



ORIGINAL ARTICLE

Introducing *Cuscuta monogyna* as Oak Trees Parasite, its Biology, and Method to Fight in Lorestan province

Saeed Nazari*¹

*¹Agricultural and Natural Resources Research Center of Lorestan, Iran

ABSTRACT

Biological factors are limiting factors of Zagros Oak forests growth. Pests and diseases have the main role among biological factors. After preparing various herbarium samples from the Dodder parasite plant on Oak trees and sending to Plant Protection Research Institute of Iran, Cuscuta monogyna was distinguished as considered species. Results of biological studies show that, Dodder seeds germinate highly after the weather conditions become appropriate (spring season) then, increase their diagonal and longitudinal growth by nutrition from pastures of forests. At the end of the season, Dodder produces numerous seeds and passes the winter. Prevention of trees cutting, prevention of agricultural activities in the area of forests, preventing the livestock grazing in polluted areas, picking up and removing dodder tangles from the twigs and burning them, organizing training classes and justification of foresters are the ways to fight with this parasite plant.

Key words: Dodder, Cuscutaceae, *Cuscuta monogyna*, *Quercus persica*.

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INTRODUCTION

Forest trees have a major role in carbon dioxide absorption and producing oxygen and consequently and weather modification. According to the available statistics, one hectare of forest produces 2.5 Tons oxygen annually. In addition to supply natural esthetics, water resources planning, Soils fertility, helping air elegance, prevention of soil erosion and dust, environmental safety, weather modification, oxygen production and preventing destructive floods, worthy products such as wood, fruit, gum, etc. forests have thousands of other byproducts each of which is used in industries and helps life and human civilization. Oak is a forest tree which grows in Zagros Mountains. This society covers a part of slopes and highlands of Zagros Mountains and extends from Eastern and Western Azerbaijan to Bakhtiari Forests and Southwestern of Iran and are distributed between latitudes of 30-38° and elevations of 1250-2200 m above sea level. According to the available statistics, the area of Zagros Forests is about 4-5 million hectares. Lorestan Province is located in the area of high peaks of Zagros, and is considered as one of the oldest global habitats. Area of his province is more than 28000 km² which is 1.7 of the area of Iran. Area of the province forests is 885000 ha. The most important forest society of the province is *Quercus persica* while, some species of *Q. infectoria*, bitter almond, pistachio, wild cherry, wild pear, *Populus euphratica* exist as dense or sparse. Every year the trees are attacked by many pests and diseases. Dodder is one of these factors which acts as a parasite due to competition in water and solute absorption, and feeds from vegetable juice and causes young twigs become dry by attacking to the young twigs. Dodder is from Cuscutaceae family and its scientific name is *Cuscuta*. According to the available references, 200 species of Dodder have been reported in the world of which 18 species are in Iran. Among the 18 reported species in Iran, *Cuscuta campestris* and *Cuscuta monogyna* cause the greatest damage to crops and horticultural products in Iran. This parasite plant is called Pichpichak or Pashmaki in the local language. Many studies have been conducted related to taxonomy, biology, chemical and biological control of this parasite plant a number of which are mentioned below:

Sabeti [1] discussed about the methods to fight with this parasite plant in a book entitled: Weeds in the fields of Iran. Taherian (1964) investigated the parasite plants in Journal of Plant Diseases. Sepasgozarian

discussed the feasibility of use of chemical pesticides in Iran against parasite plants. Maddah (1974) studied the growth period of Dodder in alfalfa fields. Ariavand (1967) discussed about conducted chromosomal studies on some Dodder species in Isfahan region. Sheimi and Bayat [5] speak about biological fighting against Dodder in Iran in a Plant Protection Congress. Reschinger (1964) described genera and species of Cuscutaceae.

Dodder has been reported on fruitful and fruitless trees and plants such as alfalfa, basil, sumac, sainfoin, chrysanthemum, clover, peas, carrots, sugar beets, citrus, grapes, olives, pistachios, hazelnuts, strawberries. No study has been conducted in Iran about the importance and role of Oak forests in Zagros Mountains and its damages; so, the present study is necessary to be conducted.

MATERIALS AND METHODS

Required materials for field experiment include: altimeter, meters, metal clipper, plastic rope, topographic map with a scale of 1:50000, press board and its components including plastic containers, diameters, application notes, camera and compass.

Requirement for experimental work: filter paper, dirt, or petri plate, autoclave, incubator, oven, sieve, microscopes, test tubes, and insect identification keys of dodder, container-breeding insects.

In this study, presence or absence of Dodder in forest societies was investigated randomly by various missions and based on observations. In this regard, visiting locations were determined based on map of forest distribution (appendix 1). Accordingly, the areas polluted by this parasite plant were determined. Then, growth, biology of *Cuscuta monogyna* such as tree growth and germination, germination period, how to connect to the host, phenology of flowering and Initialization, duration of flowering, seed production time, and the role of under epoch rangelands in the spread of diseases and how to control them were studied by constant presence at the study area. The investigations showed that, the planted seeds in trees under epochs begin to germinate in spring when the weather becomes warm. First, they grow using the materials stored within the seed and after longitudinal and diagonal growth, receive their needed water and nutritional materials from the host.

To determine the species of this plant, a number of samples were collected from different parts of the plant which affect taxonomy and identification of plant in pollution areas and were sent to Plant Protection Research Institute to be identified. According to morphological traits, this parasite plant has linked petals and the flowers are about 3-4 mm and regular (appendix).

RESULTS AND DISCUSSION

Results of biological investigation of this parasite plant show that, formation of seed mass on Dodder is in the middle to the end of summer. The mentioned seeds fall on the ground and begin to germinate upon favorable climatic conditions and then, thin and whitish filaments come out from the seeds. These thin filaments attack to grasses and under epoch of the forest and add its latitudinal and diagonal growth. They change their color and become brownish. These filaments reach to the young branches and Oak coppice (shoot) and are placed on the trees, begin to feed from plant sap of Oak trees and reduce dramatically their growth and make them dry (appendix 3). Germination period is long. It was observed that, when the filaments of the plants are placed around Oak branches, some other seeds are germinating or are at the beginning of growth. This task is true also for flowering period and seeding. Duration of germination and flowering periods is variable and is between 1 to 4 weeks depending on climatic conditions. Produced Dodder filaments length is variable so that, Dodder filaments are long enough that, are able to reach the branches of nearby trees. The number of produced seeds by each dodder filaments mass is very high and sometimes reaches to 1500 seeds. The seeds can survive for years in the ground. The filaments growth is reduced since the middle of September and completely stops in December. Dodder filaments disappear by starting cold season. These filaments are changed from yellow to dark purple in November and December. The filaments cannot pass winter, and parasite seed transports the pollution from a year to another.

To identify existing species on Oak trees, various samples were taken from different pollution areas and were transported to Plant Protection Research Institute of Iran. According to systematic traits, the sent samples were diagnosed as *Cuscuta monogyna* (Appendix 4).

For fighting with this parasite and its control, chemical fighting must never be used considering specific ecosystems of Oak forests. According to conducted investigations, controlling this parasite must be carried out under supervision of experts on plant pests and diseases.

According to the investigations, uncontrolled Oak trees cutting is a major reason of disease in forest areas as well as pastures grown under forest epoch; so, following suggestions can be effective in dodder control:

1- All foresters must look for pollution areas and report it to protection and support offices of Forests and Pastures Organization.

2- Application of special rules in forest areas and pollution prevention such as:

- Prevention of agricultural activities in forest areas
- Prevention of movement and grazing in pollution areas

3- Mechanical fighting can be useful in current situation by:

- Removing and picking up the dodder tangles from the trees and collecting them in a specific area
- Burning the gathered filaments outside the forest area

4- Lack of use of chemical pesticides

5- Courses and extension services to justify farmers and ranchers

6- Considering some of the parasitic insects on dodder, production and performance of research plan can be effective in identification of parasite insects and dodder controlling pests.

Considering limited extension of Zagros Forests and their loss due to various causes such as: ecological, human interference and topographical terrains, biological factors also have considerable role in reduction of these forests. Parasite plant of dodder is one of forest factors causing diseases particularly in Oak trees *Quercus persica* in some parts of the province.

Dodder plant is able to attack various crop crops, ornamental plants, fruit and non-fruit trees. The first attack of this parasite on Oak was reported by Prof. Reschinger. But, no study has been conducted on the biology of diffusion way, amount and the way of damage on oak trees and shrubs. So, this research project was found necessary to be implemented in Lorestan Province entitled Middle Zagros.

It was found that, the factor causing this pollution was probably human or birds and livestock can have a role in this task. Therefore, many of the pasture areas and forest under epoch have been cultivated during recent years and on the other hand, uncontrolled oak trees cutting since 1978 onwards has caused the forest trees form to be coppice, and low height of these shrubs have caused the seeds of this parasite enter the region along with crop seeds and place on these coppice oaks.

The seeds of this parasite plant place on the under epoch plants after germination. Then, they reach to these shoots on place on oak trees and shrubs. Another important point is that, no filament of seed-borne oak trees dodder was observed. After trees destruction and cutting, oak trees lose their main form (seed-borne) so that, dodder filaments place easily on them.

Another factor causing dodder to be placed in the region, is mass production of seeds with high viability by this parasite plant. Each dodder plant produces greater than 3000 seeds of which low percentage germinate in the first year. The seeds have a very thick shell which can survive up to 50 years under laboratory conditions. About 80% of temperature reaches to 25 °C when the peak of germination occurs. *Cuscuta monogyna* seed can germinate at the depth of 3-7 cm. Seed dormancy would be longer if the seed is at the deeper point of soil.

The most appropriate temperature for germination is 20 °C but, between 10-25 °C it germinates relatively well. For stem growth, at least 25 °C temperature and much light are required.

Once germination, a part of seed which plays the role of root, absorbs water from the soil but, after germination, it has no important role except of maintaining the plant in the soil, and the stem without leaf looks for a proper host.

C. monogyna bud is able to spend several weeks without a host.

C. monogyna flowers need insects for fertilization and pollination. Dodder is a plant belonging to the temperate and semi-tropical regions, floral, compulsory parasites and annual; so, in winter with the arrival of cold, all its filaments become dry and black and disappear, and many seeds fall on the ground and keep pollution talent of the soil for next years.

In these forest areas, animal transportation begins and nonstop grazing lasts until the beginning of snow in the next season on the ground surface.

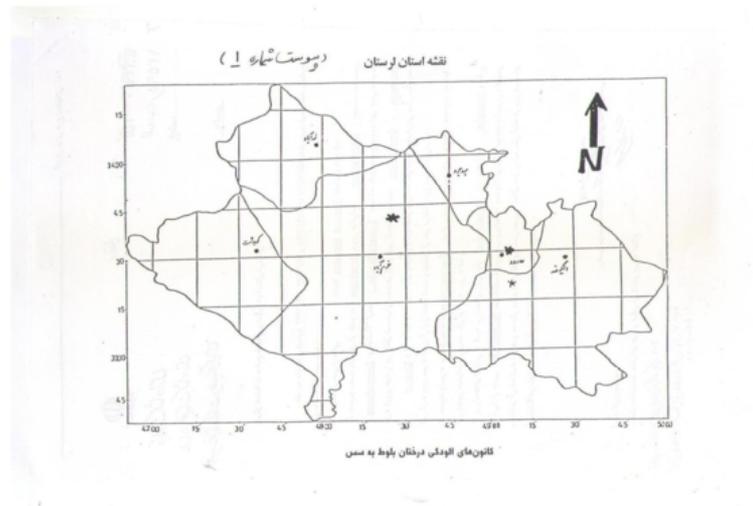
Livestock which graze and transport in the area, are mostly sheep and goats and are interested in eating dodder filaments; therefore, dodder filaments can be useful for livestock in spring and summer when, the dodder filaments are on the under epoch plants of the forest. So, controlled grazing of livestock in this limited interval and in pollution areas is one of the dodder control ways.

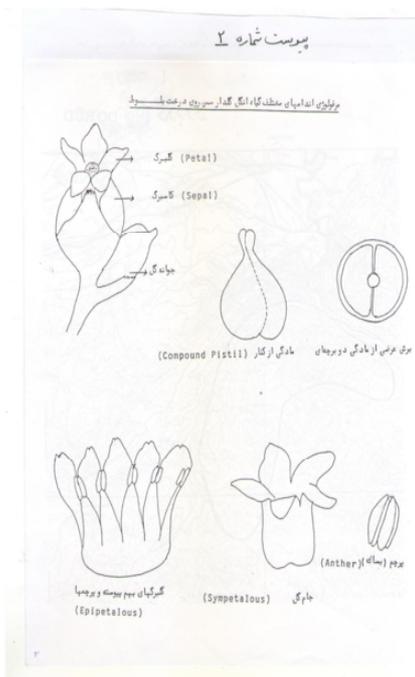
Inversely, in the middle of summer and the late autumn when dense masses of dodder form on oak branches and leaves and mostly have seed, shepherds attempt to cut off the infected branches and give them to their livestock. Since, dodder seeds have hard protective shells and are not digested in tract of ruminants, so, mostly are excreted and the seeds can be diffused in the region. But, this parasite plant can be controlled by limiting livestock movement from polluted areas to non-contaminated areas.

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پهرین شماره ۲



مرحله پیچیدن سمن به دور شاخه‌های بلوط



خشکیدگی انهای سرشاخه‌های بلوط

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