

記錄 編號	6323
狀態	NC094FJU00105021
助教 查核	
索書 號	
學校 名稱	輔仁大學
系所 名稱	生命科學系
舊系 所名 稱	
學號	493546235
研究 生(中)	李偉嘉
研究 生(英)	Wei-Chia Lee
論文 名稱 (中)	微小水稻基因 tr1 的定位選殖
論文 名稱 (英)	Positional cloning of TINY RICE Gene, tr1.
其他 題名	
指導 教授 (中)	林彥蓉
指導 教授 (英)	Yann-Rong Lin
校內 全文 開放 日期	不公開
校外 全文	不公開

開放日期	
全文不開放理由	
電子全文送交國圖.	同意
國圖全文開放日期.	2007.01.01
檔案說明	電子全文
電子全文	01
學位類別	碩士
畢業學年度	94
出版年	
語文別	中文
關鍵字(中)	定位選殖 水稻 微小
關鍵字(英)	positional cloning rice dwarf
摘要(中)	<p>水稻株高為多基因遺傳性狀，由「綠色革命」成功培育半矮株小麥與水稻高產量品種的經驗得知矮株與產量的提昇具有相關性。時至今日，許多與水稻株高相關的基因被選殖出來，更有學者以遺傳工程方式結合提升產量與降低株高的基因培育高產量的新品種水稻。本實驗所使用之微小株水稻（Tiny Rice），為日本農業生物資源研究所 Hirohiko Hirochika 博士以組織培養方式刺激水稻內生性跳躍子 Tos17 插入剔除 <i>O. sativa</i> ssp japonica cv. Nipponbare 之眾多微小株之一，編號 NC5171，由組織切片觀察到微小株之莖頂芽組織型態上較野生株尖銳、瘦長。tr1 基因並未被 Tos17 標籤住，定位選殖法便成為選殖 tr1 基因的首選。以 NC5171 與</p>

	<p>Kasalath 雜交所得的 F2 群體，經卡方檢定野生株與微小株之比例，可推知此一微小水稻性狀應為一隱性基因所調控。使用 2,157 棵隱性同型合子，以公開網路資源所取得之 4 個 SSR 及自行設計之 7 個 Indel 分子標幟將 tr1 基因定位至第八條染色體長臂尾端介於 CH811 至 RM4997 兩分子標幟之間，相距 0.058 cM，為 100.1 kb 之標的區間，共有 22 個預測之候選基因。經由 RT-PCR 已將候選基因減少至 8 個，已完成定序的四個基因序列經 BLAST 比對 Nipponbare 序列後並無發現突變，暫時排除為 tr1 的可能性。將持續進行之工作：（1）組織切片之觀察，釐清 tr1 基因影響之細胞及組織；（2）針對受影響之組織觀察 tr1 基因之表現情形；（3）繼續未完成之定序工作，找出突變發生之位置與型態。</p>
<p>摘要 (英)</p>	<p>Plant height is regulated by several genes and also influenced by environment. From the experience of “Green revolution”, which was successfully bred of the high- yield wheat and rice cultivars with semi-dwarf, we understand that the short structure is correlated to yield improvement. Up to date, more and more plant height genes have been cloned, and some researchers even incorporate high-yield genes and plant height genes by genetic engineering to establish high-yield varieties. The rice extreme dwarf mutant, Tiny Rice, is one of the Tos17 induced mutants with series number NC5171, which is created by Dr. Hirohiko Hirochika, National Institute of Agrobiological Sciences, Japan. The shape of shoot apical meristem (SAM) in the mutants is sharper than which in the wild type from the anatomy of the young seedling stage. The dwarf phenotype of NC5171 is affected by a single recessive gene named tr1, because the segregation ratio of wild type to mutants in the F2 families of NC5171 × Kasalath is obeyed the one single medelian gene by χ^2 (goodness-of-fitt) analysis. Since tr1 is not tagged by the Tos17, the “positional cloning” approach has been employed to clone the tr1 gene. In total of 2,157 recessive mutants presumed as recessive homozygotes had been genotyped with four SSR markers and seven Indel markers for high-resolution mapping. The tr1 gene is mapped between marker CH811 and RM4997, which is estimated as 0.058 cM corresponding to 100.1 kb. There are twenty-two candidate genes in the target region after annotation. The candidate genes have been reduced to eight by the RT-PCR analysis of mRNA isolated SAM and surrounding tissues. Four candidate genes might be excluded due to no detected variation sites after multiple sequence alignment against wild type of Nipponbare genomic sequences. In the future, there will be three aims to do: (1) Histological observation: finding out the cells and tissues which is affected by tr1 in detail. (2) The tr1 expression: Understanding where and when the gene expression by RT-PCR analysis. (3) Accomplishment of the sequencing of the candidate genes: Identifying the mutation site and the mutation type. Thus, we can elucidate the tr1 function at molecular and biochemical levels.</p>
<p>論文 目次</p>	<p>目錄 i 表格目錄 iii 圖目錄 iv 中文摘要 v 英文摘要 vi 前言 1 水稻之栽培與重要性 1 水稻株高之研究 3 增進水稻產量之研究 7 水稻遺傳與基因體研究 8 水稻功能性基因體研究 10 定位選殖基因 15 研究目標 19 材料與方法 20 實驗材料 20 形態觀察 20 組織切片標本之形態觀察 21 基因型鑑定</p>

與連鎖分析 22 以序列分析觀察野生株與微小株 tr1 之基因序列差異 25 標的染色體區間之 DNA 定序 27 以 RT-PCR 篩選候選基因 29 結果 33 型態觀察 33 種子外型之觀察 33 幼苗型態之觀察 35 組織切片標本之觀察 39 精細定位 tr1 基因 43 tr1 基因在 F2 子代之分離情形 43 連鎖分析 45 tr1 之物理圖譜 48 候選基因之篩選 48 標的染色體之註解 48 以 RT-PCR 方法篩選候選基因 51 候選基因之定序 56 討論 57 型態觀察 57 精細定位 58 Indel 分子標幟之搜尋條件與運用於 F2 子代基因型鑑定之情形 58 精細定位之解析度 59 以 RT-PCR 方式篩選候選基因 60 以定序方式鑑定候選基因 62 未來之實驗 63 參考文獻 64 附錄 84 附錄一、吉貝素之生合成途徑。84 附錄二、油菜素內酯之生合成途徑。85 附錄三、NC5171/Kasalath 之 F2 種子數量預估以及分離率測試 86 附錄四、NC5171 野生型與微小株種子外型之觀察。87 附錄五、自行設計之 Indel 分子標幟 88 附錄六、以定序之染色體片斷與基因相關位置圖 89 附錄七、blastn 比對之定序資料。90 附錄八、候選基因功能概述 109

參考
文獻

Agrawal, G.K., Yamazaki, M., Kobayashi, M., Hirochika, R., Miyao, A., Hirochika, H. (2001) Screening of the rice viviparous mutants generated by endogenous retrotransposon Tos17 insertion: Tagging of a zeaxanthin epoxidase gene and a novel ostatic gene. *Plant Physiol.* 125: 1248-57. An, S., Park, S., Jeong, D.H., Lee, D.Y., Kang, H.G., Yu, J.H., Hur, J., Kim, S.R., Kim, Y.H., Lee, M., Han, S., Kim, S.J., Yang, J., Kim, E., Wi, S.J., Chung, H.S., Hong, J.P., Choe, V., Lee, H.K., Choi, J.H., Nam, J., Kim, S.R., Park, P.B., Park, K.Y., Kim, W.T., Choe, S., Lee, C.B., An, G. (2003) Generation and analysis of end sequence database for T-DNA tagging lines in rice. *Plant Physiol.* 133: 2040-7 An, G., Jeong, D.H., Jung, K.H., Lee, S. (2005) Reverse genetic approaches for functional genomics of rice. *Plant Mol. Biol.* 59:111-23 Asano, K., Miura, K., Hasegawa, H., Hirochika, H., Ashikari, M., Kitano, H., Matsuoka, M. and Lin, Y.R. (2004) Mapping of the TINY RICE 1 gene, TR1. *Rice Genet. Newslett* 21: 19-20. Ashikari, M., Wu, J., Yano, M., Sasaki, T., Yoshimura, A. (1999) Rice gibberellin-insensitive dwarf mutant gene Dwarf 1 encodes the alpha-subunit of GTP-binding protein. *Proc. Natl. Acad. Sci. U S A.* 96: 10284-10289. Ashikari, M., Sakakibara, H., Lin, S., Yamamoto, T., Takashi, T., Nishimura, A., Angeles, E.R., Qian, Q., Kitano, H., Matsuoka, M. (2005) Cytokinin oxidase regulates rice grain production. *Science* 309: 741-5. Aubert, D., Chen, L., Moon, Y.H., Martin, D., Castle, L.A., Yang, C.H., Sung, Z.R. (2001) EMF1, a novel protein involved in the control of shoot architecture and flowering in Arabidopsis. *Plant Cell* 13: 1865-75. Barinaga, M. (1999) A new finger on the protein destruction button. *Science* 286: 223-225. Borden, K.L. and Freemont, P.S. (1996) The RING finger domain: a recent example of a sequence-structure family. *Curr. Opin. Struct. Biol.* 6: 395-401. Boudreau, E., Nickelsen, J., Lemaire, S.D., Ossenbuhl, F., Rochaix, J.D. (2000) The Nac2 gene of Chlamydomonas encodes a chloroplast TPR-like protein involved in psbD mRNA stability. *EMBO J.* 19: 3366-76. Chang, T.T., (1976) The origin, evolution, cultivation, dissemination and diversification of Asian and African rice. *Euphytica* 25: 435-44 Chiang, H.H., Hwang, I., Goodman, H.M. (1995) Isolation of the Arabidopsis

GA4 locus. *Plant Cell* 7: 195-201. Chin, H.G., Choe, M.S., Lee, S.H., Park, S.H., Koo, J.C., Kim, N.Y., Lee, J.J., Oh, B.G., Yi, G.H., Kim, S.C., Choi, H.C., Cho, M.J., Han, C.D. (1999) Molecular analysis of rice plants harboring an Ac/Ds transposable element-mediated gene trapping system. *Plant J.* 19: 615-23.

Davletov, B.A., Sudhof, T.C. (1993) A single C2 domain from synaptotagmin I is sufficient for high affinity Ca²⁺/phospholipid binding. *J Biol Chem.* 268: 26386-90.

Devos, K.M. (2005) Updating the 'crop circle'. *Curr. Opin. Plant Biol.* 8: 155-62.

Duncan, J.D., West, C.A. (1981) Properties of kaurene synthetase from *Marah macrocarpus* endosperm: Evidence for the participation of separate but interacting enzymes. *Plant Physiol.* 68: 1128-1134.

Duval, M., Hsieh, T.F., Kim, S.Y., Thomas, T.L. (2002) Molecular characterization of AtNAM: a member of the Arabidopsis NAC domain superfamily. *Plant Mol. Biol.* 50: 237-48.

Evans, L.T. *Crop Evolution, Adaptation and Yield* (1993) Cambridge Univ. Press, Cambridge, UK.

Fedoroff, N., Wessler, S., Shure, M. (1983) Isolation of the transposable maize controlling elements Ac and Ds. *Cell.* 35: 235-42.

Feltus, F.A., Wan, J., Schulze, S.R., Estill, J.C., Jiang, N., Paterson, A.H. (2004) An SNP resource for rice genetics and breeding based on subspecies *indica* and *japonica* genome alignments. *Genome Res.* 14: 1812-9.

Feuillet, C., Keller, B. (2002) Comparative genomics in the grass family: molecular characterization of grass genome structure and evolution. *Ann. Bot.* 89: 3-10.

Freemont, P.S. (2000) RING for destruction? *Curr. Biol.* 10: R84-7.

Fukazawa, J., Sakai, T., Ishida, S., Yamaguchi, I., Kamiya, Y., Takahashi, Y. (2000) Repression of shoot growth, a bZIP transcriptional activator, regulates cell elongation by controlling the level of gibberellins. *Plant Cell* 12: 901-15.

Futsuhara, Y. and Kikuchi, F. (1997) Inheritance of morphological characters. *Science of the rice plant v. 3*, Food and Agriculture Policy Research Center, Tokyo, pp. 300-308.

Goff, S.A., Ricke, D., Lan, T.H., Presting, G., Wang, R., Dunn, M., Glazebrook, J., Sessions, A., Oeller, P., Varma, H., Hadley, D., Hutchison, D., Martin, C., Katagiri, F., Lange, B.M., Moughamer, T., Xia, Y., Budworth, P., Zhong, J., Miguel, T., Paszkowski, U., Zhang, S., Colbert, M., Sun, W.L., Chen, L., Cooper, B., Park, S., Wood, T.C., Mao, L., Quail, P., Wing, R., Dean, R., Yu, Y., Zharkikh, A., Shen, R., Sahasrabudhe, S., Thomas, A., Cannings, R., Gutin, A., Pruss, D., Reid, J., Tavtigian, S., Mitchell, J., Eldredge, G., Scholl, T., Miller, R.M., Bhatnagar, S., Adey, N., Rubano, T., Tusneem, N., Robinson, R., Feldhaus, J., Macalma, T., Oliphant, A., Briggs, S. (2002) A draft sequence of the rice genome (*Oryza sativa* L. ssp. *japonica*). *Science.* 296: 92-100.

Greco, R., Ouwerkerk, P.B., De, Kam., R.J., Sallaud, C., Favalli, C., Colombo, L., Guiderdoni, E., Meijer, A.H., Hoge, J.H., Pereira, A. (2003) Transpositional behaviour of an Ac/Ds system for reverse genetics in rice. *Theor. Appl. Genet.* 108: 10-24.

Greco, R., Ouwerkerk, P.B.F., Taal, A.J.C., Sallaud, C., Guiderdoni, E., Meijer, A.H., Hoge, A.H.C., Pereira, A. (2004) Transcription and somatic transposition of the maize *En / Spm* transposon system in rice. *Mol. Genet. Gen.* 270: 514 - 523.

Gu, Y.Q., Wildermuth, M.C., Chakravarthy, S., Loh, Y.T., Yang, C., He, X., Han, Y., Martin, G.B. (2002)

Tomato transcription factors *pti4*, *pti5*, and *pti6* activate defense responses when expressed in Arabidopsis. *Plant Cell* 14: 817-31. Guo, H.S., Xie, Q., Fei, J.F., Chua, N.H. (2005) MicroRNA directs mRNA cleavage of the transcription factor NAC1 to downregulate auxin signals for Arabidopsis lateral root development. *Plant Cell* 17: 1376-86. Hatakeyama, S., Nakayama, K.I. (2003) Ubiquitylation as a quality control system for intracellular proteins. *J Biochem.* 134: 1-8. Hedden, P. and Phillips, A.L. (2000a) Gibberellin metabolism: new insights revealed by the genes. *Trends Plant Sci.* 5: 523-30. Hedden, P. and Phillips, A.L. (2000b) Manipulation of hormone biosynthetic genes in transgenic plants. *Curr. Opin. Biotechnol.* 11: 130-7. Hegedus, D., Yu, M., Baldwin, D., Gruber, M., Sharpe, A., Parkin, I., Whitwill, S., Lydiate, D. (2003) Molecular characterization of Brassica napus NAC domain transcriptional activators induced in response to biotic and abiotic stress. *Plant Mol. Biol.* 53: 383-97. Helliwell, C.A., Sheldon, C.C., Olive, M.R., Walker, A.R., Zeevaert, J.A., Peacock, W.J., Dennis, E.S. (1998) Cloning of the Arabidopsis ent-kaurene oxidase gene GA3. *Proc. Natl. Acad. Sci. U S A.* 95: 9019-24. Hirochika, H., Sugimoto, K., Otsuki, Y., Tsugawa, H., Kanda, M. (1996) Retrotransposons of rice involved in mutations induced by tissue culture. *Proc. Natl. Acad. Sci. USA* 93: 7783-8. Hirochika, H. (2001) Contribution of the Tos17 retrotransposon to rice functional genomics. *Curr. Opin. Plant Biol.* 4: 118-22. Hong, Z., Ueguchi-Tanaka, M., Shimizu-Sato, S., Inukai, Y., Fujioka, S., Shimada, Y., Takatsuto, S., Agetsuma, M., Yoshida, S., Watanabe, Y., Uozu, S., Kitano, H., Ashikari, M., Matsuoka, M. (2002) Loss-of-function of a rice brassinosteroid biosynthetic enzyme, C-6 oxidase, prevents the organized arrangement and polar elongation of cells in the leaves and stem. *Plant J.* 32: 495-508. Hong, Z., Ueguchi-Tanaka, M., Umemura, K., Uozu, S., Fujioka, S., Takatsuto, S., Yoshida, S., Ashikari, M., Kitano, H., Matsuoka, M. (2003) A rice brassinosteroid-deficient mutant, *ebisu dwarf (d2)*, is caused by a loss of function of a new member of cytochrome P450. *Plant Cell* 15: 2900-10. Ikeda, A., Ueguchi-Tanaka, M., Sonoda, Y., Kitano, H., Koshioka, M., Futsuhara, Y., Matsuoka, M., Yamaguchi, J. (2001) Slender rice, a constitutive gibberellin response mutant, is caused by a null mutation of the *SLR1* gene, an ortholog of the height-regulating gene *GAI/RGA/RHT/D8*. *Plant Cell* 13: 999-1010. International Rice Genome Sequencing Project. (2005) The map-based sequence of the rice genome. *Nature* 436: 793-800. Itoh, J.I., Kitano, H., Matsuoka, M., Nagato, Y. (2000) Shoot organization genes regulate shoot apical meristem organization and the pattern of leaf primordium initiation in rice. *Plant Cell* 12: 2161-74. Itoh, H., Ueguchi-Tanaka, M., Sentoku, N., Kitano, H., Matsuoka, M., Kobayashi, M. (2001) Cloning and functional analysis of two gibberellin 3 beta -hydroxylase genes that are differently expressed during the growth of rice. *Proc. Natl. Acad. Sci. USA.* 98: 8909-8914 Itoh, H., Ueguchi-Tanaka, M., Sato, Y., Ashikari, M., Matsuoka, M. (2002) The gibberellin signaling pathway is regulated by the appearance and disappearance of *SLENDER RICE1* in nuclei. *Plant Cell* 14: 57-70. Itoh, H., Tatsumi, T., Sakamoto, T.,

Otomo, K., Toyomasu, T., Kitano, H., Ashikari, M., Ichihara, S., Matsuoka, M. (2004) A rice semi-dwarf gene, Tan-Ginbozu (D35), encodes the gibberellin biosynthesis enzyme, ent-kaurene oxidase. *Plant Mol. Biol.* 54: 533-47. Iwai, H., Masaoka, N., Ishii, T., Satoh, S. (2002) A pectin glucuronyltransferase gene is essential for intercellular attachment in the plant meristem. *Proc. Natl. Acad. Sci. U S A.* 99: 16319-24. Jander, G., Norris, S.R., Rounsley, S.D., Bush, D.F., Levin, I.M., Last, R.L. (2002) Arabidopsis map-based cloning in the post-genome era. *Plant Physiol.* 129: 440-50 Jeon, J. and An, G. (2001) Gene tagging in rice: a high throughput system for functional genomics. *Plant Sci.* 161: 211-219. Jeong, D.H., An, S., Kang, H.G., Moon, S., Han, J.J., Park, S., Lee, H.S., An, K., An, G. (2002) T-DNA insertional mutagenesis for activation tagging in rice. *Plant Physiol.* 130: 1636-44. Joazeiro, C.A., Wing, S.S., Huang, H., Levenson, J.D., Hunter, T., Liu, Y.C. (1999) The tyrosine kinase negative regulator c-Cbl as a RING-type, E2-dependent ubiquitin-protein ligase. *Science* 286: 309-12. Johansson, K., Ramaswamy, S., Saarinen, M., Lemaire-Chamley, M., Issakidis-Bourguet, E., Miginiac-Maslow, M., Eklund, H. (1999) Structural basis for light activation of a chloroplast enzyme: the structure of sorghum NADP-malate dehydrogenase in its oxidized form. *Biochem.* 38: 4319-26. Kawaide, H., Imai, R., Sassa, T., Kamiya, Y. (1997) Ent-kaurene synthase from the fungus *Phaeosphaeria* sp. L487. cDNA isolation, characterization, and bacterial expression of a bifunctional diterpene cyclase in fungal gibberellin biosynthesis. *J. Biol. Chem.* 272: 21706-12. Kazama, T. and Toriyama, K. (2003) A pentatricopeptide repeat-containing gene that promotes the processing of aberrant atp6 RNA of cytoplasmic male-sterile rice. *FEBS Lett.* 544: 99-102. Khush, G.S. (1997) Origin, dispersal, cultivation and variation of rice. *Plant Mol. Bio.* 35: 25-34 Khush GS. (1999) Green revolution: preparing for the 21st century. *Genome* 42: 646-55. Klug, A. and Rhodes, D. (1987) 'Zinc fingers' A novel protein motif for nucleic acid recognition. *Trends Biochem. Sci.* 12 Komatsu, K., Maekawa, M., Ujiie, S., Satake, Y., Furutani, I., Okamoto, H., Shimamoto, K., Kyojuka, J. (2003) LAX and SPA: major regulators of shoot branching in rice. *Proc. Natl. Acad. Sci. USA.* 100: 11765-70. Komori, T., Ohta, S., Murai, N., Takakura, Y., Kuraya, Y., Suzuki, S., Hiei, Y., Imaseki, H., Nitta, N. (2004) Map-based cloning of a fertility restorer gene, Rf-1, in rice (*Oryza sativa* L.). *Plant J.* 37: 315-25. Komori, T. and Nitta, N. (2005) Utilization of the CAPS/dCAPS method to convert rice SNPs into PCR-based markers. *Breed. Sci.* 55: 93-98 Komorisono, M., Ueguchi-Tanaka, M., Aichi, I., Hasegawa, Y., Ashikari, M., Kitano, H., Matsuoka, M., Sazuka, T. (2005) Analysis of the rice mutant dwarf and gladius leaf 1. Aberrant katanin-mediated microtubule organization causes up-regulation of gibberellin biosynthetic genes independently of gibberellin signaling. *Plant Physiol.* 138: 1982-93. Konishi, M. and Sugiyama, M. (2006) A novel plant-specific family gene, ROOT PRIMORDIUM DEFECTIVE 1, is required for the maintenance of active cell proliferation. *Plant Physiol.* 140: 591-602. Krysan, P. J., Young, J. C., Sussman, M. R. (1999) T-DNA as an insertional mutagen in Arabidopsis. *Plant Cell* 11: 2283-2290. Kumar,

C.S., Wing, R.A., Sundaresan, V. (2005) Efficient insertional mutagenesis in rice using the maize En/Spm elements. *Plant J.* 44: 879-885

Kusano, H., Asano, T., Shimada, H., Kadowaki, K. (2005) Molecular characterization of ONAC300, a novel NAC gene specifically expressed at early stages in various developing tissues of rice. *Mol. Genet. Genomics* 272: 616-26.

Li, J., Thomson, M., McCouch, S.R. (2004) Fine mapping of a grain-weight quantitative trait locus in the pericentromeric region of rice chromosome 3. *Genetics* 168: 2187-95.

Li, X., Qian, Q., Fu, Z., Wang, Y., Xiong, G., Zeng, D., Wang, X., Liu, X., Teng, S., Hiroshi, F., Yuan, M., Luo, D., Han, B., Li, J. (2003) Control of tillering in rice. *Nature*. 422: 618-21.

Li, Y., Qian, Q., Zhou, Y., Yan, M., Sun, L., Zhang, M., Fu, Z., Wang, Y., Han, B., Pang, X., Chen, M., Li, J. (2003) BRITTLE CULM1, which encodes a COBRA-like protein, affects the mechanical properties of rice plants. *Plant Cell* 15: 2020-31.

Lin, H., Liang, Z.W., Sasaki, T., Yano, M. (2003) Fine mapping and characterization of Quantitative Trait Loci Hd4 and Hd5 controlling heading date in rice. *Breed. Sci.* 53: 51-59

Liu, Z.L., Han, F.P., Tan, M., Shan, X.H., Dong, Y.Z., Wang, X.Z., Fedak, G., Hao, S., Liu, B. (2004) Activation of a rice endogenous retrotransposon Tos17 in tissue culture is accompanied by cytosine demethylation and causes heritable alteration in methylation pattern of flanking genomic regions. *Theor. Appl. Genet.* 109: 200-9.

Lukowitz, W., Gillmor, C.S., Scheible, W.R. (2000) Positional cloning in Arabidopsis. Why it feels good to have a genome initiative working for you. *Plant Physiol.* 123: 795-805.

Mallory, A.C., Dugas, D.V., Bartel, D.P., Bartel, B. (2004) MicroRNA regulation of NAC-domain targets is required for proper formation and separation of adjacent embryonic, vegetative, and floral organs. *Curr Biol.* 14: 1035-46.

McCouch, S.R., Teytelman, L., Xu, Y., Lobos, K.B., Clare, K., Walton, M., Fu, B., Maghirang, R., Li, Z., Xing, Y., Zhang, Q., Kono, I., Yano, M., Fjellstrom, R., DeClerck, G., Schneider, D., Cartinhour, S., Ware, D., Stein, L. (2002) Development and mapping of 2240 new SSR markers for rice (*Oryza sativa* L.). *DNA Res.* 9: 199-207.

Michaels, S.D. and Amasino, R.M. (1998) A robust method for detecting single-nucleotide changes as polymorphic markers by PCR. *Plant J.* 14: 381-5.

Miyao, A., Tanaka, K., Murata, K., Sawaki, H., Takeda, S., Abe, K., Shinozuka, Y., Onosato, K., Hirochika, H. (2003) Target site specificity of the Tos17 retrotransposon shows a preference for insertion within genes and against insertion in retrotransposon-rich regions of the genome. *Plant Cell* 15: 1771-80.

Moore, G., Devos, K.M., Wang, Z., Gale, M.D. (1995) Grasses, line up and form a circle. *Curr Biol.* 5: 737-9.

Mori, M., Nomura, T., Ooka, H., Ishizaka, M., Yokota, T., Sugimoto, K., Okabe, K., Kajiwara, H., Satoh, K., Yamamoto, K., Hirochika, H., Kikuchi, S. (2002) Isolation and characterization of a rice dwarf mutant with a defect in brassinosteroid biosynthesis. *Plant Physiol.* 130: 1152-61.

M?ssig, C., Altmann, T. (2001) Brassinosteroid signaling in plants. *Trends Endocrinol Metab.* 12: 398-402.

Nesi, N., Jond, C., Debeaujon, I., Caboche, M., Lepiniec, L. (2001) The Arabidopsis TT2 gene encodes an R2R3 MYB domain protein that acts as a key determinant for proanthocyanidin accumulation in developing seed. *Plant Cell* 13:

2099-114. Nomura, T., Kitasaka, Y., Takatsuto, S., Reid, J.B., Fukami, M., Yokota, T. (1999) Brassinosteroid/Sterol synthesis and plant growth as affected by lka and lkb mutations of pea. *Plant Physiol.* 119: 1517 - 1526 Oikawa, T., Koshioka, M., Kojima, K., Yoshida, H., Kawata, M. (2004) A role of OsGA20ox1, encoding an isoform of gibberellin 20-oxidase, for regulation of plant stature in rice. *Plant Mol. Biol.* 55: 687-700. Olsen, A.N., Ernst, H.A., Leggio, L.L., Skriver, K. (2005) NAC transcription factors: structurally distinct, functionally diverse. *Trends Plant Sci.* 10: 79-87. Peng, J., Richards, D.E., Hartley, N.M., Murphy, G.P., Devos, K.M., Flintam, J.E., Beales, J., Fish, L.J., Worland, A.J., Pelica, F., Sudhakar, D., Christou, P., Snape, J.W., Gale, M.D., Harberd, N.P. (1999) 'Green revolution' genes encode mutant gibberellin response modulators. *Nature* 400: 256-61 Peters, J.L., Cnudde, F., Gerats, T. (2003) Forward genetics and map-based cloning approaches. *Trends Plant Sci.* 8: 484-91. Sakamoto, T., Morinaka, Y., Ishiyama, K., Kobayashi, M., Itoh, H., Kayano, T., Iwahori, S., Matsuoka, M., Tanaka, H. (2003) Genetic manipulation of gibberellin metabolism in transgenic rice. *Nat. Biotechnol.* 21: 909-13. Sakamoto, T., Miura, K., Itoh, H., Tatsumi, T., Ueguchi-Tanaka, M., Ishiyama, K., Kobayashi, M., Agrawal, G.K., Takeda, S., Abe, K., Miyao, A., Hirochika, H., Kitano, H., Ashikari, M., Matsuoka, M. (2004) An overview of gibberellin metabolism enzyme genes and their related mutants in rice. *Plant Physiol.* 134: 1642-53. Sakata, K., Nagasaki, K., Itonuma, A., Waki, K., Kise, M., Sasaki, T. (1999) A computer program for prediction of gene domain on rice genome sequence. The 2nd Georgia Tech International Conference on Bioinformatics, Abstracts p.78 Sakata, K., Antonio, B.A., Mukai, Y., Nagasaki, H., Sakai, Y., Makino, K., Sasaki, T. (2001) INE: a rice genome database with an integrated map view. *Nucleic Acids Res.* 28: 97-101. Sakata, K., Nagamura, Y., Numa, H., Antonio, B.A., Nagasaki, H., Itonuma, A., Watanabe, W., Shimizu, Y., Horiuchi, I., Matsumoto, T., Sasaki, T., Higo, K. (2002) RiceGAAS: an automated annotation system and database for rice genome sequence. *Nucleic Acids Res.* 30: 98-102 Sasaki, A., Ashikari, M., Ueguchi-Tanaka, M., Itoh, H., Nishimura, A., Swapan, D., Ishiyama, K., Saito, T., Kobayashi, M., Khush, G.S., Kitano, H., Matsuoka, M. (2002) Green revolution: a mutant gibberellin-synthesis gene in rice. *Nature.* 416: 701-2. Sasaki, A., Itoh, H., Gomi, K., Ueguchi-Tanaka, M., Ishiyama, K., Kobayashi, M., Jeong, D.H., An, G., Kitano, H., Ashikari, M., Matsuoka, M. (2003) Accumulation of phosphorylated repressor for gibberellin signaling in an F-box mutant. *Science* 299: 1896-8. Sato, Y., Sentoku, N., Miura, Y., Hirochika, H., Kitano, H., Matsuoka, M. (1999) Loss-of-function mutations in the rice homeobox gene OSH15 affect the architecture of internodes resulting in dwarf plants. *EMBO J.* 18: 992-1002. Saurin, A.J., Borden, K.L., Boddy, M.N., Freemont, P.S. (1996) Does this have a familiar RING? *Trends Biochem. Sci.* 21: 208-14. Sazuka, T., Aichi, I., Kawai, T., Matsuo, N., Kitano, H., Matsuoka, M. (2005) The rice mutant dwarf bamboo shoot 1: a leaky mutant of the NACK-type kinesin-like gene can initiate organ primordia but not organ development. *Plant Cell Physiol.* 46: 1934-43. Schmitt, L. and Tampe,

R. (2002) Structure and mechanism of ABC transporters. *Curr. Opin. Struct. Biol.* 12: 754-60. Shen, Y.J., Jiang, H., Jin, J.P., Zhang, Z.B., Xi, B., He, Y.Y., Wang, G., Wang, C., Qian, L., Li, X., Yu, Q.B., Liu, H.J., Chen, D.H., Gao, J.H., Huang, H., Shi, T.L., Yang, Z.N. (2004) Development of genome-wide DNA polymorphism database for map-based cloning of rice genes. *Plant Physiol.* 135: 1198-205. Sun, X., Cao, Y., Yang, Z., Xu, C., Li, X., Wang, S., Zhang, Q. (2004) Xa26, a gene conferring resistance to *Xanthomonas oryzae* pv. *oryzae* in rice, encodes an LRR receptor kinase-like protein. *Plant J.* 37: 517-27. Takahashi, Y., Shomura, A., Sasaki, T., Yano, M. (2001) Hd6, a rice quantitative trait locus involved in photoperiod sensitivity, encodes the alpha subunit of protein kinase CK2. *Proc. Natl. Acad. Sci. USA.* 98: 7922-7. Takano, M., Kanegae, H., Shinomura, T., Miyao, A., Hirochika, H., Furuya, M. (2001) Isolation and characterization of rice phytochrome A mutants. *Plant Cell* 13: 521-34. Tanabe, S., Ashikari, M., Fujioka, S., Takatsuto, S., Yoshida, S., Yano, M., Yoshimura, A., Kitano, H., Matsuoka, M., Fujisawa, Y., Kato, H., Iwasaki, Y. (2005) A novel cytochrome P450 is implicated in brassinosteroid biosynthesis via the characterization of a rice dwarf mutant, dwarf11, with reduced seed length. *Plant Cell* 17: 776-90. Tanaka, K., Murata, K., Yamazaki, M., Onosato, K., Miyao, A., Hirochika, H. (2003) Three distinct rice cellulose synthase catalytic subunit genes required for cellulose synthesis in the secondary wall. *Plant Physiol.* 133: 73-83. Tanksley, S.D. (1993) Mapping polygenes. *Annu Rev Genet.* 27: 205-33. Tran, L.S., Nakashima, K., Sakuma, Y., Simpson, S.D., Fujita, Y., Maruyama, K., Fujita, M., Seki, M., Shinozaki, K., Yamaguchi-Shinozaki, K. (2004) Isolation and functional analysis of *Arabidopsis* stress-inducible NAC transcription factors that bind to a drought-responsive cis-element in the early responsive to dehydration stress 1 promoter. *Plant Cell* 16: 2481-98. Tudzynski, B., Kawaide, H., Kamiya, Y. (1998) Gibberellin biosynthesis in *Gibberella fujikuroi*: cloning and characterization of the copalyl diphosphate synthase gene. *Curr Genet.* 34: 234-40. Ueguchi-Tanaka, M., Ashikari, M., Nakajima, M., Itoh, H., Katoh, E., Kobayashi, M., Chow, T.Y., Hsing, Y.I., Kitano, H., Yamaguchi, I., Matsuoka, M. (2005) GIBBERELLIN INSENSITIVE DWARF1 encodes a soluble receptor for gibberellin. *Nature* 437: 693-8. Uezu S, Tanaka-Ueguchi M, Kitano H, Hattori K, Matsuoka M. (2000) Characterization of XET-related genes of rice. *Plant Physiol.* 122: 853-9. Wang, Z.X., Yano, M., Yamanouchi, U., Iwamoto, M., Monna, L., Hayasaka, H., Katayose, Y., Sasaki, T. (1999) The Pib gene for rice blast resistance belongs to the nucleotide binding and leucine-rich repeat class of plant disease resistance genes. *Plant J.* 19: 55-64. Wu, J., Mizuno, H., Hayashi-Tsugane, M., Ito, Y., Chiden, Y., Fujisawa, M., Katagiri, S., Saji, S., Yoshiki, S., Karasawa, W., Yoshihara, R., Hayashi, A., Kobayashi, H., Ito, K., Hamada, M., Okamoto, M., Ikeno, M., Ichikawa, Y., Katayose, Y., Yano, M., Matsumoto, T., Sasaki, T. (2003) Physical maps and recombination frequency of six rice chromosomes. *Plant J.* 36: 720-30. Yano, M., Katayose, Y., Ashikari, M., Yamanouchi, U., Monna, L., Fuse, T., Baba, T., Yamamoto, K., Umehara, Y., Nagamura, Y., Sasaki, T. (2000) Hd1, a major photoperiod

	<p>sensitivity quantitative trait locus in rice, is closely related to the Arabidopsis flowering time gene CONSTANS. <i>Plant Cell</i> 12: 2473-2484. Yamaguchi, S., Sun, T., Kawaide, H., Kamiya, Y. (1998) The GA2 locus of Arabidopsis thaliana encodes ent-kaurene synthase of gibberellin biosynthesis. <i>Plant Physiol.</i> 116: 1271-8. Yamanouchi, U., Yano, M., Lin, H., Ashikari, M., Yamada, K. (2002) A rice spotted leaf gene, Spl7, encodes a heat stress transcription factor protein. <i>Proc. Natl. Acad. Sci. USA.</i> 99: 7530-5. Yamamuro, C., Ihara, Y., Wu, X., Noguchi, T., Fujioka, S., Takatsuto, S., Ashikari, M., Kitano, H., Matsuoka, M. (2000) Loss-of-function of a rice brassinosteroid insensitive 1 homolog prevents internode elongation and bending of the lamina joint. <i>Plant Cell</i> 12: 1591-606. Yano, M., Katayose, Y., Ashikari, M., Yamanouchi, U., Monna, L., Fuse, T., Baba, T., Yamamoto, K., Umehara, Y., Nagamura, Y., Sasaki, T. (2000) Hd1, a major photoperiod sensitivity quantitative trait locus in rice, is closely related to the Arabidopsis flowering time gene CONSTANS. <i>Plant Cell</i> 12: 2473-2484 Yoshimura, S., Yamanouchi, U., Katayose, Y., Toki, S., Wang, Z.X., Kono, I., Kurata, N., Yano, M., Iwata, N., Sasaki, T. (1998) Expression of Xa1, a bacterial blight-resistance gene in rice, is induced by bacterial inoculation. <i>Proc. Natl. Acad. Sci. USA.</i> 95: 1663-8. Yu, J., Hu, S., Wang, J., Wong, G.K., Li, S., Liu, B., Deng, Y., Dai, L., Zhou, Y., Zhang, X., Cao, M., Liu, J., Sun, J., Tang, J., Chen, Y., Huang, X., Lin, W., Ye, C., Tong, W., Cong, L., Geng, J., Han, Y., Li, L., Li, W., Hu, G., Huang, X., Li, W., Li, J., Liu, Z., Li, L., Liu, J., Qi, Q., Liu, J., Li, L., Li, T., Wang, X., Lu, H., Wu, T., Zhu, M., Ni, P., Han, H., Dong, W., Ren, X., Feng, X., Cui, P., Li, X., Wang, H., Xu, X., Zhai, W., Xu, Z., Zhang, J., He, S., Zhang, J., Xu, J., Zhang, K., Zheng, X., Dong, J., Zeng, W., Tao, L., Ye, J., Tan, J., Ren, X., Chen, X., He, J., Liu, D., Tian, W., Tian, C., Xia, H., Bao, Q., Li, G., Gao, H., Cao, T., Wang, J., Zhao, W., Li, P., Chen, W., Wang, X., Zhang, Y., Hu, J., Wang, J., Liu, S., Yang, J., Zhang, G., Xiong, Y., Li, Z., Mao, L., Zhou, C., Zhu, Z., Chen, R., Hao, B., Zheng, W., Chen, S., Guo, W., Li, G., Liu, S., Tao, M., Wang, J., Zhu, L., Yuan, L., Yang, H. (2002) A draft sequence of the rice genome (<i>Oryza sativa</i> L. ssp. indica). <i>Science.</i> 296: 79-92. Zhu, Q.H., Hoque, M.S., Dennis, E.S., Upadhyaya, N.M. (2003) Ds tagging of BRANCHED FLORETLESS 1 (BFL1) that mediates the transition from spikelet to floret meristem in rice (<i>Oryza sativa</i> L). <i>BMC Plant Biol.</i> 3: 6.</p>
論文 頁數	118
附註	
全文 點閱 次數	
資料 建置 時間	

轉檔日期	
全文檔存取記錄	
異動記錄	M admin Y2008.M7.D3 23:18 61.59.161.35