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蔬菜育种专题

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1. 一种富集芸薹属芽苗菜中异硫氰酸酯含量并提高产量的生产方法

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前沿资讯

1. India: Disease breakthrough for brassica crops(印度：芸苔属植物病害获得突破)

简介：来自印度旁遮普农业大学和西澳大利亚大学(UWA)的研究团队，在芸苔属油料作物的抗病性方面取得了重大突破。

芸苔属是十字花科植物中的重要植物属，其品种通常用于食品，包括西兰花、花椰菜、卷心菜、萝卜，特别是用于生产菜籽油和调味品芥末的油料作物。

菌核病对油菜和芥菜等芸苔属植物危害严重，在全世界范围内造成重大产量损失，这一发现将促进作物免受菌核病的侵害。

这项研究发表在《植物科学前沿》(Frontiers in Plant Science)杂志上，描述了与芥菜(Indian mustard)抗菌核病相关的遗传标记。

研究人员表示，通过芸薹属作物中存在的遗传抗性可以实现对菌核病的治理。培育抗病能力更强的作物是长期、低成本管理这种毁灭性的全球性病原体的唯一有效途径。研究为野生杂草芸苔的渐渗抗性基因首先应用到芥菜型油菜(B. juncea)的一系列高产品种中，随后应用到油菜(canola)及其他作物和园艺用芸苔属(Brassica)品种中开辟了道路。

芥菜是印度最主要的油料作物，在澳大利亚干旱地区具有巨大潜力。这项研究对澳大利亚和印度的农业具有显著的益处。同时为其他芸苔属作物的抗病性研究提供机会。

这项研究得到了印度政府生物技术部、印度农业研究理事会和西澳大学的支持。

来源：AgroPages

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全文链接:

http://agri.ckcest.cn/file1/M00/0E/81/CsgkOF1wcZKAOvPDAAbwHPAaaUw389.pdf

学术文献

1. Transcriptional Insight Into Brassica napus Resistance Genes LepR3 and Rlm2-Mediated Defense Response Against the Leptosphaeria maculans Infection(甘蓝型油菜抗性基因LepR3和RLM2介导的针对油菜茎基溃疡病菌感染的防御反应的转录研究)

简介：The phytopathogenic fungus Leptosphaeria maculans causes the blackleg disease on Brassica napus, resulting in severe loss of rapeseed production. Breeding of resistant cultivars containing race-specific resistance genes is provably effective to combat this disease. While two allelic resistance genes LepR3 and Rlm2 recognizing L. maculans avirulence genes AvrLm1 and AvrLm2 at plant apoplastic space have been cloned in B. napus, the downstream gene expression network underlying the resistance remains elusive. In this study, transgenic lines expressing LepR3 and Rlm2 were created in the susceptible “Westar” cultivar and inoculated with L. maculans isolates containing different sets of AvrLm1 and AvrLm2 for comparative transcriptomic analysis. Through grouping the RNA-seq data based on different levels of defense response, we find LepR3 and Rlm2 orchestrate a hierarchically

regulated gene expression network, consisting of induced ABA acting independently of the disease reaction, activation of signal transduction pathways with gradually increasing intensity from compatible to incompatible interaction, and specifically induced enzymatic and chemical actions contributing to hypersensitive response with recognition of AvrLm1 and AvrLm2. This study provides an unconventional investigation into LepR3 and Rlm2-mediated plant defense machinery and adds novel insight into the interaction between surface-localized receptor-like proteins (RLPs) and apoplastic fungal pathogens.

来源： Frontiers in Plant Science

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http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1wa-2AARtGAF1NW-kWssg039.pdf

2. Role of Major Glucosinolates in the Defense of Kale Against Sclerotinia sclerotiorum and Xanthomonas campestris pv. Campestris(主要硫代葡萄糖苷在防御羽衣甘蓝抗菌核盘菌和野油菜黄单胞菌中的作用)

简介： Glucosinolates (GSLs) are secondary metabolites present in Brassicaceae species implicated in their defense against plant pathogens. When a pathogen causes tissue damage, the enzyme myrosinase hydrolyzes GSLs into diverse products that exhibit antimicrobial activity against a wide range of bacteria and fungi in vitro. It was demonstrated that modulation of GSL content in vivo affects plant resistance to infection by pathogens in Arabidopsis. However, the roles of specific metabolites and how they interact with pathogens are poorly understood in Brassica crops. We previously developed a set of populations of Brassica oleracea var. acephala L. (kale) differing in content of three GSLs: the aliphatics sinigrin (2-propenyl [SIN]) and glucoiberin (3-methylsulphinylpropyl [GIB]) and the indolic glucobrassicin (3-indolylmethyl [GBS]). These populations can be used to study the effects of major GSLs in kale, with the advantage that genotypes within each selection have the same genetic background. This research aimed to explore the role of SIN, GIB, and GBS in the defense of kale against the necrotrophic fungus Sclerotinia sclerotiorum and the bacterium Xanthomonas campestris pv. campestris. Results showed that increasing the amount of a particular GSL did not always result in disease resistance. The effects of GSLs were apparently dependent on the pathogen and the type of GSL. Thus, the aliphatic SIN was inhibitory to infection by S. sclerotiorum and the indolic GBS was inhibitory to infection by X. campestris pv. campestris. Other factors, including the quantity and proportion of other metabolites modified during the pathogen infection process, could also modulate the degree of inhibition to the pathogen.

来源： Phytopathology

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全文链接:

http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1wb8yAP1ypAA7HZ35MJxk937.pdf

3. Possible role of HMA4a TILLING mutants of Brassica rapa in

cadmium phytoremediation programs(芜菁HMA4a TILING突变体在镉植物修复中的可能作用)

简介：Cadmium (Cd) is a dangerous transition element that causes environmental and health problems due to its high mobility in the soil-plant system. In plants, Cd causes serious alterations in physiological processes, affecting different vital functions such as photosynthesis. Species such as Brassica juncea and Brassica rapa have been selected as suitable plants for phytoremediation purposes due to their ability to tolerate the toxic effect of heavy metals. In order to improve this strategy, techniques of plant mutagenesis such as TILLING (Targeting Induced Local Lessions in Genomes) have been employed. In the present work we studied the role of the HMA4 gene in the tolerance to Cd toxicity (100μM CdCl2) using a TILLING mutant of B. rapa (BraA.hma4a-3). These mutant plants presented a lower biomass reduction and a higher Cd concentration in leaves. An increase in the GSH/GSSG ratio, in the content of photosynthetic pigments and a reduction of oxidative stress was observed, as well as a better photosynthetic index, confirming that BraA.hma4a-3 plants showed a higher tolerance to Cd. In conclusion, according to the results obtained in this work, BraA.hma4a-3 plants could be used for phytoremediation purposes of Cd contaminated soils.

来源：Ecotoxicology and Environmental Safety

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http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1wazOABan9ABMmBfkell8401.pdf

4. Efficient BoPDS Gene Editing in Cabbage by the CRISPR/Cas9 System(利用CRISPR/Cas9系统高效编辑甘蓝BoPDS基因)

简介：Genome editing offers great advantages in identifying gene function and generating agronomically important mutations in crops. Here, we report that the genome of cabbage (Brassica oleracea var. capitata), an important cruciferous vegetable, can also be precisely edited by a CRISPR/Cas9 system stacked with multiple single-guide RNA-expressing cassettes. When the phytoene desaturase BoPDS gene was used as the target gene, an albino-phenotype transgenic shoot in T0 Basta-resistant lines was observed, and 37.5% of the transgenic cabbage shoots carried BoPDS gene mutations as a result of nucleotide deletions at the expected position. Moreover, mutations were detected in sites with the same target sequence in gene Bol016089 which is paralogous to the BoPDS gene. Our results show that the CRISPR/Cas9 system is a powerful tool for cabbage variety improvement by genome editing.

来源：Horticultural Plant Journal

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http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1wbwGAG94SABnuPPIDtgQ767.pdf

5. The role of epicuticular waxes on foliar metal transfer and phytotoxicity in edible vegetables: case of Brassica oleracea species

exposed to manufactured particles(表皮蜡质对食用蔬菜叶片金属转移和植物毒性的作用：以接触人工颗粒的甘蓝为例)

简介：The rapid industrialization and urbanization of intra- and peri-urban areas at the world scale are responsible for the degradation of the quality of edible crops, because of their contamination with airborne pollutants. Their consumption could lead to serious health risks. In this work, we aim to investigate the phytotoxicity induced by foliar transfer of atmospheric particles of industrial/urban origin. Leaves of cabbage plants (Brassica oleracea var. Prover) were contaminated with metal-rich particles (PbSO4 CuO and CdO) of micrometer size. A trichloroacetic acid (TCA) treatment was used to inhibit the synthesis of the epicuticular waxes in order to investigate their protective role against metallic particles toxicity. Besides the location of the particles on/in the leaves by microscopic techniques, photosynthetic activity measurements, genotoxicity assessment, and quantification of the gene expression have been studied for several durations of exposure (5, 10, and 15 days). The results show that the depletion of epicuticular waxes has a limited effect on the particle penetration in the leaf tissues. The stomatal openings appear to be the main pathway of particles entry inside the leaf tissues, as demonstrated by the overexpression of the BolC.CHLI1 gene. The effects of particles on the photosynthetic activity are limited, considering only the photosynthetic Fv/Fm parameter. The genotoxic effects were significant for the contaminated TCA-treated plants, especially after 10 days of exposure. Still, the cabbage plants are able to implement repair mechanisms quickly, and to thwart the physiological effects induced by the particles. Finally, the foliar contamination by metallic particles induces no serious damage to DNA, as observed by monitoring the BolC.OGG1 gene.

来源：Environmental Science and Pollution Research

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http://agri.ckcest.cn/file1/M00/0E/80/CsgkOF1wcH-ACswAAC4Py4nBCaE469.pdf

相关专利

1．一种富集芸薹属芽苗菜中异硫氰酸酯含量并提高产量的生产方法

简介：本发明公开了一种富集芸薹属芽苗菜中异硫氰酸酯含量并提高产量的生产方法，包括以具备发芽能力的芸薹属蔬菜种子为原料，经消毒浸泡后，在恒温条件下再经外源褪黑素联合硫酸锌溶液发芽，制得富含异硫氰酸酯的芸薹属芽苗菜。本发明具有工艺简单，生产成本低，异硫氰酸酯含量高以及芸薹属芽苗菜产量高等特点，适用于保健食品级异硫氰酸酯芸薹属芽苗菜生产。

来源：国家知识产权局

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