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APPLICATION OF SUSTAINABLE POSTHARVEST SYSTEMS FOR THE CONTROL OF INSECTS IN FOOD PROCESSING INDUSTRIES

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The food industry is currently facing serious problems related to insect and mite contamination due to the restrictions placed on the use of chemical pesticides. Concerns over the adverse effects of fumigant residues in food and the environment have led regulatory agencies to take actions by imposing strict limitations on pesticide registration. Of the long list of fumigants two decades ago, very few remain today. MB has a relatively quick killing effect on insects, but - because of its contribution to stratospheric ozone depletion - has been phased out in developed countries since 2005, and in developing countries phase out will take place by 2015. In contrast, phosphine remains popular. Consumer demand for chemical free and contamination free products is a general tendency with which the industry finds it difficult to conform. In addition, in many countries, insects in particular have been developing resistance to contact insecticides and to the conventionally used phosphine. Phosphine fumigation is a common treatment where three important points deserve attention: sufficient gastightness, the lack of which leads to insect resistance; sufficient exposure time for complete control; and prevention of gas from diffusing into the working areas. Currently the most common non-chemical alternative in the cereal storage and processing industry is the use of aeration systems that can be effectively run during the winter to reduce the grain temperature. Under summer conditions the use of refrigeration units provides an excellent solution for quality maintenance of grain. To significantly reduce insect activity, the objective with aeration and refrigeration systems is to achieve temperatures of less than 18ºC. Currently, the only chemical product approved for disinfestation of a flour mill is natural pyrethrum applied using thermal foggers. This treatment suffers from a lack of penetration to hidden locations in the treated premises. Therefore, thermal treatment of premises is the most promising alternative solution. The potential use of volatiles of botanical origin shows promise but requires both commercial scale trials and registration procedure before they can be employed in practice. Among the new gaseous application technologies that have successfully replaced fumigants are the manipulation of modified atmospheres (MAs) alone or at high temperatures, and high pressure carbon dioxide that needs to be further explored for specific applications. A recent development is the use of MAs in a low-pressure environment. These niche applications of MAs that have resulted in very promising application treatments with market acceptability, should serve as models for wider application methods to preserve the quality of agricultural commodities during storage. A new approach to the use of pheromones is the monitoring of insects based on remote sensing electronic transmitters that are progressively integrated into control programs. An IPM program might integrate insect monitoring,

aeration in winter, chilling in summer, thermal disinfestation in the flour mill, and modified atmospheres at the final stages of the processed foods before packaging.

Key words: Postharvest systems, grain storage, non-chemical alternatives, phosphine, aeration, refrigeration, botanicals, modified atmospheres, pheromones, IPM