Seeking green insect control

K-State news service

America's enormous food processing industry must choose a new way to control the flour beetles and other insects that thrive in and around flour mills, pasta plants and pet food facilities.

That's because the favored fumigant, methyl bromide, which kills all life stages of insect pests, has been classified as a Class I ozone-depleting substance under the U.S. Clean Air Act. While the use of methyl bromide was to have been phased out by 2005, the EPA has granted critical use exemptions until a "technically and economically feasible alternative" to it can be found.

To help, a scientific team led by Kansas State University grain scientists and economists and U.S. Department of Agriculture scientists has begun a three-year, science-based investigation. The Department of Agriculture-Cooperative State Research, Education and Extension Service awarded the team $784,805 under its Methyl Bromide Transitions Program for a research and technology transfer project to facilitate a switch by the U.S. grain and food industry.

Possible alternatives have included a non-chemical method that uses high temperature, from 122-140 degrees F for 18-24 hours; a non-ozone depleting chemical fumigant, sulfuryl fluoride; and integrated pest management, which involves using multiple tactics with favorable economic and environmental consequences.

The K-State-led study is going to compare methyl bromide, heat treatment and sulfuryl fluoride one-to-one-to-one for the first time.

What's needed urgently is science-based evidence about the cost and effectiveness of the alternatives against the pests, according to Bhadriraju "Subi" Subramanyam, K-State professor of grain science and industry.

"A lot of misinformation is floating around out there," Subramanyam said. "We need to separate the facts from the anecdotes about costs and benefits of methyl bromide and its alternatives."

Subramanyam and Dirk Maier, professor and head of K-State's department of grain science, are project co-directors. Collaborators include Wat cultural economics at K-State; Xingwei Hou, a former K-State research associate who now works for the Canadian Pest Management Regulatory Authority; James Campbell and Paul Flinn from the U.S. Department of Agriculture's Grain Marketing and Product Research Center in Manhattan; and Linda Mason, professor of stored-product entomology at Purdue University.

Comparing notes about cost-effectiveness of each method is like comparing apples, elephants and automobiles because sanitation practices, post-treatment practices, insect densities and environmental conditions are not the same across these facilities, Subramanyam said.

Another unknown is the impact of the timing of interventions, he said. Recent K-State and U.S. Department of Agriculture research indicates that fumigating according to a calendar of convenience -- such as on holidays when many processing plants are closed -- might not be very useful.

"Fumigation has to bear a strong relationship to insect population dynamics in a facility," Subramanyam said.

Other insect control issues that will be investigated during the project include the impact of sanitation on insect population in and around a plant and machinery, and how sanitation impacts each treatment.

Sanitation, spraying cracks and crevices, or fogging for insects when they appear, plus an alternative treatment, should control insects to acceptable levels, Subramanyam said.

The K-State-led research will initially take place at the university's Hal Ross Flour Mill, a highly advanced facility. The mill will be treated within a few weeks' time frame that represents just one environmental condition: methyl bromide, sulfuryl fluoride and heat treatment in the spring, and then again in the summer or fall during the first two years of the project.

The mill also will be systematically infested to understand population dynamics and treatment lethality. Insect boxes containing tens of thousands of red flour beetles at all life stages will be set out throughout the flour mill, and dead and still alive insects will be count-

the U.S.

"We're extremely fortunate that milling and food processing companies are giving us access to facilities so we can work on this problem in real-world conditions," Subramanyam said. "The fumigant manufacturers/applicators and the heat treatment providers also have been extremely cooperative. Everyone wants accurate information to work with."

K-State will be host to hands-on training workshops for stakeholders at the time of the treatments. During the three-year project period, a total of three workshops will be conducted: one about heat treatment, one about sulfuryl fluoride and one about methyl bromide. By the end of the project, Subramanyam said the team will be able to provide solid, scientific data about the effectiveness of control and the economics of each alternative.