment of diseases has attracted the attention of traditional medicine specialists since ancient times. Medicinal plants with rich sources of secondary metabolites provide the basic active ingredients of many drugs. Although the biosynthesis of secondary metabolites is genetically controlled, but their production is strongly influenced by environmental factors [17]. The tendency to use medicinal plants is increasing day by day because many synthetic drugs and chemicals used in modern medicine have many side effects and their effects are temporary. In addition to the growing importance of medicinal plants in the world, which are quickly replacing many chemical drugs, the export of these plants can also be a great source of foreign exchange income for the country. Iran, with its historical background and potential geographical, climatic, and plant species diversity, can respond to the needs of human society in the field of medicinal plants. The increasing importance, position, and role of medicinal plants in sustainable management, especially in the macro dimensions of economic, environmental, health (medicinal self-sufficiency), employment, food security, and genetic resources in the national and global area, is such that it can be done today. Deepening, revitalization, and its role, especially in drug supply, were taken into consideration as one of the indicators of development in the country [18]. One of these plants in Iran is the medicinal plant Prangos (*P. frulacea*), which is often introduced as one of the most valuable fodder, protective, medicinal, and industrial plants [19]. In this review, among the 15 species available for the genus Prangos, the species *Prangos* has been studied because of the greater

importance of this species in the province of Kohgiluyeh-Boyarahmad of Iran.

## Kohgiluyeh-Boyerahmad Province in IRAN

The province of Kohgiluyeh-Boyarahmad is located in the southwest of Iran, between 30 degrees and 9 minutes to 31 degrees and 32 min of north latitude and 49 degrees and 57 minutes to 50 degrees and 42 minutes of east longitude, with an area of 264.16 square kilometers [8]. This province is bordered by Chahar Mahal and Bakhtiari provinces in the north, Fars and Bushehr provinces in the south, Isfahan and Fars provinces in the east, and Khuzestan province in the west (Fig. 1). Dana Peak with a height of 4409 m is the highest in the province and the lowest area is Leishter with a height of 500 meters above sea level [8]. Kohgiluyeh-Boyerahmad province is a mountainous and relatively high land, which is surrounded by the Zagros Mountains with parallel ranges, all over the north and east, and the black and white mountains, Khomi, Khaiz, and the Nile in the southeast. The highest point of the province is Dana Peak with a height of 4409 meters and the lowest area is Leishter with a height of 500 m above sea level. Marun, Bashar, Zohra, Khorsan and Nazmekan rivers pass through this province and their heights are the source of several rivers. Four-fifths of the region's area consists of the heights and hills of Mahors [8]. In cold regions, there are higher altitudes and more hills, and in tropical regions, there are shorter heights and fewer hills. In cold regions, there are higher altitudes and more hills, and in tropical regions, there are shorter heights and fewer hills. The plains also make up about a fifth of the province's area, and most of the agricultural land is usually located in the plains. According to the geographical conditions of the province, the closer we get to the main stretch of the Zagros Mountains from the northeast to the southwest, the height of the mountains and the amount of rainfall and air humidity decrease noticeably. This natural situation has created dual climate characteristics and has divided the province into cold and tropical regions [8].

## MATERIALS AND METHODS

In this review, the author searched the main related keywords of medicinal plants in main biological data centers e.g. Science Direct, PubMed, and Google Scholar. Then, the authors classified articles and only discussed the valid full papers in different categories.

## Importance, Functional Aspects and Compounds of *Prangos Frulacea*

*P. frulacea* is a medicinal plant native to Iran, which is used in traditional medicine [3]. *P. frulacea* is one of the well-known and widely used medicinal plants in various places in Iran, as well as in the Middle East and Mediterranean countries, which is used to treat digestive disorders, nervous disorders, and cough [5]. The results showed that this medicine has valuable natural compounds such as coumarins, flavonoids, glycosides, and essential terpenoids [5]. During the review of studies, it was found that the *P. frulacea* plant has many medicinal effects such as antioxidant, antimicrobial, analgesic, anti-spasm, and anti-diabetic, which have been proven in different studies [5]. The traditional uses of *P. frulacea* plant in the treatment of many diseases and the presence of valuable herbal and medicinal compounds in this plant can create a basis for discovering herbal medicines in the production of antibiotics, pain relievers, and diabetes drugs and provide keys in conducting trials, provide clinical data to scientists [12]. *P. frulacea* is a plant that, in addition to its fodder and medicinal value, can also help control soil erosion [5].

## Botany of Medicinal Plant of *Prangos Frulacea*

*P. frulacea* (L.) Lindl belongs to the family Apiaceae and the genus *Prangos* (Fig. 2). The genus Prangos has about 30 species there are 15 species in Iran and 5 of them are native to Iran [3]. *Prangos frulacea* is an aromatic and forage perennial herbaceous plant in Iran [3]. The genus Prangos in Kohgiluyeh-Boyerahmad province belongs to seven species *P. hausslmechtii, P. lophoptera, P. corymbosa, P. uloptera, P. acaulis, P. platychlaena, and P. frulacea.* [3].

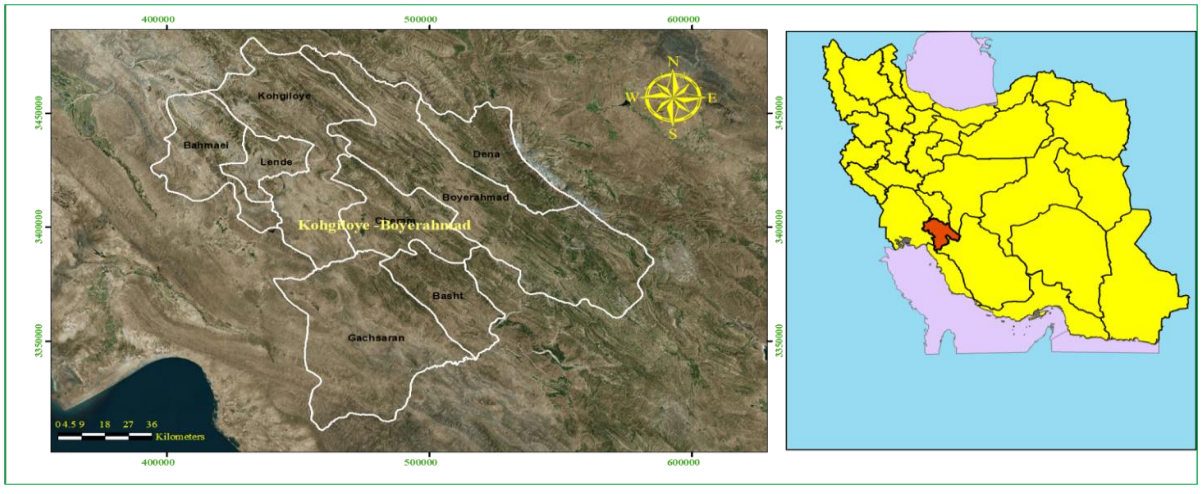


**Fig. 1** Geographical location of Kohgiluyeh-Boyerahmad province in Iran

**Fig. 2** *P. frulacea* plant in Kohgiluyeh-Boyerahmad habitat and its seeds

Among the most important nematodes are plant parasites that reduce the yield of agricultural products, and plant contamination with this nematode causes galls in the roots and reduced growth, resulting in reduced yield. In a study, the effect of the plant species *P. frulacea* against the tomato root-knot nematode *M. javanica* was investigated and in laboratory conditions, the investigated plant at a concentration of 1% caused 50% mortality and at a concentration of 9%, the caused 100% mortality of second instar nematode larvae [14]. In greenhouse studies, tomato growth indices in treatments with more than 0.15% leaf powder had a statistically significant increase compared to the control treatments. Nematode indices in treatments with more than 0.1% leaf powder were significantly reduced compared to the control, and the highest reduction was observed in treatments inoculated with 0.45% leaf powder [14]. Research to identify the ingredients and study the antimicrobial effects of the essential oil of *P. frulacea* showed that among the 10 identified compounds of this plant, α-pinene (36.6%), β-pinene (31.9%) and β-phlandrene (7%) are considered the main compounds. The most antimicrobial effects of the essential oil of this plant were observed against Staphylococcus aureus and it was concluded that a significant percentage of the said essential oil is composed of hydrocarbon monoterpene compounds and the only sesquiterpene identified in this essential oil is β-caryophyllene (3.1%) [1]. [20] investigated the compatibility of natural dyes *P. frulacea*, Ronas, and pomegranate peel on wool yarn. The results showed that the curve of dyeing ability of two dyes *P. frulacea* and Ronas, are similar to each other. The ability to dye woolen yarn with pomegranate peel dye is different compared to the other two dyes. Thus, the similarity of the dyeing ability of *P. frulacea* and Ronas shows the compatibility of these dyes. The difference between the dyeing ability curves of pomegranate peel indicates the low compatibility of this material in combination with *P. frulacea* and Ronas. The final results showed that Ronas and *P. frulacea* pigments have a good to excellent degree of compatibility in combination with each other. In this way, it is possible to combine two dyes, Ronas and *P. frulacea*, in one dyeing bath. The combination of pomegranate peel with each of the two pigments Ronas and *P. frulacea* causes low compatibility with a very weak to weak degree. For this reason, it can be acknowledged that there is no combination of two dyes, Ronas and *P. frulacea*, with pomegranate peel. Also, in research [22], the antidiabetic role of the hydroalcoholic extract of this plant was investigated in the treatment of diabetic rats treated with streptose and tocin. The results indicated a significant decrease in blood glucose levels in the group treated with *P. frulacea* stem and leaf extract and also pancreatic tissue repair. Therefore, the extract of this plant can be suggested as a natural antidiabetic drug without side effects as an alternative to existing chemical drugs. Next, the important compounds isolated and identified (coumarins, flavonoids and phenols, and components identified from the essential oil) of *P. frulacea* medicinal plant are shown in Figures 3 to 5 [5] and these compounds are the secondary metabolites that have a very important effect in communicating between plants and their surroundings. These compounds play an important role in the plant's response to environmental stresses, and stressful conditions, some of these compounds increase significantly in the plant. Considering the defensive role of secondary metabolites, the impact of environmental stress on the production of these products presents us with a complex and ambiguous picture. Under stress conditions, the production of some of these compounds increases several times, in many cases, the amount of secondary metabolites decreases under stress conditions [17].

## Ecology and Principles of Cultivation of *P. Frulacea*

*P. frulacea* is a plant that grows in mountainous areas in snow-covered heights. This plant emerges from the ground in early spring after the snow melts in the highlands and continues to grow until the end of May and the beginning of June.

The genus *Prangos* in Iran has 15 species of perennial plants, all of which have significant fodder value, and for this reason, it is among the species suitable for planting in mountainous areas. *P. frulacea* The main habitat of *P. frulacea* in Iran is in the Zagros region. This plant has been seen in provinces of central Fars, Kohgiluyeh-Boyerahmad, Kermanshah, Chaharmahal and Bakhtiari, Isfahan, Kermanshah, Lorestan, Hamedan, Kerman and in parts of the Alborz Mountains.

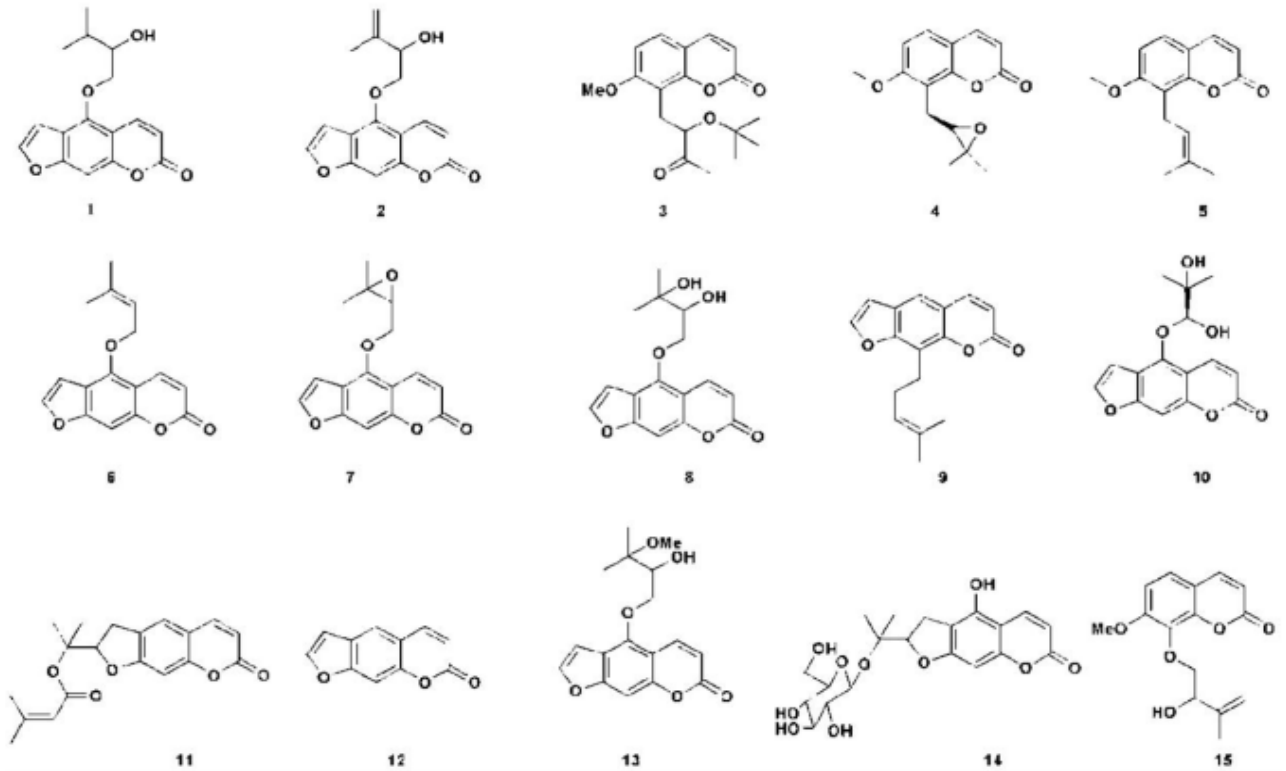

**Fig. 3** The structure of coumarin compounds isolated from the *plant P. frulacea* [5]
Compounds (1) pranferol, (2) gosferol, (3) pranferin, (4) meranzin, (5) osthole, (6) isoimperatorin, (7) oxypeucedanin, (8) hydrate oxypeucedanin, (9) imperatorin, (10) Hydroxypeucedanin hydrate, (11) pranchimgin, (12) psoralen, (13) oxypeucedanin methnolate, (14) coumarin glycosidic and (15) frudenol were isolated and identified as the structure of coumarin compounds from *P. frulacea*

The amount of rainfall varies between 500 and 900 mm in different growth points of *P. frulacea* [11]. The duration of germination of *P. frulacea* seeds is 25-7 days and the suitable temperature for germination is 18-25 degrees Celsius, the planting depth of this plant is one centimeter, and with a planting distance between and on the row of 50 x 50 cm. To plant *P. frulacea* seeds are two methods of direct planting or cultivation by transplanting. The choice of planting depends on the climate of your area. Thus, if you are in cold regions where there is frostbite in early spring, it is better to choose the transplant method for planting. Before planting *P. frulacea* seeds in the field, add some rotted animal manure or compost to the soil and mix well with the soil.
The seeds of *P. frulacea* grow best in soil that has plenty of nutrients and good drainage. After preparing the ground, you can sow the seeds of *P. frulacea* at a depth of one centimeter from the surface. After planting the seed, cover it with soil and water it slowly so that the soil does not move in the seed [2]. *Prangos frulacea* seeds usually germinate after 7-25 days. Germination of this seed takes some time. Therefore, the seeds may not germinate even 30 days after planting. But don't worry, you can grow *P. frulacea* seeds by keeping the soil moist. This seed has the best germination at a temperature of 18 to 25 degrees Celsius.

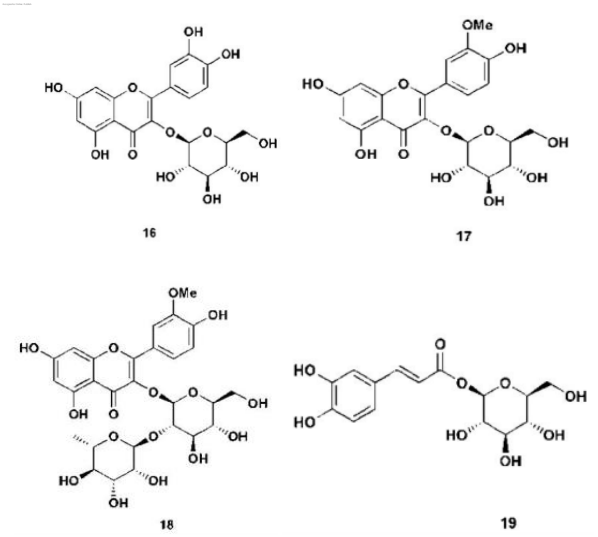

**Fig. 4** Chemical structure of flavonoid and phenolic compounds isolated from *P. frulacea* plant [5]

Compounds (16) quercetin-3-O-ß-glucoside, (17) isorhamnetin-3-O-ß-glucoside, (18) isorhamnetin-3-O-glucorhamnoside and (19) caffeic acid glucosyl ester as the structure of flavonoid compounds and phenol isolated from *P. frulacea* plant were isolated and identified.

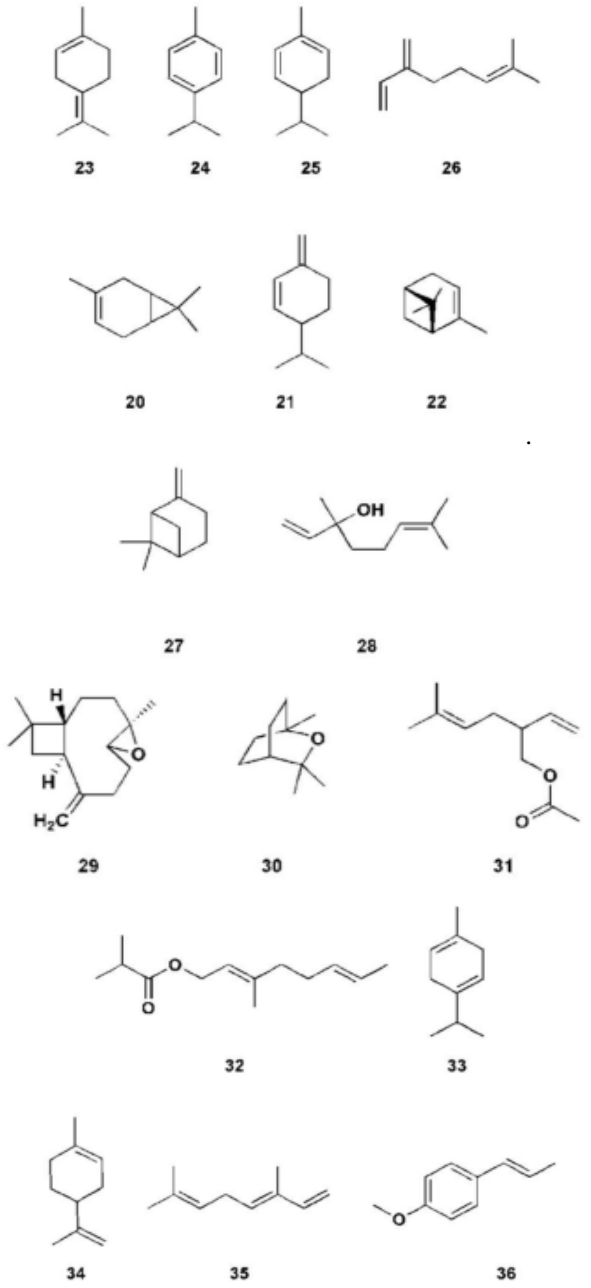


**Fig. 5** Chemical structure of the main compounds identified from the essential oil of the plant *P. frulacea* [5]
Compounds (20) δ-3-carene, (21) ß-phellandrene, (22) a-pinene, (23) terpinolene, (24) p-cymene, (25) a-phellandrene, (26) myrcene, (27)) ß-pinene, (28) linalool, (29) caryophyllene oxide, (30) 1, 8-cineole, (31) lavandulyl acetate, (32) geranyl isobutyrate, (33) γ-terpinene, (34) terpinene, (35) ocimene-ß (E) and (36) (E)-anethole were respectively reported as the components of the main compounds identified from the essential oil of *P. frulacea*

If you have chosen seedlings for planting after the plants have produced 4 true leaves, you can transfer them to the field and plant them with a planting distance between and on the row of 50 x 50 cm, or if you plan to grow this valuable medicinal plant in a pot, you can plant the seedlings in large pots. Cold treatment is also recommended for this seed. In order to keep the seed away from moisture for two months before planting it on the lower floor of the refrigerator and then start planting. In the Zagros Mountains, this plant, which grows on its own, usually emerges from the soil in the spring after the weather becomes favorable and the mountain ice melts, it grows until the end of May and June, and then goes into a state of dormancy or is coming sleep wintry. Each year, this plant is only seen on the ground for a few months, and only the roots remain in the ground during dormancy. *Prangos frulacea* grows like this in the following years. In the years 6-8, the plant becomes mature gives yellow flowers, and then produces fruit. When the plant is green, water the plant whenever it is dry, and in the year of flower production, to strengthen the plant, you can use special flowering fertilizers that are high in potassium and phosphorus [2], which are needed in terms of germination, aspects Agricultural (planting date, nutrition, density, and environmental stresses) of the medicinal plant *P. frulacea* should be researched to reveal the principles of agriculture for its revival and planting.

## Challenges of the Medicinal Plant of *P. frulacea*

Plants are one of the most valuable genetic resources in the world. It is predicted that more than 15 to 40 percent of living species will become extinct in 2050. Studies on endangered species and the preservation of genetic reserves in the world have been seriously discussed since 1960. So international organizations were formed in this direction [23]. Due to its special geographical location, the province of Kohgilooyeh and Boyerahmad is the place of residence of various plant species, some of which are unique and can grow only in this province, so this province has 2100 plant species, which includes 28% of the country's plant species. Of these, 425 species are medicinal plants, but in recent years, a significant part of these species have been endangered due to various reasons [9]. Among the species of medicinal plants exposed to damage and extinction in this province, based on the survey results of [15], is the medicinal plant *P. frulacea*. *P. frulacea* (L.) Lindl, as one of the best pasture plants in Iran, is one of the plant species whose reproduction is in danger due to its unprincipled use [19], which the occurrence of environmental crises (water changes and air, unprincipled exploitations, changes of uses, etc.), has put this valuable plant species in danger of extinction so that the saving of this species and the ecosystem containing them requires precise scientific studies.

## Strategies for Revitalization the Medicinal Plants *P. Frulacea*

In Iran, there are many problems with the production of medicinal plants that must be thought of to solve these problems. Optimum agricultural production, identifying potential areas for the production of each medicinal plant, supporting companies that produce raw materials with global standards, creating model plantations and industry of medicinal plants in the country, etc., can all be

effective solutions for the production of medicinal plants in Iran [18]. In order to protect endangered and endangered species, there are measures such as the establishment of plant gene banks, the designation of protected areas to preserve the genetic reserves, and the planting of endangered species in botanical gardens and farms. In order to form plant gene banks and plant species in fields and introduce them alternately with crops or to create a pilot to preserve, maintain, reproduce, and grow endangered plants in the province, knowledge of improving techniques and increasing germination seed, establishing and creating a healthy and strong seedling and increasing the high efficiency of the plant in the fields is required [7]. Determining the cardinal temperature and timing is useful for finding the optimal temperature for the fastest germination, as a criterion for the distribution of species under different climate change scenarios, on the other hand, priming is one of the methods of improving the function and increasing the quality of seeds are for germination in adverse environmental conditions [6] and seed priming is a physiological method that improves the efficiency of seeds for rapid and coordinated germination [13]. That the strategies and effective measures mentioned above can be used to preserve endangered species and produce medicinal plants of *P. frulacea*.

## CONCLUSION

*P. frulacea* is a medicinal plant native to the southern regions of Iran, which has been used in traditional medicine in the treatment of many disorders, and numerous researches have been conducted to identify its herbal compounds and therapeutic properties. The occurrence of environmental crises (climate changes, unprincipled exploitations, changes of uses, etc.), has put this valuable plant species at risk of extinction so the saving of this species and the ecosystem containing them requires accurate scientific studies. Optimum agricultural production, identifying potential areas for the production of each medicinal plant, supporting companies that produce raw materials with global standards, creating model plantations and industry of medicinal plants in the country, etc., can all be effective solutions for the production of medicinal plants in Iran. The traditional uses of *P. frulacea* plant in the treatment of many diseases and the presence of valuable herbal and medicinal compounds in this plant can create a basis for the discovery of plant-based drugs in the production of antibiotics, painkillers, and diabetes drugs, and in addition to its fodder value and Medicine and dyeing can help to control soil erosion and against plant diseases. *P. frulacea* seeds usually germinate after 7-25 days. Germination of this seed takes some time, so it may not germinate until 30 days after planting. But don't worry, you can grow *P. frulacea* seeds by keeping the soil moist. This seed has the best germination at a temperature of 18 to 25 degrees Celsius. If you have chosen a seedling for planting, after the plants have produced 4 true leaves, you can transfer them to the field and plant them with a planting distance between and on the row of 50 x 50 cm.

## REFERENCES


1. Amiri H. Chemical Composition and Antibacterial Activity of Essential Oil of *Prangos frulacea*. J Med Plants. 2007; 6 (21): 36-41.
2. Anonymous. The seeds of *Prangos frulacea*, a fragrant food from Zagros, along with the planting and breeding guide. 2023; https://fardinkesht.com/.
3. Azarkish P., Moghadam M., Ghasemi Pirbaluti A., Khakdan F. Change in morphological characteristics, total phenol content and antioxidant activity of different populations of three species of Prangos spp. Collected from the habitats of Fars, Kohgiluyeh and Boyer Ahmad provinces. Ecophytochem Med Plants. 2018; 6(3): 1-20.
4. Babaei F, Ebrahimi A, Naghipour AA, Haidarian M. Potential geographic distribution of *Prangos frulacea* in Chaharmahal and Bakhtiari province under climate change scenarios. Plant Ecosyst Conver. 2022; 10 (20): 207-224.
5. Bahadri M.B., Abdullah Nejad H., Khorrami R. Review of phytochemical compounds and phytopharmacological effects of the medicinal plant *Prangos frulacea*. Advanced Res. Med. Plants. 2022; 1(1): 25-35.
6. Basra S.M.A., Ashraf M., Iqbal N., Khaliq A., Ahmad R. Physiological and biochemical aspects of pre- sowing heat stress on cotton seed. Seed Sci. Technol. 2004; 32:765-774.
7. Boddy L.G., Bradford K.J., Fischer A.J. Population-based threshold models describe weed germination and emergence patterns across varying temperature, moisture and oxygen conditions. J. Appl. Ecol. 2012; 49(6): 1225-1236.
8. Environmental protection of Kohgiluyeh-Boyerahmad. Geographical location of Kohgiluyeh and Boyar Ahmad province, General Department of Environmental Protection of Kohgiluyeh and Boyar Ahmad province. Yasuj, Iran. 2024; https://kb.doe.ir
9. Fattahi S., Khoshdali F. Strategic problemology of development in Kohgiluyeh and Boyer Ahmad provinces. It is the center of strategic investigations of the Presidency. 2016; 25.
10. Fattahi B., Nazeri V., Kalantari S. Evaluation of different ecotypes of Salvia reuterana Bioss. in Iran. J .Crop Prod. Process. 2014; 4: 133-148.
11. Bostani R. Study and investigation of the distribution of different species of *Prangos frulacea* in Iran. National Conference of Medicinal Plants, Sari. 2010; https://civilica.com/doc/342283.
12. Kafash Farkhad N., Asadi-Samani M., Khaledifar B. A review on secondary metabolites and pharmacological effects of *Prangos frulacea*. J. Shahrekord Univ. Med. Sci. 2013; 15 (3): 98-108.
13. Sajjadi S.E., Mehregan I. Chemical composition of the essential oil of *Prangos asperula* Boiss. Subsp. haussknechtii (Boiss.) Herrnst. Etheyn fruits. DARU J. Pharma. Sci. 2003; 11 (2): 79-81.
14. Mohammadi G.R., Amiri F. The effect of priming on seed performance of canola (*Brasica napus* L.) under drought stress. American-Eurasian J. Agric. Environ. 2010; 9 (2): 202-207.

15. Mozafarian Sh., Abdullahi M., Chareghani H.A. Inhibitory effect of *Prangos frulacea* and *Satureja hortensis* extract on root knot nematode (*Meloidogyne javanica*). Plant Dis. 2016; 52(4): 464-445.
16. Naghipour Borj A.A., Nowrozi M., Bushra H. Investigation of flora, morphology and geographical distribution of plants in Maimand protected area, Kahkiloeh and Boyer Ahmad, Iran. Taxon. Biosyst. 2013; 6(19): 67-82.
17. Rahimi A. The effect of mycorrhizal fungi on the physiological properties, active substances and yield of the medicinal plant Borage (*Borago officinalis* L.) under water stress, doctoral thesis, Yasouj Uni. 2017; 106 pages.
18. Rahimi A., Moradi A.A., Abdipour J. A look at the secondary metabolites of medicinal plants under drought stress conditions and mycorrhizal fungi, the third international conference on sustainable agriculture and natural esources, Tehran. 1394; https://civilica.com/doc/417165.
19. Rahimi A., Salahi Ardakani A., Jafarinejad Bastami M., Abdipour J. Investigating the situation and obstacles in the production of medicinal plants in Iran, 9th National Conference on Sustainable Agriculture and Natural Resources, Tehran. 2018; https://civilica.com/doc/822695
20. Safaiyan R., Azarnivand H. Investigating the effect of some treatments on dormancy failure and improvement of *Prangos frulacea* seed germination. Iran J. Range Des. Res. 2010; 17(2): 331-339.
21. Safapour S., Shahparori M.R., Ghornjig K.A. Studying the compatibility of natural dyes *Prangos frulacea*, Ronas and pomegranate peel in dyeing wool yarn. J. Color Sci. Technol. 2019; 13(1): 25-37.
22. Soltaniband Kh., Farrokhi F., Togmechi A., Kafash Farakhd N. The effect of hydroalcoholic extract of *Prangos frulacea* plant on the treatment of type 2 diabetes. National Conference of Med Plants. 2010; https://sid.ir/paper/821116/fa.
23. Tohidfar M., Haji Barat Z. Saving endangered plant species using transgenics. J. Biosafety 2016; 9(4): 23-31.