

ABSTRACT

During the last few decades, white oaks in North Central region of the United States have developed malformations of newly developing leaves. These malformations termed "oak tatters", give the leaves a tattered appearance, as most leaves are void of interveinal tissue. Oak tatters can affect a substantial portion of a tree's canopy, making them susceptible to insects and diseases. Environmental stress to the trees in spring just when leaves are emerging, frost conditions, insect attack and herbicide drift, are all thought to be possible causes for oak tatters. Initial studies have not verified a herbicide cause, although acetochlor and atrazine have been applied near some instances of oak tatters. In order to help identify the cause(s) behind oak tatters, a survey questionnaire will be mailed in early spring 2004 to interested volunteers from various Illinois natural resource and gardening organizations. To provide information on oak tatters to these participants, educational material has been posted on a website. Any indications on oak tatter cause(s) from the survey will be used in the field experiments to be conducted over summer 2004 and 2005 to verify the cause. Further studies will involve treating plants at different growth stages with herbicides and a study of leaf anatomy of the susceptible white oak and resistant red oak species.

OBJECTIVES

- Informally survey Illinois State natural resource and gardening organizations to determine extent, timing, and possible herbicides associated with "leaf tatters".
- Conduct research to confirm a specific herbicide as the cause of "leaf tatters".
- Develop a website and fact sheet to provide information and assistance in diagnosing "leaf tatters" of white oak.
- Study the leaf anatomy of susceptible white oaks and resistant red oak species.

INTRODUCTION

During the last few decades, white oaks in North Central region have developed malformations of newly developing leaves. These malformations give the leaves a tattered appearance as most leaves are nearly void of interveinal tissue. This problem can affect a substantial portion of a tree's canopy reducing the overall health of trees, and making them susceptible to other stresses. Leaf tatters can reoccur over multiple seasons and has been noticed on white oaks of all ages. The red oaks do not seem to get affected with oak tatters. The problem of oak tatters has been reported in Illinois and neighboring states including Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio and Wisconsin. Although no research has been done to date, to confirm the cause of oak tatters, environmental stress to the trees in spring just when leaves are emerging, frost conditions, insect attack and herbicide drift, are all thought to be possible causes for oak tatters. However we hypothesize the "oak tatters" damage on white oaks due to drift of acetochlor and atrazine from use in corn and soybean fields.

Photos 1 and 2 show a progression in the development of oak tatters. The leaves of white oak at first begin to lose interveinal tissues (photo 1) leaving only veins, with almost no or little leaf tissues surrounding the veins (photo 2). A close up view of tattered oak leaves can be seen in photo 3. Photo 4 shows an infested oak branch with tattered leaves.

Photo 1



Photo 2



Photo 3



Photo 4



MATERIALS AND METHODS

INFORMAL SURVEY

An informal survey will be conducted in early spring 2004. Volunteers from the following Illinois natural resource and gardening organizations have been contacted.

- Master Gardener's
- Illinois Nurserymen's Association
- International Society of Arboriculture
- Volunteer Stewardship Network
- Champaign County Forest Preserve District Foundation
- Illinois State Forester's

A survey questionnaire has been mailed to interested volunteers starting January 2004. The questionnaire focus is on site conditions, proximity of the affected oak trees to corn and soybean fields, the species of oaks being affected and the extent of damage.

WEBSITE

In order to provide information on oak tatters to the volunteers, educational material has been posted at the following URL: www.extension.uiuc.edu/mg/oaktatters.htm.

All information is posted in the form of question and answers and supplemented with photos showing white oaks infested with tatters. The site is updated with additional questions and their answers, as we hear queries from the volunteers. Results from the oak tatter study will also be updated on the site.

FIELD STUDY

Experiment 1

- Completely Randomized Design.
- 6 possible herbicide treatments including mixture of acetochlor and atrazine. Other treatments to be shortlisted based on help from survey.
- 4 herbicide concentration levels- 1X, 1/10X, 1/100X and 1/1000X.
- Control treatment to be included at single concentration for white oaks. Red oaks to be included in the control treatment. Red oaks will also serve a control for the overall conditions under which the experiment will be performed.
- Application of herbicides to the oak trees will be made at four different stages of development (2) -
 1. Buds swollen but bud scales not separated
 2. Bud scales loose and leaf margins visible
 3. Leaves visible < 2.5 cm in length
 4. Leaves visible > 2.5 cm in length
- At appropriate stage of growth, the specific herbicide concentration will be sprayed using hand atomizer and the treated branches will be bagged for 15-20 minutes. The bag will be removed and the treated branches will be marked for further observations.
- Visual ratings will be taken on treated branches and injury will be photographed for documentation purposes.

Experiment 2

Based on results from year 1 (2004), leaf anatomical differences can be carried out on white and red oak species. On the basis of study of Conley *et al.* (1), samples will be taken from white and red oaks first on daily basis, for the first two weeks, and then leaf anatomy of the oaks will be studied by collecting leaf samples on monthly basis, over the growing season. A split-plot experimental design will be followed with whole plot being the affected and non-affected oak species, and the split-plot factor being the sampling date.

LITERATURE CITED

1. Conley M.E., E.T. Papparozi, J.C. Pair and W.W. Stroup. 1995. Leaf tatter in *Acer saccharum*: An anatomical link. *Int. J. Plant Sci.* 156: 303-310.
2. Kolb T.E. and D.A.J. Teulon. 1991. Relationship between sugar maple budburst phenology and pear thrips damage. *Can. J. For. Res.* 21:1043-1048.

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