[4034] EFFICACY OF PHOSPHINE TO CONTROL *Sitophilus oryzae*, *S. zeamais* (COLEOPTERA: CURCULIONIDAE), *Rhyzopertha dominica* (COL: BOSTRICHIDAE) AND *Oryzaephilus surinamensis* (COL: SILVANIDAE) IN THE FUMIGATION OF STORED SOY BRAN

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The efficacy of phosphine was determined against *Sitophilus oryzae* (L.), *S. zeamais* (Mots.)(Coleoptera: Curculionidae), *Rhyzopertha dominica* (Fab.)(Col: Bostrichidae) and *Oryzaephilus surinamensis* (L.)(Col: Silvanidae) exposed to treated soy bran. The experiment was conducted in a warehouse simulating storage conditions. Each treatment, replicated 4 times, was composed by barrels with 100 kg of soy bran and the doses tested, during a period of 240 hours, were 1, 2, 3, 4 and 5 g of phosphine/m3. To evaluate the efficacy of phosphine, 5 small cages/replicate, containing 200 g of soy bran and 10 adults of each species tested, were inserted into the soy bran mass. Barrels were hermetically closed and 240 hours after treatment all cages were removed from the soy bran and dead insects counted. The results showed that all doses of phosphine tested achieved 100% of mortality after 240 hours.
Index terms: Phosphine, fumigation, stored products insects

[4035] EFFICACY OF PHOSPHINE AND CARBON DIOXIDE TO CONTROL DIFFERENT STAGES OF *RHYZOPERTHA DOMINICA*

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Rhyzopertha dominica is the most important pest of stored wheat and rice grain in Brazil. The climate condition favors field infestation multiplication of many generations a year during storage. Development of insect populations carrying resistance to contact insecticides and phosphine (PH^3), inadequate structure and poor sealing during fumigation are the great concern. To overcome these constraints some tests using a mixture of PH^3 and carbon dioxide (CO_2) were performed aiming to control all life stages of *R. dominica*. Fumigation chambers measuring 25 cm high x 30 cm diameter were built with PVC tubes. Valves for injection and exhaustion of gases were mounted low on the side and on top, respectively. The experimental chambers were filled with wheat grain at 13.5% moisture and infested samples with all developmental life stages (eggs, 1st, 2nd, 3rd, 4th, pupa and adults insects) were individually involved in soft cloth and placed inside the chambers. Fumigation tests were conducted for 48, 72 and 96 hours under a combination of 100, 200, 400 and 600 ppm PH^3 in an atmosphere saturated with 10, 20, 30 and 40% CO_2. First the natural atmosphere, in each test chamber, was substituted for the respective CO_2 concentration from cylinders . Following, PH^3 was transferred from a phosphine release apparatus using an industrial gas syringe at the correct doses. Complete control of eggs was obtained only at the fumigation time of 72 and 96 hours under all doses of PH^3 in combination either with 30 or 40 % CO_2. Phosphine and CO_2 alone, even at the highest doses were not effective. The 1st instar larva little more susceptible to PH^3 and CO_2 than eggs, because a complete control was obtained under 72 and 96 fumigation time when 30 or 40% CO_2 were combined with all doses of PH^3. Doses of 10 or 20% CO_2 mixed with 400 or 600 ppm PH^3 also provided control above 99% of 1st instar larva. The efficacy of the mixture of PH^3 and CO_2 to control the 2nd, instar larva followed basically the same pattern for the 1st instar larva; however the 3rd and 4th were more tolerant. The pupa was distinctively more resistant stage. Only the combination of 30 or 40% CO_2 with 600 ppm PH^3 under 96 hours fumigation time killed them all. Adults were easier to control in all fumigation time tested. CO_2 alone provided more than 99% control at 30 and 40% concentration and under 72 and 96 hours fumigation time. It can be concluded that the mixture of PH^3 and CO_2 can be used to control all life stage of *R. dominica* and a synergistic effect of CO_2 was observed.
Index terms: Lesser grain borer, fumigation, controlled atmosphere, stored grain

[4036] MODELLING A NEW AND EFFECTIVE TOOL IN STORED PRODUCT PEST CONTROL

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ABSTRACT NOT RECEIVED

[4037] MODELLING AS A TOOL FOR INTEGRATED PEST MANAGEMENT IN THE RURAL MAIZE STORE ECOSYSTEM

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Models simulating the interaction between stored maize, insect pests (*Prostephanus truncatus* and *Sitophilus zeamais*), biocontrol agents (*Teretriosoma nigrescens*) and measures of farmer intervention are valuable tools for organizing scientific research, for optimizing control strategies and for anticipating the effects of various Integrated Pest Management (IPM) strategies. Using agro-climatological data to drive the models, different IPM scenarios can be visualized on regional scale and thus used to help direct IPM resources, such as resistant varieties, biological control agents or grain treatment technology, to where they are most needed and are expected to work most efficiently. A farmer may use IPM strategies to achieve different goals: One goal of an effective IPM strategy could be simply to diminish the rate of grain damage or pesticide use, and another could involve maximizing the economic outcome. Decision rules to opt for one strategy or the other can be derived from expected insect population growth, given clearly-defined assumptions, which are integrated with maize market price dynamics. These decision rules can be used to develop and refine store-monitoring procedures, which farmers can use to gauge the current pest status and make decisions about pest management.
Index terms: maize, economics, *Prostephanus truncatus, Sitophilus zeamais*, sampling, simulation modelling, *Teretriosoma nigrescens.*