2022年第52期总375期

蔬菜育种专题

本期导读

前沿资讯

1. Plant Physiology | 山西农业大学徐进课题组揭示转录因子NAC32调控植物镁毒害响应的分子机理

学术文献

1. 一种低成本的高通量表型系统，用于自动量化叶面积和绿色度

2. 一种促进植物生长的细菌Priestia megaterium JR48通过水杨酸依赖性信号通路诱导植物对十字花科黑腐病的抗性

3. 油菜素内酯对芥菜幼苗在正常和热胁迫条件下的生长和抗氧化防御有促进作用

4. 全基因组关联研究揭示了一个调节甘蓝型油菜株高的糖原合成酶激酶3基因

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
2022年12月26日

前沿资讯

1. Plant Physiology | 山西农业大学徐进课题组揭示转录因子NAC32调控植物镁毒害响应的分子机理

简介：近日，山西农业大学园艺学院徐进教授课题组在Plant Physiology在线发表了题为“NAC32 alleviates magnesium toxicity-induced cell death through positive regulation of XIPOTL1 expression”的研究论文，阐述了转录因子NAC32通过调控XIPOTL1表达，调节植物对Mg毒害响应的分子机理。

来源：植物生物技术Pbj

发布日期:2022-12-10

全文链接:

http://agri.ckcest.cn/file1/M00/10/18/CsgkOGOYPqGAcoHpAAjZh8sXQS8567.pdf

学术文献

1．A low-cost high-throughput phenotyping system for automatically quantifying foliar area and greenness(一种低成本的高通量表型系统，用于自动量化叶面积和绿色度)

简介：With modern advances in genetic sequencing technology, plant phenotyping has become a substantial bottleneck in crop improvement programs. Traditionally, researchers have manually measured phenotypic traits to help determine genotype-phenotype relationships, but manual measurements can be time consuming and expensive. Recently, automated phenotyping systems have increased the spatial and temporal density of measurements, but most of these systems are extremely expensive and require specialized expertise. In the present paper, we develop and validate a low-cost, scalable, high-throughput phenotyping (HTP) system for automating the measurement of foliar area and greenness.

During a greenhouse experiment on the effects of abiotic stress on Brassica rapa, we collected images of hundreds of plants every hour for over a month with a system that cost approximately US$1000.

In comparison with manually acquired images, this HTP system was able to produce similar estimates of foliar area and greenness, developmental trends, and treatment effects. Foliar area was correlated between the two image sets, but greenness was not.

These findings highlight the potential of HTP systems built from low-cost hardware and freely available software. Future work can use this system to investigate genotype-environment interactions and the genetic loci underlying morphological changes resulting from abiotic stress.

来源：Applications in Plant Sciences

发布日期:2022-11-26

全文链接:

http://agri.ckcest.cn/file1/M00/03/46/CsgkOYfu7n-AJNwnACAAibAfT6s187.pdf

2．A plant growth-promoting bacteria Priestia megaterium JR48 induces plant resistance to the crucifer black rot via a salicylic acid-dependent signaling pathway(一种促进植物生长的细菌Priestia megaterium JR48通过水杨酸依赖性信号通路诱导植物对十字花科黑腐病的抗性)

简介：Xanthomonas campestris pv. campestris (Xcc)-induced black rot is one of the most serious diseases in cruciferous plants. Using beneficial microbes to control this disease is promising. In our preliminary work, we isolated a bacterial strain (JR48) from a vegetable field. Here, we confirmed the plant-growth-promoting (PGP) effects of JR48 in planta, and identified JR48 as a Priestia megaterium strain. We found that JR48 was able to induce plant resistance to Xcc and prime plant defense responses including hydrogen peroxide (H_2O_2) accumulation and callose deposition with elevated expression of defense-related genes. Further, JR48 promoted lignin biosynthesis and raised accumulation of frees salicylic acid (SA) as well as expression of pathogenesis-related (PR) genes. Finally, we confirmed that JR48-induced plant resistance and defense responses requires SA signaling pathway. Together, our results revealed that JR48 promotes plant growth and induces plant resistance to the crucifer black rot probably through reinforcing SA accumulation and response, highlighting its potential as a novel biocontrol agent in the future.

来源：Front Plant Sci

发布日期:2022-11-10

全文链接:

http://agri.ckcest.cn/file1/M00/03/46/CsgkOYfu8iaAeqrVAC2pjmZI2Xs005.pdf

3．Seed priming with brassinolides improves growth and reinforces antioxidative defenses under normal and heat stress conditions in seedlings of Brassica juncea(油菜素内酯对芥菜幼苗在正常和热胁迫条件下的生长和抗氧化防御有促进作用)

简介：Environmental stresses pose a major challenge for plant researchers to fulfill increasing food demand. Researchers are trying to generate high-yielding and stress-tolerant or resistant varieties using classical genetics and modern gene-editing tools; however, both approaches have limitations. Chemical treatments emerged as an alternative to improve yield and impart stress resilience. Brassinosteroids (BRs) are a group of phytohormones that regulate various biological processes, including stress management. With foliar spray methods, BR treatments showed promising results but are not economically feasible. We hypothesize that priming of seeds, which requires lesser amounts of BRs, could be equally effective in promoting growth and stress tolerance. Owing to this notion, we analyzed the impact of priming seeds with selected BRs, namely, 24-epibrassinolide (EBL) and 28-homobrassinolide (HBL), in Brassica juncea under normal and heat shock stress conditions. Seeds primed with BRs and grown until seedlings stage at normal con-ditions (20℃) were subjected to a heat shock (35℃) for a few hours, relating to

what plants experience in natural conditions. Heat shock reduced the growth and biomass with an increased accumulation of reactive oxygen species. As anticipated, BRs treat-ments significantly improved the growth and physiological parameters with an enhanced antioxidant defense under both conditions. Transcriptional analyses revealed that BRs concomitantly induce growth and oxidative stress-responsive gene expression via the canonical BR-signaling pathway. Transfer of unstressed and heat-shock-treated seedlings to field conditions demonstrated the long-term effectivity of BR-priming. Our results showed seed priming with BRs could improve growth and resilience against heat shock; hence, it appears to be a viable strategy to enhance crop yields and stress tolerance.

来源： Physiologia Plantarum

发布日期:2022-11-03

全文链接:

http://agri.ckcest.cn/file1/M00/03/46/CsgkOYfu8LyAKcfOAO5K102e4LQ566.pdf

4．Genome-wide association study reveals a GLYCOGEN SYNTHASE KINASE 3 gene regulating plant height in Brassica napus(全基因组关联研究揭示了一个调节甘蓝型油菜株高的糖原合成酶激酶3基因)

简介： Rapeseed (Brassica napus) is an allotetraploid crop that is the main source of edible oils and feed proteins in the world. The ideal plant architecture breeding is a major objective of rapeseed breeding and determining the appropriate plant height is a key element of the ideal plant architecture. Therefore, this study aims to improve the understanding of the genetic controls underlying plant height. The plant heights of 230 rapeseed accessions collected worldwide were investigated in field experiments over two consecutive years in Wuhan, China. Whole-genome resequencing of these accessions yielded a total of 1,707,194 informative single nucleotide polymorphisms (SNPs) that were used for genome-wide association analysis (GWAS). GWAS and haplotype analysis showed that BnaA01g09530D, which encodes BRASSINOSTEROID-INSENSITIVE 2 and belongs to the GLYCOGEN SYNTHASE KINASE 3 (GSK3) family, was significantly associated with plant height in B. napus. Moreover, a total of 31 BnGSK3s with complete domains were identified from B. napus genome and clustered into four groups according to phylogenetic analysis, gene structure, and motif distribution. The expression patterns showed that BnGSK3s exhibited significant differences in 13 developmental tissues in B. napus, suggesting that BnGSK3s may be involved in tissue-specific development. Sixteen BnGSK3 genes were highly expressed the in shoot apical meristem, which may be related to plant height or architecture development. These results are important for providing new haplotypes of plant height in B. napus and for extending valuable genetic information for rapeseed genetic improvement of plant architecture.

来源： Front Plant Sci

发布日期:2022-11-02

全文链接:

http://agri.ckcest.cn/file1/M00/10/18/CsgkOGOYPWKAPZJXAQzbVdOL54A291.pdf