



Research Kernels

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Efficacy of methoprene applied at different temperatures and rates to surface substrates to control eggs and fifth instars of *Plodia interpunctella* Hubner

Methoprene is an insecticide that is used in pest management programs for stored grains, and works by inhibiting the molting process of insect larvae. Methoprene is effective on stored-product beetles, but there are comparatively fewer data regarding effectiveness on the Indianmeal moth. We conducted tests by exposing eggs or larvae of the Indianmeal moth on packaging materials or flooring surfaces treated with methoprene. Eggs of the Indianmeal were not susceptible to methoprene. However, depending on the specific packaging material and the time of exposure, larvae were susceptible and most of them did not reach the adult stage after they were exposed to methoprene. An economic analysis showed the risks and benefits associated with methoprene treatment, and results of the tests and the budget analysis show that methoprene could be used in pest management plans to control larvae of the Indianmeal moth.

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Efficacy of grain protectants against four psocid species on maize, rice, and wheat

Psocids, or booklice, are emerging pests in stored products, including stored grains. Currently, their control is based on the use of fumigants and contact insecticides; however, newer data indicate that psocids are tolerant to insecticides used to control other stored-grain insect pests. In this study, we evaluated the insecticides registered in the US for use on stored corn, rice, and wheat for control of the psocid species *Lepinotus reticulatus*, *Liposcelis entomophila*, *L. bostrychophila*, and *L. paeta*. On wheat and rice, chlorpyrifos-methyl + deltamethrin was generally more effective in controlling adults and reducing progeny production than spinosad or pyrethrum, while pirimiphos-methyl was more effective on corn than spinosad or pyrethrum. In most cases, progeny production was suppressed in all treated grains. Chlorpyrifos-methyl + deltamethrin and pirimiphos-methyl were the most effective insecticides for all species and

commodities for which they are registered. Efficacy of spinosad or pyrethrum was dependent on the psocid species and commodity. This information will help grain storage managers select protectant insecticides for psocid control.

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Functionality of gliadin proteins in wheat flour tortillas

The tortilla industry is one of the fastest growing segments of the U.S. baking industry with annual sales surpassing \$6 billion. Flour used in tortilla production has been typically optimized for bread making and thus the flour properties that determine good quality bread do not necessarily provide good quality tortillas. In this study gliadin functionality in tortilla quality was studied using gliadin deletion wheat lines. Gliadins are proteins in wheat that may play an important role in determining the functional properties of wheat flour. Deletions in some gliadin proteins produced dough with greater extensibility which improved the diameter and overall quality of the tortillas while not altering the rollability. Deletions in another set of gliadins had the opposite result producing a stronger dough that decreased the diameter and overall quality of the tortillas. The data suggests that altering certain gliadin proteins could be a viable strategy to develop cultivars improved for the specific functionality requirements needed for the rapidly growing tortilla market.

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Automated single-kernel sorting to enhance end-use quality in wheat breeding lines

Wheat breeding programs continually strive to improve the quality of their lines to meet market demands. Plants may be selected based on the presence of genes that are presumed to result in beneficial characteristics, or based on the expression of desirable traits. Seeds likely to propagate these desirable traits can be selected using molecular techniques or by measuring the seed chemical composition or morphological characteristics. However, these methods are either tedious, time-consuming, applicable only to large samples, or destructive. We applied single kernel

near-infrared (SKNIR) sorting technology to selecting kernels with specific traits. The SKNIR system was effective at sorting kernels to increase hardness, protein content, or grain color purity, and it was effective at enabling selection for permanent increases in the expression of these traits in progeny. One advantage of enriching a population for desirable traits is that a breeder can more easily select for desirable lines in the sorted populations that have those traits. The chance of identifying an improved line can be increased with sorting which will improve the efficiency of breeding programs, thus resulting in more rapid release of improved cultivars.

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Rubisco activase and wheat productivity under heat stress conditions

Rubisco activase (RCA), an enzyme involved in photosynthesis, is subject to thermal inactivation in plants that are under heat stress. In this study, we investigated the possible relationship between relative amounts of RCA and plant yield in eleven European cultivars of winter wheat following prolonged exposure to heat stress. In addition, we also examined the effect of a short-term heat stress on RCA accumulation in four genotypes of wheat, five genotypes of maize and one genotype of Arabidopsis. Heat stress affected the accumulation of RCA in a few genotypes of wheat and maize but not in Arabidopsis. A significant positive linear correlation was found between the accumulation of wheat RCA and plant productivity under heat stress conditions. The results support the hypothesis that the endogenous level of RCA could play an important role in plant productivity under high temperature conditions.

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Beta-conglycinin and glycinin soy protein fractions differentiated using high resolution H-NMR spectroscopy

The applications of soy proteins in food systems continue to grow, due to the introduction of soy genotypes that fit the end-use properties of newly developed food products. In the West, soybeans are rarely sold as whole beans for consumption, but rather as ingredients in many prepared foods. The most recognized soy ingredients are soy proteins. One of the advantages of using soy proteins is their ability to enhance nutritional and functional properties of many foods. The major storage protein fractions of soy are beta-conglycinin (7S) and glycinin (11S) globulins. These fractions

comprise more than 88% of the total protein in soy. The interaction between soy globulins and food ingredients may be related to their functional properties and stability in food systems. In the last decade, food scientists have recognized the value of NMR spectroscopy in research and development. NMR has been used to characterize proteins from wheat, barley, pea, corn, and soy. In general, these studies showed that grain proteins have primary structures dominated by a few amino acids when NMR spectra are obtained. This research used ¹H NMR spectroscopy to discriminate soy protein fractions in four genotypes grown in the same location to eliminate environmental factors and compare signatures. The amino acid composition and ¹H NMR spectra of beta-conglycinin and glycinin fractions of soy proteins from four genotypes suggest that these proteins can provide unique signatures and thus can differentiate soy proteins from different genotypes. This technique has potential to be used in central laboratories for quality control and breeding selection.

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