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摘要: 高效、稳定的遗传转化体系是开展大豆转基因育种及功能基因组学研究的重要前提。自1988年首次建立基因枪和农杆菌介导的大豆遗传转化技术以来,围绕影响大豆转化效率提高的各种因素,国内外学者对大豆转化方法进行了多方面的改进,包括在共培养基中添加抗氧化剂类化合物,选用强毒农杆菌菌株以及不同的外植体和筛选剂等。经过20多年的发展,大豆遗传转化效率不断提高,目前已报道的大豆转化效率最高可达32.6%。文章对近年来大豆遗传转化技术研究进展进行了综述,并对影响大豆转化效率的主要因素进行了探讨。

Abstract: Efficient and stable transformation is a prerequisite to production of transgenic soybean and soybean functional genomics research. Since the successful transformation of the cultivated soybean by Agrobacterium-mediated and microprojectile bombardment methods independently in 1988, soybean transformation efficiency has been greatly improved by modification of many important factors affecting soybean transformation and regeneration, including addition of antioxidant compounds mixture in co-cultivation medium, utilization of super-virulent strains, different explants and selection agents, etc., with the highest transformation efficiency of 32.6% obtained recently. In this paper, recent advances in soybean transformation were reviewed and some factors influencing transformation efficiency were also discussed.

参考文献/References:

- [1] Somers D A, Samac D A, Olhoft P M. Recent advances in legume transformation[J]. Plant Physiology, 2003, 131: 892-899.
- [2] Masuda T, Goldsmith P D. World soybean production: Area harvested, yield, and long-term projections[J]. International Food and Agribusiness Management Review, 2009, 12: 143-162.
- [3] James C. Global status of commercialized biotech/GM crops: 2010[C]. The International Service for the Acquisition of Agri-biotech Applications Brief No. 42. ISAAA: Ithaca, NY, 2011.
- [4] 王美林, 孙月剑, 邢杰, 等. 中国转基因植物产业化的研究进展及存在问题[J]. 中国农业科学, 2006, 39(7): 1328-1335. (Wang G L, Sun Y J, Na J, et al. Progress and problems of commercial production to transgenic plants in China[J]. Scientia Agricultura Sinica, 2006, 39(7): 1328-1335.)
- [5] Schmutz J, Cannon S B, Schlueter J, et al. Genome sequence of the palaeopolyploid soybean[J]. Nature, 2010, 463, 178-183.
- [6] Somerville C, Somerville S. Plant functional genomics[J]. Science, 1999, 285: 383-385.
- [7] Kaiser J. From genome to functional genomics[J]. Science, 2000, 288: 1715-

1716.

- [8]Christou P, Murphy J E, Swain W F. Stable transformation of soybean by electroporation and root formation from transformed callus [J]. Proceedings of the National Academy of Sciences of the United States of America, 1987, 84:3962-3966.
- [9]Lin W, Odell J T, Schreiner R M. Soybean protoplast culture and direct gene uptake and expression by cultured soybean protoplasts[J]. Plant Physiology, 1987, 84:856-861.
- [10]Hinchee M A W, Connor-Ward D V, Newell C A, et al. Production of transgenic soybean plants using Agrobacterium-mediated gene transfer [J]. Nature Biotechnology, 1988, 6:915-922.
- [11]McCabe D E, Swain W F, Martinell B J, et al. Stable transformation of soybean (*Glycine max*) by particle acceleration [J]. Nature Biotechnology, 1988, 6:923-926.
- [12]Sato S, Newell C, Kolacz K, et al. Stable transformation via particle bombardment in two different soybean regeneration systems [J]. Plant Cell Reports, 1993, 12:408-413.
- [13]Arago 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.
- [14]Ko T S, Nelson R L, Korban S S. Screening multiple soybean cultivars (MG 00 to MG VIII) for somatic embryogenesis following Agrobacterium-mediated transformation of immature cotyledons [J]. Crop Science, 2004, 44:1825-1831.
- [15]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.
- [16]Paz M M, Martinez J C, Kalvig A B, et al. Improved cotyledonary node method using an alternative explant derived from mature seed for efficient Agrobacterium-mediated soybean transformation [J]. Plant Cell Reports, 2006, 25:206-213.
- [17]Hwang Y, Dawson J, Sigareva M, et al. Transformation of immature soybean seeds through organogenesis: US Patents, US 2008/0229447 A1 [P]. 2008-9-18.
- [18]Zhong H, Que Q. Method for transforming soybean (*Glycine max*): US Patents, US 2009/0023212 A1 [P]. 2009-1-22.
- [19]Trick H N, Finer J J. SAAT: Sonication assisted Agrobacterium-mediated transformation [J]. Transgenic Research, 1997, 6:329-336.
- [20]Meurer C A, Dinkins R D, Collins G B. Factors affecting soybean cotyledonary node transformation [J]. Plant Cell Reports, 1998, 18:180-186.
- [21]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, 17:482-488.
- [22]Santarem E R, Trick H N, Essig J S, et al. Sonication assisted Agrobacterium-mediated transformation of soybean immature cotyledons: optimization of transient expression [J]. Plant Cell Reports, 1998, 17:752-759.
- [23]Yan B, Reddy M S S, Collins G B, et al. Agrobacterium tumefaciens-mediated transformation of soybean [*Glycine max* (L.) Merrill] using immature zygotic cotyledon explants [J]. Plant Cell Reports, 2000, 19:1090-1097.
- [24]Martinell B J, Julson L S, Emler C A, et al. Soybean transformation method: US Patents, US 8030076 B2 [P]. 2011-10-4.
- [25]Ko T S, Lee S, Krasnyanski S, et al. Two critical factors are required for efficient transformation of multiple soybean cultivars: Agrobacterium? strain and orientation of immature cotyledonary explants [J]. Theoretical and Applied Genetics, 2003, 107(3):439-447.
- [26]Yukawa K, Kaku H, Tanaka H, et al. Characterization and host range determination of soybean super virulent Agrobacterium tumefaciens? KAT23 [J]. Bioscience, Biotechnology and Biochemistry, 2007, 71(7):1676-1682.
- [27]Yukawa K, Kaku H, Tanaka H. Enhanced soybean infection by the legume 'super-virulent' Agrobacterium tumefaciens? strain KAT23 [J]. Bioscience, Biotechnology and Biochemistry, 2008, 72(7):1809-1816.
- [28]Olhofs P M, Somers D A. L-cysteine increases Agrobacterium-mediated T-DNA delivery into soybean cotyledonary-node cells [J]. Plant Cell Reports, 2001, 20:706-711.
- [29]Olhofs 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.
- [30]Cao D, Hou W, Song S, et al. Assessment of conditions affecting Agrobacterium rhizogenes-mediated transformation of soybean [J]. Euphytica, 2004, 136:167-179.
- [31]Zhang Z Y, Xiang A Q, Staswick Q. 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.
- [32]Clemente T E, LaVallee B J, Howe A R, et al. Progeny analysis of glyphosate selected transgenic soybeans derived from Agrobacterium-mediated transformation [J]. Crop Science, 2000, 40(3):797-803.
- [33]Khan R. Method of transforming soybean: US Patents, US 2004/0034889 A1 [P]. 2004-2-19.
- [34]Zhang Z J, Chen X, Nguyen H T. Auto-regulated expression of bacterial isopentenyl transferase gene promotes T-DNA transformation in soybean: US Patents, US 2008/0184393 A1 [P]. 2008-7-31.
- [35]刘海坤, 卫志明. 大豆遗传转化研究进展 [J]. 植物生理与分子生物学学报, 2005, 31(2):126-134. (Liu H K, Wei Z M. Recent advances in soybean genetic transformation [J]. Journal of Plant Physiology and Molecular Biology, 2005, 31(2):126-134.)

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(02):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(02):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(02):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(02):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(02):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(02):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(02):33.[doi:10.3969/j.issn.1000-9841.2013.01.008]
- [8]盖江南,张彬彬,吴昊,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(02):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(02):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(02):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(02):31.[doi:10.11861/j.issn.1000-9841.2014.01.0031]
- [12]徐建美,杨巧,李砚,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(02):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(02):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):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(02):569.[doi:10.11861/j.issn.1000-9841.2011.04.0569]
- [16]吴坤,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(02):29.[doi:10.3969/j.issn.1000-9841.2012.01.007]
- [17]姚丙晨,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(02):364.[doi:10.3969/j.issn.1000-9841.2012.03.006]
- [18]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(02):529.[doi:10.3969/j.issn.1000-9841.2012.04.004]
- [19]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(02):20.[doi:10.11861/j.issn.1000-9841.2011.01.0020]
- [20]练云,梁慧珍,余永亮,等.转基因技术在大豆育种中的应用[J].(article.aspx?type=view&id=201102035)大豆科学,2011,30(02):333.[doi:10.11861/j.issn.1000-9841.2011.02.0333]

LIAN Yun, LIANG Hui-zhen, YU Yong-liang, et al. Application of Transgenic Technology in Soybean Breeding[J]. Soybean Science, 2011, 30(02):333. [doi:10.11861/j.issn.1000-9841.2011.02.0333]

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