



2019年第5期总5期

杂交水稻专题

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▶ 前沿资讯

1. 研究发现水稻中过表达Os03L2和Os03L3全长和截断片段均可降低米粒中的镉积累

简介: 镉是一种高毒性重金属，它可积累于人体的多个器官（特别是肝和肾），即使是低剂量地长期摄入也会造成严重后果，例如使人患上癌症或其他疾病。水稻是全球半数人口的主要粮食，它同时也是人类镉摄入的主要来源。2013年的一篇新闻报道指出，在广东抽检的大米中，近半数的镉含量都超过国家标准。为解决水稻镉积累问题，中国科学院华南植物园转基因中心副研究员王昌虎等人在研究员区永祥的指导下开展相关科学研究。2016年，王昌虎等发现，在水稻中过表达OXS3（氧化胁迫3基因）的家族成员Os03L2和Os03L3的截短片段不但可以降低根和叶中的镉吸收，而且能显著降低种子中镉的积累（Wang C et al. 2016. Molecular Plant 9:301-304）。由于该发现在抗镉积累的水稻分子育种中具有显著的应用价值，相关的多肽和基因在2018年获得了中国发明专利的授权。鉴于获取组成型过表达Os03L2和Os03L3全长基因的植株非常困难，所以在以往的试验中并未涉及相关的功能研究，为了检验Os03L2和Os03L3截短序列的抗镉功能是来自该基因本身，还是源自人为截短基因，最近王昌虎等尝试用诱导性表达的方式对这两个基因的全长序列进行了功能研究。结果表明，跟截短序列一样，过表达Os03L2和Os03L3全长序列可以在不影响锰、铁、铜和锌等重要金属元素的含量下，明显降低米粒中的镉含量(图1)，这便明确了水稻抗镉功能是来自于此两个基因的本身。同时也发现全长基因的表达转化率显著低于截短片段，提示该基因过表达量过高可能致死转基因系。此外，Os03L2和Os03L3的细胞和组织学定位结果显示，这两个蛋白是维管束细胞中与组蛋白H2A互作的一类核蛋白，由此推测，它们很可能通过与H2A互作而改变染色质的结构，进一步调控下游的基因表达，从而减少水稻中的镉积累。

来源: 中国科学院

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全文链接:

http://www.cas.cn/syky/201907/t20190712_4699530.shtml

2. 中国海水稻在迪拜取得巨大突破

简介: 2018年10月，受迪拜方邀请，武汉海稻国际农业开发有限公司承接了E0（迪拜酋长私人办事处工程办公室）《利用水稻种植改良土地项目（2期）》的服务合同，为迪拜沙漠环境下开展海水稻的种植提供完整的配套技术服务。合同签订后，武汉海稻国际农业开发有限公司专门成立了由资深水稻专家组成的迪拜项目5人专家小组，带着具有自主知识产权的海水稻品种——“海稻86”及系列品种于2018年11月27日正式进驻迪拜沙漠腹地的Al Marmoom Site 2项目基地，按E0要求合同要求的服务内容，在沙漠盐碱地开始了项目的落地工作。迪拜农业生态气候条件特殊，水稻生产的安全窗口期非常的短暂，在技术上稍有疏忽就会导致水稻绝收。在半年多的时间里，项目专家小组克服了“苗期夜间低温、穗期高温干热风、全生育干旱少雨”等对水稻生长极端不利气候条件的影响，以及“沙土保水保肥能力差，土壤团粒结构缺乏，地下害虫与地面鸟害严重，淡水资源紧张，土壤及井水盐度高，项目区不准使用农药和无机氮肥，农业劳工缺乏”等诸多困难，通过创新播种方式、科学的肥水管理，严格的生长进程管控，项目最终取得了最终的成功。2019年6月6日，由中国科学院院士谢华安、上海农业生物基因中心研

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究员罗利军、四川省农科院水稻高粱研究所研究员郑家奎、湖北荆楚种业股份有限公司农业推广研究员段洪波以及迪拜E0公司总经理助理Arun、项目管理经理Jinu、项目助理Liangxiaochuan等7人组成的专家小组,对项目区试种的海水稻系列品种采取随机取样、实割称重的方式进行了测产,在扣除杂质、水分后,实收净谷平均亩产达到629公斤,实现了迪拜沙漠盐碱地水稻种植的重大突破。专家组认为,项目成果达到了沙漠盐碱地上水稻种植的国际先进水平。

来源: 中国青年网

发布日期:2019-07-12

全文链接:

<http://www.wzrb.com.cn/%E9%94%9B%EF%BF%BD25252525255c/article955970show.htm>
[1](#)

➤ 学术文献

1. Higher endogenous bioactive gibberellins and alpha-amylase activity confer greater tolerance of rice seed germination to saline-alkaline stress (内源性生物活性较高的赤霉素和 α -淀粉酶活性使水稻种子萌发对盐碱胁迫具有更大的耐受性)

简介: Seed germination is the most critical phase in plant life cycle and sensitive to saline-alkaline stress. However, few studies have investigated the mechanisms by which rice seeds respond and tolerate to saline-alkaline stress. We explored physiological and molecular mechanisms underlying tolerance to saline-alkaline stress during seed germination using two rice genotypes (Dongdao-4 and Jigeng-88) differing in their tolerance to saline-alkaline stress. Seed germination in Dongdao-4 rice was less inhibited by saline-alkaline stress than Jigeng-88 rice, as evidenced by higher ratio of seed germination rate between saline-alkaline stress and control in Dongdao-4 than that in Jigeng-88. Higher endogenous concentrations of gibberellins (GA(1) and GA(4)) and greater expression levels of GA biosynthetic genes and lower expression levels of genes involved in inactivation of GAs in Dongdao-4 than in Jigeng-88 seeds were observed when challenged by saline-alkaline stress, suggesting that a higher concentration of bioactive GAs may underpin the greater tolerance of Dongdao-4 to saline-alkaline stress than that of Jigeng-88. We further demonstrated that exogenous application of GA and GA biosynthetic inhibitors enhanced and suppressed seed germination under conditions of saline-alkaline stress, respectively. Moreover, we demonstrated a higher activity of alpha-amylase in Dongdao-4 than in Jigeng-88 seeds under saline-alkaline stress. These findings highlight that a greater amount of endogenous bioactive GAs and a higher activity of alpha-amylase in seeds may account for the greater tolerance of Dongdao-4 to saline-alkaline stress during seed germination.

来源: Environmental and experimental botany

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全文链接:

<http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0xMkWAcZFLAAuPkjvBZyI740.pdf>

2. The role of OsNLA1 in regulating arsenate uptake and tolerance in rice (OsNLA1在调节水稻砷酸盐吸收和耐受中的作用)

简介: Arsenic (As) contamination in agricultural soil can cause phytotoxicity and lead to As accumulation in crops. Rice (*Oryza sativa*) feeds half of the world's population, but the molecular mechanism of As detoxification is not well understood in rice. In this study, the role of OsNLA1 in arsenate uptake and tolerance in rice was analyzed. OsNLA1 expression was induced in response to As(V) stress. The *osnla1* mutant was more sensitive to As(V) stress than those of the wild type (WT). When exposed to As(V), mutation of OsNLA1 resulted in 30% greater As accumulation in roots and shoots of the WT. Although OsPT8 expression was induced after As(V) exposure, the amount of its protein was reduced. Unexpectedly, the *osnla1* mutant showed a significant increase in punctate structures of OsPT8-GFP in response to As(V) stress, while the amount of the OsPT8-GFP protein in the *osnla1* mutant was greater than in the WT. Combining OsNLA1 mutation with OsPT8 overexpression resulted in As(V) hypersensitivity, As hyperaccumulation, and higher shoot to root ratio of As in rice. These results indicated that OsNLA1 plays an important role in arsenate uptake and tolerance, mainly via regulating the amount of Pi transporters.

来源: Journal of Plant Physiology

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全文链接:

<http://agri.ckcest.cn/file1/M00/06/89/Csgk0F0xP0yANQrpACIZ0gf35Q4708.pdf>

3. Differential growth and yield response of hybrid rice (*Oryza sativa* L.) to seasonal variability (杂交稻对季节变异的差异生长和产量响应)

简介: The response of hybrid rice to seasonal changes is largely unknown. This study presents the effort to assess the response of tropical hybrid rice to rainy and winter seasons in alluvial soils at Regional Research Sub-Station under Bidhan Chandra Krishi Viswavidyalaya, Chakdah, West Bengal. Five commercial tropical hybrid rice cultivars together with a local HYV were evaluated in randomized complete block design with three replications. The variety NPH-207 (Champion) produced taller plants and recorded significantly higher number of effective tillers than the local HVY (Satabdi) did during both the seasons. The cultivar NPH-8 8 89 (Karishma) recorded the maximum chlorophyll content at all dates of observations and it was statistically at par with NPH-207 (Champion). The values of all measured yield components were higher in the hybrid cultivar NPH-207 (Champion) in comparison with any other tested cultivars. Consequently, NPH-207 (Champion) produced significantly higher grain and straw yield, accounting 67.9 and 50.1 % more than those obtained from HYV in rainy season, while 98.2 and 103% more than those obtained from HYV in winter season, respectively. The significant and positive correlations with grain yield were observed between plant height, 1000 grain weight and chlorophyll content at 30 DAT both in rainy and winter season.

来源: Indian journal of agricultural research

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