

ORIGINAL ARTICLE

The study of Galls Growing on Oak tree's Importance in Producing Tannin (Case study in Ghalaie region in Lorestan Province)

Fatemeh Pirozi¹, Kamran Adeli², Majid Tavakoli³

1-Natural Resources Research Department, Lorestan Agricultural and Natural Resources Research and Education Center, AREEO, Khoramabad, Iran

2-Department of Forestry, Faculty of Natural Resources University of Lorestan Iran

3-Natural Resources Research Department, Lorestan Agricultural and Natural Resources Research and Education Center, AREEO, Khoramabad, Iran

Email: pirozi9@yahoo.com

ABSTRACT

Oak galls are one of the most important products of south forests including Lorestan Forests. Their role in producing Tannin for medical and industry uses is very important. Tannins are chemical structures, which has phenolic instructions and they could be combined with protein. These materials are of a group of clutch natural substances, found varied in terms of number, in plants. The most common use of these materials is in tannery industry as to produce leather, and in dyeing industry as coloring jag, and in oil industry for digging wells, in plastic industry and in medical as clutch medicines, Alkaloid anti-toxins, on serological experiences, and recently in environments of bacterial planting, their effects as anti-liver and skin cancer medicines have been proved for years. Tannin's medical value as anti-biotic and its other anti-cancer values were also studied. The galls producing Tannin, in Libani in Lorestan Province, including Green Mazouj Galls, White or yellow, Kharnouk, Grassy Ghashka, Sichka, Ghalghaf, Star-shaped, and thorny, in which the amount of Tannin produced in them were measured as to be 52, 51, 48, 31, 30, 26, 25 percent. In this study, the ghalaie region which is a home for a type of Oak Tree named Libani, (*Q. infectoria*) and some other sub-divisions of this type. And actually, it's a home for gall generating bees.

Key words: Gall, Oak Tree, Tannin, Lorestan, Ghalaie

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INTRODUCTION

Zagros Jungles with a width of 5 million Hectare have a share of 40% of Iran's forests in general. The indicator of Zagros region's type of Oak Trees is *Quercus*, but there are also other types, such as Banneh, Badamak, Arzhan, Kikem, Kind of pear, etc. [7]

To produce secondary products is one of the most important functions and qualities of the Zagros Jungles. One of these products is Oak's gall. Galls are damages and salience's, which happen to a tree by an abnormal increase of plants texture due to the activities of some insects called Parasite or some other hanger like tick and also some mono-cells. Oak Tree's galls happen in an unnatural way of increasing in the texture of plant and in a different form from the main organs, due to the secretions of the embryonic and larva of cynipidae bees, in different parts especially tree leaves and buds. The reason of galls happening is that of only the larva and the secretions and the reaction of plant texture to this event and provoking it's cells to increase the amount of mitotic cell divisions and in some cases, to revitalize the activities like waking it up to start increasing the texture.

There are varied types and shapes of plant galls. Shape, size, and the place of these galls creating, depends on the species of the host plant and the kind of the gall generating organism, which creates galls. Galls will happen to different parts of a plant like in roots, stalls, leaves, flowers, inflorescence (Hela) and the plant

seeds. And the science which studies these galls and studies the interaction effects of that of between gall generating Factors and host plants is called Cecidology. The Oak Tree's Galls are rich in sources of substances producing Tannin Material. Tannins are phenolic structures very complicated and wide-spreading group of chemical structures in the inherit region of this plant. Tannins consists of Poly-phenolic Polymers. Tannins has a high molecular weight with a normal Aromatic Circular structure which consists of Hydroxyl groups. These active constructions reaction with other biochemical type of constructions easily by means of their Hydroxyl groups. They can accelerate the proteins, Enzymes, Carbohydrates, Alkaloid functions, and it has been thousands of times since they were used first for turning the animal's substances into leathers. Tannins are used in woods, skins, leaves, buds, flower petals, seeds, and roots.

In this research, the most important Oak Tree galls in Ghalae region, and their share of Tannin Percentage, and some of their medical and industrial usages were studied.

MATERIALS AND METHODS

According to the fact that creating galls on Oak Trees doesn't have an order yearly and it could be a whole year until a gall appears, so in order to cover the whole operation, it was necessary to limit the number of visiting and sampling to some special sites. In this research, the Oak Trees which had the most galls appeared on them, were selected, according to the observations in the first visit. And then, they were sampled and transferred to laboratory to be identified in terms of gall type, combinations, and their cause of happening, and also to collect the data about picking methods, picking amount, drying and keeping methods, sale amount, and the purchasers. Also from each kind of galls, one sample of 0/5 to 1 km were sent to atomic energy organization where it was analyzed and their share of Tannin were measured.

RESULTS AND DISCUSSION

Zagros jungles are one of the treasures and clear examples of different species of Quercus (*Q. infectoria*) in the country and even in the world. Quercus is the most abundant kind of west oak that has an important effect on protecting water and soil and can be brought up in national levels. Therefore recognizing different kinds of arthropods related to Quercus jungles and in particular Libani in different habitats, and their role from the point of view of pest or being beneficial (parasite, pollinator, etc.) is very essential. A group of these arthropods including insects affects the operation of different parts (root, stall, rod and fruit) of the Quercus tree and causes growth and unusual malformations in these tissues, and these malformations are called Galls. Among the insects, the Cynipidae family is especially important.

The most important group of the gall generating insects in the region's Quercus jungle communities are the bees of the Cynipidae family. These insects create various galls on the region's Quercus trees, and they are known as the creators of the Quercus Galls. The female bees in the young Meristem tissues of the tree that are actively being divided, lay eggs, which are in some cases fed to larvae and in some cases the secretions and the stimulations of the female insect's small egg cause the creation of gall. The bees' larvae feed inside the gall and there, they are changed into pupa and finally the last form of the bee is created and then it comes out by chewing the inside of the gall and causing a hole.

In the studied region, various galls are observed on the Quercus trees in most seasons, and they have existed from the very old times and there is no special origin from the point of view of time for them. The creation process of galls is in fact the plant's reaction to the parasite, and it's caused in the form of a bump or a malformation and is as a result of the unusual growth of the plant tissues. The form of the gall is determined by the gall generating bee which is feeding in the inside. [3]

In general, as a result of a long evolution between the plants and insects that has caused them to be compatible with each other, galls are a suitable place for the plant insects' lives. And in some of the plant tissues that insects have attacked them, under the effect of the mechanical stimuli of the chemical actions caused by insects or other creatures, some bumps are created that are called galls. Galls are a settlement to parasites and a sheltered home for egg-laying and a haven for larvae. Their pupa and the plant's reaction causes the creation of a layer of alive plant tissues that the larvae feeds on them.

The most important secondary products of the tannic species in Lorestan, such as Mazouj, Ghalghaf or Gelye, Kharnouk, sichka, etc. are valuable because of their high amount of Tannin.

In the studies conducted in the oak growing area of in the Lorestan province, 13 different kinds of galls were collected from the buds, stalls, inflorescence (rods) and oak leaves and were developed for the isolation of generators under laboratory conditions. Eight numbers of the dominant existing galls in the region were chemically analyzed and their Tannin percentage were determined. The Tannin-producing galls of the oak trees in the Lorestan include green Mazouj, white or yellow Mazouj, Kharnouk, herbal Gheshka, Sichka, Ghalghaf, thorny and star-shaped, and their Tannin percentage in order are; 52, 51, 48, 31, 30, 26, 25%.

Table. 1 : The most important oak galls, identified in the Ghalai Region

In another study, they affected the antibacterial attribute of aqueous and methanol extracts of the *Quercus infectoria's* gall, which is created by the gall generating bee, *Adleria gallae-tinctoria*, on the bacteria, *Cellulosimicrobium cellulans*, in different densities. [4]

In some study methanol, aqueous, hexane, chloroform and ethanol extracts of *Quercus infectoria* (gall generating bee's type unspecified) on standard tags of bacteria *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis* were examined in Thailand. Among those extracts, the methanol extract was more effective than the others. And among the bacteria, the *Bacillus subtilis* is the more sensitive and the *Escherichia* bacteria are the more robust of all. [2].

Table 1: The most important oak galls, identified in the Ghalai Region

Scientific name of galls:	Gall's name	Row
<i>Andricus sternlichti</i> (Asexual)	Mazouj gall	1
<i>Andricus quercustozae</i> (Asexual)	Ghalghaf gall	2
<i>Andricus curtisii</i> (Asexual)	Sichka gall	3
<i>Andricus tomentosus</i> (Asexual)	Pot-like gall	4
<i>Andricus moreae</i> (Asexual)	Kharnouk gall	5
<i>Andricus caputmedusae</i> (Asexual)	Gheshka gall	6
<i>Andricus conglomerates</i> (Asexual)	Beramazou gall	7
<i>Andricus macropterus</i> (Asexual)	Funnel-shaped gall	8
<i>Andricus grossulariae</i> (Asexual)	Star-shaped gall	9
<i>Andricus quercustozae</i> (Asexual)	Apple gall	10
<i>Andricus quercustozae</i> (Asexual)	Nut gall	11
<i>Andricus pseudoaries</i> (Asexual)	Gelile gall	12
<i>Andricus divisa</i> (Asexual)	Tasghale gall	13

But unfortunately until now, no outstanding and useful studies were conducted on the industrial and pharmaceutical attributes of oak tree galls in Ghalai region, with attention to the fact that this region's oak trees are of the Libani sort.

In general, no integrated management has been performed on the collection, sale, domestic and foreign markets and the usages of the oak tree galls, in terms of both trading and protecting the jungles.

Table 2: The analysis of some Oak Galls regarding to Tannin's percentage

Tannin percentage	Gall's type
52	Green Mazooj
51	White or yellow Mazooj
48	Kharnook
31	Grassy Gheshka
30	Sichka
26	Ghelghaf
25	Star-shaped
16	Thorny

Gall markets

In the Middle East, Turkey and Emirates are major purchasers who buy galls from Iran, which they buy these galls from Iranian local intermediaries, and sell them without any processing to other countries such as Europeans. The major purchasers in the whole world are Syria, Belgium, the United States of America, Lebanon, Tunisia, England, Spain, France, and Libya WHO purchase case by case. But purchasers like the United State of America, Lebanon, West Germany, Russia, and Tunisia are permanent purchasers of these products who pay the highest price for every gall's kilogram.

These days, a type of product called Tannin is exported to Germany with a price of 40000 tomans per each kilogram and is used to produce Tannic Acid in medicine.

According to the studies done, Kurdistan, West Azarbayjan, and Lorestan are potential sources for producing this product. So that in Lorestan, in some years, about 20 to 30 tones gall are collected by the rural people in Ghalai Rural District, which every kilogram of them are purchased between 20 to 30

thousands to mans, which is very effective not only in economic situation of rural families, but it also in protecting the jungles by rural people as job opportunities.

Some of the Tannin Applications of Galls:

Tannins found in Oak Tree galls, were used in different sorts by human being 7000 years before. The most common consuming cases is in tannery industry to produce leather, and in dyeing industry as coloring jag, and in oil industry to dig oil wells, in plastic and in medical industry as clutch Anti-diarrhea, Styptic, Lowering the organ swelling, Treatment of tuberculosis, Swelling of the kidney, stomach ulcer, Alkaloid anti-toxin, in Serologic experiences, and recently in bacteria planting environments. Gall Tannins are used in leather making, fishing nets protections, plastic industry, glue making, ceramic industry, well digging, oil Purification, medicine(to heal diarrhea, burns), compound ink, and in extracting metals.

The experience of dyeing thread fiber or raw silk were done by means of Oak Tree galls, and since the galls had a potential percentage of substances owning Tannins and they had jags themselves and they didn't need any extra jags to a fixed color. And this is a good quality. And from this research's coloring, 30 scales of colors were acquired. This colors' range is from a dark black to the lightest i.e. cream color, and they could be a good source for earning money and income, and they can stop the currency getting out of the country. [11]

Studies showed that Ethanol extraction, produced by Gall generating Bees (*Andricus sternlichti*), from this galls on *Quercus infectoria* is reported as being very beneficial in anti-cancer uses, in (Hela) Cervical cancer cells, and in ovarian cancer (3_Caov), Flavones as a main combination of this gall controlling the cell increasing cell proliferation, in vitro In. [5]

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