2022年第17期总340期

蔬菜育种专题

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学术文献

1. A single-base insertion in BoDFR1 results in loss of anthocyanins in green-leaved ornamental kale(BoDFR1中的单碱基插入可导致绿叶观赏羽衣甘蓝中花青素损失)

简介：Anthocyanins are widely distributed in nature and give plants their brilliant colors. Leaf color is an important trait for ornamental kale. In this study, we measured anthocyanin contents and performed transcriptome deep sequencing (RNA-seq) of leaves from pink and green ornamental kale. We observed substantial differences in the expression levels of the two DIHYDROFLAVONOL 4-REDUCTASE-encoding genes BoDFR1 (Bo9g058630) and its ortholog BoDFR2 (Bo2g116380) between green-leaved and pink-leaved kale by RNA-seq and RT-qPCR. We cloned and sequenced BoDFR1 and BoDFR2 from both types of kale. We identified a 1-bp insertion in BoDFR1 and a 2-bp insertion in BoDFR2 in green-leaved kale compared to the sequences obtained from pink-leaved kale, both mapping to the second exon of their corresponding gene and leading to premature termination of translation. To confirm the genetic basis of the absence of anthocyanins in green kale, we used CRISPR/Cas9 genome editing to separately knock out BoDFR1 or BoDFR2 in the pink-leaved ornamental kale inbred line P23. We detected very low accumulation of anthocyanins in the resulting mutants Bodfr1-1 and Bodfr1-2, while Bodfr2-1 and Bodfr2-2 had anthocyanin levels comparable to those of the wild-type. We conclude that the insertion in BoDFR1, rather than that in BoDFR2, underlies the lack of anthocyanins in green-leaved ornamental kale. This work provides insight into the function of DFR and will contribute to germplasm improvement of ornamental plants.

来源：Theoretical and Applied Genetics

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http://agri.ckcest.cn/file1/M00/0F/FF/CsgkOGJdBOSAE__OACqfSuRz_IM413.pdf

2. The Effect of Various Foliar Treatments and Nitrogen Nutrition Levels on the Yield and Physicochemical Parameters of Flowering Chinese Cabbage(不同叶面处理和氮素营养水平对开花大白菜产量和理化指标的影响)

简介：Flowering Chinese cabbage (Brassica campestris L. ssp. chinensis var. utilis Tsen et Lee) is an original leafy vegetable from China, and it is a valuable source of bioactive compounds. In the literature, there are no practical recommendations for the cultivation and fertilization of this species. Our study aimed to investigate the effect of nitrogen nutrition levels (70 and 90 mg N per dm^3) and various foliar treatments (Se, Si, Li, V, and SA—salicylic acid) on the quantity of the yield and the quality of flowering Chinese cabbage grown in two varied soilless cultivation systems: under pot cultivation (mixture of peat and sand) and hydroponic culture. In conducted studies, we have confirmed the hypothesis that the intensity of nitrogen nutrition and the application of foliar spraying modify the yield of

plants, both the quantity and the quality aspects. The factors under analysis had a diversified and multidirectional influence on the yield, growth, and quality of the plants. The results varied between the two cultivation systems. This was proved by the PCA (principal component analysis). Generally, the plants grown in the hydroponic system were characterized by higher yields than those grown in pot cultivation. This was found to be a stimulating effect of N nutrition on the content of that nutrient in the aerial parts of the plants. Plants sprayed with Si and Se were characterized by a high content of Chl a, Chl b, carotenoids, and relatively high antioxidant activity. Finally, the samples subjected to different foliar spray treatments could be classified into appropriate groups based on the quality parameters.

来源： Agronomy

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http://agri.ckcest.cn/file1/M00/03/2D/CsgkOYazvH2AaLOOACkc75idaVA951.pdf

3. Ultraviolet-B Irradiation Increases Antioxidant Capacity of Pakchoi (Brassica rapa L.) by Inducing Flavonoid Biosynthesis(利用紫外线-B通过诱导类黄酮生物合成提高小白菜（Brassica rapa L.）的抗氧化能力)

简介： As an important abiotic stress factor, ultraviolet-B (UV-B) light can stimulate the accumula-tion of antioxidants in plants. In this study, the possibility of enhancing antioxidant capacity in pak-choi (Brassica rapa L.) by UV-B supplementation was assessed. Irradiation with 4 μmol •m^{-2} •s^{-1} UV-B for 4 h or 2 μmol •m^{-2} •s^{-1} UV-B for 24 h significantly increased the 1,1-diphenyl-2-picrylhydrazyl (DPPH) scavenging activity and total reductive capacity, as a result of inducing a greater accumulation of total polyphenols and flavonoids without affecting the plant biomass. A high performance liquid chromatography (HPLC) analysis showed that the concentrations of many flavonoids significantly increased in response to UV-B treatment. The activities of three enzymes involved in the early steps of flavonoid biosynthesis, namely phenylalanine ammonia-lyase (PAL), cinnamate-4-hydroxylase (C4H), and 4-coumarate: coenzyme A (CoA) ligase (4CL), were significantly increased after the corresponding UV-B treatment. Compared with the control, the expression levels of several flavonoid biosynthesis genes (namely BrPAL, BrC4H, Br4CL, BrCHS, BrF3H, BrF3′H, BrFLS, BrDFR, BrANS, and BrLDOX) were also significantly up-regulated in the UV-B treatment group. The results suggest that appropriate preharvest UV-B supplementation could improve the nutritional quality of greenhouse-grown pakchoi by promoting the accumulation of antioxidants.

来源： Plants

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http://agri.ckcest.cn/file1/M00/0F/FF/CsgkOGJdCAmAa1pKACQKXhLO-VI150.pdf

4. Nitrogen Absorption Pattern Detection and Expression Analysis of

Nitrate Transporters in Flowering Chinese Cabbage(开花大白菜中硝酸盐转运蛋白的吸氮模式检测及表达分析)

简介：Nitrate transporters (NRTs) play an important role in nitrate absorption and internal distribution in plant roots and other parts. Experiments were carried out to explore the sequences and expression characteristics of NRT genes, and their correlation with the N uptake in flowering Chinese cabbage. We have isolated three important BcNRTs (BcNRT1.1, BcNRT1.2, and BcNRT2.1) from flowering Chinese cabbage. Spatio-temporal expression analysis found that BcNRT1.1 and BcNRT2.1 were mainly expressed in roots, while BcNRT1.2 was more expressed in roots than in leaves during vegetative growth and was mainly expressed in leaves during reproductive growth. The NO_3^- uptake rate of the entire growth period was significantly correlated with BcNRT1.1 and BcNRT1.2 expression in roots. In addition, the total N content was increased with the increase in NO_3^- concentration in flowering Chinese cabbage. The NH_4^+ uptake was slightly induced by NH_4^+, but the total N content had no significant difference under the NH4+ concentration of 1-8 mmol/L. We also found that lower concentrations of NH_4^+ promoted the expression of BcNRT1.1 and BcNRT1.2 while inhibiting the expression of BcNRT2.1 in the roots of flowering Chinese cabbage. The amount of total N uptake in the treatment with 25/75 of NH_4^+/NO_3^- was significantly higher than that of the other two treatments (0/100 and 50/50). In the mixture of NH_4^+ and NO_3^-, total N uptake was significantly correlated with the BcNRT1.2 expression. We concluded that mixed nutrition with an NH_4^+/NO_3^- of 25/75 could significantly increase total nitrogen uptake in flowering Chinese cabbage, in which two members of the NRT1 subfamily (BcNRT1.1 and BcNRT1.2) might play a major regulatory role in it. This study is a beneficial attempt to dig deeper into the NRT genes resources and lays the foundation for the ultimate use of genetic improvement methods to increase the NUE with less nitrogen fertilizer in flowering Chinese cabbage.

来源：Horticulturae

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http://agri.ckcest.cn/file1/M00/03/2D/CsgkOYazu3CAWkJpACGnTy6HUfk495.pdf

5. Construction of an Intragenic SSR-Based Linkage Map and QTL Mapping for Agronomic Traits in Chinese Cabbage (Brassica rapa L. ssp. pekinensis)(基于基因内 SSR 的大白菜农艺性状连锁图谱和 QTL 定位的构建 (Brassica rapa L. ssp. pekinensis))

简介：Chinese cabbage (Brassica rapa L. ssp. pekinensis) is one of the most widely cultivated and economically important vegetables in China. Constructing an effective genetic linkage map and mapping quantitative trait loci (QTLs) related to yield and leafy head morphology is of great importance for molecular breeding of Chinese cabbage. Using two diverse Chinese cabbage inbred lines, ZHB and G291, as parents, an F_2 segregating population consisting of 240 individuals was prepared for genetic map construction and phenotype investigation in this study. The two parents are significantly different in both shape and size. Sixteen important agronomic traits of F_2 individuals were investigated. A genetic map of 105

intragenic simple sequence repeat (SSR) markers distributed across 10 linkage groups (LGs) was constructed, which was 2034.1 cM in length and had an average inter-locus distance of 21.75 cM. We identified 48 QTLs for the tested important agronomic traits on the studied LGs, with LOD scores of 2.51-12.49, which explained the phenotypic variance of 3.41-26.66%. The QTLs identified in this study will facilitate further genetic analysis and marker-assisted genetic improvement of Chinese cabbage.

来源： Horticulturae
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http://agri.ckcest.cn/file1/M00/03/2D/CsgkOYazul-ANWVuAAmngUw8zFY517.pdf