2019年第35期总202期

蔬菜育种专题

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1．一种创建油菜细胞核雄性不育系和保持系的方法

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前沿资讯

1. Scientists successfully innoculate, grow crops in salt-damaged soil(科学家成功在盐渍化土壤中种植作物)

简介：研究人员可能已经找到了一种方法，来扭转由于日益盐渍化的农田而导致的农作物减产。这项研究最近发表在《微生物学前沿》（Frontiers in Microbiology）上。

在杨百翰大学（Brigham Young University）微生物学和分子生物学教授布伦特·尼尔森（Brent Nielsen）的带领下，科学家们利用在耐盐植物根部发现的细菌，成功地将苜蓿植株接种到盐渍化土壤上。

研究者解释说，他们将这些耐盐植物（称为盐生植物）的根磨碎，然后在实验室的培养皿中培养细菌，分离出了40多种不同的细菌菌株，其中一些能够耐受一定的盐含量。然后，研究小组通过溶液将细菌分离物施用于苜蓿种子，并测试苜蓿在高盐条件下生长的能力。他们在实验中发现了苜蓿能够显著生长。

该项研究确定了两种特殊的细菌分离株—盐单胞菌和芽孢杆菌。它们在1%氯化钠存在下刺激植物生长，这一水平显著抑制了未接种植物的生长。这一发现意义重大，因为中国、澳大利亚和中东地区以及美国西南部的主要农田盐渍化越来越严重。

如果一个地区的土地被反复用于农业，由于灌溉用水中含有盐分，当盐分蒸发或被植物吸收时，盐分就会被留在土壤，导致土壤盐度上升。研究者表示，根据他们的发现，现在由于高盐度而无法维持植物生命的土地，可以再次被用于种植农作物。

除了对美国第四大农作物紫花苜蓿的研究外，研究小组已经开始对水稻、绿豆和生菜进行实验室和温室试验。下一步是对接种的作物进行田间试验。

来源：ScienceDaily

发布日期:2019-08-22

全文链接:

http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1mHFeAWjloAAMeZu2SJD8181.pdf

学术文献

1. Selenium spiked in soil promoted zinc accumulation of Chinese cabbage and improved its antioxidant system and lipid peroxidation (土壤中添加硒促进大白菜锌的积累，改善其抗氧化系统和脂质过氧化作用)

简介：Selenium (Se) and zinc (Zn) are necessary mineral nutrients for human body but millions of people have an inadequate intake of them, and eat food enriched with Se and Zn may minimize these problems. Chinese cabbage is an important food in people's daily life. The aim of this study was to evaluate the effects of single Se, Zn and their combination treatment in soil on their accumulation, antioxidant system and lipid peroxidation in roots and leaves of Chinese cabbage using soil pot culture experiment. When 0.5 mg kg^{-1} Se +30 mg kg^{-1} Zn and 1.0 mg kg^{-1} Se +30 mg kg^{-1} Zn were spiked in soils, Zn concentrations in roots and leaves of Chinese cabbage were significantly increased ($p < 0.05$) by 20.2%, 37.8% and 17.9%, 34.1% respectively compared to the treatment of 30 mg kg^{-1} Zn added, and the latter

was significantly higher ($p < 0.05$) than that of former, indicating Se significantly promoted Zn accumulation. Almost all physiological indexes including POD, SOD, CAT, APX, GR, Chlorophyll a, Chlorophyll b, Carotenoids, MDA and Free proline in the treatments of Se or Zn spiked were significantly improved ($p < 0.05$) or basically unaffected compared to the control without Se or Zn added. The biomass change trends were similar with these indexes either. These results showed that the addition in soil of Se and Zn significantly increased their accumulation in Chinese cabbage without affected its formal growth. Particularly, the addition of Se promoted Zn accumulation. The conclusions were more important reference for the production practice of cash crop enriched of Se and Zn either.

来源： Ecotoxicology and Environmental Safety

发布日期:2019-05-10

全文链接:

http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1mGeGACKwUAAj77uHDHp0981.pdf

2. First Report of Bacterial Leaf Spot Caused by Pseudomonas viridiflava on Chinese Cabbage in China（绿黄假单胞菌（Pseudomonas viridiflava）引起大白菜细菌性叶斑病初报）

简介： Chinese cabbage (Brassica rapa L. ssp. pekinensis) is an important and widely cultivated vegetable in China and is consumed worldwide. However, the yield and quality of this vegetable can be affected by soft rot, downy mildew, and virus diseases during the growing season.

来源： Plant Disease

发布日期:2019-05-07

全文链接:

http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF117jaAD7DrAAGU31iFTzU223.pdf

3. Understanding the Resistance Mechanism in Brassica napus to Clubroot Caused by Plasmodiophora brassicae（甘蓝型油菜抗根肿病机理的研究）

简介： Exploring the mechanism of plant resistance has become the basis for selection of resistance varieties but reports on revealing resistant mechanism in Brassica napus against Plasmodiophora brassicae are rare. In this study, RNA-seq was conducted in the clubroot-resistant B. napus breeding line ZHE-226 and in the clubroot-susceptible rapeseed cultivar Zhongshuang 11 at 0, 3, 6, 9, and 12 days after inoculation. Strong alteration was detected specifically in ZHE-226 as soon as the root hair infection happened, and significant promotion was found in ZHE-226 on cell division or cell cycle, DNA repair and synthesis, protein synthesis, signaling, antioxidation and secondary metabolites. Combining results from physiological, biochemical and histochemical assays, our study highlights an effective signaling in ZHE-226 in response to P. brassicae. This response consists of a fast initiation of receptor kinases by P. brassicae; the possible activation of host intercellular G proteins which might, together with an enhanced Ca2+ signaling, promote the production of reactive oxygen species; and programmed cell death in the host. Meanwhile, a strong ability to maintain

homeostasis of auxin and cytokinin in ZHE-226 might effectively limit the formation of clubs on host roots. Our study provides initial insights into resistance mechanism in rapeseed to P. brassicae.

来源：Phytopathology

发布日期:2019-04-12

全文链接:

http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1mGUKATUj-ACE1jyjgWzU263.pdf

4. CRISPR/Cas9-mediated genome editing reveals differences in the contribution of INDEHISCENT homologues to pod shatter resistance in Brassica napus L.(CRISPR / Cas9介导的基因组编辑揭示了INDEHISCENT同源物对甘蓝型油菜抗裂角性的贡献差异)

简介：The INDEHISCENT (IND) and ALCATRAZ (ALC) gene homologues have been reported to be essential for dehiscence of fruits in Brassica species. But their functions for pod shatter resistance in Brassica napus, an important oil crops, are not well understood. Here, we assessed the functions of these two genes in rapeseed using CRISPR/Cas9 technology. The induced mutations were stably transmitted to successive generations, and a variety of homozygous mutants with loss-of-function alleles of the target genes were obtained for phenotyping. The results showed that the function of BnIND gene is essential for pod shatter and highly conserved in Brassica species, whereas the BnALC gene appears to have limited potential for rapeseed shatter resistance. The homoeologous copies of the BnIND gene have partially redundant roles in rapeseed pod shatter, with BnA03.IND exhibiting higher contributions than BnC03.IND. Analysis of data obtained from the gene expression and sequence variations of gene copies revealed that cis-regulatory divergences alter gene expression and underlie the functional differentiation of BnIND homologues. Collectively, our results generate valuable resources for rapeseed breeding programs, and more importantly provide a strategy to improve polyploid crops.

来源：Theoretical and Applied Genetics

发布日期:2019-04-12

全文链接:

http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1l8oWAFfj3ACQltPJJztM026.pdf

5. Inherited allelic variants and novel karyotype changes influence fertility and genome stability in Brassica allohexaploids(遗传等位变异和新核型改变对芸薹属异源六倍体的育性和基因组稳定性的影响)

简介：Synthetic allohexaploid Brassica hybrids (2n=AABBCC) do not exist naturally, but can be synthesized by crosses between diploid and/or allotetraploid Brassica species. Using these hybrids, we aimed to identify how novel allohexaploids restore fertility and normal meiosis after formation.

Chromosome inheritance, genome structure, fertility and meiotic behaviour were assessed in

three segregating allohexaploid populations derived from the cross (B. napus ×B. carinata)×B. juncea using a combination of molecular marker genotyping, phenotyping and cytogenetics. Plants with unbalanced A-C translocations in one direction (where a C-genome chromosome fragment replaces an A-genome fragment) but not the other (where an A-genome fragment replaces a C-genome fragment) showed significantly reduced fertility across all populations. Genomic regions associated with fertility contained several meiosis genes with putatively causal mutations inherited from the parents (copies of SCC2 in the A genome, PAIR1/PRD3, PRD1 and ATK1/KATA/KIN14a in the B genome, and MSH2 and SMC1/TITAN8 in the C genome).

Reduced seed fertility associated with the loss of chromosome fragments from only one subgenome following homoeologous exchanges could comprise a mechanism for biased genome fractionation in allopolyploids. Pre-existing meiosis gene variants present in allotetraploid parents may help to stabilize meiosis in novel allohexaploids.

来源： New Phytologist

发布日期: 2019-03-19

全文链接:

http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1l86KAafVfABxeUJr-LRs621.pdf

相关专利

1. 一种创建油菜细胞核雄性不育系和保持系的方法

简介： 本发明公开了一种创建油菜细胞核雄性不育系和保持系的方法，直接通过CRISPR-cas9技术，敲除油菜野生型中的LOC106443696基因和LOC106370785基因创建不育系，并通过对不同的敲除个体进行杂交筛选获得其细胞核雄性不育系和保持系。利用该方法可以直接通过敲除野生型基因创建不育系，不需要对保持系和不育系进行多代转育，大大缩短了育种时间；获得的雄性不育系育性稳定，不育系败育彻底；并且本方法虽然采用了基因编辑和转基因技术，但采用其创建的不育系不含转基因的成分；该技术也适用于含有该基因的其它十字花科作物，应用范围广。

来源： 国家知识产权局

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全文链接:

http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1mHvGAM-8BAB8pKpOEWB4597.pdf