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前沿资讯

1. Google wants Indian farmers to use AI to find bugs in cotton crop, improve annual yield(印度农民利用人工智能防控棉花害虫)

简介：印度是世界上最大的棉花生产国和第二大棉花出口国。然而，对于种植棉花的农民来说，2017年是可怕的一年。因为这一年受到棉红铃虫袭击导致棉花产量减少近50%。尽管印度棉农在棉花上使用的杀虫剂占到近55%，但这种情况仍未能避免。主要原因是由于在害虫出现的早期，未能及时发现害虫。如果农民能够在虫害早期及时发现，2017年大部分棉花本就可以得到挽救。Wadhwani AI的目标是改变这一点。Wadhwani AI开发了人工智能模型，可实时识别作物上的各种害虫，并通过处理云中收集的数据向农民提供现场建议。

Wadhwani AI是一家位于孟买的非营利组织。该组织表示，它致力于利用人工智能促进社会福利。该公司专注于在健康和农业领域使用人工智能。

在我们了解这家初创公司如何帮助印度的小户棉农之前，重要的是要了解是什么导致了大规模的虫害，比如2017年的那次，它摧毁了棉花作物。小农户主要依靠野外工作人员或政府指定的推广人员提供咨询。这些推广人员考察每个村庄的农田，那里都有害虫诱捕器—基本上是可以粘贴害虫的粘纸。他们手动识别害虫并对其进行计数。他们在智能手机上输入这些数据，并将其发送给专家征求意见。当专家分析这些数据后，他们会向有虫害的农场提出建议。

然而，这项技术效率不高，因为它不是非常可靠，而且也很费时。这就是Wadhwani AI开发的基于人工智能模型的原因，该模型最近得到了谷歌一些专家的支持。

与工人手动识别和计数害虫不同，人工智能只需工人拍摄害虫的照片。在后台工作的人工智能模型能够识别各种害虫，并通过处理云中收集的数据向农民提供现场建议。这些数据也将提交给专家进行进一步分析。

虽然该方法是有效的，但是它也存在使其无效的可能性，特别是在通讯不发达的区域。Wadhwani AI通过压缩其人工智能模型来解决这个问题，这样它就可以在基本的智能手机上工作。压缩模型的实现，使得这个人工智能模型足够小，可以安装在一个基本的智能手机上，因此可以实现离线工作。近期在东京举行的谷歌人工智能解决方案会议上，研发人员谈到了该方案的细节。

这个特性的有趣之处在于它不是以独立的形式提供的，相反，它是一个开源模型，适用于世界各地的任何农业项目。通过提高人类技能，就能够帮助数百万农民，可称为人工智能的规模效应。

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学术文献

1. 天然氨基酸诱导野油菜黄单胞菌降解DSF-家族群体感应信号活性分析

简介：【背景】野油菜黄单胞菌(Xanthomonas campestris pv. campestris，Xcc)是十字花科植物黑腐病的致病菌。Xcc中DSF (diffusible signal factor)信号依赖的群体感应系统和RpfB介导的群体感应退出机制均与其致病性密切相关。【目的】分别检测18种氨基酸对DSF-家族群体感应信号分子合成的影响，为研发新型生物防治方法提供思路。【方法】添加不同浓度的氨基酸到Δ rpfC菌株XYS培养体系中，接种后不同时间点取样提取DSF信号分子，利用高效液相色谱法(high performance liquid chromatography，HPLC)分析DSF和BDSF浓度。【结果】18种氨基酸中，甲硫氨酸、色氨酸和胱氨酸能有效降低Δ rpfC菌株培养体系中DSF和BDSF水平，抑制效果与氨基酸浓度密切相关；3种氨基酸对DSF信号分子的抑制作用存在叠加效应；甲硫氨酸、色氨酸或胱氨酸不影响Δ rpfC Δ rpfB双突变体菌株中DSF和BDSF水平。【结论】本研究首次发现了甲硫氨酸、色氨酸和胱氨酸通过RpfB诱导Xcc退出群体感应状态。
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2. 甘蓝SI相关基因BoCDPK14的克隆与分析

简介：甘蓝自交不亲和性(self-incompatibility, SI)是柱头对相同单倍型的花粉产生的排斥或抑制反应。钙依赖蛋白激酶 (calcium-dependent protein kinase, CDPK)是植物面对逆境信号时参与抗逆反应的重要元件。本文通过甘蓝自花授粉0～60 min 的柱头转录组数据分析，成功地筛选到一个受自花授粉诱导上调表达的基因BoCDPK14，该基因与拟南芥中参与植物逆境信 号传导的钙依赖蛋白激酶基因高度同源。BoCDPK14基因开放阅读框1599 bp，编码一种具有533个氨基酸残基的亲水性蛋白， 可在大肠杆菌胞质中被诱导表达，其相对分子质量为60.4 kD，表明BoCDPK14为活性胞质蛋白。该基因起始密码子上游2000 bp的核苷酸序列中含有胁迫反应、激素反应、代谢调节等应答元件。BoCDPK14在甘蓝柱头、花粉、花蕾、花瓣和叶片中表 达，且柱头中的表达量低于花粉。荧光定量PCR结果证实，BoCDPK14在0～60 min的表达变化趋势与转录组分析结果一致。 通过酵母双杂交发现，BoCDPK14蛋白激酶结构域与谷氨酸受体通道蛋白BoGLR2.8d存在相互作用，表明BoCDPK14可能是 参与SI反应过程的新蛋白。本研究结果表明BoCDPK14可能作为Ca2+信号元件参与甘蓝柱头响应花粉刺激的分子过程，这为 甘蓝自交不亲和的进一步研究和利用提供了新内容。
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3. Abscisic acid-generating bacteria can reduce Cd concentration in pakchoi grown in Cd-contaminated soil(脱落酸细菌可降低镉污染土壤中小白菜的镉浓度)

简介：Contamination of vegetable plants with cadmium (Cd) has become a serious issue in recent years. In the present study, pakchoi (Brassica chinensis L.) grown in Cd-contaminated soil inoculated with abscisic acid (ABA)-generating bacteria, Azospirillum brasilense and

Bacillus subtilis, showed 28%-281% and 26%-255% greater biomass, and 40%-79% and 43%-77% lower Cd concentrations, respectively, than those of the control$_{bacteria\text{-}free}$ plants. These treatments also alleviated the Cd-induced photosynthesis inhibition and oxidative damage (indicated by malondialdehyde [MDA], H_2O_2, and $O_2^{\bullet-}$). Furthermore, the application of bacteria also remarkably improved the levels of antioxidant-related compounds (total phenolics, total flavonoids, ascorbate, and 2,2-diphenyl-1-picrylhydrazyl [DPPH] activity) and nutritional quality (soluble sugar and soluble protein) in the Cd-supplied plants. Based on these results, we conclude that the application of ABA-generating bacteria might be an alternative strategy for improving the biomass production and quality of vegetable plants grown in Cd-contaminated soil.

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4. Boosting the Brassica napus L. tolerance to salinity by the halotolerant strain Pseudomonas stutzeri ISE12(耐盐菌Pseudomonas stutzeri ISE12提高甘蓝型油菜耐盐性的研究)

简介： Soil salinisation is one of the major pervasive environmental hazards and abiotic stress factors limiting plant productivity worldwide. Since most of the known crops are susceptible to high salinity, there is great interest in improving technologies in agriculture and making major crop species more robust and productive under saline conditions. In our work, we hypothesized that halotolerant plant growth promoting endophytic bacteria may have a beneficial effect on the growth and development of Brassica napus L. cultivated under salt stress conditions. The main aim of our study was to evaluate the role of the Pseudomonas stutzeri ISE12 strain, isolated from the halophyte Salicornia europaea, in mitigating salt stress in Brassica napus L. Verification of the influence of P. stutzeri on B. napus was based on the wide range of plant parameters responsible for abiotic and biotic stress factors: growth and biochemical parameters, the level of RSH gene expression, and changes in the chemical composition and physical properties of cell walls.

In accordance with our assumption, salinity decreased plant growth and increased levels of proline, total glutathione and lipid peroxidation in plants. Inoculation of plants with the halotolerant P. stutzeri ISE12 increased the plant growth in both types of substrate (non-saline and saline) and decreased the accumulation of non-enzymatic antioxidants. The RSH1 and RSH3 gene expression in B. napus organs depended on the level of salinity and bacterial inoculation, while we have not observed effect of these biotic and abiotic factors in the case of CRSH and RSH2 genes. Moreover, increased levels and changes in the distribution of homogalacturonans (HGs) with varying de-esterification patterns were observed in cell walls in response to saline stress.

In conclusion, inoculation of B. napus with the halotolerant strain P. stutzeri ISE12 alleviates the salt stress experienced by host plants by activating their antioxidant defence system and triggering the rearrangement of cell walls, which, consequently, promotes plant growth.

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5. A novel stress-responsive BnaNAL1 transcriptional activator in oilseed rape positively modulates reactive oxygen species production and cell death(一种新的胁迫响应BnaNAL1转录激活因子对油菜活性氧产生和细胞死亡的调节作用)

简介：Programmed cell death (PCD) is an active, genetically controlled process associated with a number of developmental processes including response/adaptation to abiotic and biotic stresses and leaf senescence. Reactive oxygen species (ROS) are important modulators of PCD and leaf senescence. However, the transcriptional control of ROS and PCD in oilseed rape (Brassica napus L.) is largely unknown. In this study, we identified a NAC transcription factor gene BnaNAL1 from oilseed rape, which encodes a transcriptional activator and plays an important role in modulating ROS and cell death. BnaNAL1 was localized exclusively to the nucleus. Expression profiling of the gene showed increased transcript levels in early senescent and mature leaves. Expression of BnaNAL1 resulted in hypersensitive response (HR)-like cell death symptoms. Further analysis of various physiological indices such as diaminobenzidine (DAB) staining, malondialdehyde contents and electrolyte leakage supported the role of BnaNAL1. Furthermore, we also observed an increase in DNA fragmentation and ROS levels. A quantitative reverse transcription PCR (qRT-PCR) analysis indicated genes involved in ROS production (RbohB), cell death (VPE1a, ZEN1), defense (PR2) and leaf senescence (HIN1, ZAT12) as putative downstream targets. We further verified that BnaNAL1 activated promoters of ZEN1, HIN1, ZAT12 and VPEs using a dual luciferase reporter assay. Using electrophoretic mobility shift assay (EMSA) and chromatin immunoprecipitation (ChIP)-qPCR assays, we further confirmed that BnaNAL1 could bind to the promoters of ZEN1, ZAT12, HIN1 and four VPEs for direct transcriptional modulation of these genes. Collectively our results demonstrate that BnaNAL1 positively modulates cell death and leaf senescence.
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6. Efficacy of biofungicides against root rot and damping-off of microgreens caused by Pythium spp.(生物杀菌剂对腐霉菌引起的根腐病和猝倒病的防治效果)

简介：Pythium spp. are the causal agents of Pythium root rot and damping-off on microgreens. The objective of this project was to assess the efficacy of biofungicides on Pythium root rot and damping-off caused by Pythium aphanidermatum and Pythium dissotocum on microgreens in greenhouses. In the first experiment, arugula (Eruca sativa

Mill.), kale (Brassica oleracea var. sabellica L.), radish (Raphanus raphanistrum subsp. sativus L.), and mustard (Brassica juncea L. Czern) microgreens were treated with Companion® (Bacillus subtilis GB03), Triathlon BA® (Bacillus amyloliquefaciens D747), or RootShield Plus® (Trichoderma harzianum KRL-AG2 and Trichoderma virens G-41) in a hydroponic nutrient film technique system. Two days after treatment, the plants were inoculated with 3×10^5 zoospores of Pythium spp. After seven days, we measured root necrosis, damping-off incidence and severity, and plant biomass. All plants infected with Pythium spp. were smaller by 28% or more compared with non-inoculated plants. Overall disease was low, but biomass was lower in all treatments inoculated with Pythium spp. Arugula infected with Pythium spp. and treated with Triathlon BA® resulted in 8% lower disease incidence compared with the positive control, yet Triathlon BA® resulted in the highest root necrosis. On a separate experiment, arugula and mustard were grown in propagation trays, irrigated manually, and treated with the biofungicides mentioned above or Cease® (Bacillus subtilis QST 713). Arugula and mustard plants inoculated with Pythium spp. had 74.4% reduction of shoot dry weight. Arugula and mustard treated with Cease®, with and without Pythium spp., resulted in ≥59% more biomass compared with the untreated inoculated control. In the tray experiment, all the infected plants treated with biofungicides had more biomass than plants with no biofungicides. Results from this experiment suggest that microbial biofungicides can be introduced in nutrient solutions in nutrient film technique or applied in the irrigation to prevent Pythium root rot and damping-off in brassica microgreens. However, biofungicides can reduce plant biomass and growers may need to extend production time to achieve target yields.

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科技图书

1. OECD-FAO Agricultural Outlook 2019-2028(OECD-FAO农业展望2019-2028)

简介：The Agricultural Outlook 2019-2028 is a collaborative effort of the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization (FAO) of the United Nations. It brings together the commodity, policy and country expertise of both organisations as well as input from collaborating member countries to provide an annual assessment of the prospects for the coming decade of national, regional and global agricultural commodity markets. This year's Special Feature will focus on agricultural development in Latin America.

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