



Der Einbenfreunde



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Endangered Species**
(with emphasis on Yew (*Taxus baccata*))



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The effect of site factors on tree and natural regeneration of Yew in Ziarat valley of Gorgan

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(oral)

Abstract

Yew is a valuable native and endangered species in Hyrcanian forests. The present study was conducted to investigate the quantitative and qualitative status of the stands and natural regeneration characteristics in Yew natural habitats located in three altitudes 1300 to 1950 meters above sea level including Dobrar Alangdareh, Tarkat Jahan-Nama and Cefid-Dera Zayatri respectively. The inventory of Yew was done by 1000 square meters circle samples with 10% intensity (100-100 m network). Allometric variables such as species type, dbh, total height, crown height and trunk length, crown radius, canopy cover and sex determination were measured. Also, the frequency of regeneration was studied by 100 square meters micro-plot in the center of main plot in three height and three diameter classes. Soil sampling was done in a completely randomized way and two depths. The results showed that the frequency per hectares in the middle region is more than others and the tree health was reduced with increasing altitude. On the other hand the yews had more favorable growth conditions in higher altitude than the others. In general, the natural regeneration was very poor in all three regions and correlated with the density of Yew which seems to be due to competition for light and soil moisture. The soil studies showed that similar physical properties in all regions and Tarkat habitat with clay loamy soil texture and more nitrogen seems more suitable for Yew presence than the other regions aspect of mean dbh and uneven-aged distribution.

Key words: Natural Regeneration, Stand structure, soil, Yew.



Structure of *Taxus baccata* stands at Chino region of Aliabad

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Abstract

Taxus baccata is one of the few coniferous species in Hyrcanian forests of northern Iran and is considered as a relict from tertiary geological period. This species is also included in Red Data Book of Iran and is protected as an endangered tree species in national level. In this investigation, we aimed to study the structure of *T. baccata* stands at Chino region of Aliabad which is a 5 ha *T. baccata* stand mixed with other tree species. We recorded height and diameter at breast height of all trees with D.B.H of above 12 cm in 3 sample plots with the area of 400 m² in the study site. Results showed that *T. baccata* averagely constituted 31% of species composition within the studied sample plots. The mean height of *T. baccata* trees was 21 m which is smaller than the mean height of the other species (27.2 m) that means *T. baccata* is understory species at the study site. While the mean diameter of *T. baccata* was 46 cm that is almost two times greater than mean diameter of other species (24 cm). Lack of regeneration and young trees were observed therefore at the time initiating and developing the regeneration is of great importance to guarantee the future of this valuable stands

Keywords: *Taxus baccata*, Hyrcanian forests, Stand structure, Endangered species



The necessity of integrated evaluation and Protection of genetic resources of Yew (*Taxus baccata* L.) and the establishment seed orchard in Iran

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Yew (*Taxus baccata* L.) is one of the rare needle leaved trees species in Hyrcanian forest. As time goes by, extent of Yew forests has decreased due to some reasons such as destructive human activities, grazing, global warming and wood smuggling. It appears to be quite necessary to preserve Yew genetic diversity for very slow growing, long period of live and, environmental numerous stresses. Integrated Planning for its Evaluation and Protection (IPEP) would be based on scientific research results, in particularly, genetic diversity topics. There have not been the integrated genetic studies about Yew in Iran yet. Most of the preceding relevant studies to date, focused on efficiency of genetic maker which don't seem to be appropriate enough for Yew 's IPEP codification. Whereas in contrast, in other countries which are Yew's habitat, the genetic investigations have widely been performed. The results show the extensive range of genetic diversity indices. Regarding the distribution of the Yew's habitat along the Hyrcanian Forest in north of Iran -800 km length-, the integrated evaluation of genetic diversity seems necessary in order to IPEP. Therefore, there is a growing need for the identifying of range of Yew's distribution as well as improving study of ecological and silviculture characteristic. It is suggested that genetic evaluation will be carried out in all habitats in order to obtain the information including the number of rare and unique alleles, kinship, and genetic differentiation between and within the stands, pollination system, seed propagation structure and gen flow. Then, the habitats should be prioritized based on genetic diversity and habitat destruction rate.

The Genetic Resources Conservation Program should be carried out in the following ways:

1. Carrying out the necessary measures to reduce and its destruction in cooperation with the Forests, Range and Watershed Management Organization, Research Institute of Forests and Rangelands, Agricultural and Natural Resources Universities, Environment Protect Organization, Non-Governmental Organization and local societies.
2. Codification of guidelines and include them in the forestry operations to protect the Yew stands, taking care of the seed trees and trying to help to set up of regeneration. Enter it in to forestry operation in order to conservation of Yew stands, seed trees and regeneration.
3. Planning and performing of protection plan of genetic reserves as follows:
 - 3.1 Identification and registration of superior genetic trees in the habitats for seed production and selection of seed zones.
 - 3.2 Trying to help to seedlings' reciprocal distribution in different habitats to enhance genetic diversity.
 - 3.3 Inside and outside of habitat conservation based on the results of genetic investigation
 - 3.4 Provenance-progeny testing in order to evaluate the potential of trees in transfer their genetic resources (seeds and seedlings) to their progenies.
 - 3.5 Creating the seed orchards based on provenance-progeny studies results aim to produce Yew's high quality and quantity seeds



Yew, a tree under nature conservation

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Abstract:

In 1903 M. Zeiske carried out an inventory of the yews in northern Hesse and published it in the papers of the Verein für Naturkunde zu Kassel. Sabine Gessert then carried out an inventory in the area of North Hesse/South Lower Saxony in 1983 and in the 1990s the Hessische Forstlichen Versuchsanstalt in Hann.-Münden carried out a Hesse-wide survey (Holzberg, H. (1997)). A nationwide inventory was carried out between 2009 and 2012 on behalf of the Federal Agency for Agriculture and Food. In the area of North Hesse-South Lower Saxony-West Thuringia, the yew is the most widespread tree in Germany, especially in the Muschelkalk dominated areas (BLE 2013). In the years 2016 to 2018 I carried out my own inventory of the yews in the area of the Wehretal Forestry Office. The trees were measured with GPS and the chest height was determined, as far as the tree was reachable. With stick rashes or multi-stem growth was measured below the branching. Particularly in the case of older, sparsely splayed trees, the circumference must be determined more accurately than the diameter. Annual ring analyses (Voigt, O. 1993) have shown that a middle annual ring in the "Graburg" stand, on the northern slope, has a width of about 0.7 mm, which corresponds to a BHD of 25 and a circumference of 80 cm at the age of 180 years. At my admission all yews were counted, which can no longer be destroyed by deer. For this they must be over 1.5 m high and have over 5 cm BHD, or stand at the steep slope, which is not attainable for deer. At 14 locations, which were also recorded by Zeiske, 3411 yews were found (Zeiske: 3188). In addition there are 5 sites with today 476 trees which were not mentioned by Zeiske and 4 new settlements by planting with about 2077 trees. The small increase of yews for more than 100 years from 3188 to 3411 at the locations compared to Zeiske is frightening when one considers that the yew has been protected since 1935. This increase would have been even smaller without the trees planted at the respective sites. It seems that the existing conservation strategies are hardly sufficient to ensure the survival of the species through natural rejuvenation.



**Yew, timber production, cultivation concept, yew as valuable timber in the forestry office
Wehretal**

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Abstract:

Since the beginning of the 1980s, experiments have been carried out in the forestry office with the nurturing and planting out of yew seedlings. After the yew was named tree of the year in 1994, the Hessische Forstliche Versuchsanstalt in Hann.-Münden attracted a large number of cuttings and seedlings, most of which were advertised here in the forestry office. Since these could not all be handed over, the forestry office took over the remaining stocks of about 5000 pieces in order to save them from destruction. The idea was to plant these yews in good locations where beech would not compete in the foreseeable future in order to enable them to grow rapidly. This should make it possible to produce valuable timber within a normal rotation period of around 150 years. With today's ideas about permanent forest, a longer growth period is also conceivable without further ado. The transformation areas in the southern part of the Graburg, the Abt. 22 - 28, were suitable for the planting of yew trees. 100 years before, they were founded as spruce, pine and black pine seeds on agricultural hats, and about 10 years before they were thinned out and underlaid with sycamore maple. The subsoil is a Muschelkalk with loess bedding, which has more or less good water storage capacities at small sites, depending on the thickness of the loess layer. A part of the yews was planted in a 5x5 m formation in already existing small creels. However, most of the plants were distributed over the whole area of the stands, in an area of 10 x 10 m. The hope that the large number of plants would overtax the deer and reduce the browsing rate was quickly shattered, so that individual protection had to be applied over the next few years. The wide bandage was intended to give the trees a great chance of survival, and later branchings were accepted. Since 2015, experiments have also been carried out with planting in small groups of about 10 m in diameter (planting bandage 1x1 m), whereby the natural cleaning of the branches should work better, but only a small part of the plants will reach a usable strength. The yew should grow in these stands as the 2nd tree layer and, in addition to its serving function, shade the sycamore maple from the soil, which tends to graze in pure maple stands. This makes the site a catchy habitat for other native deciduous tree species as well as beech and oak, which migrate from neighbouring stands or have been planted in small areas. The maple provides the necessary shade so that the young yews grow up in a semi-shade climate with treetops and fine branches. Observations on older yew rejuvenation have shown that too much light promotes the formation of strong lateral branches, which leads to large injuries



when branches are knotted, and to tension-backed trunk forms due to the hollows under the branches. Studies in dense natural regeneration of yew trees here at the forestry office have shown that at a distance of less than one metre between the stems the branches die off with a thickness of less than 1 cm, while at distances of 1 metre and more they remain vital for considerably longer and reach greater thicknesses. A distance of 1 m between the yews is, at least for the local origins, the upper limit for an early natural cleaning of the branches. The fine-branched upbringing as a prerequisite for a later value burdening is the momentary big challenge for the forest enterprise. Here we are in the process of gaining experience that can describe a compromise between fine-branch and thickness growth. Basically, the yew should receive the same treatment as our other tree species grown for the production of valuable wood. Keeps the yew dense in its youth, after cleaning the branches the standing space is extended so that a rapid increase in diameter takes place.



The Swiss yew population – its development, endangering and promotion based on data of the Swiss National Forest Inventory (NFI)

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Abstract

Switzerland is 32% covered with forest. It lies in the middle of the main European area of yew (*Taxus baccata*) and has by far the highest density of yews (1.23/ha with dbh \geq 8 cm). The population of 1.3 million individuals corresponds to that of Austria, Germany and Italy as a whole. Yews in the Swiss forest are mainly younger than 200 years. They originated after forest pasturing was stopped between 1800 and 1850 and game was almost extinct by hunting in the beginning of the 19th century. At present, there are only a few (very) old yews. Most yews grow in the submontane and lower montane vegetation belt (median 720 m a.s.l.) on (steep) slopes, mainly on basic soils and often together with beech (*Fagus sylvatica*) in the upper layer. Although yew is not protected in 24 out of 26 cantons, the National Forest Inventory (NFI) confirms a generally very restrained and responsible-minded use of this rare species. Thus, the number of thicker yews with \geq 24 cm dbh has quadrupled within the last 30 years. In contrast, young yews of 0-7 cm dbh have decreased by half during the same period. Studies using NFI data show that yew regeneration has been steadily decreasing since about 1910. The reason is, that after the introduction of the first national hunting law in 1874/75 and the reintroduction of roe deer in 1890, game populations have continuously increased. Since about 1940, there has been hardly any natural regeneration without protection. In the first NFI 1983/85, 40% of the yews in the height class 40-130 cm were damaged by browsing, in the fourth NFI 2009/17, no more yews were found in this height class at all. In recent years, older yews have also been bark peeled by deer. Rare species have been promoted in a federal programme since 1997. In order to preserve and improve forest biodiversity, in 2012 the Federal Council implemented a Biodiversity Strategy and subsequently defined six fields of activity, based on potential and deficit analyses. One is the promotion of species and habitats of national importance. Yew is one of the 14 rare and ecologically valuable tree species that are to be promoted. Activities should focus on core areas and areas to connect (sub-)populations, also in order to facilitate genetic exchange. Two strategies are recommended: a) protection of natural regeneration against game browsing and b) clearing of the upper layer up to a crown coverage of 50-70% in order to promote the growth and fructification of older yews and the growth of regeneration. Prerequisites are an area of 1-5 ha to be treated and a minimum occurrence of yews ($>$ 30/ha). These measures are subsidised by the Confederation and the cantons. To identify suitable locations to promote yew, NFI has modelled the niches realised for all tree species nationwide at a resolution of 25



meters. Tree data from the NFI as well as data on topography, climate, soil and forest structure were used to develop five models (ensemble modelling). Occurrence is mapped as "likely" if at least four models predict yew. When comparing with field data, about 90% of NFI occurrences are predicted correctly. Without regeneration in the next decades, Yew will change from IUCN status LC (least concern) to NF (near threatened). Although forest owners are compensated for their support measures, activities to date have been modest and positive effects cannot yet be demonstrated with the NFI. Forest owners should also increasingly recognise the economic value of yew wood and thus be motivated to promote yew trees in the long term. However, this does not change the fact that the most important driving factor of missing regeneration, roe deer and deer, must be regulated more strongly by hunting and by predators such as wolf and lynx. The management of big game and predators and the corresponding damage to forests and agriculture are currently the biggest forest policy problems in Switzerland.



Plant communities and ecology of common yew forests in Jahan-nama protected area, Northern Iran

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(oral)

Abstract

In this paper we are going to outline phytosociological classification and ecology of yew, *Taxus baccata* L. stand, in Jahan-nama protected area (JNPA) as a favourable yew population with heterogeneous floristically composition in the East Hyrcanian forests. Vascular plant species composition with their cover percentage and topographical features as well as soil parameters were recorded in 86 sample plots with an area 400 m². Vegetation units were determined using modified TWINSpan and translated into syntaxonomic system. In syntaxonomic system, re-arrangement of each sample plot was done based on diagnostic species occurrences and expert knowledge with the aim of increasing floristic distinctiveness of vegetation units. Syntaxa were finally analysed using diagnostic species and environmental parameters according to phi- values and ANOVA, respectively. DCA was used to illustrate the similarity of syntaxa and their relationships with main environmental factors. We also used species combination concept for determining diagnostic species in second association. Result showed that JNPA yew forests were into 6 vegetation units including: 2 groups of *Fagus orientalis*- *T. baccata*, 1 groups of *Carpinus orientalis*- *T. baccata* and 3 groups of *C. betulus*- *C. orientalis*- *T. baccata* forests. These patterns were translated into 1 phytosociological alliance (*Carpinet betuli*- *Taxion baccatae*), 2 associations (*Fago orientale*-*Taxetum baccatae* and *Carpineto betuli*- *Carpineto orientale*- *Taxetum baccatae*), 5 sub associations and 2 variants. It forms *Fageto*- *Taxetum* in northern aspect with lower slopes and deep soil while *C. orientale*- *Taxetosum* syntaxa appeared in high slope of northeast and northwest aspects with lower soil depth. It also formed *Carpineto betuli*- *Carpineto orientale*- *Taxetum baccatae* in the intermediate slopes. The main factors determining the species composition of the JNPA syntaxa are slope, eastness, elevation and clay content. Our results showed that Yew could be associated with different plant species which are distributing in different site suitability. It caused to have various yew syntaxa in JNPA and considerably reiterate high floristically and ecologically capacity of this area.

Keywords: Vegetation classification, Phytosociology, Diagnostic species, *Taxus baccata*, Hyrcanian forests



The idea of protecting by using- using the example of the Yew tree

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(oral)

Abstract

Yew (*Taxus baccata*) has played an important role in the interglacial ice ages in Europe. Due to macrofossils it is proven that man has been using wood selectively since very early times. For the ancient peoples yew was important as a raw material for their bows. In the 15th and 16th century A.D. (Anno Domini) there was a shortage of raw materials of yew wood in England for the production of the English longbow. In order to secure the bow production further, it came to forced imports. Due to these extensive uses, which took place in addition to the regional needs of the population, yew was exterminated in wide areas of Europe. The potential spread of yew covers Europe almost completely. In the north, under the influence of the Gulf Stream, it reaches the 63rd degree of latitude in Norway. Extreme rock locations on which yew still occurs naturally today, must be addressed as relic locations, on which yew has withdrawn itself from human access by simply not being accessible. In Western Europe, there are very few yews that bear witness to the growth that yew can achieve. In the Caucasus, too, the reasons for the frequent absence of yew in the forest ecosystem are probably anthropogenic. Today, the most valuable use of yew wood is for the production of veneer. However, yew has additional beneficial properties for the forest ecosystem and wood production. As a serving tree species, yew can prevent the shoots of adventitious shoots in oak, cherry and maple trees. At the beginning of the 20th century, Hugo Conwentz developed the ideas of his teacher Göppert for the preservation of old original tree individuals into a general conservation of natural monuments. He dealt with this important tree species in terms of cultural history until shortly before his death. Through Hugo Conwentz, yew has played a very important role in establishing the idea of nature conservation in European society at the beginning of the 20th century. With regard to yew, pure conservation has not been able to prevent the natural occurrence of yews from declining further in the last 100 years. This is why 25 years ago the idea was developed that only by integrating yew into normal forest management the existence of yew can be secured in the long. How valuable and vital this yew raw material can be has only become apparent in recent years. In 1992, the new drug TAXOL was approved in the USA. This drug was initially derived from the bark of yew. *Taxus brevifolia* was on the verge of extinction in the USA due to bark extraction. In the meantime, it is produced semi-synthetically from the needles of yew. Large plantations have been established for this purpose in order to obtain sufficient needle material. These backgrounds may make it understandable why I am so excited about these persistent occurrences of *Taxus baccata* in the hyrcanian Mountains. I hope that the visit of yew occurrences in the Hyrcanian Mountains will give me a better understanding of the way of life of *Taxus baccata*.



Study on endangered species yew (*Taxus baccata* L.) in different conservation situation in Arasbaran Forests, Iran

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Abstract

Yew is one of the most important and threatened tree species in Arasbaran region in northwest Iran. Maintaining the natural structure of stands is a main goal of forest management plans. We assessed the structural characteristics and composition of yew forest communities using the nearest neighbour and full callipering method at three sites with different management histories. Within each site, tree characteristics including diameter, height, and crown diameter were measured in a one-hectare sampling area. To investigate trees quantitative characteristics, within each sampling area, 56 sample points were investigated in a 25 m × 25 m grid in which distance from reference to neighbour trees was recorded. Some indices including mingling, distance to neighbour, diameter and height differentiation, uniform angle, and Clark and Evans were calculated to quantify the structural characteristics in areas of different conservation status. The mean height of yew trees at the long-term conservation sites was about 5 meters. These trees were located in the lower story. In the short-term conservation site, yew trees (4.04 m) had approximately the same height as other trees (4.3 m). Results revealed that four species – hornbeam (68%), maple (8%), yew (7%), and oak (5.2%) – composed 88% of tree species. There was a low distance (2–3 m) between neighbours for majority of trees. The mean TDi for long-term and short-term conservation areas was 0.59 and 0.06, respectively. In the long-term conservation areas, Clark and Evans index was 1.18 while it was less than 1 (0.82) in short-term conservation area. The results of this research show the conservation period effects on yew stands. Reducing tree density and basal area of other species will lead to yew trees strength in the studied sites. Since yew trees need moderate light conditions, excessive decreases in the tree density can be harmful.

Keywords: Forest conservation, Diameter differentiation, Structure indices, Yew



Spatial pattern and interaction of Yew (*Taxus Baccata* L.) in Afratakhteh reserve

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Abstract

The distribution pattern and the species composition of different species of trees are directly related to the dynamics and relationships among trees in natural forest stability. The research area was selected after visiting forests and the spatial coordinates of 417 yew trees and 59 yew regenerations were recorded and the distance between the trees was measured. The results showed that the spatial pattern of yew trees and regeneration follow the random distribution. Also, the interaction between trees and the yew regeneration suggests an intense competition between them. The ability to restrict species dispersal leads to competitive monopolies that do not allow superior species to reach all desirable sites, competition between trees, usually between small trees. Interspecific competition, having lightweight seed, old age of yew trees, and the toxicity of yew can be considered as factors influencing the pattern of distribution and interaction of yew.

Keywords: Spatial pattern, Competition, Ripley K Function, *Taxus baccata*



Comparative seed morphology of *Prunus avium* in North of Iran

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Abstract

Wild cherry (*Prunus avium* L.) is a diploid member of the Rosaceae and it is used for high quality wood production and being an essential component of sensitive and threatened ecosystems. The main aim of our search was to describe the distribution of seed variability of wild cherry (*Prunus avium* L.) in North of Iran. Seeds were collected from 50 open-pollinated trees from five populations sampled from different provenances in the natural distribution range of the species in northern Iran and transferred to Gorgan University Laboratory. We measured some biometrical traits (length, width, diameter, L/W ratio, Weight of 1000 seed, Seed number/kg). There were significant ($p < 0.05$) variations among the provenances in number of seeds, seed weight, seed length and diameter. In Hyrcanian Forests (North of Iran) seeds size characteristics of *Prunus avium* increased with longitude from east to west.

Keywords: Seed morphology, *Prunus avium*, Provenance, Iran



Methods of *Taxus baccata* propagation and its non-timber forest products (NTFPs)

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Abstract

Taxus baccata is the softwood of the Taxaceae family that is native to the west, central and southern Europe, northwest Africa, southwest Asia and northern Iran. *Taxus baccata* L. is one of the few native species of the Northern forests of Iran, which is a relict from third geological period and has been significant in terms of genetic resources. Iran's yew stand is one of the densest and ancient yew stands of the world. The most important habitat of *Taxus baccata* in Iran is located in Zaringol Valley, Aliabad Katoul, Golestan province. Yew trees are the source of extraction of Taxol as an anticancer substance. In Iran, it is an endangered species being extinct due to changes in weather conditions, uncontrolled harvesting and grazing. Its natural regeneration is problematic, especially in the east of the Caspian forests due to the low depth of soil. Therefore, the purpose of the present study is the evaluation of methods for increasing propagation without requiring the harvest of natural areas as well as the Non-timber forest products (NTFPs) of this species. This study is a review which is provided by the library method using researches in Iran or abroad, with emphasis on the methods of yew propagation. Since cuttings are one of the most common and least expensive methods of growing plants, the achievement to this method for yew propagation can be one of the best and cheapest sources of biomass production to obtain Taxol. According to the investigated researches, the best cuttings for yew reproduction are made of 2 to 3-year-old branches which are still not completely wooden and are green. The most suitable growth regulator for easier rooting of *Taxus baccata* was detected the IBA hormone at a concentration of 2 mg /L. In another study, the effect of the base growth medium on the production of Taxol anticancer drugs was investigated in Cell suspension culture of *Taxus baccata*. The evaluation of the results showed that the type of growth medium is effective in the production of Taxol and its emission from cells. The most important and effective method for producing Taxol is using culture medium techniques and bioreactor systems. In addition to the production of secondary metabolites, the use of the culture medium system in regeneration and proliferation of the yew trees from callus tissue is very much considered. The results of this study indicated that the non-timber forest products of *Taxus baccata* (Taxol) are possible with different methods.

Keywords: Yew, Taxol, Caspian forests, Golestan, Iran



Effect of antifungal activity of leaves healthy trees extracts of host plants and nanomaterial on the growth of the fungus caused charcoal disease and ophiostoma

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Abstract

This study was to investigate the inhibitory effect of plant extracts, nanochitosan and nanocopper on the growth of fungi diseases, Charcoal (*Biscogniauxia mediterranea*) and ophiostoma (*Ophiostoma novo-ulmi*), respectively. Three forest species of Caucasian oak (*Quercus castaneifolia*) and Siberian elm (*Zelkova carpinifolia*) that has infected was performed in-vitro periphery. Purification of fungi was performed based on outward symptoms of leaf, trunk and bark from focus of infection from Ghorogh and Daland forest parks that are located in Golestan province, Iran. To control the fungus disease, Nano-chitosan in 50, 100 and 150 ppm, and Nano-copper in 60, 80 and 100 ppm was prepared in the 4 replicate. In PDA medium, pathogen fungi were purified and then cultured for a week and their growth was examined and eventually inhibition was calculated. Based on the growth inhibition of infective fungi on examined species by methanol extract of healthy plant leaf, result showed the greatest effect in 1500 ppm treatment of methanol extract of oak leaf on Charcoal. Methanol extract of Siberian elm leaf on all 3 concentrations had no effect on their fungus disease pathogen. Fungal pathogen control with nanomaterial showed the highest effect in 100 ppm (100% survival) on the growth inhibit of the fungus *Ophiostoma novo-ulmi* and 150 ppm on *Biscogniauxia mediterranea*. Nanocopper and Nano-chitosan combination had a good effect on inhibiting the growth of fungi, but it seems that Nano-chitosan had better effectiveness due to bio-based with less environmentally damaging effect.

Key word: Nanocopper, Nanochitosan, Fungi diseases, *Buxus hyrcana*, *Biscogniauxia mediterranea*



Review of methods for Taxol production

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Abstract

Taxol has been introduced as a highly effective natural compound with low toxicity in controlling and treating a wide range of cancers, which yew plant (*Taxus* spp.) is the primary source of its production. The amount of this material in the plant is very low (0.01-0.05% of dry weight), so that to produce 1 g Taxol, the bark of three 100-years-old trees is needed, while Taxol synthesis is very difficult and expensive due to its complex structure. Due to the high consumption of this substance in medicine as well as the limitation of its production from these plant sources, it is necessary to study the biosynthesis mechanism and also, its extraction and measurement methods. Recently, there is a lot of effort for the complete and semi-complete synthesis of Taxol as well as its extraction from cell cultures, each of which has its own specific problems. This study investigates the most important methods used in the production and extraction of Taxol in the world.

Keywords: *Taxus baccata*, Taxol, Anti-cancermedicine, Extraction, Synthesis



Endophytic fungi in the yew as an appropriate source for producing Taxol and a protective approach

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Abstract

Yew trees are known worldwide for the production of anticancer material of Taxol (peclitaxol). Recent studies have opened new horizons with a protective approach in the production of Taxol using yew endophytic fungi and producing such material. The aim of this study was to investigate the use of endophytic fungi in yew as an appropriate source for producing Taxol and protective approach to prevent damage to valuable yew trees. This study was a review of the studies and materials published in internal and external sources. In addition to the presence of Taxol in different tissues of yew, a large number of endophytic fungi that live in yew and even other healthy trees have been reported. However, endophytic fungi, pathogens, and saprophytes are also Taxol producers. Several fungal species have been reported to have significant Taxol production, which could be a good option. Taxol producing endophytic fungi can be a suitable and non-destructive source for yew in the production of Taxol used in drugs.

Keywords: Endophytic fungus, Taxol, Yew, Peclitaxol



The effect of ecotourism development to protect yew forest

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Abstract

According to the principles of protection and management, the development of ecotourism in different countries has brought about appropriate results. There is a need for a comprehensive and precise program to develop ecotourism that takes into account the ecological capability. Forest preparation with the proper substraction is critical for attracting and educating visitors. Ecotourism or tourism in nature is one of the most important types of tourism that has the most consistent with sustainable development. In this research, the paired comparison method was used to study the effects of ecotourism on forest conservation. The results of prioritizing the criteria showed that increasing local people's income and reducing unauthorized harvest of wood (weighing 0.38) was the most important criterion in assessing the effects of ecotourism on forest protection and the weight of ecotourism development risks in the studied area (0.546) was more than ecotourism development opportunities (0.445). The results showed that in the case of proper management, co-operation and education, ecotourism can be established with the least damage to the environment and ecotourism planning requires comprehensive study and planning.

Keywords: Ecotourism, Environment, Development, Paired Comparison Analysis.



Plant species diversity hotspots for forest conservation

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Abstract

In forest habitats, reducing the area of old-growth forests, reducing the complexity of the structure, destroying the integrity of the forests, as well as disturbing the natural and evolutionary habitat conditions, causes to be indanger many plant species. Countries member of the convention on biological diversity (1992) were obliged rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies. So far, many areas have been managed for the conservation of plant species in forest habitats. Many of these areas lack management, executive, investment and, in some cases, no specific boundaries, and only one official name is set for it. Protecting the largest number of plant species at each level of protection and with the lowest cost is necessary to select and prioritize forest protection areas. Diversity hotspots is appropriate and practical tool to show the actual extent of the protective challenges in terms of threatened species and intensive decrease in the level of natural habitat. In this study, with the review of scientific researches, the importance of hotspots in forest habitats, its global status and its identification, are explained with the aim of preserving plant species.

Keywords: Hotspots, Plant species, Forest conservation.



Evaluation of forest logging ban on development and protection of endangered species in Northern forests

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Abstract

The area of Northern forests of Iran (Hyrcanian) was formerly about 5 million hectares, which has decreased to 3.4 before the nationalization of Iranian forests and gradually 1.8 million hectares which indicates the condition of its destruction over the past hundred years. These forests are among the world's ancient forests dating back to the emergence and development of more than a million years, so the biodiversity of these forests are at least three times higher than the forests of the central Europe. Another characteristic of Hyrcanian forest is their naturalness, because most European forests are man-made planted during the last 100 years while these forests are sometimes more than 500 years old. After half a century of management in the Hyrcanian forests, with a focus on timber harvesting, the quantity (area and volume of wood) and quality (ecological parameters and biodiversity) of stands were decreased. In the sixth Iranian development program, paragraph F the Law 38 expressed the exploitation of any wood from forest trees was officially prohibited Therefore, it was supposed to provide more protection for forest stands through the financing of the national funding by the budget and planning organization. Unfortunately, funding assigned to logging ban were limited and did not result in the complete implementation of the plan that has led to timber smuggling especially in terms of high economic value trees such as yew. Valuable stands of yew in the Northern forests of the Iran, which are rare and endangered species, should be preserved. Therefore a plan for the protection of rare stands should be added to the logging ban plan in short term. A separate section of the sustainable forest management in Hyrcanian region should be allocated to the conservation of rare or endangered species especially yew in midterm and after evaluating and completing the yew gene bank in the country.

Keywords: Logging ban, Forest reserve, Endangered species, Gen Bank, Yew



Yew a living heritage of the Northern forests in the cure of cancer

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Abstract

The use of plants organs as a medicine for preventing and treating diseases has been focused in the traditional medicine from the earliest days. By the beginning of the 16th century, it was the most prudent method for the treatment of diseases. The Northern Iran is rich in biodiversity so it is one of the most important reasons for paying attention to herbal substances and finding bioactive compounds for cancer treatment. Cancer is one of the most deadly diseases that human beings have been struggling with, and after cardiovascular disease is one of the most common causes of human mortality in the world. According to the annual report of the International Agency for Research on Cancer, Cancer Lung with ۱۳% is the most common type of cancer, after which breast, colon and prostate cancer are the most common types of cancer in the world, which annually inflict huge financial costs on the affected family. Yew belonging to the Taxaceae family is a shade tolerant tree, mixed with other forest species, from the United States to Europe and some parts of Asia such as Northern Iran. The value of the medicine taxol is due to the presence of Paclitaxel, in the various organs of the plant, especially in the bark. Plant tissue culture can be an appropriate alternative method to provide raw material for medicinal purposes. Development of biotechnological methods such as tissue culture, cell culture and capillary roots is one of the most important ways to solve problems related to the destructive effects of cutting plants and trees with food, industrial and medicinal properties.

Keywords: Yew, Taxol, Biotechnology methods, Golestan



Vegetative propagation techniques for regeneration of *Taxus baccata*

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Abstract

English Yew (*Taxus baccata* L.) is one of the most important native evergreen and valuable species in Northern forests of Iran. It has been found that seed germination of this species is naturally difficult. Application of different methods for dormancy breaking has not helped to regenerate it. Hence, vegetative propagation techniques could be proposed to have high quality seedling of yew for conservation and restoration of present sites. Up to date, few research have documented on vegetative propagation of this species. In this study we attempt to introduce on the best method for vegetative propagation of yew.

1. Cuttings should be belong green two or three years old branches of east direction.
2. Treated cutting with Indole Butyric Acid (IBA) and Indole-3-Acetic Acid (IAA), in 10000 ppm concentration in aqueous hormonal solution (s) for 18 hours prior to planting.
3. Treated simple cutting with IBA at 2 mg L⁻¹ concentration for 30 minutes.
4. Treated shoot cutting with IBA at 1000 ppm for stimulating rooting juvenile cuttings and 2000 ppm in mature cuttings for few seconds and allowed to dry for 15 min.
5. Treated shoot cutting with IBA at 500 ppm for 24 hours.

It can be concluded that the IBA hormone could be more useful as plant growth regulator in vegetative propagation of Yew trees.

Key words: English Yew, Cutting, Plant growth regulators, Regeneration



Development of yew sites based on ecological requirement and environmental conditions in the north of Iran

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Abstract

Yew (*Taxus baccata* L.) is one of the five native species of needle-leaves of Iran that presented in the list of endangered species. Although the yew logging is prohibited, the traditional extraction of medicinal products and the occurrence of climate change can be a serious threat to the sites of this species in the north of Iran, especially the largest stand located in Ali-Abad, Golestan province. According to the above mentioned, the development of yew in similar sites seems to be necessary. Study of the sensitive and endangered species, simultaneously a large number of environmental factors should be considered and decision making based on the value and weight of each of these factors should be adopted. To make obviously, the lack of attention to the effective factors in this issue can fail the expected results of the decisions made and cause serious losses. A multi-criteria decision-making (MCDM) process consists of a set of processes such as weights or convergence analyzes that allow a range of criteria to be related to a subject, scoring, and weighing, and then the tools of the experts and groups involved are ranked. Combining MCDM with the GIS will allow the site to be identified in accordance with the target species and extracted from it. These findings can provide the key information for the chief executives to apply managerial decisions with scientific support and based on applied results.

Keywords: Decision-making, Climate change, Environmental factors



Application of different parts of the yew in traditional and modern medicine

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Abstract

Yew (*Taxus baccata* L.) has an important position in traditional medicine. Traditional knowledge, traditionally transmitted from generation to generation, is now shrinking due to the transformation of the cultural structure resulting from the rapid socio-economic development of societies. This study was conducted as a review of the literature to study the medical importance of yew. Observations and reports suggested that products from different parts of yew species can be used to treat many diseases from common pains and fever to advanced infections, respiratory troubles, arthritic problems, and recently the treatment of the most aggressive cancers through taxoids. The study of traditional medicine, in addition to discovering the secrets of ancient medicine, allows for new avenues in the treatment of various diseases. The results of studies in providing the beneficial effects of yew in the treatment of severe diseases, such as cancer, have led to over-use of yew in many sites around the world. Therefore, conservation, and development of yew in the field, as well as laboratory and greenhouse environments, is very necessary besides the use of medicines.

Keywords: Alkaloids, Taxol, Cure, Dendrochronology



Floristic investigation of box trees (*Buxus hyrcana* Pojark.) reserve in Cheshme-Bolbol Bandargaz forest

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Abstract

Cheshmeh-Bolbol forest reserved has one of the best intact habitats of box trees (*Buxus hyrcana* Pojark.) in Hyrcanian forests. In this area, the lowest and the highest altitudes are 82 to 300 meters and located in Southeast of Bandargaz. The floristic-physiognomic investigation which was performed by field-walk procedure showed that flora of this region included 49 plant species which belonged to 48 genera and 31 families. The important families were Rosaceae, Lamiaceae, and Liliaceae with 13%, 8% and 3% of individuals respectively. These families contained 31 percent of the total species. Phanerophytes, Hemicryptophytes and Cryptophytes were the most important life form of the local biological spectrum according to Raunkiaer system. The result showed that the chorotype form Euro_Siberia was the most important phytochorion which make up the chorological structure of box trees stands in Cheshmeh-Bolbol forest reserved.

Key word: Forest reserved, Box trees (*Buxus hyrcanus* Pojark.), Life form, Chorotype



Presentation of some endangered species in Syria

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Abstract:

The biodiversity situation in Syria is improper and is getting worse with the degradation of some forest ecosystems or the decline of some wild plants, due to destruction of natural environments. The destruction of these ecosystems is already happening, but the acceleration is much higher than in the past due to more exploitation and more natural resources degradation (deforestation and conversion to agricultural land, excessive forest cutting, over grazing, Fire, drought etc.). This study aims to identify and review the rare and endangered plant species in a geographic region, as well as identification of the causes of threats for each species particularly major medicinal plants, as well as those that are important for gardens and ornamental purposes. This study also proposes recommendations to preserve these species and protect against various risks and threats. Some of these important plants are economically valuable, and some have not been studied, in addition to a small number of crops that are being used in food system. It should be borne in mind that the loss of these plants will lead to the loss of important genetic resources, thus threatening the survival of human beings on the planet. Rare and endangered plant species identified in the study area based on field tours and plant studies conducted in this area since the beginning of the present century. IUCN is a reference in which the plant species are evaluated as to whether they are threatened. The results of this research have pointed to some rare and endangered species that include species from different families. Species such as: *Quercus aegilops* from the family *Fagaceae*, *Laurus nobilis* from the family *Lauraceae*, *Ceratonia siliqua* from the *Caesalpiniaceae* family and *Juniperus excelsa* from the *cupressaceae* family are endangered tree species, *Malus trilobata* species from the family *Rosaceae*, *Myrtus communis* from the family *Myrtaceae* and *Mespilus germanica* from the family *Rosaceae* are endangered shrub species, and *Adiantum capillus-veneris* from the family *Adiantaceae* and *Dryopteris pallida* from the *Aspleniaceae* family are endangered herbaceous plant species. The result of this study suggests that further research on these species should be carried out. The necessary measures to support these species in a specific and diverse way in Syria should be detected.

Keywords: Mediterranean vegetation floors, Endangered species, IUCN



Effect of climate change on cambial activity and wood formation of yew (*Taxus baccata* L.) in Iran

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Abstract:

Yew (*Taxus baccata*) is one of the most valuable and rare native coniferous in Iran. Surviving remnants of third geological era that has been subjected to extinction unfortunately, due to the climate change and the excessive grazing. Regarding its valuable wood and lack of data toward the site impact on the tree growth, activities of cambium layer and the procedure of increasing in the number of mature cells were investigated. Three regions of Iran, Golestan province (Afra-Takhteh (A), Chahar-Bagh (B) and Poone-Aram (C)) were selected which among them, A was the highest temperature site. 6 normal trees with upright trunks of each region and almost the same diameter were selected to study. Sampling was done from March to early November 2014, with two weeks interval. Micro-cores were examined under a light microscope after sectioning and staining. Then average number of cells in the cambium region and mature tracheid were counted. Climate data (precipitation and monthly temperature) were received by the meteorological stations near study area. The results indicated that cambium activity was began two weeks earlier in site A comparing the other sites in early May and finished in late October at the same time in all sites. Cambium cells enumeration also showed that peak cambium activity occurred in mid-June with 10 cells number. Although, cambium activity started sooner in warmer region (A) and the number of cambium cells were more than other areas in early growth season, but there were no differences in the number of final mature tracheid among 3 sites in late growth season. It can be concluded that higher temperature in sites A & B had a positive effect on growth in early growing season, but negatively impact on the number of cambium cells and growth rate, in mid-summer. This issue can create a negative impression on A & B yew trees in near future, as air humidity decreases and it becomes warmer.

Keywords: Yew (*Taxus baccata*), Cambial Activity, Wood Formation, Iran



The effect of age and planting depth of cuttings on the vegetative propagation success of Yew Species (*Taxus baccata*)

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Abstract

The problem in decrease in yew regeneration in the natural habitats, including Afra-Takhte and Pooneh-Aram, has been presented in researches. This issue indicates severe degradation of the sites and the necessity of vegetative propagation of this species to maintain the genetic traits of the parent individuals for better establishment in the main habitat. The current study aims to determine the best germination conditions, survival, and growth of the cuttings regarding the age and appropriate depth of yew cutting. For this purpose, an experiment was conducted in a completely randomized design with two factors including cuttings age (three levels of soft, semi-woody and woody) and planting depth (low: 3 cm, medium: 5-7 cm and deep: 8-10 cm) in 3 replications with 10 cuttings in each replication (270 cuttings). The following parameters were studied: germination, survival, seedling height, and length of the largest root, number of the main roots, aerial biomass, root biomass, and total biomass. The results showed that the age and planting depth have significant effects on survival and the success of vegetative propagation of yew. Because of significant superiority such as relatively high survival and growth, the semi-woody cuttings planted in the medium depth treatment would be recommended to improve vegetative traits and vegetative propagation

Keywords: Asexual reproduction, Yew, Planting depth, Cuttings age.



Leaf chlorophyll content variation in different provenances of Wild Cherry seedlings under drought stress

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Abstract

Monitoring the demographic and individual characteristics of plant species also morphological and physiological characteristics allows scientists to measure ecosystem health and the status of specific species. Meanwhile, tracking these parameters helps managers to identify realistic goals or necessary modifications to management and protection plans. Chlorophyll is one of the important indicators that can be cited for environmental changes and even species conservation. Investigating the physiological responses of wild cherry seedlings from different sources to drought stress can help identify effective mechanisms of drought resistance and also select the best source for introducing different areas. We investigated the effect of drought stress on leaf chlorophyll content of wild-cherry seedlings in a completely randomized block design with three replications in a research greenhouse of forest sciences faculty located in Gorgan University. The treatments were considered at four levels (control, 25, 50 and 75 % of drought stress) and five seedling provenances (Asalem, Sangdeh, Farim, Lajim and Kordkoy). The results showed that the applied treatments had a significant effect on the measured traits in the level of 5%. The interaction of drought stress and seedling provenances has also had a significant effect. The highest amounts of a, b and total chlorophylls were 1.71, 0.89 and 2.59 mg/g, respectively, while non-stressed (control) treatments and the lowest was 0.86, 0.45 and 1.31 mg/g was less than 75% of treatment.

Keywords: Drought stress, Provenance, Chlorophyll, Wild cherry



Classification of yew (*Taxus baccata* L.) plant communities in Tuskestan forests, Gorgan

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Abstract

Yew (*Taxus baccata* L.) is one of the native coniferous species in Iran, which is found in mountainous Hyrcanian oak (*Quercus castanefolia*) or beech (*Fagus orientalis*) forests. Involving yew population in the Tuskestan as the last beech forest in the Eastern Hyrcanian region make it more prominent in terms of ecology or plant community. So we are going to have phytosociological study in order to indicate fundamental floristic variations. In this study, 38 relevé with an area 400 m² (20 × 20 m) were selectively sampled by emphasizing indicator stands concept. In each relevé, the list of all species was recorded, and the canopy cover of vegetation percentage was estimated based on Van der Maarel frequency-dominance coefficients. Plant communities' classification was done using modified TWINSpan and Braun-Blanquet synoptic table. Diagnostic species in each syntaxa were determined using phi-coefficient index. Result showed there were two distinct associations (i.e. *Salvia glutinosa*-Fagetum orientale and *Taxeto baccatae*-Fagetum orientale) as well as a sub association (*Taxeto*- Fagetum Subasso *Euonymetosum*) in the Tuskestan beech forest. Three phytosyntaxa with differential plant species were emphasized to high floristically and ecologically capacity of this fragmented beech population in the east of Hyrcanian forests.

Keywords: Vegetation classification, TWINSpan, Indicator species, Braun-Blanquet



Increasing triterpenoid synthesis in bark endophytic fungi of *Betula pendula* Roth species using cellulose nanofibers and sodium nitrate

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Abstract

Endophytic fungi are remarkable microorganisms in the internal tissues of plants that live on host organs without any negative effects. They are often a good reservoir for secondary metabolites and contain bioactive compounds. Sometimes these fungi can be one of the most important and effective alternatives to extract secondary metabolites, especially from plants that cannot be directly used and are at risk of extinction. *Betula pendula* Roth is one of the medicinal species at risk of extinction in Iran, which is highly valuable due to the presence of many terpenes with anticancer activity in the bark. In the present study, the amount of terpenes isolated from three endophytic fungi (*Fusarium fuckelii*, *Alternaria alternata* and *Penicillium citrinum*) extracted from the bark of this species was increased using elicitors. Changes in the amount of triterpenoid produced by cellulose nanofibers and sodium nitrate elicitors were determined at 3 concentrations and 3 different times using HPLC technique. The results showed that the cellulose nanofibers elicitor had more effect on the synthesis of triterpenoids than sodium nitrate, so that the concentration of 100 mg/l cellulose nanofibers in *P. citrinum* and *F. fuckelii* fungi produced 27.5 and 8-folds triterpenoids in compare to control, respectively. In *A. alternata* fungi, the use of two sources of carbon and nitrogen was not effective, and the accumulation of biomaterial was decreased in comparison to the control treatment.

Keywords: *Betula pendula*, Endophytic Fungi, cellulose nanofibers, sodium nitrate



Genetic diversity of *Thuja orientalis* populations by markers Peroxidase and Esterase in Fazel Abad Sorkesh

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Abstract

Thuja orientalis is one of the rare native conifers of Iran due to the presence of just two habitats, so it was submitted as threatened species. Increasing genetic diversity is one of the usual and accepted strategies to protect rare and endangered species. To achieve this goal, it is necessary to know the genetic level of populations. This study aims to serve and compare the genetic diversity of *Thuja orientalis* populations by biochemical markers of peroxidase and esterase branches in Sorkesh, Golestan province. The sampling was done simultaneously from 30 two years old branches of *Thuja orientalis*. Extract was performed immediately after sampling. Data analysis was performed by GenAlEx software on the allele characteristics of the studied markers. The grouping of the bases was examined within and between-population variation using cluster analysis of electrophoretic data (prepared gels) by NTSYS 2.02 software. Qualitative measures were studied by vertical electrophoresis and PAGE (polyacrylamide gel electrophoresis) method. According to the results, population number two showed the highest genetic diversity. Peroxidase compared to esterase has higher ability to separate the bases of the *Thuja orientalis*. Therefore it was generally observed that Sorkesh reserve is one of the most important genetic reserves of the country's wooden species. It is necessary to help with the expansion of the storage area due to the relatively good genetic variation, but the small size of the remaining population.

Keywords: Biochemical marker, Genetic diversity, *Thuja orientalis*.



Review on vegetation survival threats (common problems and available solutions)

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Abstract

There has been widespread global climate change in recent years, especially in the Middle East. In Iran, not only numerous droughts stress and reduced rainfall but also mismanagement of water resources and excessive use of underground water resource in agricultural and industrial applications have threatened the future of country. Agricultural lands are diverse and fragmented, so inappropriate management endangered plant and even animal species in southwestern Iran. The present library based research tries to provide information about the risk factors of threatened species and existing solutions. The most important factors causing plant species to become extinct are overgrazing, irregular and out-of-season harvesting and land use changes. The preservation of the existing state and the expansion of the cultivation of the plant species which are at risk are of importance.

Keywords: Plant species, Extinction risk, Livestock grazing, Climate change.

