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大豆开花盛期快速叶绿素荧光参数的QTL分析

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QTL Mapping for Fast Chlorophyll Fluorescence Parameters in Soybean

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- 摘要
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摘要 【目的】定位大豆R2时期(开花盛期)快速叶绿素荧光参数(JIP参数)QTL, 分析不同参数间的遗传关系, 比较参数在R2和R6时期(鼓粒盛期)遗传基础的异同。【方法】以大豆品种科丰1号和南农1138-2及其杂交衍生的184份重组自交系为材料, 在盆栽条件下测定R2时期JIP参数, 检测其QTL。【结果】检测到16个JIP参数QTL, 分布在连锁群A1、C2、D2、I、M、N和O上, 单个QTL的LOD值为2.40—5.65, 贡献率为4.40%—20.06%; 检测到3个同时控制多个参数的染色体区间, 分别是连锁群C2上标记区间Satt286—Satt316、连锁群I上标记区间Sat_418—Satt650和连锁群O上标记区间Sat_231—Sat_196。【结论】不同JIP参数间既有共同的控制基因(QTL), 也有各自独特的控制基因; JIP参数多数QTL不能在R2和R6时期重复检测到, 控制其表达的遗传机制较为复杂; 连锁群O上标记区间Sat_231—Sat_196在大豆R2和R6时期均检测到, 该区间可能存在稳定表达的控制光合器官内禀结构和功能的基因, 具有一定的育种价值。

关键词: 大豆 快速叶绿素荧光参数(JIP参数) 重组自交系 QTL定位

Abstract: 【Objective】 The present study is aimed to identify QTL associated with fast chlorophyll fluorescence parameters (JIP parameters), examine the genetic relationships among different parameters, and compare the genetic base underlying the parameters between the two growth stages of R2 and R6 in soybean. 【Method】 A pot experiment was carried out to evaluate five JIP parameters at R2 growth stage using 184 recombinant inbred lines (RILs) derived from a cross between two varieties of Kefeng 1 and Nannong 1138-2, and then the QTL of above parameters were detected and mapped. 【Result】 A total of 16 QTL, located on linkage groups (LGs) A1, C2, D2, I, M, N and O, respectively, were identified, and explained phenotypic variation ranging from 4.40% to 20.06% with the LOD score from 2.40 to 5.65. Three major genomic regions were detected to be associated with several parameters simultaneously, which were between markers Satt286 and Satt316 on LG C2, marker Sat_418 and Satt650 on LG I, and marker Sat_231 and sat_196 on LG O, respectively. 【Conclusion】 Different JIP parameters might be controlled by the same or different genes. Most of the QTL associated with JIP parameters were not detected consistently at R2 and R6 growth stage, indicating that the genetic mechanism underlying the JIP parameters is relatively complicated. The marker interval between Sat_231 and Sat_196 on LG O was detected at both R2 and R6 growth stage, and this genomic region may contain stably expressing genes underlying the intrinsic features of the photosynthetic apparatus and be useful in the breeding practice of soybean.

Key words: soybean fast chlorophyll fluorescence parameters (JIP parameters) recombinant inbred line (RIL) QTL mapping

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- [1] Krause G, Weis E. Chlorophyll fluorescence and photosynthesis: the basics. *Annual Review of Plant Biology*, 1991, 42: 313-349. 
- [2] Stirbet A, Govindjee Z. On the relation between the Kautsky effect (chlorophyll a fluorescence induction) and photosystem II: Basics and applications of the OJIP fluorescence transient. *Journal of Photochemistry and Photobiology B*, 2011, 236-257.
- [3] 李鹏民, 高辉远, Strasser R J. 快速叶绿素荧光诱导动力学分析在光合作用研究中的应用. *植物生理与分子生物学学报*, 2005, 31(6): 559-566. 
Li P M, Gao H Y, Strasser R J. Application of the fast chlorophyll fluorescence induction dynamics analysis in photosynthesis study. *Journal of Plant Physiology and Molecular Biology*, 2005, 31(6): 559-566. (in Chinese)
- [4] Bilger W, Schreiber U. Energy-dependent quenching of dark-level chlorophyll fluorescence in intact leaves. *Photosynthesis Research*, 1986, 10: 303-308. 
- [5] Genty B, Briantais J M, Baker N. The relationship between the quantum yield of photosynthetic electron transport and quenching of chlorophyll fluorescence. *Biochimica et Biophysica Acta*, 1989, 900: 87-92.
- [6] Strasser R J, Srivastava A, Tsimilli-Michael M. Analysis of the chlorophyll a fluorescence transient//Papageorgiou G C, Govindjee. *Chlorophyll fluorescence: a signature of photosynthesis (Advances in photosynthesis and respiration)*. The Netherlands: Springer, 2004: 321-362.
- [7] 梁慧珍, 王树峰, 余永亮, 练云, 王庭峰, 位艳丽, 巩鹏涛, 刘学义, 方宣钧. 大豆异黄酮与脂肪、蛋白质含量基因定位分析. *中国农业科学*, 2009, 42(8): 2652-2660. 浏览
Liang H Z, Wang S F, Yu Y L, Lian Y, Wang T F, Wei Y L, Gong P T, Liu X Y, Fang X J. QTL mapping of isoflavone, oil and protein content in soybean. *Scientia Agricultura Sinica*, 2009, 42(8): 2652-2660. (in Chinese)
- [8] 丁安明, 崔法, 李君, 赵春华, 王秀芹, 王洪刚. 小麦单株产量与株高的QTL分析. *中国农业科学*, 2011, 44(14): 2857-2867. 浏览
Ding A M, Cui F, Li J, Zhao C H, Wang X Q, Wang H G. QTL analysis on grain yield per plant and plant height in wheat. *Scientia Agricultura Sinica*, 2011, 44(14): 2857-2867. (in Chinese)
- [9] Yin Z T, Meng F F, Song H N, Wang X L, Xu X M, Yu D Y. Expression quantitative trait loci analysis of two genes encoding rubisco activase in soybean. *Plant Physiology*, 2010, 152: 1625-1637. 
- [10] Jompuk C, Fracheboud Y, Stamp P, Leipner J. Mapping of quantitative trait loci associated with chilling tolerance in maize (*Zea mays* L.) seedlings grown under field conditions. *Journal of Experimental Botany*, 2005, 56: 1153-1163.
- [11] Guo P, Baum M, Varshney R K, Graner A, Grando S, Ceccarelli S. QTLs for chlorophyll and chlorophyll fluorescence parameters in barley under post-flowering drought. *Euphytica*, 2008, 163: 203-214. 
- [12] Yin Z T, Meng F F, Song H N, He X H, Xu X M, Yu D Y. Mapping quantitative trait loci associated with chlorophyll a fluorescence parameters in soybean (*Glycine max* (L.) Merr.). *Planta*, 2010, 231: 875-885.
- [13] Yin Z T, Meng F F, Song H N, Wang X L, Chao M N, Zhang G Z, Xu X M, Deng D X, Yu D Y. The expression of the GmFtsH9 gene correlates with in vivo photosystem II function, probed by chlorophyll a transient and eQTL mapping in a soybean population of recombinant inbred lines. *Planta*, 2011, 234: 815-827. 
- [14] Fu S X, Zhan Y, Zhi H J, Gai J Y, Yu D Y. Mapping of SMV resistance gene Rsc-7 by SSR markers in soybean. *Genetica*, 2006, 128: 63-69. 
- [15] Cregan P B, Jarvik T, Bush A L, Shoemaker R C, Lark K G, Kahler A L, Kaya N, VanToai T T, Lohnes D G, Chung J, Specht J E. An integrated genetic linkage map of the soybean genome. *Crop Science*, 1999, 39: 1464-1490. 
- [16] Wang S C, Basten C J, Zeng Z B. *Windows QTL Cartographer v2.5*. Raleigh, NC: North Carolina State University, 2011.
- [17] Churchill G A, Doerge R W. Empirical threshold values for quantitative trait mapping. *Genetics*, 1994, 138: 963-971.
- [18] Lee S Y, Ahn J H, Cha Y S, Yun D W, Lee M C, Ko J C, Lee K S, Eun M Y. Mapping QTLs related to salinity tolerance of rice at the young seedling stage. *Plant Breeding*, 2007, 126: 43-46.
- [19] Landjeva S, Neumann K, Lohwasser U, Börner A. Molecular mapping of genomic regions associated with wheat seedling growth under osmotic stress. *Biologia Plantarum*, 2008, 52: 259-266. 

[20] 印志同, 宋海娜, 孟凡凡, 许晓明, 喻德跃. 大豆光合气体交换参数的QTL分析. 作物学报, 2010, 36(1): 92-100.


Yin Z T, Song H N, Meng F F, Xu X M, Yu D Y. QTL mapping for photosynthetic gas-exchange parameters in soybean. *Acta Agronomica Sinica*, 2010, 36(1): 92-100. (in Chinese) 


[21] Fracheboud Y, Jompuk C, Ribaut J M, Stamp P, Leipner J. Genetic analysis of cold-tolerance of photosynthesis in maize. *Plant Molecular Biology*, 2004, 56: 241-253. 

[22] Fracheboud Y, Ribaut J M, Vargas M, Messmer R, Stamp P. Identification of quantitative trait loci for cold-tolerance of photosynthesis in maize (*Zea mays* L.). *Journal of Experimental Botany*, 2002, 53: 1967-1977. 

[23] Cui S Y, He X H, Fu S X, Meng Q C, Gai J Y, Yu D Y. Genetic dissection of the relationship of apparent biological yield and apparent harvest index with seed yield and yield related traits in soybean. *Australian Journal of Agricultural Research*, 2008, 59: 86-93. 

[24] Padraic J F, Jeremy H, Mark G M A. Natural genetic variation in plant photosynthesis. *Trends in Plant Science*, 2011, 16: 327-335. 

[25] Sinclair T R, Purcell L C, Sneller C H. Crop transformation and the challenge to increase yield potential. *Trends in Plant Science*, 2004, 9: 70-75. 

[26] Lazar D. Modeling of light-induced chlorophyll a fluorescence rise (O-J-I-P transient) and changes in 820 nm-transmittance signal. *Photosynthetica*, 2009, 47: 483-498. 

[1] 赵天宏, 金东艳, 王岩, 曹莹. 臭氧胁迫对大豆酚类化合物含量和抗氧化能力的影响 [J]. *中国农业科学*, 2011, 44(4): 708-715.

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