The pollution effect of Persian Gulf war on the physiological reaction of Oak growth (*Quercus brantii* var. *persica*) in south western of Iran

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Abstract:

During the Persian Gulf War, different ecosystems were damaged severely in the southern and southwestern regions of Iran (1). Pollutants in some physiological aspects such as wood growth affected trees. In this project, annual growth rate was measured within 20 individuals and compared in Oak trees (*Quercus brantii* Lindl. var. *persica*) during 14 years by dendrochronological methods (3).

A 14 years-old branch was selected according to annual nodes from each individual and used for preparing a disk. Disks were dried at 60º-80ºC and then polished by rubbing. The annual growth rate was measured by use of stereomicroscope and a computerized (Motic) program in two vertical directions from center of wood toward cambium layer and analyzed statistically.

Moreover enzymatic reactions against the pollution effects were studied. Results indicated that annual growth in 1370 (stress year) showed decreasing in comparison to 1371-1379 (after stress year) and 136-1369 (before stress year) in spite of more rainfall in 1370. This indicated effect of pollution on growth decreasing. The enzymatic reaction has confirmed these results. Results could lead us to usage of trees as a suitable indicator for ecological assessment.

Introduction

At the January 1991 Persian Gulf War were happened and during 42 days war more than 700 oil well were fired. It was deduced to black rain happening per more than 16 provinces of Iran (1). In fact, this environmental disaster result to many different negative physiological effects likes as decreasing of trunk growth and agricultural products. One of the evaluation methods for damage assessment is dendrochronology.

As a matter of fact light and climate are the most effective elements on the growth rate. Therefore it could be demonstrated, all of the growth rate vacillation in the normal light and climate situation is related to some other parameters like as stress. Pollution is one of the most important stress sources and could affect on the growth rate intensively (3).

Oak manna tree (*Quercus brantii* Var. *persica*) is one of the most important species in the Zagros Mountain at the western regions of Iran. This is a widespread species with the most frequency in compare with the other species. Lordegan that have situated at the Chahar-Mahal & Bakhtiari province is one of its habitats that have been affected by black rain (4). Lordegan has been located in the south of this province. There are several tree, shrub, range, as well as important medicinal plant species that occur naturally in this part of the province. Its climate is warmer than the other regions of province although its mean precipitation is about. Its elevation is about 1700m from sea level. Minimum means temperature 5.9 and means 14.5 and maximum temperature is about 23.
Material and methods
At first 20 Oak individuals were selected and a 14 years old branches according to annual nodes from each individual and used for preparing a disk for dendrochronology studies and extraction for enzymatic studies (3 & 4). Disks were dried at 60º-80ºC and then polished by rubbing. The annual growth rate was measured by use of stereomicroscope and a computerized (Motic) program in two vertical directions from center of wood toward cambium layer. Then all of the information was processed by cross date method and finally the growth curve of it was designed. In addition different Branches of related to each year during 1989- 2000 were separated with an accurate procedure and extracted for enzyme analysis (2,5,6). Qualitative studies were done by PAGE (Polyacrylamide Gel Electrophoresis) method (4). Amylase was chosen as one of the most important enzymes in all of the plant metabolism process and energy production (5).

Results
Dendrochronological studies conducted on the different vacillation of annual growth rate (Figure 1 & 2). It contains precipitation, temperature and dendrochronology curves.

Figure 1- Precipitation, temperature curve of Lordegan and dendrochronological results of 6 Oak individuals
Figure 2 - Dendrochronological results of 15 Oak individuals
One of the 20 individuals was loosed regard to loosed annual ring years.

Figure 3 - Amylase gel image for one of the Oak individuals Q19 as a representative of all individuals
Discussion
Chaharmahal & Bakhtiari province has been located faraway from the center of pollution. But with regard to climatological conditions it has been occurred some black rain in different regions of this province and Lordegan is one of the most important locations. Results conclude on the depth of pollution in the central and western regions of Iran. Amylase gel pattern shows reaction against the pollution during 1990 and 1991 and could express the negative pollution effects (4). In addition dendrochronology results shows that most of the individuals have reacted against the pollution effects and their growth rate show a decreasing process at the 1991 in spite of more rainfall in 1370 in compare with mean precipitation rate. Therefore it could be demonstrated dendrochronology studies could be used as a suitable indicator for pollution effects assessment as it has been done by other method like as enzyme studies. Moreover, trees reaction is not equal to each other and some of them are more sensitive than the others. Therefore it must be done by several samples.

References
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