核农学报 2012, 26(1) 22-27 DOI: ISSN: 1000-8551 CN: 11-2265/S

植物诱变育种·农业生物技术

利用SRAP分子标记评价小麦三雌蕊近等基因系的遗传背景

杨在君[1,2], 彭正松[1], 周永红[2], 彭丽娟[1], 魏淑红[1]

1. 西华师范大学西南野生动植物资源保护教育部重点实验室,四川 南充 637009;
2. 四川农业大学小麦研究所,四川 成都 611130

摘要:

普通小麦三雌蕊突变体(TP)具有明显的穗粒数优势,为评估该突变体在育种中的利用价值,进行了近等基因系培育。以三雌蕊突变体(TP)为供体,单雌蕊中国春、川麦28、绵阳29、内麦9号为轮回亲本,经7代回交和4代自交,初步培育出三雌蕊近等基因系CSTP、CM28TP、MY29TP和NM9TP。利用128对SRAP引物对培育的近等基因系及轮回亲本进行遗传分析,结果表明:(1)128对引物共扩增出978条谱带。其中有120对引物的扩增产物具有多态性,占所用引物的93.8%。这120对引物共扩增出638个差异谱带,占总谱带数的65.2%;(2)利用128对SRAP引物计算9个材料之间的遗传相似系数。其中中国春与CSTP的相似系数为0.9346,绵阳29与MY29TP的遗传相似系数为0.9070,川麦28与CM28TP的遗传相似系数为0.9397,内麦9号与NM9TP的遗传相似系数为0.8732;(3)通过聚类分析筛选出2对遗传相似性大于0.93的近等基因系,即CM28TP与川麦28、CSTP与中国春。

关键词: 小麦 三雌蕊性状 近等基因系 SRAP

EVALUATION ON THE GENETIC BACKGROUND OF WHEAT NEAR ISOGENTIC LINES FOR THREE PISTILS CHARACTER BY SRAP MARKERS

YANG Zai-jun[1,2], PENG Zheng-song[1], ZHOU Yong-hong[2], PENG Li-juan[1], WEI Shu-hong[1]

1. Key Laboratory of Southwest China Wildlife Resource Conservation (Ministry of Education), China West Normal University, Nanchong, Sichuan 637009;
2. Triticeae Research Institute, Sichuan Agricultural University, Chengdu, Sichuan 611130

Abstract:

For common wheat line, three pistils (TP), is a valuable mutant trait for wheat breeding, because it could potentially increase the number of gains per spike. In this study, the material with 3 pistils was used as donor parent, and Chinese spring, Chuanmai 28, Mianyang 29 and Neimai 9 were used as recurrent male parents. After successive backcrossing for 7 generations and then self-crossing for 4 generations, 4 near isogentic lines (NILs), CSTP, CM28TP, MY29TP and NM9TP were bred. Genetic similarity and genetic distance of 4 near isogentic lines and their recurrent parents were compared and analyzed by SRAP marker. The results were summarized as follows: (1) All the 128 pairs of SRAP primers amplified 978 bands, 120 pairs (93.8%) of primers produced polymorphic bands and 638 bands (65.2%) were polymorphic; (2) The genetic similarity coefficient of CSTP, CM28TP, MY29TP and NM9TP with their recurrent parents were 0.9346, 0.9397, 0.9070 and 0.8732, respectively. (3) Cluster analysis revealed that CSTP and CM28TP had least difference with the recurrent parent, and was clustered into a small class with the similarity coefficient of 0.93

Keywords: wheat three pistils character near isogentic lines SRAP

收稿日期 2011-03-18 修回日期 2011-10-08 网络版发布日期

DOI:

基金项目:

国家自然科学基金项目(30871533)

通讯作者: 彭正松(1964-),男,四川安岳人,教授,主要从事小麦遗传育种研究。; 周永红(1962-),男,四川达州人,教授,主要从事小麦遗传育种研究。

作者简介: 杨在君(1981-),男,四川仪陇人,博士,主要从事小麦遗传育种研究。E-mail: yangzaijun1@126.com

作者Email: pzs8833@163.com; zhouyh@sicau.edu.cn

参考文献:

[1] Young N D, Zamir D G, Ganal M W, et al. Use of isogenic lines and simultaneoue probing to identify DNA markers tightly linked to the *Tm-2a* gene in tomato［J］. Genetics, 1988, 120: 579-585

[2] 田清震, 周荣华, 贾继增. 小麦抗白粉病近等基因系遗传背景的分子标记检测［J］. 作物学报, 2004, 30(3): 205-209

[3] 张 毅, 李云峰, 谢 戎, 杨正林,钟秉强,沈福成,谭自俊,何光华. 水稻小穗簇生性近等基因系的构建及其近等性评价［J］. 作物学报, 2006, 32(3): 397-401

[4] Harrach BD, Fodor J, Pogány M, et al. Antioxidant, ethylene and membrane leakage responses to powdery mildew infection of near-isogenic barley lines with various types of resistance［J］. Eur J Plant Pathol, 2008, 121: 21-33

[5] Mumtaz S, Khan I A, Ali S, et al. Development of RAPD based markers for wheat rust resistance gene cluster (*Lr37-Sr38-Yr17*) derived from *Triticum ventricosum* L. ［J］. Afr J Biotechnol, 2009, 8(7): 1188-1192

[6] Zhu S, Walker D R, Boerma H R, et al. Effects of defoliating insect resistance QTLs and a *cry1Ac* transgene in soybean near-isogenic lines［J］. Theo Appl Genet, 2008, 116: 455-463

[7] Brevis J C, Chicaiza O, Khan I A, et al. Agronomic and quality evaluation of common wheat near-isogenic lines carrying the leaf rust resistance gene *Lr47*［J］. Crop Sci, 2008, 48: 1441-1451

[8] Zhou R H, Zhu Z D, Kong X Y, et al. Development of wheat near-isogenic lines for powdery mildew resistance［J］. Theo Appl Genet, 2005, 110: 640-648

[9] 方宣钧, 吴为人, 唐纪良. 作物DNA标记辅助育种［M］. 北京: 科学出版社, 2002: 1-9

[10] Li G, Quiros C F. Sequence-related amplified polymorphism (SRAP), a new marker system based on a simple PCR reaction: its application to mapping and gene tagging in *Brassica*［J］. Theo Appl Genet, 2001, 103: 455-461

[11] 李巧燕, 林瑞庆, 朱兴金. SRAP分子标记及其应用概述［J］. 热带医学杂志, 2006, 6(4): 467-469

[12] 陈济世, 张岭华, 吴秉礼. "三粒小麦"的发现及选育初报［J］. 作物学报, 1983, 9(1): 69-72

[13] 沈光华, 童一中, 沈革志. 普通小麦多子房基因单体分析的染色体定位及双端体分析的染色体壁定位［J］. 遗传学报, 1992, 19 (6): 513-516

[14] 武 军, 李邦琴, 赵继新. 三粒小麦多子房性状的遗传分析［J］. 西北农业大学学报, 2000, 28(6): 58-60

[15] 马守才, 张改生, 李红茹, 赵常胜. 小麦品系多Ⅱ多子房性状的遗传分析［J］. 麦类作物学报, 2006, 26(1): 35-37

[16] Peng ZS. A new mutation in wheat producing three pistils in a floret［J］. J Agron Crop Sci, 2003, 189: 270-272

[17] Peng Z S, Yang J, Wei S H, et al. Characterization of common wheat (*Triticum aestivum* L.) mutation line producing three pistils in a floret［J］. Hereditas, 2004, 141: 15-18

[18] Peng Z S, Martinek P, Kosuge K, et al. Genetic mapping of a mutant gene producing three pistils per floret in common wheat［J］. J Appl Genet, 2008, 49: 135-139

[19] Doyle J J, Doyle J L. A rapid DNA isolation procedure for small quantities of fresh leaf tissue［J］. Phytochem Bull, 1987, 19: 11-15

[20] 邵清松, 郭巧生, 房海灵. 药用菊花SRAP-PCR 反应体系的优化［J］. 核农学报, 2009, 23(5): 820-824

[21] 陆光远, 杨光圣, 傅延栋. 应用于油菜研究的简便银染AFLP标记技术的构建［J］. 华中农业大学学报, 2001, 20: 413-415

[22] 朱东旭, 马守才, 张改生,牛 娜. 小麦多子房性状近等基因系遗传背景的分子标记检测［J］. 麦类作物学报, 2010, 30(3): 406-410

[23] 马守才, 张改生, 牛 娜. 小麦多子房性状近等基因系的选育及遗传背景的检测［J］. 核农学报, 2007, 21(6):

585-588

[24] Ruiz J J, Garcia-Martinez S, Pico B, et al. Genetic variability and relationship of closely related Spanish traditional cultivars of tomato as detected by SRAP and SSR markers［J］. J Am Soc Hort Sci, 2005, 130(1): 88-94

本刊中的类似文章

1. 朱彩霞, 古佳玉, 郭会君, 赵林姝, 赵世荣, 邵群, 刘录祥.小麦TaKu70和TaKu80基因的克隆和分析[J]. 核农学报, 2009,23(6): 917-922
2. 孙岩, 张宏纪, 王广金, 刘东军, 杨淑萍, 郭怡璠, 孙光祖.转优质HMW-GS基因春小麦品系品质特性与农艺性状的研究[J]. 核农学报, 2009,23(6): 923-927
3. 郭艳萍, 张改生, 程海刚, 朱展望, 张龙雨, 牛娜, 马守才, 李红霞.小麦粘类CMS育性恢复基因的SSR分子标记与定位[J]. 核农学报, 2009,23(5): 729-736
4. 别同德, 冯祎高, 徐川梅, 陈佩度.小麦-鹅观草易位系T7A/1Rk#1的选育与鉴定[J]. 核农学报, 2009,23(5): 737-742
5. 李鹏, 孙明柱, 张峰, 张凤云, 李新华.小麦高分子量谷蛋白亚基突变体的筛选与鉴定[J]. 核农学报, 2009,23(6): 935-938
6. 孙黛珍, 杨海峰, 王曙光, 曹亚萍, 杨武德.山西小麦品种资源醇溶蛋白组成的遗传变异[J]. 核农学报, 2009,23(6): 939-946
7. 单成钢, 倪大鹏, 王维婷, 张教洪, 苏学合, 朱彦威, 王志芬.丹参种子航天诱变生物学效应研究[J]. 核农学报, 2009,23(6): 947-950
8. 王维婷, 单成钢, 倪大鹏, 王志芬.卫星搭载处理丹参种子SP2代的SRAP分析[J]. 核农学报, 2009,23(5): 758-761
9. 王广金,闫文义,孙岩,黄景华,刁艳玲,邓双丽,孙光祖.春小麦航天育种效果的研究[J]. 核农学报, 2004,18(04): 257-260
10. 杨景成,于元杰,齐延芳.外源DNA导入小麦后雄性不育变异的初步研究[J]. 核农学报, 2004,18(01): 6-10
11. 张建伟,杨保安,吕丽萍.豫麦57的辐照改良[J]. 核农学报, 2003,17(06): 427-429
12. 李世娟,诸叶平,孙开梦,鄂越.冬小麦节水灌溉制度下不同施氮量的氮素平衡[J]. 核农学报, 2003,17(06): 472-475+480
13. 寇长林,徐建生,王恒宇.砂质潮土冬小麦对氮肥的利用与氮素平衡[J]. 核农学报, 2003,17(06): 476-480
14. 尚兴甲,王梅芳,张兰稳,孔繁华,王淑杰,陈建中.冬小麦不同时期追施尿素的效果[J]. 核农学报, 2003,17(06): 485-487
15. 王志芬,范仲学,张凤云,王未名,陈建爱,闫树林,周舫.鸡粪对高产冬小麦根系活力和光合性能的影响[J]. 核农学报, 2003,17(05): 379-382