2023年第5期总380期

蔬菜育种专题

本期导读

学术文献

1．转录组和代谢组学分析揭示了uniconazole通过抑制BrbZIP39-BrPAL4模块介导木质素生物合成诱导开花大白菜下胚轴矮化的机制

2．分离油菜体内镉（Cd）积累和耐受的基因，揭示其功能机制

3．通过使用抗性的关联分析检查甘蓝型油菜品种对BnP5CR2的单核苷酸多态性（SNP）和单倍型多样性（Hd）以及BnP5CR2的表达模式

4．甘蓝蔬菜中硫代葡萄糖苷衍生的胺的形成

科技图书

1．用于加速作物改良的植物雄性不育系统

中国农业科学院农业信息研究所
联系人：张晓静;祁冉;顾亮亮
联系电话： 010-51503648
邮箱：agri@ckcest.cn
2023年1月30日

学术文献

1. Transcriptomic and metabolomic analyses reveal the mechanism of uniconazole inducing hypocotyl dwarfing by suppressing BrbZIP39-BrPAL4 module mediating lignin biosynthesis in flowering Chinese cabbage(转录组和代谢组学分析揭示了uniconazole通过抑制BrbZIP39-BrPAL4模块介导木质素生物合成诱导开花大白菜下胚轴矮化的机制)

简介：Uniconazole, a triazole plant growth regulator, is widely used to regulate plant height and prevent the overgrowth of seedlings. However, the underlying molecular mechanism of uniconazole in inhibiting the hypocotyl elongation of seedlings is still largely unclear, and there has been little research on the integration of transcriptomic and metabolomic data to investigate the mechanisms of hypocotyl elonga-tion. Herein we observed that the hypocotyl elongation of flowering Chinese cabbage seedings was significantly inhibited by uniconazole. Interestingly, based on combined transcriptome and metabolome analyses, we found that the "phenylpropanoid biosynthesis" pathway was significantly affected by uniconazole. In this pathway, only one member of the portal enzyme gene family, named BrPAL4, was remarkably downregulated, which was related to lignin biosynthesis. Furthermore, the yeast one-hybrid and dual-luciferase assays showed that BrbZIP39 could directly bind to the promoter region of BrPAL4 and activate its transcript. The virus-induced gene silencing system further demonstrated that BrbZIP39 could positively regulate hypocotyl elongation and the lignin biosynthesis of hypocotyl. Our findings provide a novel insight into the molecular regulatory mechanism of uniconazole inhibiting hypocotyl elongation in flowering Chinese cabbage and confirm, for the first time, that uniconazole decreases lignin content through repressing the BrbZIP39-BrPAL4 module-mediated phenylpropanoid biosynthesis, which leads to the hypocotyl dwarfing of flowering Chinese cabbage seedlings.

来源：Front Plant Sci

发布日期:2022-12-14

全文链接:

http://agri.ckcest.cn/file1/M00/10/1B/CsgkOGPEsv6AJ3bPAR6p3NJRdD8485.pdf

2. Isolation of Three Metallothionein Genes and Their Roles in Mediating Cadmium Resistance(分离油菜体内镉（Cd）积累和耐受的基因，揭示其功能机制)

简介：Isolating the genes responsible for cadmium (Cd) accumulation and tolerance in oilseed rape and uncovering their functional mechanism is of great significance for guiding genetic improve-ment to cope with heavy metal pollution. In this study, we screened the cDNA library of Brassica napus cv. Westar using a yeast genetic complementation system and isolated BnMT2-22a, BnMT2-22b and BnMT3b, which can mediate Cd tolerance in yeast. They all have two cysteine-rich domains in their sequence. Ectopic expression of these MTs demonstrated that all of them enhanced Cd and Cu tolerance in yeast, but had no effect

on Mn and Zn tolerance. The fusion of the red fluorescent protein mRFP did not affect their function in mediating Cd tolerance, and using these functional fusion proteins we observed that they were all localized in cytosol. Meanwhile, their expression in yeast did not affect the accumulation of Cd in the yeast transformants. Gene expression analyses found that BnMT2-22a, BnMT2-22b and BnMT3b were all induced by Cd in roots, and BnMT3b was also significantly induced in shoots. These results indicate that the genes BnMT2-22a, BnMT2-22b and BnMT3b isolated with cDNA library screening can mediate Cd tolerance, and they may detoxify Cd via cytosolic chelation.

来源： Agronomy

发布日期: 2022-11-26

全文链接:

http://agri.ckcest.cn/file1/M00/03/49/CsgkOYgbaNGAFJWgADOgF7O9yi4900.pdf

3. SNP and Haplotype Variability in the BnP5CR2 Gene and Association with Resistance and Susceptible Cultivars for Sclerotinia sclerotiorum in Brassica napus(通过使用抗性的关联分析检查甘蓝型油菜品种对BnP5CR2的单核苷酸多态性(SNP)和单倍型多样性(Hd)以及BnP5CR2的表达模式)

简介： Sclerotinia sclerotiorum is a serious disease of oil crop. The P5CR gene is the first gene reported to be associated with resistance to Sclerotinia infection in soybeans, and its closest homologs are located on chromosomes A10 and C09 of Brassica napus. We named these BnP5CR1 and BnP5CR2, respectively. The purpose of this study was to examine the single-nucleotide polymorphism (SNP) and haplotype diversity (Hd) of BnP5CR2 among canola cultivars with different levels of resistance to S. sclerotiorum as well as the expression patterns of BnP5CR2 via an association analysis using resistant and susceptible cultivars of B. napus. The results can thus provide information for future research on the mechanisms of disease resistance to S. sclerotiorum and the breeding of resistant canola cultivars. A total of 95 and 12 polymorphic sites were detected in 1870 and 678 SNP sites in 16 BnP5CR2 and their coding DNA sequence (CDS) population, respectively. A total of six different haplotypes (H1H6) were inferred from the 16 BnP5CR2 gene-CDS that contributed to the high level of polymorphism. Hd was equal to 0.617, and H1 shared by 10 cultivars was the dominant haplotype, suggesting that H1 is an ancient haplotype among the BnP5CR2 genes. H6 and H5 haplotpypes were present in Nan12R and ZhongYou821, respectively. The expression level in vitro of the BnP5CR2 between Nan12R and ZhongYou821 was significantly different. The upregulated expression of BnP5CR2 in resistant cultivars was higher than that of susceptible cultivars under 6 h, 12 h, 24 h, and 36 h treatments of pathogen stress, among which the expression level was significantly increased at 6 h, 12 h and 36 h in resistant cultivars, and the difference reached a highly significant level at 6 h ($p < 0.01$). The two cultivars with clear differences in expression features possessed different BnP5CR2 gene-CDS-haplotypes, indicating that gene-CDS-haplotype diversity may have greater power than SNPs for the detection of causal genes for quantitative traits.

来源： Agronomy

发布日期:2022-11-25
全文链接:
http://agri.ckcest.cn/file1/M00/03/49/CsgkOYgbZjyAThcpACDRpYdERus441.pdf

4. Glucosinolate-derived amine formation in Brassica oleracea vegetables(甘蓝蔬菜中硫代葡萄糖苷衍生的胺的形成)

简介:Glucosinolates are precursors of bioactive and health-promoting isothiocyanates (ITCs). Upon enzymatic hy-drolysis, Brassica vegetables, such as cabbage, also often yield nitriles and epithionitriles as main products next to ITCs. Here, we show that amines can be additional main enzymatic hydrolysis products of glucosinolates in Brassica vegetables. We propose that a plant endogenous ITC hydrolase (ITCase) is responsible for the enzymatic-like conversion of ITCs to amines in cabbage samples. This ITCase seems to have high activity towards alkenyl ITCs like allyl ITC and lower activity towards methylthioalkyl ITCs, and not to converting methyl-sulfinylalkyl ITCs like sulforaphane. In contrast, during heat treatment of homogenized cabbage material, methyl-sulfinylalkylamine levels increased by 400 % after 2 h of heating, which is likely due to thermal decomposition of ITCs, whereas alkenyl amine levels did not change due to heat treatment. The results show that amines from glucosinolates are part of the human diet.
来源:Food Chemistry
发布日期:2022-11-12
全文链接:
http://agri.ckcest.cn/file1/M00/10/1B/CsgkOGPEs_KAXTw1ABnHz7zlUhE185.pdf

科技图书

1. Plant Male Sterility Systems for Accelerating Crop Improvement(用于加速作物改良的植物雄性不育系统)

简介:This book covers all aspects of hybrid breeding technologies applied for crop improvement in major field crops. The different male sterility systems such as genetic male sterility (GMS), cytoplasmic male sterility (CMS), cytoplasmic and genetic male sterility (CGMS), and male sterility induced by the photoperiod (PGMS), temperature (TGMS), and chemicals are discussed in detail. The different chapters in this book provide a timeline of the key breakthroughs witnessed in the field of plant male sterility technologies, their application in hybrid breeding, and the relevance to the current need for food security.
来源:Springer
发布日期:2022-10-11
全文链接:
http://agri.ckcest.cn/file1/M00/10/1B/CsgkOGPEtc2AOmQTAAX9ruz8c_U471.pdf