

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

« 上一篇 (DArticle.aspx?type=view&id=201501029) 下一篇 (DArticle.aspx?type=view&id=201501030)



PDF下载 (pdfdown.aspx?Sid=201501029)
+分享 (http://www.jiathis.com/share?uid=1541069)



微信公众号: 大豆科学

基本信息 (/Corp/5007.aspx)
期刊介绍 (/Corp/5008.aspx)
刊物历史 (/Corp/5009.aspx)
被收录情况 (/Corp/5010.aspx)
获奖情况 (/Corp/5011.aspx)
期刊参数 (/Corp/5012.aspx)

[1]李艳超,赵青松,王凤敏,等.大豆遗传转化技术研究进展[J].大豆科学,2015,34(01):155-162.[doi:10.11861/j.issn.1000-9841.2015.01.0155]
LI Yan-chao,ZHAO Qing-song,WANG Feng-min,et al.Research Poggess on Soybean Genetic Transformation Technology [J].Soybean Science,2015,34(01):155-162.[doi:10.11861/j.issn.1000-9841.2015.01.0155]
点击复制

大豆遗传转化技术研究进展

《大豆科学》 [ISSN:1000-9841 /CN:23-1227/S] 卷: 第34卷 期数: 2015年01期 页码: 155-162 栏目: 出版日期: 2015-02-25

Title: Research Poggess on Soybean Genetic Transformation Technology
作者: 李艳超 (KeySearch.aspx?type=Name&Sel=李艳超); 赵青松 (KeySearch.aspx?type=Name&Sel=赵青松); 王凤敏 (KeySearch.aspx?type=Name&Sel=王凤敏); 陈强 (KeySearch.aspx?type=Name&Sel=陈强); 史晓蕾 (KeySearch.aspx?type=Name&Sel=史晓蕾); 杨春燕 (KeySearch.aspx?type=Name&Sel=杨春燕)
河北省农林科学院 粮油作物研究所/国家大豆改良中心石家庄分中心/农业部黄淮海大豆生物学与遗传育种重点实验室/河北省遗传育种重点实验室, 河北 石家庄 050035

Author(s): LI Yan-chao (KeySearch.aspx?type=Name&Sel=LI Yan-chao); ZHAO Qing-song (KeySearch.aspx?type=Name&Sel=ZHAO Qing-song); WANG Feng-min (KeySearch.aspx?type=Name&Sel=WANG Feng-min); CHEN Qiang (KeySearch.aspx?type=Name&Sel=CHEN Qiang); SHI Xiao-lei (KeySearch.aspx?type=Name&Sel=SHI Xiao-lei); YANG Chun-yan (KeySearch.aspx?type=Name&Sel=YANG Chun-yan)
Hebei Academy of Agricultural and Forestry Sciences/Shijiazhuang Branch of National Soybean Improvement Centre/North China Key Laboratory of Soybean Biology and Genetic Improvement/Ministry of Agriculture Cereal & Oil Crop Institute, Shijiazhuang 050035, China

关键词: 大豆 (KeySearch.aspx?type=KeyWord&Sel=大豆); 遗传转化 (KeySearch.aspx?type=KeyWord&Sel=遗传转化); 研究进展 (KeySearch.aspx?type=KeyWord&Sel=研究进展)

Keywords: Soybean (KeySearch.aspx?type=KeyWord&Sel=Soybean); Genetic transformation (KeySearch.aspx?type=KeyWord&Sel=Genetic transformation); Research poggess (KeySearch.aspx?type=KeyWord&Sel=Research poggess)

分类号: S565.1
DOI: 10.11861/j.issn.1000-9841.2015.01.0155 (http://dx.doi.org/10.11861/j.issn.1000-9841.2015.01.0155)

文献标志码: A

摘要: 近年来,随着植物基因工程的快速发展,利用转基因技术进行大豆分子育种和基因功能研究成为一种重要手段。现阶段大豆转基因的研究重点主要集中在大豆遗传转化的方法和建立高效、稳定地遗传转化再生体系方面。本文对大豆遗传转化相关方法、转化再生体系及转化效率相关的因素进行了阐述,为大豆遗传转化及转基因新品种培育等相关研究提供参考。

Abstract: In recent years, soybean transgenic technology as an important way has been used for soybean molecular breeding and gene function research, with the rapid development of plant genetic engineering. Now the main progress on soybean transformation focuses on soybean genetic transformation method and establishing a highly efficient and stable genetic transformation regeneration system. This paper reviewed related methods of soybean genetic transformation, transformation regeneration system and some factors affecting transformation efficiency. It provided reference for the research on transgenic soybean breeding.

参考文献/References:
[1] Stacey G, Vodkin L, Parrott W A, et al. National science foundation-sponsored workshop report. Draft plan for soybean genomics [J]. Plant Physiology, 2004, 135(1): 59-70.
[2] Alkharouf N W, Matthews B F. SGMD: the soybean genomics and microarray database [J]. Nucleic Acids Research, 2004, 32: 398-400.
[3] 武小霞,李文滨,张淑珍.我国大豆转基因研究进展 [J].大豆科学,2005,24(2):144-149.(Wu X X, Li W B, Zhang S Z. The research advance on soybean transgene in China [J]. Soybean Science, 2005, 24(2): 144-149.)
[4] 李凤.大豆子叶节高效再生体系的建立与GmC011基因的遗传转化 [D].长沙:湖南农业大学,2006.(Li F. Establishment of effective regeneration system of soybean cotyledonary nodes and genetic transformation of GmC011 gene in soybean [D]. Changsha: Hunan Agricultural University, 2006.)
[5] James C. Global status of commercialized biotech/GM crops: 2012. ISAAA Brief No.44 [M]. NY, Ithaca: 2012.
[6] 杨加银.转基因大豆生产的现状与趋势 [J].世界农业,2002(6):40-42.(Yang J Y. Present situation and developing trends of transgenic soybean production [J]. World Agriculture, 2002(6): 40-42.)
[7] 钱迎倩,魏伟,桑卫国,等.转基因作物对生物多样性的影响 [J].生态学报,2001,21(3):337-343.(Qian Y Q, Wei W, Sang W G, et al. Effect of transgenic crops on biodiversity [J]. 2001, 21(3): 337-343.)
[8] 陈继承,周瑞宝.转基因大豆及其安全性 [J].粮食与油脂,2004(9):36-39.(Chen J C, Zhou R B. Transgenic soybeans and safety [J]. Journal of Cereals & Oils, 2004 (9): 36-39.)
[9] McCabe D E, Swain W F, Martinell B J, et al. Stabe transformation of soybean (Glycine max) by particle acceleration [J]. Bio Techonlogy, 1988, 6: 923-926.
[10] Hinchee M A W, Connor-Ward A V, Newell C A, et al. Production of transgenic soybean plants using Agrobacterium-mediated DNA transfer [J]. Biotechnology, 1988, 6: 915-922.
[11] Meurer C A, Dinkins R D, Collins G B. Factors affecting soybean cotyledonary node transformation [J]. Plant Cell Reports, 1998, 18(3-4): 180-186.

- [12] Trick H N, Finer J J. Sonication-assisted Agrobacterium-mediated transformation of soybean [Glycine max(L.) Merrill] embryogenic suspension culture tissue [J]. Plant Cell Reports, 1998, 17(6-7): 482-488.
- [13] Zhao Z Y, Gu W, Cai T, et al. Molecular analysis of T₀ plants transformed by Agrobacterium and comparison of Agrobacterium-mediated transformation with bombardment transformation in maize [J]. Maize Genetics Cooperation Newsletter, 1998, 72: 34-37.
- [14] Dai S H, Zheng P, Marmey P, et al. Comparative analysis of transgenic rice plants obtained by Agrobacterium-mediated transformation and particle bombardment [J]. Molecular Breeding, 2001, 7: 25-33.
- [15] Shou H X, Frame B R, Whitham S A, et al. Assessment of transgenic maize events produced by particle bombardment or Agrobacterium-mediated transformation [J]. Molecular Breeding, 2004, 13(2): 201-208.
- [16] Horsch R B, Fry J E, Hoffman N L, et al. A simple and general method for transferring genes into plants [J]. Science, 1985, 227(4691): 1229-1231.
- [17] Parrott W A, Hoffman L M, Hildebrand D F, et al. Recovery of primary transformants of soybean [J]. Plant Cell Reports, 1989, 7(8): 615-617.
- [18] Zhang Z Y, Xing A Q, Staswick P, et al. The use of glufosinate as a selective agent in Agrobacterium-mediated transformation of soybean [J]. Plant Cell, Tissue and Organ Culture, 1999, 56: 37-46.
- [19] 卜云萍, 王广科, 胡国武. 深黄被孢酶 $\Delta 6$ -脂肪酸脱氢酶基因导入大豆 [J]. 生物技术, 2003, 13(3): 6-8. (Bu Y P, Wang G K, Hu G W. Introduction of $\Delta 6$ -fatty acid desaturase gene from *Mortierella isabellina* into soybeans by Agrobacterium infection [J]. Biotechnology, 2003, 13 (3): 6-8.)
- [20] Olthoff P M, Somers D A. L-cysteine increases Agrobacterium-mediated T-DNA delivery into soybean cotyledonary-node cells [J]. Plant Cell Reports, 2001, 20(8): 706-711.
- [21] Paz M M, Martinez J C, Kalvig A B, et al. Improved cotyledonary node method using an alternative explants derived from mature seed for efficient Agrobacterium-mediated soybean transformation [J]. Plant Cell Reports, 2006, 25(3): 206-213.
- [22] Yamada T, Watanabe S, Arai M, et al. Cotyledonary node pre-wounding with a micro-brush increased frequency of Agrobacterium-mediated transformation in soybean [J]. Plant Biotechnology, 2010, 27(2): 217-220.
- [23] Liu S J, Wei Z M, Huang J Q. The effect of co-cultivation and selection parameters on Agrobacterium-mediated transformation of Chinese soybean varieties [J]. Plant Cell Reports, 2008, 27(3): 489-498.
- [24] 赵晓雯, 吴芳芳, 狄少康, 等. 农杆菌介导的大豆子叶节遗传转化技术流程及操作要点 [J]. 大豆科学, 2011, 30(3): 362-368. (Zhao X W, Wu F F, Di S G, et al. Technique flow and key operation points of Agrobacterium-mediated genetic transformation of soybean cotyledonary node [J]. Soybean Science, 2011, 30(3): 362-368.)
- [25] 刘翠, 李喜焕, 常文锁, 等. 农杆菌介导大豆不同外植体遗传转化研究 [J]. 华北农学报, 2012, 27(3): 35-40. (Liu C, Li X H, Chang W S, et al. Studies of Agrobacterium-mediated genetic transformation by different explants in soybean (Glycine max. L.) [J]. Acta Agriculturae Boreali-Sinica, 2012, 27(3): 35-40.)
- [26] 蓝凤, 吴帅, 申丽威, 等. 根瘤农杆菌介导大豆转Bt-cryIA抗虫基因 [J]. 中国油料作物学报, 2013, 35(1): 29-35. (Lan L, Wu S, Shen L W, et al. Transgenic of soybean with Bt-cryIA gene mediated by Agrobacterium tumefaciens [J]. Chinese Journal of Oil Crop Sciences, 2013, 35(1): 29-35.)
- [27] Wang P, Wang G, Ji J, et al. Genetic transformation of immature cotyledon via Agrobacterium tumefaciens in soybean [J]. Soybean Science, 2004, 23(2): 86-89.
- [28] Dang W, Wei Z M. Efficient Agrobacterium-mediated transformation of soybean [J]. Journal of Molecular Cell Biology, 2007(3): 85-96.
- [29] 姜楠, 王东, 崔征, 等. 异黄酮合成酶基因高表达的大豆转基因愈伤组织的研究 [J]. 沈阳药科大学学报, 2009, 26(1): 63-68. (Jiang N, Wang D, Cui Z, et al. Transgenic soybean callus with high expression of IFS gene [J]. Journal of Shenyang Pharmaceutical University, 2009, 26(1): 63-68.)
- [30] 王晓春, 李静, 王萍, 等. 基因枪法对大豆进行-CpTI-基因的遗传转化 [J]. 华北农学报, 2007, 22(2): 10-14. (Wang X C, Li J, Wang P, et al. Put CpTI Gene transfer into soybean somatic embryo via microprojectile bombardment [J]. Acta Agriculturae Boreali-Sinica, 2007, 22(2): 10-14.)
- [31] Finer J J, McMullen M D. Transformation of soybean via particle bombardment of embryogenic suspension culture tissue [J]. In Vitro Cellular & Developmental Biology-Plant, 1991, 27: 175-182.
- [32] Arag-o F J L, Sarokin L, Vianna G R, et al. Selection of transgenic meristematic cells utilizing a herbicidal molecule results in the recovery of fertile transgenic soybean [Glycine max(L.) Merrill] plants at a high frequency [J]. Theoretical and Applied Genetics, 2000, 101: 1-6.
- [33] Stewart C N J, Adang M J, All J N, et al. Genetic transformation, recovery, and characterization of fertile soybean transgenic for a synthetic *Bacillus thuringiensis* cryIAC gene [J]. Plant Physiology, 1996, 112(1): 121-129.
- [34] Hadi M Z, McMullen M D, Finer J J. Transformation of 12 different plasmids into soybean via particle bombardment [J]. Plant Cell Reports, 1996, 15(7): 500-505.
- [35] Santarem E R, Finer J J. Transformation of soybean [Glycine max(L.) Merrill] using proliferative embryogenic tissue maintained on semi-solid medium [J]. In Vitro Cellular & Developmental Biology-Plant, 1999, 35(6): 451-455.
- [36] Maughan P J, Philip R, Cho M J, et al. Biolistic transformation, expression, and inheritance of bovine beta-casein in soybean (Glycine max) [J]. In Vitro Cellular & Developmental Biology, 1999, 35(4): 344-349.
- [37] Ponappa T, Brzozowski A E, Finer J J. Transient expression and stable transformation of soybean using the jellyfish green fluorescent protein [J]. Plant Cell Reports, 1999, 19(1): 6-12.
- [38] Khalafalla M M, Rahman S M, El-Shemy H A, et al. Optimization of particle bombardment conditions by monitoring of transient sGFP (S65T) expression in transformed soybean [J]. Breeding Science, 2005, 55(3): 257-263.
- [39] 王萍, 王罡, 吴颖, 等. 影响大豆基因枪遗传转化因子的研究 [J]. 农业生物技术学报, 2002, 10(3): 36-37. (Wang P, Wang G, Wu Y, et al. Studies in the factors affecting on genetic transformation by particle bombardments in soybean [J]. Journal of Agricultural Biotechnology, 2002, 10(3): 36-37.)
- [40] 周光宇, 翁坚, 龚蓁蓁. 农业分子育种-授粉后外源DNA导入植物的技术 [J]. 中国农业科学, 1988, 21(3): 1-6. (Zhou G Y, Wong J, Gong Z Z. Molecular breeding of agriculture-A technique for introducing exogenous DNA into plants after self pollination [J]. Scientia Agricultura Sinica, 1988, 21(3): 1-6.)
- [41] Lei B J, Yin G C, Lu C H, et al. Study on exogenous DNA directly transferred into soybean [J]. Soybean Science, 1991, 10(1): 58-63.
- [42] Lei B J, Li X C, Lu C H, et al. Introduction of wild soybean DNA into cultivar soybean and molecular RAPD confirmation [J]. Science in China Series B, 1994, 24: 596-601.
- [43] Liu J F, Su Q, An L J, et al. Transfer of a minimal linear marker free and vector-free smGFP cassette into soybean via ovary-drip transformation [J]. Biotechnological Letters, 2009, 31(2): 295-303.
- [44] Shou H X, Palmer R G, Wang K. Irreproducibility of the soybean pollen-tube pathway transformation procedure [J]. Plant Molecular Biology Reporter, 2002, 20: 325-334.
- [45] 刘北东, 朱延明, 杨谦, 等. 大豆再生体系的建立及遗传转化的研究进展 [J]. 大豆科学, 2003, 22(1): 64-70. (Liu D B, Zhu Y M, Yang Q, et al. Recent advances in soybean tissue culture and gene transformation [J]. Soybean Science, 2003, 22(1): 64-70.)
- [46] Cheng T Y, Saka H, Voqui-Dinh T H. Plant regeneration from soybean cotyledonary node segments in culture [J]. Plant Science Letters, 1980, 19: 91-99.

- [47] Luo G, Hepburn A, Widholm J. A simple procedure for the expression of genes in transgenic soybean callus tissue [J]. *Plant Cell Reports*, 1994, 13(11): 632-636.
- [48] 姬月梅, 陈受宜, 李英慧. 农杆菌介导大豆子叶节遗传转化体系的优化研究 [J]. *大豆科学*, 2008, 27(1): 26-32.(Ji Y M, Chen S Y, Li Y H, et al. Optimization of genetic transformation system from soybean cotyledon mediated by *Agrobacterium* [J]. *Soybean Science*, 2008, 27(1): 26-32.)
- [49] 王伟, 王罡, 季静, 等. 大豆子叶节植株再生体系的优化及转 EPSPS 基因的研究 [J]. *作物杂志*, 2012(3): 23-27.(Wang W, Wang G, Ji J, et al. Optimization of plant regeneration system via cotyledonary node and transformation of EPSPS gene in soybean [J]. *Crops*, 2012(3):23-27.)
- [50] 姬月梅, 张银霞, 宋晓华. 农杆菌介导大豆遗传转化的研究进展 [J]. *农业科学研究*, 2009, 30(1): 47-50.(Ji Y M, Zhang Y X, Song X H, et al. Research progress of *Agrobacterium*-mediated transformation in soybean [J]. *Journal of Agricultural Sciences*, 2009, 30(1): 47-50.)
- [51] Liu H K, Yang C, Wei Z M. Efficient *Agrobacterium tumefaciens*-mediated transformation of soybeans using an embryonic tip regeneration system [J]. *Planta*, 2004, 219: 1042-1049.
- [52] Kartha K K, Pahl K, Leung N L, et al. Plant regeneration from meristems of grain legumes:Soybean, cowpea, peanut, chickpea, and bean [J]. *Canadian Journal of Botany*, 1981, 59: 1671-1679.
- [53] Barwale U B, Keans H R, Widholm J M. Plant regeneration from callus cultures of several soybean genotypes via embryogenesis and organogenesis [J]. *Planta*, 1986,167(4): 473481.
- [54] Wright M S, Ward D V, Hinchee M A, et al. Regeneration of soybean (*Glycine max* L. Merr.) from cultured primary leaf tissue [J]. *Plant Cell Reports*, 1987, 6(2): 83-89.
- [55] Wright M S, Williams M H, Pierson P E, et al. Initiation and propagation of *Glycine max* (L.) Merr.: Plants from tissue-cultured epicotyls [J]. *Plant Cell Tissue and Organ Culture*, 1987, 8: 83-90.
- [56] McCabe D E, Swain W F, Martinell B J, et al. Stable transformation of soybean (*Glycine max*) by particle acceleration [J]. *Biotechnology*, 1988, 6: 923-926.
- [57] Kim J, LaMotte C E, Hack E. Plant regeneration in vitro from primary leaf nodes of soybean (*Glycine max*) seedlings [J]. *Journal of Plant Physiology*, 1990, 136(6): 664-669.
- [58] Wei Z M, Xu Z H. Plant regeneration from protoplasts of soybean (*Glycine max* L.) [J]. *Plant Cell Reports*, 1988, 7(5): 348-351.
- [59] 罗希明, 赵桂兰, 简玉瑜. 大豆原生质体的植株再生 [J]. *植物学报*, 1990, 32(8): 616-621.(Luo X M, Zhao G L, Jian Y Y. Plant regeneration from protoplast of soybean [J]. *Acta Botanica Sinica*, 1990, 32(8): 616-621.)
- [60] Dhir S K, Dhir S, Widholm J M. Regeneration of fertile plants from protoplasts of soybean (*Glycine max* L. Merr.): Genotypic differences in culture response [J]. *Plant Cell Reports*, 1992, 11(2): 85-89.
- [61] 张贤泽, 小松田隆夫. 大豆原生质体经体细胞胚胎再生植株 [J]. *中国科学(B辑)*, 1993, 23 (2): 154-158.(Zhang Z X, Takao Komatsuda. Plant regeneration from somatic embryogenesis of soybean protoplast [J]. *Science in China (Series B)*, 1993, 23(2): 154-158.)
- [62] 肖文音, 王连铮. 大豆幼茎子叶原生质体培养及植株再生 [J]. *作物学报*, 1994, 20(6): 2665-2669.(Xiao W Y, Wang L Z. Protoplast culture and plant regeneration of immature cotyledons of soybean (*Glycine max* L.) [J]. *Acta Agronomica Sinica*, 1994, 20(6): 2665-2669.)
- [63] Christianson M L, Warnick D A, Carlson P S. A morphogenetically competent soybean suspension culture [J]. *Science*, 1983, 222: 632-634.
- [64] Lazzeri P A, Hildebrand D F, Collins G B. A procedure for plant regeneration from immature cotyledon tissue of soybean [J]. *Plant Molecular Biology Reporter*, 1985, 3(4): 160-168.
- [65] Ranch J P, Oglesby L, Zielinski A C. Plant regeneration from embryo derived tissue cultures of soybeans [J]. *In Vitro Cellular & Developmental Biology*, 1985, 21(11): 653-658.
- [66] Barwale U B, Keans H R, Widholm J M. Plant regeneration from callus cultures of several soybean genotypes via embryogenesis and organogenesis [J]. *Planta*, 1986, 167: 473-481.
- [67] Finer J J. Apical proliferation of embryonic tissue of soybean (*Glycine max* L.Merrill) [J]. *Plant Cell Reports*, 1988, 7(4): 238-241.
- [68] Finer J J, Nagasawa A. Development of an embryogenic suspension culture of soybean (*Glycine max* Merrill.) [J]. *Plant Cell Tissue and Organ Culture*, 1988, 15(2): 125-136.
- [69] 张淑珍, 徐鹏飞, 林世锋. 大豆体细胞胚再生体系的研究进展及展望 [J]. *大豆科学*, 2004, 23(3): 232-236.(Zhang S Z, Xu P F, Lin S F. Recent advances and prospect on soybean somatic embryogenesis system [J]. *Soybean Science*, 2004, 23(3): 232-236.)
- [70] 王晓春, 王罡, 季静. 农杆菌介导的大豆体细胞胚遗传转化影响因子的研究 [J]. *大豆科学*, 2005, 24 (1): 21-26.(Wang X C, Wang G, Ji J. The factors influencing genetic transformation system in somatic emrnryos of soybean mediated by *Agrobacterium* [J]. *Soybean Science*, 2005, 24 (1): 21-26.)
- [71] 刘北东, 朱延明, 柳谦, 等. 大豆再生体系的建立及遗传转化的研究进展 [J]. *大豆科学*, 2003, 22(1): 63-68.(Liu D B, Zhu Y M, Yang Q, et al. Recent advances in soybean tissue culture and gene transformation [J]. *Soybean Science*, 2003, 22(1): 63-68.)
- [72] Donaldson P A, Simmonds D H. Susceptibility to *Agrobacterium tumefaciens* and cotyledonary node transformation in short-season soybean [J]. *Plant Cell Reports*, 2000, 19(5): 478-484.
- [73] 李文霞, 吕文河, 李文滨, 等. 基因型对大豆子叶节系统再生和转化的影响 [J]. *作物杂志*, 2007(3): 71-73.(Li W X, Lyu W H, Li W B, et al. Effect of genotype on soybean cotyledonary node regeneration system and transformation [J]. *Crops*, 2007(3): 71-73.)
- [74] 王凤敏, 李涛, 王运杰, 等. 影响农杆菌介导大豆子叶节遗传转化因素的研究 [J]. *大豆科学*, 2011, 30(4): 557-562.(Wang F M, Li T, Wang Y J, et al. Assessment of factors affecting soybean cotyledonary-node *Agrobacterium* mediated genetic transformation [J]. *Soybean Science*, 2011, 30(4): 557-562.)
- [75] 邱波, 王志坤, 孟凡立, 等. 不同大豆基因型再生性及对农杆菌敏感性的研究 [J]. *大豆科学*, 2011, 30(5): 752-756.(Qiu B, Wang Z K, Meng F L, et al. Regeneration and sensitivity to *Agrobacterium* of different soybean genotypes [J]. *Soybean Science*, 2011, 30(5): 752-756.)
- [76] Ko T S, Lee S, Krasnyanski S, et al. Two criticafactors are required for efficient transformation of multiple soybean cultivars: *Agrobacterium*strain and orientation of immature cotyledonary explant [J]. *Theoretical and Applied Genetics*, 2003, 107(3): 439-447.
- [77] 刘海坤, 卫志明. 利用根瘤农杆菌介导转化大豆成熟种胚尖获得转基因植株 [J]. *植物生理与分子生物学学报*, 2004, 30(6): 631-636.(Liu H K, Wei Z M. Transgenic soybean obtained with *Agrobacterium tumefaciens*-mediated transformation of embryonic tip of soybean mature seeds [J]. *Journal of Plant Physiology and Molecular Biology*, 2004, 30(6): 631-636.)
- [78] 王栋, 买合木提·克衣木, 王永雄, 等. 植物组织培养中的褐化现象及其防止措施 [J]. *黑龙江农业科学*, 2008 (1): 7-10.(Wang D, Keyimu·M, Wang Y X, et al. Browning phenomenon in plant tissue culture and its prevention measures [J]. *Heilongjiang Agricultural Sciences*, 2008(1):7-10.)
- [79] 李海燕, 刘淼, 吴小霞, 等. 大豆转化过程中的褐化现象研究 [J]. *作物杂志*, 2010(1): 33-36.(Li H Y, Liu M, Wu X X, et al. Study on the browning during soybean transformation [J]. *Crops*, 2010(1): 33-36.)
- [80] 王昌陵, 赵军, 李英慧, 等. 转录因子ABP9转化大豆(*Glycine max* L.)及遗传转化条件优化 [J]. *中国农业科学*, 2008, 41 (7): 1908-1916.(Wang C L, Zhao J, Li Y H, et al. Transforming transcription factor ABP9 into soybean and optimization of the transformation system [J]. *Scientia Agricultura Sinica*, 2008, 41(7): 1908-1916.)
- [81] Olhoft P M, Fligel L E, Donovan C M, et al. Efficient soybean transformation using hygromycin B selection in the cotyledonary-node method [J]. *Planta*, 2003, 5: 723-735.

- [82] 汲逢源, 王戈亮, 许亦农. 抗氧化剂对农杆菌介导的大豆下胚轴-GUS-基因瞬时表达的影响 [J]. 植物生态学报, 2006, 30(2): 330-334. (Ji F Y, Wang G L, Xu Y N. The effects of antioxidants on the transient expression of GUS gene in soybean hypocotyls mediated by Agrobacterium tumefaciens [J]. Journal of Plant Ecology, 2006, 30(2): 330-334.)
- [83] Wang G L, Xu Y N. Hypocotyl based Agrobacterium mediated transformation of soybean(Glycine max) and application for RNA interference [J]. Plant Cell Reports, 2008, 27(7): 1177-1184.
- [84] 龚学臣, 季静, 王萍, 等. 苗龄与6-BA浓度对大豆子叶节丛生芽诱导的影响 [J]. 吉林农业大学学报, 2005, 27(2): 128-130. (Gong X C, Ji J, Wang P, et al. Effect of aseptic seeding age and 6-BA concentration on overgrowing shoots of soybean cotyledonary node [J]. Journal of Jilin Agricultural University, 2005, 27(2): 128-130.)
- [85] 武小霞, 李静, 姜成涛, 等. 大豆子叶节再生中植物生长调节剂浓度及基因型筛选 [J]. 中国油料作物学报, 2011, 33(2): 123-129. (Wu X X, Li J, Jiang C T, et al. Optimization of regeneration system from soybean cotyledonary node [J]. Chinese Journal of Oil Crop Sciences, 2011, 33(2):123-129.)
- [86] 陈李森, 田星星, 单志慧, 等. 利用农杆菌介导法转化大豆子叶节的影响因素研究 [J]. 大豆科学, 2012, 31(1):17-23. (Chen L M, Tian X X, Shan Z H, et al. Optimization of the factors affecting genetic transformation of soybean cotyledonary node mediated by Agrobacterium tumefaciens [J]. Soybean Science, 2012, 31(1):17-23.)
- [87] 邱承祥, 武天龙. 6-BA对大豆茎尖诱导再生植株的研究 [J]. 大豆科学, 2003, 22(1): 32-35. (Qiu C X, Wu T L. Study on 6-BA to the regeneration of tip shoot of soybean [J]. Soybean Science, 2003, 22(1): 32-35.)
- [88] Zeng P, Vadnais D A, Zhang Z, et al. Refined glufosinate selection in Agrobacterium-mediated transformation of soybean [Glycine max(L.) Merrill] [J]. Plant Cell Reports, 2004, 22(7): 478-482.
- [89] 刘京, 刘建巍, 韩天富, 等. 潮霉素作为筛选剂对大豆发状根诱导的影响 [J]. 大豆科学, 2013, 32(4): 449-454. (Liu J, Liu J W, Han T F, et al. Effect of hygromycin as a screening agent on the induction of soybean hairy roots [J]. Soybean Science, 2013, 32(4):449-454.)
- [90] 宋张悦. 以草甘膦为筛选剂的大豆转基因研究 [D]. 杭州: 浙江大学, 2013. (Song Z Y. Transformation of soybean using glyphosate as a selective agent [D]. Hangzhou: Zhejiang University, 2013.)

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(01):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(01):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(01):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(01):19. [doi:10.3969/j.issn.1000-9841.2013.01.005]
- [5]卢清瑶, 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(01):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(01):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 "Jihuang13" [J]. Soybean Science, 2013, 32(01):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]
- GAO 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(01):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(01):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(01):46. [doi:10.3969/j.issn.1000-9841.2013.01.011]
- [11]张兴政, 王昌陵, 卢福荣, 等. 根瘤农杆菌介导大豆转化 LePT1 基因的研究[J]. (article.aspx?type=view&id=201401007)大豆科学, 2014, 33(01):31. [doi:10.11861/j.issn.1000-9841.2014.01.0031]
- ZHANG Xingzheng, WANG Changling, LU Furong, et al. Transformation of LePT1 Gene into Soybean via Agrobacterium mediation [J]. Soybean Science, 2014, 33(01):31. [doi:10.11861/j.issn.1000-9841.2014.01.0031]
- [12]徐建美, 杨巧, 李硕, 等. 发根土壤杆菌介导的大豆发根转化体系改进[J]. (article.aspx?type=view&id=201402003)大豆科学, 2014, 33(02):161. [doi:10.11861/j.issn.1000-9841.2014.02.0161]
- XU Jian-mei, YANG Qiao, LI Shuo, et al. Improvement of Soybean Hairy root System Mediated by Agrobacterium Rhizogenes [J]. Soybean Science, 2014, 33(02):161. [doi:10.11861/j.issn.1000-9841.2014.02.0161]
- [13]张福丽, 舒文涛, 张怡, 等. 大豆整体子叶节再生体系的建立及应用于农杆菌介导遗传转化初探[J]. (article.aspx?type=view&id=201206001)大豆科学, 2012, 31(06):865. [doi:10.3969/j.issn.1000-9841.2012.06.001]
- ZHANG Fu-li, SHU Wen-tao, ZHANG Yi, et al. Cluster Bud Induction of Soybean Whole Cotyledonary Node and Application in Agrobacterium mediated Genetic Transformation [J]. Soybean Science, 2012, 31(06):865. [doi:10.3969/j.issn.1000-9841.2012.06.001]
- [14]王凤敏, 李涛, 王运杰, 等. 影响农杆菌介导大豆子叶节遗传转化因素的研究[J]. (article.aspx?type=view&id=201104005)大豆科学, 2011, 30(04):557. [doi:10.11861/j.issn.1000-9841.2011.04.0557]
- WANG Feng-min, LI Tao, WANG Yun-jie, et al. Assessment of Factors Affecting Soybean Cotyledonary-node Agrobacterium-mediated Genetic Transformation [J]. Soybean Science, 2011, 30(04):557. [doi:10.11861/j.issn.1000-9841.2011.04.0557]
- [15]张书利, 刘丽君, 唐晓飞, 等. 利用农杆菌介导法将BrCS基因导入大豆的研究[J]. (article.aspx?type=view&id=201104008)大豆科学, 2011, 30(04):557. [doi:10.11861/j.issn.1000-9841.2011.04.0557]

豆科学, 2011, 30(04):569. [doi:10.11861/j.issn.1000-9841.2011.04.0569]

ZHANG Shu-li, LIU Li-jun, TANG Xiao-fei, et al. Transformation of BrCS Gene into Soybean by Agrobacterium-mediated Method[J]. Soybean Science, 2011, 30(01):569. [doi:10.11861/j.issn.1000-9841.2011.04.0569]

[16] 吴帅, 王志坤, 蓝岚, 等. 引进大豆种质遗传转化适用基因型的筛选[J]. (article.aspx?type=view&id=201201006) 大豆科学, 2012, 31(01):29. [doi:10.3969/j.issn.1000-9841.2012.01.007]

WU Shuai, WANG Zhi-kun, LAN Lan, et al. Screening of the Optimal Acceptor Genotypes in Introduced Soybean Germplasm [J]. Soybean Science, 2012, 31(01):29. [doi:10.3969/j.issn.1000-9841.2012.01.007]

[17] 杨向东, 隋丽, 李启云, 等. 大豆遗传转化技术研究进展[J]. (article.aspx?type=view&id=201202031) 大豆科学, 2012, 31(02):302. [doi:10.3969/j.issn.1000-9841.2012.02.031]

YANG Xiang-dong, SUI Li, LI Qi-yun, et al. Recent Advances in Soybean Transformation[J]. Soybean Science, 2012, 31(01):302. [doi:10.3969/j.issn.1000-9841.2012.02.031]

[18] 姚丙辰, 沈艳茹, 韩雪, 等. 大豆子叶节和胚尖再生体系的比较及大豆SR1基因的遗传转化[J]. (article.aspx?type=view&id=201203006) 大豆科学, 2012, 31(03):364. [doi:10.3969/j.issn.1000-9841.2012.03.006]

YAO Bing-chen, SHEN Yan-ru, HAN Xue, et al. Comparison with Cotyledonary Node and Embryonic Tip Regeneration System in Soybean[Glycine max(L.)Merrill] and Genetic Transformation of SR1 [J]. Soybean Science, 2012, 31(01):364. [doi:10.3969/j.issn.1000-9841.2012.03.006]

[19] 陈子奇, 李夏, 王丕武, 等. 利用RNA干扰技术提高大豆脂肪含量[J]. (article.aspx?type=view&id=201204004) 大豆科学, 2012, 31(04):529. [doi:10.3969/j.issn.1000-9841.2012.04.004]

CHEN Zi-qi, LI Xia, WANG Pi-wu, et al. Using RNA Interference Technology to Improve Soybean Fat Content[J]. Soybean Science, 2012, 31(01):529. [doi:10.3969/j.issn.1000-9841.2012.04.004]

[20] 叶美, 张敏, 杨素欣, 等. 大豆成熟种子胚尖基因枪转化体系的优化[J]. (article.aspx?type=view&id=201101004) 大豆科学, 2011, 30(01):20. [doi:10.11861/j.issn.1000-9841.2011.01.0020]

YE Mei, ZHANG Min, YANG Su-xin, et al. Optimization of Biolistics Transformation of Embryonic Tips of Soybean [Glycine max (L.) Merrill] Mature Seeds[J]. Soybean Science, 2011, 30(01):20. [doi:10.11861/j.issn.1000-9841.2011.01.0020]

备注/Memo 基金项目: 国家转基因生物新品种培育重大专项(2012ZX08004); 国家现代农业产业技术体系(CARS-004-PS06)。

第一作者简介: 李艳超(1985-), 女, 硕士, 主要从事大豆转基因育种研究。E-mail: yanchoo@163.com。

通讯作者: 杨春燕(1966-), 女, 研究员, 主要从事大豆遗传育种研究。E-mail: chyayang66@163.com。

更新日期/Last Update: 2015-04-13

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