



2024年第2期总3期

饲料用酶工程

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1. 外源酶在反刍动物饲料添加剂中的应用

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➤ 政策法规

1. Congressman Greg Pence Introduces the Innovative Feed Enhancement and Economic Development Act of 2023 (美国众议院拟提议《2023年创新饲料增强和经济发展法案》)

简介: Since 1958, American farmers have benefited from the FDA's safe and effective feed additives. However, since then, as a result of bureaucratic red tape, many animal feed additive products have gotten caught up in an expensive and long drug regulation process. Congressman Pence's Innovative FEED Act de-regulates animal feed additives and spurs innovation by: a) Creating a new category of animal feeds called "zootechnical animal food substances" and defining them as substances that only act within the GI tract of the animal to lower food pathogens, reduce byproducts for animals, or affect its gut microbiome. b) Making it clear that zootechnical animal food substances would be regulated within FDA's existing Food Additive Petition process for market approval, saving innovators time and money. c) Providing farmers with more voluntary tools to help nourish their animals and support farmers' profitability. d) Leveling the playing field for American farmers and innovators.

来源: Congressman Greg Pence

发布日期: 2023-12-07

全文链接: <http://agri.nais.net.cn/file1/M00/10/36/Csgk0EFbHZCAQmUeAA0btou4tRQ309.pdf>

➤ 前沿资讯

1. Spirulina shows potential as protein source for poultry feed (螺旋藻显示出作为家禽饲料蛋白质来源的潜力)

简介: A study underscores the potential of *Spirulina sp.* as a novel protein ingredient for poultry feeds, emphasizing its nutritional value, particularly its protein content, amino acid profile, protein solubility, and in vitro protein digestibility.

来源: Feed Navigator

发布日期: 2024-01-05

全文链接: <http://agri.nais.net.cn/file1/M00/03/64/Csgk0WWx0vmAPWrBAAGsX5USzg663.pdf>

2. Qatar team identifies way to inhibit mycotoxin growth in fishfeed (卡塔尔研究小组发现了抑制鱼饲料中霉菌毒素生长的方法)

简介: Qatar based researchers say the findings of their study indicate that aquaculture feed imports from some Asian and European countries can be contaminated with moderate levels of mycotoxins. Although the levels of individual mycotoxins are generally within the permissible limits, the simultaneous occurrence of the two toxins, aflatoxins (AFs) and ochratoxin A (OTA), in the feed samples might possibility lead to synergistic effects on farmed fish and subsequently on consumer health, said the authors, who are based at Qatar University and an aquatic research center run under that country's ministry of the environment. Those experts acknowledged that studies in this field show that human exposure to those mycotoxins through the consumption of fish fed contaminated feed is unlikely.

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Nevertheless, they claim that the results of their research, in which AFs were detected in the muscle of rohu and kurkufan, suggest the need for further evaluation of the safety of fish products, both local and imported. Their work also assessed the impact of deploying bacterial volatiles to suppress mycotoxin growth and boost feed safety.

来源: Feed Navigator

发布日期: 2023-11-23

全文链接: <http://agri.nais.net.cn/file1/M00/03/64/Csgk0WW4qFaACoidAA7deiec3VY315.pdf>

➤ 学术文献

1. Effects of host-associated low-temperature probiotics in olive flounder (*Paralichthys olivaceus*) aquaculture (宿主相关低温益生菌对牙鲆 (*Paralichthys olivaceus*) 养殖的影响)

简介: This study investigated the effects of supplementation of low-temperature probiotics isolated from the intestines of olive flounder on the growth performance, digestibility, and regulation of intestinal microbiota and the expression of genes related to growth, immunity, and apoptosis in olive flounder. Bacteria showing high growth at approximately 15–20 °C, which is the temperature of olive flounder culture, were isolated and confirmed to be *Pseudomonas* species through 16S rRNA gene sequence analysis. Whole-genome sequencing revealed that the strain has a 6,195,122 bp single circular chromosome and a guanine cytosine content of 59.9%. In the feeding trial, supplementation with 1×10^8 CFU/g of the isolate strain positively modulated growth performances, digestive enzyme activity, and gut microbiota composition of olive flounder. RT-qPCR for the comparison of growth, immunity, and apoptosis-related gene expression levels showed no significant differences between the groups. Therefore, the isolated host-associated low-temperature probiotics improved the growth performance of olive flounder by causing positive changes in digestive activity and intestinal microbial composition without affecting host gene expression.

来源: Scientific Reports

发布日期: 2024-01-25

全文链接: <http://agri.nais.net.cn/file1/M00/10/36/Csgk0EFbUQUANR5uADiEiIJ11QQ674.pdf>

2. Designed allosteric protein logic (设计变构蛋白逻辑)

简介: The regulation of protein function by external or internal signals is one of the key features of living organisms. The ability to directly control the function of a selected protein would represent a valuable tool for regulating biological processes. Here, we present a generally applicable regulation of proteins called INSRTR, based on inserting a peptide into a loop of a target protein that retains its function. We demonstrate the versatility and robustness of coiled-coil-mediated regulation, which enables designs for either inactivation or activation of selected protein functions, and implementation of two-input logic functions with rapid response in mammalian cells. The selection of insertion positions in tested proteins was facilitated by using a predictive machine learning model. We showcase the robustness of the INSRTR strategy on proteins with diverse folds and biological functions, including enzymes, signaling mediators, DNA binders, transcriptional regulators, reporters, and antibody domains implemented as

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chimeric antigen receptors in T cells. Our findings highlight the potential of INSRTR as a powerful tool for precise control of protein function, advancing our understanding of biological processes and developing biotechnological and therapeutic interventions.

来源: Cell Discovery

发布日期: 2024-01-16

全文链接: <https://doi.org/10.1038/s41421-023-00635-y>

3. Impact of Dietary Probiotics on the Immune and Reproductive Physiology of Pubertal Male Japanese Quail (*Coturnix coturnix japonica*) Administered at the Onset of Pre-Puberty (青春期前饲喂益生菌对青春期雄性日本鹌鹑免疫和生殖生理的影响)

简介: Fertility in males is dependent on the proper production of sperms involving the synchronization of numerous factors like oxidative stress, inflammatory processes, and hormonal regulation. Inflammation associated with oxidative stress is also known to impair sperm function. Nutritional factors like probiotics and prebiotics have the potential benefits to modulate these factors which may enhance male fertility. In the present study, immature male Japanese quail at the beginning of 3rd week were administered with *Lactobacillus rhamnosus* (L), *Bifidobacterium longum* (B), and mannan-oligosaccharides (M) through dietary supplementation in individual groups as well as in combinations like LB and MLB. Markers of oxidative stress including SOD and catalase were examined by native PAGE; inflammatory biomarkers (IL-1 β , IL-10, and NF κ B), apoptotic markers (caspase 3 and caspase 7), steroidal hormones, and their receptors estrogen receptor alpha (ER α) and beta (ER β) were assessed in testis. The study reveals that dietary supplementation of 1% L, B, and M in combination significantly and positively increases the overall growth of immature male quail specifically testicular weight and gonadosomatic index (GSI). Furthermore, significant improvement in testicular cell size; increased steroidal hormones like testosterone, FSH, and LH levels; increase in SOD, catalase enzymes; decrease in apoptotic factors Caspase 3, Caspase 7 and immune system strength observed indicated by a decrease in expression of IL-1 β , NF κ B; and increase of IL-10 in testis when LBM was used in combination. These variations are attributed to the increase in testicular estrogen receptors alpha and beta, facilitated by the neuroendocrine gonadal axis, ultimately leading to improved male fertility. It can be concluded that the dietary supplementation in combination with L, B, and M enhances male fertility in immature quail by increased expression of estrogen receptors via gut microbiota modulation. It also sheds light on the potential use of these nutritional factors in avian species as therapeutic interventions to overcome low fertility problems in quail thereby benefitting the poultry industry.

来源: Probiotics and Antimicrobial Proteins

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全文链接: <http://agri.nais.net.cn/file1/M00/03/64/Csgk0WW4oFWAK5LXADiz20intJI462.pdf>

4. Recent advances in biosynthesis of mycotoxin-degrading enzymes and their applications in food and feed (生物合成的真菌毒素降解酶及其在食品和饲料中的应用研究进展)

简介: Mycotoxins are secondary metabolites produced by fungi in food and feed, which can cause serious

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health problems. Bioenzymatic degradation is gaining increasing popularity due to its high specificity, gentle degradation conditions, and environmental friendliness. We reviewed recently reported biosynthetic mycotoxin-degrading enzymes, traditional and novel expression systems, enzyme optimization strategies, food and feed applications, safety evaluation of both degrading enzymes and degradation products, and commercialization potentials. Special emphasis is given to the novel expression systems, advanced optimization strategies, and safety considerations for industrial use. Over ten types of recombinases such as oxidoreductase and hydrolase have been studied in the enzymatic hydrolysis of mycotoxins. Besides traditional expression system of *Escherichia coli* and yeasts, these enzymes can also be expressed in novel systems such as *Bacillus subtilis* and lactic acid bacteria. To meet the requirements of industrial applications in terms of degradation efficacy and stability, genetic engineering and computational tools are used to optimize enzymatic expression. Currently, registration and technical difficulties have restricted commercial application of mycotoxin-degrading enzymes. To overcome these obstacles, systematic safety evaluation of both biosynthetic enzymes and their degradation products, in-depth understanding of degradation mechanisms and a comprehensive evaluation of their impact on food and feed quality are urgently needed.

来源: Critical Reviews in Food Science and Nutrition

发布日期:2023-12-18

全文链接:<http://agri.nais.net.cn/file1/M00/10/37/Csgk0EFhtzuAN6zXAFft2cBRjwk708.pdf>

5. Development of a two-enzyme system in *Aspergillus niger* for efficient production of N-acetyl- β -D-glucosamine from powdery chitin (黑曲霉粉末状几丁质高效生产n-乙酰- β -d-氨基葡萄糖的双酶体系的建立)

简介: A chitinase (PbChi70) from *Paenibacillus barengoltzii* was engineered by directed evolution to enhance its hydrolysis efficiency towards powder chitin. Through two rounds of screening, a mutant (mPbChi70) with a maximum specific activity of 73.21 U/mg was obtained, which is by far the highest value ever reported. The mutant gene was further transformed into *Aspergillus niger* FBL-B (Δ glaA) which could secrete high level of endogenously β -N-acetylglucosaminidase (GlcNAcase), thus a two-enzyme expression system was constructed. The highest chitinase activity of 61.33 U/mL with GlcNAcase activity of 353.1 U/mL was obtained in a 5-L fermentor by high-cell density fermentation. The chitin-degrading enzyme cocktail was used for the bioconversion of GlcNAc from powder chitin directly, and the highest conversion ratio reached high up to 71.9 % (w/w) with GlcNAc purity \geq 95 % (w/w). This study may provide an excellent chitinase as well as a double enzyme cocktail system for efficient biological conversion of chitin materials.

来源: Bioresource Technology

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全文链接:<http://agri.nais.net.cn/file1/M00/03/64/Csgk0WW4kheAW5IxAEBe0fB3f5c474.pdf>

6. ProsperousPlus: a one-stop and comprehensive platform for accurate protease-specific substrate cleavage prediction and machine-learning model construction (ProsperousPlus:一站式综合平台,用于准确预测蛋白酶特异性底物切割和机器学习模型构建)

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简介: Proteases contribute to a broad spectrum of cellular functions. Given a relatively limited amount of experimental data, developing accurate sequence-based predictors of substrate cleavage sites facilitates a better understanding of protease functions and substrate specificity. While many protease-specific predictors of substrate cleavage sites were developed, these efforts are outpaced by the growth of the protease substrate cleavage data. In particular, since data for 100+ protease types are available and this number continues to grow, it becomes impractical to publish predictors for new protease types, and instead it might be better to provide a computational platform that helps users to quickly and efficiently build predictors that address their specific needs. To this end, we conceptualized, developed, tested and released a versatile bioinformatics platform, ProsperousPlus, that empowers users, even those with no programming or little bioinformatics background, to build fast and accurate predictors of substrate cleavage sites. ProsperousPlus facilitates the use of the rapidly accumulating substrate cleavage data to train, empirically assess and deploy predictive models for user-selected substrate types. Benchmarking tests on test datasets show that our platform produces predictors that on average exceed the predictive performance of current state-of-the-art approaches. ProsperousPlus is available as a webserver and a stand-alone software package at <http://prosperousplus.unimelb-biotools.cloud.edu.au/>.

来源: Briefings in Bioinformatics

发布日期: 2023-10-24

全文链接: <https://doi.org/10.1093/bib/bbad372>

7. Genetic engineering of complex feed enzymes into barley seed for direct utilization in animal feedstuff (通过基因工程在大麦种子中编辑饲用酶使其直接用于动物饲料)

简介: Currently, feed enzymes are primarily obtained through fermentation of fungi, bacteria, and other microorganisms. Although the manufacturing technology for feed enzymes has evolved rapidly, the activities of these enzymes decline during the granulating process and the cost of application has increased over time. An alternative approach is the use of genetically modified plants containing complex feed enzymes for direct utilization in animal feedstuff. We co-expressed three commonly used feed enzymes (phytase, β -glucanase, and xylanase) in barley seeds using the Agrobacterium-mediated transformation method and generated a new barley germplasm. The results showed that these enzymes were stable and had no effect on the development of the seeds. Supplementation of the basal diet of laying hens with only 8% of enzyme-containing seeds decreased the quantities of indigestible carbohydrates, improved the availability of phosphorus, and reduced the impact of animal production on the environment to an extent similar to directly adding exogenous enzymes to the feed. Feeding enzyme-containing seeds to layers significantly increased the strength of the eggshell and the weight of the eggs by 10.0% - 11.3% and 5.6% - 7.7% respectively. The intestinal microbiota obtained from layers fed with enzyme-containing seeds was altered compared to controls and was dominated by Alisipes and Rikenella. Therefore, the transgenic barley seeds produced in this study can be used as an ideal feedstuff for use in animal feed.

来源: PLANT BIOTECHNOLOGY JOURNAL

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全文链接: <http://agri.nais.net.cn/file1/M00/03/64/Csgk0WW4oz-AFfrWAEw7SBW0seI236.pdf>

科技图书

1. Exogenous Enzymes as Feed Additives in Ruminants (外源酶在反刍动物饲料添加剂中的应用)

简介: This book addresses a global issue of increasing high quality food from ruminant animals while reducing their impacts on the environment. However, one of the main constraints to livestock development and the underlying cause of the low productivity in many developing countries is inadequate nutrition associated with inefficient utilization of forages and fibrous feed resources. In many countries, fibrous feed makes up the bulk of available feed resource base, which is characterized by scarcity and fluctuating supply in the quantity and quality of feed resources, nutrient imbalance as seen in many native pastures, grasslands and crop residues-based feeding systems with limited use of commercial concentrate feeds such as soybean, cottonseed and groundnut meals, etc. Furthermore, the production of methane, an important greenhouse gas (GHG), from ruminants fed highly fibrous diets such as straws and stover is higher than those animals fed better quality forages or concentrate diets. Recent research shows that supplementing livestock diets with exogenous fibre degrading enzymes can improve feed utilization by enhancing intake, fibre degradation in the rumen and overall digestibility of fibrous feeds which in turn leads to improved animal performance, farmers' income, and a reduction in GHG emissions. The book editors would like to acknowledge the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture for funding part of the studies that make up some of these chapters and were part of the final reports of a coordinated research project financed by IAEA.

来源: Science Direct

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