

林学—应用研究

溃疡病影响杨树根部淀粉的年度积累

李树战<sup>1</sup>, 崔令军<sup>2</sup>, 孙志强<sup>2</sup>, 乔杰<sup>2</sup>, 黄琳<sup>2</sup>, 赵俊芳<sup>3</sup>

- 1. 中南林业科技大学生命科学与技术学院
- 2. 国家林业局泡桐研究开发中心
- 3. 河南省濮阳市林科所

摘要:

为了了解新发生的溃疡病的严重程度对杨树根部淀粉积累的影响, 通过根部淀粉积累的变化初步探索溃疡病对杨树树势的影响, 笔者按照溃疡病发病指数的大小, 选取5年生中林46杨, 采用固定样株取根和碘-淀粉比色法, 测量了2008年休眠期、2009年生长期和2009年休眠期杨树根部淀粉含量的变化。结果表明, 2008年休眠期感病植株的淀粉含量与健康植株的差异不显著。持续发病显著降低了发病指数>60%, 即发病严重植株2009年生长期的淀粉含量与健康植株的差异不显著。持续发病显著降低了发病指数>60%, 即发病严重植株2009年生长期的淀粉含量显著高于发病轻和严重发病树木。t检验结果证实, 只有发病指数>60%的植株自身的淀粉含量在2009年生长期(t=5.197, P=0.001)和休眠期(t=3.219, P=0.008)分别显著低于2008年休眠期。健康和发病轻的树木淀粉含量虽然均有所下降, 但差异均不显著; 而发病中等树木2009年生长期根部的淀粉含量较2008年休眠期高, 同时2009年休眠期的淀粉含量较2008年休眠期高, 但均未达显著水平。本研究初步揭示, 当杨树罹患溃疡病后, 其根部淀粉含量的变化受发病指数的影响呈现出不同的变化趋势: 当发病指数>60%, 即严重发病时, 根部淀粉积累呈现极显著的下降趋势, 因而其生长势受到较大的负面影响; 轻度发病不会影响树木生长势; 而发病中等的树木经过2年生长期, 其淀粉含量显著高于发病轻和发病重的树木, 其树势可能增强。

关键词: 杨树; 中林46; 溃疡病; 发病指数; 淀粉

Impact of Canker Disease on Annual Starch Accumulation in Poplar Roots

1 1 1 1 1  
, , , , ,

Abstract:

In order to better understand the impact of newly occurred cankers on soluble starch accumulations in poplar roots, and to further assess trees' vigor along to the change of starch reserves in roots, *Populus euramericana* 'zhonglin 46' with new canker were selected during 2008 growing season and marked according to disease severity indices and their roots were collected at dormancy period in 2008, growing season in 2009 and dormancy in 2009 from 6 temporary plots in Qingfeng County, respectively. Starch in roots was determined using iodine colorimetric method. Starch of diseased trees was not significantly different compared to that of healthy trees at 2008 dormancy (F=0.535, P=0.660). Starch content was significantly different among roots of healthy, slightly diseased, intermediately diseased and severely diseased trees in 2009 growing season (F=3.668, P=0.02) and 2009 dormancy (F=3.335, P=0.035), particularly a significant reduce of starch was found among those severely diseased trees; while starch content in intermediately diseased trees was significantly higher than that of slightly diseased and severely diseased trees in 2009 dormancy. The t-test indicated that starch content of severely diseased trees significantly decreased during 2009 growing season (t=5.197, P=0.001) and dormancy period (t=3.219, P=0.008) compared to 2008 dormancy. At the same time, no significant difference of starch content change was found in healthy and slightly diseased trees. Interestingly, an increment of starch content was found in intermediately diseased trees, while the change was not significantly. This study revealed that the change of starch content was affected by severities of canker in different ways. Starch content in severely diseased trees reduced significantly and further reduced trees' vigor, while slightly disease trees' vigor was not affected due to insignificant decreases of starch reserves. A slightly increase of starch reserve was observed in those intermediately diseased trees which most likely meant a slight increase of vigor.

Keywords: poplar; *Populus euramericana* 'zhonglin 46' canker disease severity index starch

收稿日期 2011-03-14 修回日期 2011-03-24 网络版发布日期 2011-05-06

DOI:

扩展功能

本文信息

- Supporting info
- PDF(646KB)
- [HTML全文]
- 参考文献[PDF]
- 参考文献

服务与反馈

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- 引用本文
- Email Alert
- 文章反馈
- 浏览反馈信息

本文关键词相关文章

- 杨树; 中林46; 溃疡病; 发病指数; 淀粉

本文作者相关文章

- 李树战
- 崔令军
- 孙志强
- 乔杰
- 黄琳
- 赵俊芳

PubMed

- Article by Li,S.Z
- Article by Cui,L.J
- Article by Xun,Z.J
- Article by Qiao,j
- Article by Huang,l
- Article by Diao,J.F

通讯作者: 孙志强 国家林业局泡桐研究开发中心, 郑州450003

作者简介:

作者Email: sun371@163.com

### 参考文献:

- [1] Kramer PJ, Kozlowski TT. Physiology of woody plants[M]. New York, San Francisco, London.: Academic Press 811, 1979.
- [2] Kruger EL, Reich PB. Responses of hardwood regeneration to fire in mesic forest openings. III. Whole-plant growth, biomass distribution, and nitrogen and carbohydrate relations[J]. Canadian Journal of Forest Research, 1997, 27(11): 1841-1850.
- [3] Adams AS, Rieske LK. Prescribed fire affects white oak seedling phytochemistry: implications for insect herbivory[J]. Forest Ecology and Management, 2003, 176(1-3): 37-47.
- [4] Adams AS, Rieske LK. Herbivory and fire influence white oak (*Quercus alba* L.) seedling vigor[J]. Forest Science, 2001, 47(3): 331-337.
- [5] Frey BR, Lieffers VJ, Landh?usser SM, et al. An analysis of sucker regeneration of trembling aspen [J]. Canadian Journal of Forest Research, 2003, 33(7): 1169-1179.
- [6] Landh?usser SM, Lieffers VJ. Seasonal changes in carbohydrate reserves in mature northern *Populus tremuloides* clones[J]. Trees-Structure and Function, 2003, 17(6): 471-476.
- [7] Kobe RK. Carbohydrate allocation to storage as a basis of interspecific variation in sapling survivorship and growth[J]. Oikos, 1997, 80(2): 226-233.
- [8] Landh?usser SM, Lieffers VJ. Leaf area renewal, root retention and carbohydrate reserves in a clonal tree species following aboveground disturbance[J]. Journal of Ecology, 2002, 90(4): 658-665.
- [9] Mundell TL, Landh?usser SM, Lieffers VJ. Root carbohydrates and aspen regeneration in relation to season of harvest and machine traffic[J]. Forest Ecology and Management, 2008, 255(1): 68-74.
- [10] 骆有庆,张星耀. 面向 21 世纪的森林防灾减灾[J]. 中国农业科技导报, 2000, 2(1): 67-72.
- [11] 张星耀, 骆有庆, 叶建仁,等. 国家林业新时期的森林生物灾害研究[J]. 中国森林病虫, 2004, 23(6): 8-12.
- [12] 张星耀, 赵嘉平, 梁军,等. 树木枝干溃疡病菌致病力分化研究[J]. 中国森林病虫, 2008, 27(1): 1-4.
- [13] 刘会香, 贾秀贞, 吕全,等. 中国杨树溃疡病的发生与防治[J]. 世界林业研究, 2005, 18(4): 60-63.
- [14] 梁军, 姜俊清, 刘会香,等. 我国杨树与溃疡病菌互作的病理学研究[J]. 林业科学研究, 2005, 18(2): 214-221.
- [15] Weiland JE, Stanosz JAC, Stanosz GR. Prediction of long-term canker disease damage from the responses of juvenile poplar clones to inoculation with *Septoria musiva*[J]. Plant Disease, 2003, 87(12): 1507-1514.
- [16] 黄烈健,苏晓华. 我国杨树溃疡病研究进展[J]. 世界林业研究, 2003, 16(4): 49-53.
- [17] 景耀,朱玮. 杨树树皮中化学成分与溃疡病关系的初步研究: I 常量营养元素与溃疡病的关系[J]. 林业科学, 1989, 25(4): 304-310.
- [18] 朱玮,景耀. 杨树树皮中化学成份与溃疡病关系的初步研究—II. 酚类与溃疡病的关系[J]. 西北林学院学报, 1989, 4(2): 45-54.
- [19] 赵仕光,景耀. 杨树树皮内过氧化物酶和多酚氧化酶活性与抗溃疡病的关系[J]. 西北林学院学报, 1993, 8(3): 13-17.
- [20] 王 静,崔令军,梁军,等. 中型景观尺度下杨树人工林分特征对干部病害发生的影响—以河南省清丰县为例[J]. 生态学报, 2011, 31(刊印).
- [21] 张峻松, 贾春晓, 毛多斌,等. 碘显色法测定烟草中的淀粉含量[J]. 烟草科技, 2004, (5): 24-28.
- [22] 惠会清. 用分光光度法确定碘和淀粉显色反应的定量测定条件[J]. 中国卫生检验杂志, 2008, 18(1): 60-61.
- [23] Kleijn D, Treier UA, Müller-Sch?rer H. The importance of nitrogen and carbohydrate storage for plant growth of the alpine herb *Veratrum album*[J]. New Phytologist, 2005, 166(2): 565-575.
- [24] 高英志, 王艳华, 王静婷,等. 草原植物碳水化合物对环境胁迫响应研究进展[J]. 应用生态学报, 2009, 20(11): 2827-2831.
- [25] Von Fircks Y, Sennerby-Forsse L. Seasonal fluctuations of starch in root and stem tissues of coppiced *Salix viminalis* plants grown under two nitrogen regimes[J]. Tree physiology, 1998, 18(4): 243.
- [26] DesRochers A, Lieffers VJ. Root biomass of regenerating aspen (*Populus tremuloides*) stands of different densities in Alberta[J]. Canadian Journal of Forest Research, 2001, 31(6): 1012-1018.
- [27] 张艳红, 曾波,付天飞,等. 长期水淹对秋华柳 (*Salix variegata* Franch) 根部非结构性碳水化合物含量的影响[J]. 西南师范大学学报: 自然科学版, 2006, 31(3): 153-156.
- [28] 张卓民. 环剥环割技术在旱地枣树栽培上的应用[J]. 河南农业, 2005, (7): 28-28.
- [29] 张香纯. 苹果树均衡树势的几种修剪方法[J]. 北京农业, 2007, (11): 29-29.
- [30] 李早东. 农业技术中的物理原理[J]. 现代物理知识, 2010, 22(2): 50-53.

[31] Trumble JT, Kolodny-Hirsch DM, Ting IP. Plant compensation for arthropod herbivory[J]. Annual Review of Entomology, 1993, 38(1): 93-119.

[32] 梁军,孙志强,乔杰,等.天然林稳定性与病虫害干扰的关系: 调控与被调控[J]. 生态学报, 2010, 30(9): 2454-2464.

本刊中的类似文章

---

Copyright by 中国农学通报