

全国中文核心期刊  
中国科技核心期刊  
中国农业核心期刊  
RCCSE中国核心学术期刊  
中国科学引文数据库 (CSCD) 期刊  
CAB International 收录期刊  
美国《生物学文摘》收录期刊  
美国《化学文摘》(CA) 收录期刊

首页 (/) 期刊介绍 编委会 投稿须知 期刊订阅 广告合作 联系我们 返回主页  
(/Corp/10.aspx) (/Corp/3600.aspx) (/Corp/5006.aspx) (/Corp/50.aspx) (http://www.haasep.cn/)

«上一篇 (DArticle.aspx?type=view&id=200805015)  
下一篇 (DArticle.aspx?type=view&id=200805017)



PDF下载 (pdfdown.aspx?Sid=200805016)

+分享  
(http://www.jiathis.com/share?uid=1541069)



微信公众号: 大豆科学

[1]刘金波,许艳丽,李春杰,等.大豆连作土壤盆栽大豆根腐病及生长发育状况[J].大豆科学,2008,27(05):806-810.  
[doi:10.11861/j.issn.1000-9841.2008.05.0806]  
LIU Jin-bo,XU Yan-li,LI Chun-jie,et al.Effect of Long Term Soybean Monoculture on Soybean Root Rot and Soybean Growth and Development in Pot Experiment[J].Soybean Science,2008,27(05):806-810.  
[doi:10.11861/j.issn.1000-9841.2008.05.0806]

点击复制

## 大豆连作土壤盆栽大豆根腐病及生长发育状况

《大豆科学》 [ISSN:1000-9841 /CN:23-1227/S ] 卷: 第27卷 期数: 2008年05期 页码: 806-810 栏目:  
出版日期: 2008-10-25

Title: Effect of Long Term Soybean Monoculture on Soybean Root Rot and Soybean Growth and Development in Pot Experiment

文章编号: 1000-9841(2009)05-0806-05

作者: 刘金波<sup>1</sup> (KeySearch.aspx?type=Name&Sel=刘金波); 许艳丽<sup>1</sup> (KeySearch.aspx?type=Name&Sel=许艳丽); 李春杰<sup>1</sup> (KeySearch.aspx?type=Name&Sel=李春杰); 刁琢<sup>1</sup> (KeySearch.aspx?type=Name&Sel=刁琢); 刁琢<sup>3</sup> (KeySearch.aspx?type=Name&Sel=刁琢)

1中国科学院东北地理与农业生态研究所, 黑龙江 哈尔滨, 150081;  
2中国科学院研究生院, 北京, 100049;  
3东北农业大学农学院, 黑龙江 哈尔滨, 150030

Author(s): LIU Jin-bo<sup>1</sup> (KeySearch.aspx?type=Name&Sel=LIU Jin-bo); XU Yan-li<sup>1</sup> (KeySearch.aspx?type=Name&Sel=XU Yan-li); LI Chun-jie<sup>1</sup> (KeySearch.aspx?type=Name&Sel=LI Chun-jie); DIAO Zhuo<sup>1</sup> (KeySearch.aspx?type=Name&Sel=DIAO Zhuo); DIAO Zhuo<sup>3</sup> (KeySearch.aspx?type=Name&Sel=DIAO Zhuo)

1 Northeast Institute of Geography and Agricultural Ecology, CAS, Harbin 150081;  
2 Graduate School, CAS, Beijing 100049  
3 Northeast Agricultural University, The College of Agriculture, Harbin 150030, Heilongjiang, China

关键词: 大豆 (KeySearch.aspx?type=KeyWord&Sel=大豆); 连作 (KeySearch.aspx?type=KeyWord&Sel=连作); 根腐病 (KeySearch.aspx?type=KeyWord&Sel=根腐病); 生长发育 (KeySearch.aspx?type=KeyWord&Sel=生长发育)

Keywords: Soybean (KeySearch.aspx?type=KeyWord&Sel=Soybean); Monoculture (KeySearch.aspx?type=KeyWord&Sel=Monoculture); Root rot (KeySearch.aspx?type=KeyWord&Sel=Root rot); Growth and development (KeySearch.aspx?type=KeyWord&Sel=Growth and development)

分类号: S565.1

DOI: 10.11861/j.issn.1000-9841.2008.05.0806 (http://dx.doi.org/10.11861/j.issn.1000-9841.2008.05.0806)

文献标志码: A

摘要: 根腐病是引起大豆连作障碍的主要原因。对取自海伦农业生态试验站长期定位试验区大豆连作16 a、轮作和休闲3个小区大豆田耕层土壤, 采用盆栽方法, 探讨长期连作对大豆根腐病及生长发育的影响。分别于大豆播种后20、30和55 d取样调查大豆根腐病发病程度、株高和鲜重, 并分别在20 d和55 d时调查病原菌和胞囊数量。结果表明: 大豆连作17 a土壤盆栽大豆根腐病发病程度略低于轮作, 两者之间差异不显著, 轮作高于休闲, 两者相比差异显著。播种55 d后休闲大豆株高最高, 与大豆连作17 a和轮作比差异显著; 其次为轮作, 大豆连作17 a株高最低。休闲鲜重最高, 其次为轮作, 连作17 a最低, 但3者之间无明显差异。从大豆根中共分离出镰孢菌和腐霉菌2种病原菌, 镰孢菌分离频率明显高于腐霉菌, 连作17 a和轮作无明显差异。轮作大豆根上胞囊数量高于大豆连作17 a, 差异显著, 休闲土盆栽大豆未发现胞囊。因此, 大豆长期连作土壤盆栽大豆根腐病与轮作无明显差异, 但连作17 a大豆生长发育状况较轮作稍差。

Abstract: Soybean root rot was the main cause of soybean monoculture obstacle. By pot experiment with soils from soybean monoculture 16 years (S-S...-S), Wheat-Corn-Soybean rotation (W-C-S) and fallow arable layer soils in Hailun Agricultural Ecology Experimental Station, the research was carried to probe the effect of soybean monoculture on soybean root rot and plant growth. Soybean root rot severity, plant height and fresh weight were detected after sowing 20 d; pathogens and Cyst quantity were respectively surveyed after sowing 20 d and 55 d. The results showed that, soybean root rot severity in S-S...-S was lower than W-C-S, and no significant differences between them, but significant differences were found between W-C-S and fallow. Plant height was the highest in fallow, which were significantly different to S-S...-S and W-C-S. After sowing 55 d, the plant height was the highest in fallow, has significant differences to S-S...-S and W-C-S; the plant height of W-C-S was the second and in S-S...-S was the lowest. Fresh weight was the highest in fallow, W-C-S...W-C-S was the second and S-S...-S was the lowest, but there were no significant differences among them. Two genus pathogens of Fusarium spp. and Pythium spp. were isolated in soybean root. Fusarium spp. had higher isolation frequency than Pythium spp., but no difference between S-S...-S and W-C-S. The cysts quantity of W-C-S...W-C-S on soybean root was higher than S-S...-S, and significant differences were found between them, but no cyst was found in fallow. In short, soybean root rot of potted soybean plants were no significant differences between S-S...-S and W-C-S soil, but the growth and development of soybean in S-S...-S were slightly inferior to W-C-S...W-C-S.

参考文献/References:

- [1]Kageyama K, Ui T, Narita Y. Influence of *Pythium* spp. on the injury by bean monoculture [J]. *Annals Phytopathology Society of Japan*, 1981, 47: 320-326.
- [2]王德身, 李哲, 于希臣. 几种旱田作物在轮作中的地位研究[J]. *辽宁农业科学*, 1991 (3):1-6. (Wang D S, Li Z, Yu X C. Several species dry farmland crops position in rotation. [J]. *Liaoning Agricultural Sciences*, 1991 (3): 1-6.)
- [3]刘忠堂, 何志鸿, 祖伟, 等. 重迎茬对大豆产量影响及机理的研究[J]. *大豆科学*, 2001, 20(2): 153. (Liu Z T, He Z H, Zhu W, et al. Effect of soybean continuous cropping and alternate cropping soybean on the yield of soybean and mechanism study [J]. *Soybean Science*, 2001, 20(2):153.)
- [4]Porter P M, Lauer J G, Lueschen W E, et al. Environment affects the corn and soybean rotation effect[J]. *Agronomy Journal*, 1997, 93:619-626.
- [5]Porter P M, Chen S Y, Reese C D, et al. Population response of soybean cyst nematode to long term Corn-Soybean cropping sequences in Minnesota[J]. *Agronomy Journal*, 2001, 93:619-626.
- [6]Pedersen P, Lauer J G. Influence of rotation sequence on the optimum corn and soybean plant population[J]. *Agronomy Journal*, 2002, 94:968-974.
- [7]Pedersen P, Lauer J G. Soybean growth and development response to rotation sequence and tillage system [J]. *Agronomy Journal*, 2004, 96:1005-1012.
- [8]许艳丽, 王光华, 韩晓增. 连作大豆生物障碍研究[J]. *中国油料*, 1997, 19(3):46-49. (Xu Y L, Wang G H, Han X Z. Study on biological barrier in continuous soybean[J]. *Chinese Journal of Oil Crop Sciences*, 1997, 19(3):46-49.)
- [9]Kageyama K, Ui T. *Pythium*-species isolated from bean plants and soils in the experimental plots of monoculture and rotation[J]. *Annals Phytopathology Society of Japan*, 1981, 47: 313-319.
- [10]Kageyama K, Ui T, Narita Y, et al. Relation of *Pythium* spp. to monoculture injury of soybean[J]. *Annals Phytopathology Society of Japan*, 1982, 48: 333-335.
- [11]许艳丽, 刘爱群, 韩晓增, 等. 黑龙江省黑土区不同茬口对不同生长发育及产量和品质影响的研究[J]. *大豆科学*, 1996, 15(1): 48-55. (Xu Y L, Liu A Q, Han X Z, et al. Study of the influence on yield and quality of soybean by different rotation system in chernozemic soil area of north east of China[J]. *Soybean Science*, 1996, 15(1): 48-55.)
- [12]何志鸿, 刘忠堂, 许艳丽, 等. 大豆重迎茬减产的原因及农艺对策研究 I. 重迎茬对大豆产量与品质的影响[J]. *黑龙江农业科学*, 2003 (3): 1-4. (He Z H, Liu Z T, Xu YL, et al. Study on the reason reducing production of soybeans cultured continuously and the way to get more output I. Yield and quality[J]. *Heilongjiang Agricultural Sciences*, 2003(3): 1-4.)
- [13]邹莉, 袁晓颖, 李玲, 等. 连作对大豆根部土壤微生物的影响研究[J]. *微生物学杂志*, 2005, 25 (2): 27-30. (Zou L, Yuan X Y, Li L, et al. Effects continuous cropping on soil microbes on soybean roots [J]. *Journal of Microbiology*, 2005, 25 (2): 27-30.)
- [14]苗淑杰, 乔云发, 韩晓增. 大豆连作障碍的研究进展[J]. *中国生态农业学报*, 2007, 15 (3): 203-206. (Miao S J, Qiao Y F, Han X Z. Review of researches on obstacles of continuous cropping of soybean[J]. *Chinese Journal of Eco-Agriculture*, 2007, 15 (3): 203-206.)
- [15]文景芝, 张明厚. 重迎茬大豆根腐病的发生与防治[J]. *大豆通报*, 1996, 3: 5-6. (Wen J Z, Zhang M H. Continuous cropping and alternate cropping soybean root rot occurrence and control[J]. *Soybean Bulletin*, 1996(3):5-6.)
- [16]马汇泉, 郑桂萍, 赵九洲, 等. 大豆连作障碍及产生机理[J]. *土壤*, 1997(1): 46-48. (Ma H Q, Zheng G P, Zhao J Z, et al. Soybean monoculture obstacle and mechanism[J]. *Soil*, 1997(1): 46-48.)
- [17]王向东, 梁秀凤, 丁晓敏, 等. 大豆根腐病的识别与防治技术[J]. *大豆通报*, 2006(1):22-23. (Wang X D, Liang X F, Ding X M, et al. Identification and control in soybean root rot[J]. *Soybean Bulletin*, 2006(1):22-23.)
- [18]李春格, 李晓鸣, 王敬国. 大豆连作对土体和根际微生物群落功能的影响 [J]. *生态学报*, 2006, 26 (4): 1144-1150. (Li C G, Li X M, Wang J G. Effect of soybean continuous cropping on bulk and rhizosphere soil microbial community function [J]. *Acta Ecologica Sinica*, 2006, 26 (4): 1144-1150.)
- [19]靳学慧, 辛惠普, 郑雯, 等. 长期轮作和连作对土壤中大豆胞囊线虫数量的影响[J]. *中国油料作物学报*, 2006, 28(2): 189-193. (Jin X H, Xin H P, Zheng W, et al. The influence of soil on the long-term rotation and continuous cultivation on soybean cyst nematode[J]. *Chinese Journal of Oil Crop Sciences*, 2006, 28(2): 189-193.)
- [20]林蔚刚, 胡立成, 董雨华. 连作对大豆生长发育及根际病虫害影响的初步分析[J]. *黑龙江农业科学*, 1997(1):10-14. (Lin W G, Hu L C, Dong L H. The primary analysis on affect of continuous cropping on growth and root disease and insect of soybean [J]. *Heilongjiang Agricultural Sciences*, 1997(1):10-14.)
- [21]许艳丽, 刘晓冰, 韩晓增, 等. 大豆连作对生长发育动态及产量的影响[J]. *中国农业科学*, 1999, 32 (增刊): 64-68. (Xu Y L, Liu X B, Han X Z, et al. Effect of continuous-cropping on yield and growth-development of soybean[J]. *Scientia Agricultura Sinica*, 1999, 32 (Supplement): 64-68.)
- [22]金剑, 王光华, 刘晓冰, 等. 东北黑土区高产大豆R5期根系分布特征[J]. *中国油料作物学报*, 2007, 29(3):266-271. (Jin J, Wang G H, Liu X B, et al. Characteristics of root distribution at R5stage in high yielding soybean in black soil [J]. *Chinese Journal of Oil Crop Sciences*, 2007, 29(3):266-271.)
- [23]Puricelli E C, Faccini D E, Orioli G A, et al. Spurred Anoda (*Anoda cristata*) competition in narrow and wide row soybean (*Glycine max*) [J]. *Weed Technology*, 2003, 17:446-451.
- [24]何志鸿, 刘忠堂, 许艳丽, 等. 大豆重迎茬减产的原因及农艺对策研究-重迎茬大豆的根际土壤有机化合物[J]. *黑龙江农业科学*, 2003 (5): 1-5. (He Z H, Liu Z T, Xu Y L, et al. Study on the reason reducing production of soybeans planted continuously and the way to get more output-organic compound of rhizosphere soil [J]. *Heilongjiang Agricultural Science*, 2003 (5): 1-5.)
- [25]Zhang B Q, Yang X B. Pathogenicity of *Pythium* populations from corn-soybean rotation fields[J]. *Plant Disease*, 2000, 84:94-99.
- [26]Cichy K A, Snapp S S, Kirk W W. Fusarium root rot incidence and root system architecture in grafted common bean lines[J]. *Plant Soil*, 2007, 300:233-244.
- [27]王震宇, 王英祥, 陈祖仁. 重茬大豆生长发育障碍机制初探[J]. *大豆科学*, 1991, 10(1):31-36. (Wang Z Y, Wang Y X, Chen Z Y. Preliminary study of soybean growth and development obstacle mechanism in soybean-soybean cropping [J]. *Soybean Science*, 1991, 10(1):31-36.)
- [28]刘春红, 敖奎. 大豆残茬对后茬大豆生长发育的影响[J]. *黑龙江农业科学*, 2003(6):15-17. (Liu C H, Ao K. The Influence of the soybean stubble on the growth and development of soybean[J]. *Heilongjiang Agricultural Science*, 2003(6): 15-17.)
- [29]张红梅, 张鸿雁, 肖立杰. 不同培肥措施对大豆生长发育影响的研究. *吉林农业科学*, 2004, 29(3):23-25. (Zhang H M, Zhang H Y, Xiao L J. Effect of fertility raising practices on growth and development of soybean [J]. *Journal of Jilin Agricultural Science*, 2004, 29(3): 23-25.)

## 相似文献/References:

- [1]刘章雄, 李卫东, 孙石, 等. 1983~2010年北京大豆育成品种的亲本地理来源及其遗传贡献[J]. (article.aspx?type=view&id=201301001) *大豆科学*, 2013, 32(01):1. [doi:10.3969/j.issn.1000-9841.2013.01.002]  
LIU Zhang-xiong, LI Wei-dong, SUN Shi, et al. Geographical Sources of Germplasm and Their Nuclear Contribution to Soybean Cultivars Released during 1983 to 2010 in Beijing [J]. *Soybean Science*, 2013, 32(05):1. [doi:10.3969/j.issn.1000-9841.2013.01.002]
- [2]李彩云, 余永亮, 杨红旗, 等. 大豆脂转运蛋白基因GmLTP3的特征分析[J]. (article.aspx?type=view&id=201301002) *大豆科学*, 2013, 32(01):8. [doi:10.3969/j.issn.1000-9841.2013.01.003]  
LI Cai-yun, YU Yong-liang, YANG Hong-qi, et al. Characteristics of a Lipid-transfer Protein Gene GmLTP3 in *Glycine max* [J]. *Soybean Science*, 2013, 32(05):8. [doi:10.3969/j.issn.1000-9841.2013.01.003]
- [3]王明霞, 崔晓霞, 薛晨晨, 等. 大豆耐盐基因GmHAL3a的克隆及RNAi载体的构建[J]. (article.aspx?type=view&id=201301003) *大豆科学*, 2013, 32(01):12. [doi:10.3969/j.issn.1000-9841.2013.01.004]  
WANG Ming-xia, CUI Xiao-xia, XUE Chen-chen, et al. Cloning of Halotolerance 3 Gene and Construction of Its RNAi

- Vector in Soybean (*Glycine max*) [J]. *Soybean Science*, 2013, 32(05):12. [doi:10.3969/j.issn.1000-9841.2013.01.004]
- [4] 张春宝, 李玉秋, 彭宝, 等. 线粒体ISSR与SCAR标记鉴定大豆细胞质雄性不育系与保持系[J]. (article.aspx?type=view&id=201301005) 大豆科学, 2013, 32(01):19. [doi:10.3969/j.issn.1000-9841.2013.01.005]
- ZHANG Chun-bao, LI Yu-qiu, PENG Bao, et al. Identification of Soybean Cytoplasmic Male Sterile Line and Maintainer Line with Mitochondrial ISSR and SCAR Markers[J]. *Soybean Science*, 2013, 32(05):19. [doi:10.3969/j.issn.1000-9841.2013.01.005]
- [5] 卢清瑞, 赵琳, 李冬梅, 等. RAV基因对拟南芥和大豆不定芽再生的影响[J]. (article.aspx?type=view&id=201301006) 大豆科学, 2013, 32(01):23. [doi:10.3969/j.issn.1000-9841.2013.01.006]
- LU Qing-yao, ZHAO Lin, LI Dong-mei, et al. Effects of RAV gene on Shoot Regeneration of *Arabidopsis* and Soybean [J]. *Soybean Science*, 2013, 32(05):23. [doi:10.3969/j.issn.1000-9841.2013.01.006]
- [6] 杜景红, 刘丽君. 大豆fad3c基因沉默载体的构建[J]. (article.aspx?type=view&id=201301007) 大豆科学, 2013, 32(01):28. [doi:10.3969/j.issn.1000-9841.2013.01.007]
- DU Jing-hong, LIU Li-jun. Construction of fad3c Gene Silencing Vector in Soybean[J]. *Soybean Science*, 2013, 32(05):28. [doi:10.3969/j.issn.1000-9841.2013.01.007]
- [7] 张力伟, 樊颖伦, 牛腾飞, 等. 大豆“冀黄13”突变体筛选及突变体库的建立[J]. (article.aspx?type=view&id=201301008) 大豆科学, 2013, 32(01):33. [doi:10.3969/j.issn.1000-9841.2013.01.008]
- ZHANG Li-wei, FAN Ying-lun, NIU Teng-fei, et al. Screening of Mutants and Construction of Mutant Population for Soybean Cultivar “Ji Huang 13” [J]. *Soybean Science*, 2013, 32(05):33. [doi:10.3969/j.issn.1000-9841.2013.01.008]
- [8] 盖江南, 张彬彬, 吴瑶, 等. 大豆不定胚悬浮培养基因型筛选及基因枪遗传转化的研究[J]. (article.aspx?type=view&id=201301009) 大豆科学, 2013, 32(01):38. [doi:10.3969/j.issn.1000-9841.2013.01.009]
- GAI Jiang-nan, ZHANG Bin-bin, WU Yao, et al. Screening of Soybean Genotypes Suitable for Suspension Culture with Adventitious Embryos and Genetic Transformation by Particle Bombardment[J]. *Soybean Science*, 2013, 32(05):38. [doi:10.3969/j.issn.1000-9841.2013.01.009]
- [9] 王鹏飞, 刘丽君, 唐晓飞, 等. 适于体细胞胚发生的大豆基因型筛选[J]. (article.aspx?type=view&id=201301010) 大豆科学, 2013, 32(01):43. [doi:10.3969/j.issn.1000-9841.2013.01.010]
- WANG Peng-fei, LIU Li-jun, TANG Xiao-fei, et al. Screening of Soybean Genotypes Suitable for Somatic Embryogenesis [J]. *Soybean Science*, 2013, 32(05):43. [doi:10.3969/j.issn.1000-9841.2013.01.010]
- [10] 刘德兴, 年海, 杨存义, 等. 耐酸铝大豆品种资源的筛选与鉴定[J]. (article.aspx?type=view&id=201301011) 大豆科学, 2013, 32(01):46. [doi:10.3969/j.issn.1000-9841.2013.01.011]
- LIU De-xing, NIAN Hai, YANG Cun-yi, et al. Screening and Identifying Soybean Germplasm Tolerant to Acid Aluminum [J]. *Soybean Science*, 2013, 32(05):46. [doi:10.3969/j.issn.1000-9841.2013.01.011]
- [11] 盖志佳, 范文婷, 于敦爽, 等. 连作大豆化感作用研究进展[J]. (article.aspx?type=view&id=201201031) 大豆科学, 2012, 31(01):141. [doi:10.3969/j.issn.1000-9841.2012.01.032]
- GAO Zhi-jia, FAN Wen-ting, YU Dun-shuang, et al. Allelopathy in Continuous Cropping Soybean [J]. *Soybean Science*, 2012, 31(05):141. [doi:10.3969/j.issn.1000-9841.2012.01.032]
- [12] 肖翠红, 孙冬梅, 汤晖, 等. 连作与轮作大豆土壤反硝化细菌多样性与组成结构[J]. (article.aspx?type=view&id=201203018) 大豆科学, 2012, 31(03):425. [doi:10.3969/j.issn.1000-9841.2012.03.018]
- XIAO Cui-hong, SUN Dong-mei, TANG Hui, et al. Molecular Diversity and Characterization of Nitrite Reductase Genes from Continuous and Rotational Cropping Soybean [J]. *Soybean Science*, 2012, 31(05):425. [doi:10.3969/j.issn.1000-9841.2012.03.018]
- [13] 王孟雪, 张玉先. 麦/玉/豆轮作制度下不同施肥措施对大豆产量的影响[J]. (article.aspx?type=view&id=200906020) 大豆科学, 2009, 28(06):1040. [doi:10.11861/j.issn.1000-9841.2009.06.1040]
- WANG Meng-xue, ZHANG Yu-xian. Fertilization Measures Affects Soybean Yield under Wheat-Maize-Soybean Rotation Cropping [J]. *Soybean Science*, 2009, 28(05):1040. [doi:10.11861/j.issn.1000-9841.2009.06.1040]
- [14] 薛庆喜. 作物茬口对缓解大豆连作危害效果的研究[J]. (article.aspx?type=view&id=201001015) 大豆科学, 2010, 29(01):68. [doi:10.11861/j.issn.1000-9841.2010.01.0068]
- XUE Qing-xi. Effects of Crop Stubbles on Alleviating the Damages by Continuous Cropping Soybean [J]. *Soybean Science*, 2010, 29(05):68. [doi:10.11861/j.issn.1000-9841.2010.01.0068]
- [15] 张喜林, 周宝库, 高中超, 等. 不同比例氮、磷、钾配合施用对白浆土区连作大豆生育性状及产量的影响[J]. (article.aspx?type=view&id=201004025) 大豆科学, 2010, 29(04):659. [doi:10.11861/j.issn.1000-9841.2010.04.0659]
- ZHANG Xi-lin, ZHOU Bao-ku, GAO Zhong-chao, et al. Effect of Different Proportion of N, P and K on Agronomic Traits and Yield of Continuous Planting Soybean in White Paste Soil [J]. *Soybean Science*, 2010, 29(05):659. [doi:10.11861/j.issn.1000-9841.2010.04.0659]
- [16] 王树起, 韩晓增, 乔云发, 等. 寒地黑土大豆轮作与连作不同年限土壤酶活性及相关肥力因子的变化[J]. (article.aspx?type=view&id=200904010) 大豆科学, 2009, 28(04):611. [doi:10.11861/j.issn.1000-9841.2009.04.0611]
- WANG Shu-qi, HAN Xiao-zeng, QIAO Yun-fa, et al. Variation of Soil Enzymes Activity and Relevant Nutrients at Different Years of Soybean (*Glycine max* L.) Rotation, Alternate and Continuous Cropping [J]. *Soybean Science*, 2009, 28(05):611. [doi:10.11861/j.issn.1000-9841.2009.04.0611]
- [17] 薛庆喜, 杨思平, 张玉春, 等. 不同作物茬口对连作大豆产量及农艺性状的影响[J]. (article.aspx?type=view&id=200901015) 大豆科学, 2009, 28(01):72. [doi:10.11861/j.issn.1000-9841.2009.01.0072]
- XUE Qing-xi, YANG Si-ping, ZHANG Yu-chun, et al. Effects of Different Crop Stubbles on Yield and Agronomic Characters of Continuous Cropping Soybean [J]. *Soybean Science*, 2009, 28(05):72. [doi:10.11861/j.issn.1000-9841.2009.01.0072]
- [18] 李春杰, 许艳丽, 王喜斌, 等. 追肥方式对连作大豆生长发育和产量的影响[J]. (article.aspx?type=view&id=200806020) 大豆科学, 2008, 27(06):1003. [doi:10.11861/j.issn.1000-9841.2008.06.1003]
- LI Chun-jie, XU Yan-li, WANG Xi-bin, et al. Effect of Top Dressing Fertilizer Patterns on Growth and Yield of Continuous Cropping Soybean [J]. *Soybean Science*, 2008, 27(05):1003. [doi:10.11861/j.issn.1000-9841.2008.06.1003]
- [19] 张广娜, 陈利军, 陈振华, 等. 大豆轮作与连作对黑钙土酶活性和动力学特性的影响[J]. (article.aspx?type=view&id=200805014) 大豆科学, 2008, 27(05):795. [doi:10.11861/j.issn.1000-9841.2008.05.0795]
- ZHANG Guang-na, CHEN Li-jun, CHEN Zhen-hua, et al. Effects of Different Cropping Systems of Soybean on Chernozem Enzyme Activities and Kinetic Parameters [J]. *Soybean Science*, 2008, 27(05):795. [doi:10.11861/j.issn.1000-9841.2008.05.0795]
- [20] 阎吉昌, 张奕, 韩丽梅. 连作大豆化感作用研究[J]. (article.aspx?type=view&id=200203012) 大豆科学, 2002, 21(03):214. [doi:10.11861/j.issn.1000-9841.2002.03.0214]
- Yan Jichang, Zhang Yi, Han Limei. THE REVIEW OF CONTINUOUS CROPPING SOYBEAN ALLELOPATHY [J]. *Soybean Science*, 2002, 21(05):214. [doi:10.11861/j.issn.1000-9841.2002.03.0214]

备注/Memo 基金项目: 中国科学院知识创新工程重要方向资助项目 (kzcx2-yw-408); 国家“十一五”科技支撑资助项目 (GA06B101); 中国科学院东北地理与农业生态研究所黑土生态重点实验室基金资助课题 (HTST07); 黑龙江省“十一五”科技攻关资助项目 (GA06B101-1-5)。

作者简介: 刘金波 (1982-), 女, 在读硕士, 主要从事土壤微生物生态研究。E-mail: liujinbo529@163.com。

更新日期/Last Update: 2014-10-06

版权所有 © 2012 黑龙江省农科院信息中心  
黑ICP备11000329号-2