



# Research Kernels

## Our Latest Research Results – January 2016

### Characterization of a novel oil-in-water emulsion adjuvant for swine influenza virus and *Mycoplasma hyopneumoniae* vaccines

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**Submitted to:** Vaccine

Although attenuated live organisms are frequently used as vaccines to control infectious diseases, these modified live vaccines (MLV) may pose potential safety risks when administered to immune-compromised animals or the virus/bacteria is capable of reverting to a virulent form. The incorporation of an adjuvant into a vaccine can achieve qualitative and quantitative alteration of the immune protection and provide functionally appropriate types of immune responses. Adjuvants also act to reduce the antigen dose required to generate a protective response and extend the duration of effective immunity. Adjuvants can be broadly divided into two categories, the first being antigen vehicles, such as emulsions and liposomes, which act to present vaccine antigens to the immune system in a more efficient way and prolong the release of antigens to increase the specific immune responses. The second category of adjuvants are immuno-stimulants, such as Toll-like receptor (TLR) agonists, aluminum hydroxide, saponins and cytokines. One major limiting factor of adjuvants is that many of them have unacceptable side effects and lack of biocompatibility. However, recent reports suggest that some adjuvants lack efficacy for several pathogens. Conventional oil-in-water emulsions use various chemical emulsifiers (i.e. Tween 80 and Span 80), but the safety of these chemicals when injected intramuscularly remains controversial. Herein, we use food-grade plant-derived surfactants commonly used in human food processing as emulsifiers to stabilize a novel oil-in-water emulsion, referred to as OW-14. OW-14 uses inexpensive, readily available materials, is stable at temperatures up to 40°C, and can be autoclaved for sterilization. Furthermore, OW-14, when mixed with whole inactivated swine influenza and mycoplasma antigens can elicit higher and prolonged antibody responses as compared to commercial vaccines for the same pathogens. Here, we provide evidence that OW-14 emulsion is a low-cost, easy-to-use alternative adjuvant for use in swine vaccines. Vaccinated pigs developed high and prolonged antibody titers to both SIV and M. hyo.

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### Single kernel deoxynivalenol accumulation in wheat cultivars having different resistance levels to *Fusarium* head blight

**Authors:** K.H.S. Peiris; W. W. Bockus; F. E. Dowell

**Submitted to:** Journal Cereal Chemistry

Fusarium head blight (FHB) is a destructive disease of wheat and has severely affected the economic outlook of major wheat growing communities in the Northern Great Plains. In this study, we used near-infrared spectroscopy (NIRS) to determine FHB symptoms, single kernel deoxynivalenol (DON) levels, and distribution of DON levels among kernels in wheat cultivars that had different levels of FHB resistance. The percentage of DON-containing spikelets/spike were significantly different among point inoculated spikes of cultivars with different levels of resistance. The percentage of visually Fusarium damaged kernels in point inoculated susceptible cultivars was significantly higher than the resistant cultivar. However, values for spray inoculated spikes were not significantly different among the three cultivars. DON levels in spikelets below the inoculated spikelet in point inoculated spikes showed marked differences among the three cultivars. The susceptible cultivar had the highest DON accumulation in kernels. This NIRS method may be used to evaluate wheat cultivars for FHB resistance components such as resistance to pathogen infection, resistance to pathogen spread, and resistance to toxin accumulation. This information can then be used by breeders to improve their efforts to develop FHB-resistant cultivars.

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## Evaluation of 265 sorghum [*Sorghum bicolor* (L.) Moench] accessions for antioxidant capacity

**Authors:** T. J. Herald, P. Gadgil, R. Perumal and T. Tesso

**Submitted to:** Int'l Journal of Food Science and Technology

Phytonutrients such as phenolic compounds are found in plants and may offer human health benefits. Health benefits that have been reported include antioxidants properties that help fight against cancer, cardiovascular, and other chronic diseases. A genetically diverse set of 265 sorghum lines were grown in two different locations and evaluated for total phenolic content and tannin content. These compounds were further evaluated for their antioxidant capacity. Approximately 50% of the sorghum grain analyzed possessed antioxidant properties greater than blueberries, a recognized source rich in antioxidants. Knowledge of the genetic basis underlying the phytonutrient properties of sorghum is essential to direct breeding programs in identifying accessions containing health promoting compounds.

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## Combination of null alleles with allelic pair of 7+9 at Glu-B1 locus on the long arm of group 1 chromosome increase dough extensibility and produce good quality wheat tortillas

**Authors:** Y. E. Tuncil, T. Joniko, M. Tilley, D. B. Hays and J. M. Awika

**Submitted to:** LWT - Food Science and Technology

Tortillas are the second most consumed bread type in the United States after white bread and are offered on two-thirds of restaurants menus nationwide. Good quality tortillas must be soft without sticking together, flexible without cracking and tearing when folded, have large diameters (17- 18 cm), and good shelf stability, because most of them are not consumed on the day of production. To provide these desirable properties of tortilla, functionality of gluten is important, because both diameter and flexibility are mainly controlled by wheat storage proteins (glutenins and gliadins) rather than other endosperm sub-fractions. Therefore, it is possible to select right glutenin and gliadin composition in wheat cultivars to produce good quality. However, no wheat cultivars have been developed to produce optimum quality tortillas. Tortillas made from bread flour often give smaller diameter due to the strong gluten network, thus require use of additives, such as reducing agents, to obtain extensible dough which is suitable for production of large diameter tortillas. This study showed that combining glutenin subunits 7+9 with deletions at Glu-A1, Glu-D1 loci have potential for the production of wheat tortillas with optimum quality.

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## Fusarium head blight resistance loci in a stratified population of wheat landraces and varieties

**Authors:** L.Tao, Z. Dadong, Z. Xiali, G.Bai, L. Lei, G. Shiliang

**Submitted to:** Euphytica

Wheat Fusarium head blight (FHB) is a destructive disease of wheat worldwide. An extensive search for wheat FHB resistance showed that some Chinese and Japanese landraces possess the highest levels of resistance. To characterize the resistance genes in Chinese and Japanese wheat landraces and varieties, we assembled an association panel with 195 wheat accessions. Association analysis identified 11 DNA markers associated with FHB resistance. Most of these markers can be traced to known genes for FHB resistance. However, a novel resistance gene was identified on chromosome 5D. The resistance loci characterized here will further diversify the wheat FHB resistance gene pool, and provide breeders with additional sources of resistance for improvement of FHB resistance in wheat.

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## Food source and residual efficacy of chlorfenapyr on sealed and unsealed concrete

**Authors:** F.H. Arthur

**Submitted to:** Journal of Stored Products Research

Residual insecticides are used to treat floors inside flour mills and food warehouses for the control of insect pests. Floors are usually concrete and are sometimes treated with sealants that might impact insecticide absorption. Evaluation of residual efficacy of the insecticide Phantom® against adult red flour beetles indicated that sealing concrete did not improve efficacy, but that the presence of food material on the concrete, whether sealed or not, greatly decreased residual efficacy. Managers can use this information to emphasize the importance of sanitation before using a residual insecticide, and to make decisions about whether or not sealing concrete is necessary for this particular insecticide.

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