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FUNGAL CONTAMINATION OF RAT BAITS

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Abstract The rats control in environment involves the chemical control using poison baits that are composed by paraffin blocks, mixture of seeds or pellets in packs. Some products used in pest control are natural organic certified rodent. These materials can be distributed externally or around the places using indoor system or boxes, called bait stations. However, the climatic conditions during the year in tropical areas, could affect the quality of baits during the control period. Fungal growth on surface of these baits could change the attractive smell or odour. The moulds are common in the areas that show high humidity, mainly in rainy seasons. The objective of this present study was analyzed the fungal occurrence in baits spread in external environment during spring. The samples collected showed high percentage of moulds after samples incubation on Sabouraud agar in Petri dishes and the results demonstrated that baits suffer the fungal attack mainly in environmental conditions during spring season.

Key Words Fungi, rodenticides, seasons, environmental, spring

INTRODUCTION

Rats belong to the Order Rodentia, which covers all rodents. Of the more than 2,000 species distributed worldwide, about 125 are classified as pests and 3 are of great importance to man, *Mus musculus, Rattus norvegicus* and *Rattus rattus*. These species rarely occur in isolation, but in some situations we may even have two species infesting a particular area (Nowak, 1999).

These animals compete directly with man for food since that attack crops and stored products, estimated an annual loss of up to 8% of world production of cereals and roots, and that each rodent consumes per day the equivalent to 10% of its weight. The losses may be even greater if we consider the contamination of food with urine and feces and waste by the disruption of sacks and other packaging, as were the meals and animal feeds (WHO/VBC/87.949, 1987).

Several sectors of the agribusiness production chains are also submitted to these rodents, as in meat processing industries, oil refineries, sugar and alcohol plants, feed mills, farms, warehouses, fields and small flocks of animals. The presence of these rodents in our environment can still cause other problems such as accidents due to damage to wires and cables, electricity, telephone and fiber optics. Rats are also responsible for transmitting various diseases to humans (WHO/VBC/87.949, 1987).

Currently the most widely used method for eliminating existing infestations is chemical control.

These baits can be ground in the form of paraffin blocks, mixture of seeds or pellets in packs or integrals containing only broken grains. The main cereals used in commercial baits are corn, rice, wheat, rye, barley, canary seed and sunflower seed. Some manufacturers add attractive substances to their bait as some oils, mainly coconut and sugar. The blocks are made of waterproof pellets or whole grain surrounded by a waterproofing substance (paraffin) forming a single block. They are used in places where the ambient moisture content is high, where the common baits were destroyed by deterioration, no longer being accepted by rodents infesting. Although the blocks under adverse conditions may also jeer and deteriorate over time, its half life is much larger than the common baits (FUNASA, 2002).

Fungal Contamination

The mainly components of some kind of baits are grains or cereals. Corn, sunflower seeds, rice, wheat and others are present in many baits formulations. Fungi can contaminate grains from cultivation to harvest, during

transportation and storage, and in various production phases, whenever the fungus is under favorable conditions of temperature and humidity (Frisvad and Samson, 1991). The effects of fungal invasion include a reduced germination potential, development of visible moldiness, discoloration, unpleasant odor, loss of dry matter, heating, chemical and nutritional changes, loss of quality, and production of mycotoxins (Christensen and Kaufmann, 1969).

Fungal contamination was present in the four substrates studied by Braghini (2009) as sunflower, corn, wheat and rice. For all substrates, the largest number of CFU/g was observed in the samples grains. Fungi were detected in all sunflower seed samples, as well as in samples of corn, wheat and rice grain, with the genus *Aspergillus* being the most frequent.

These fungal species invade cereals, oleaginous plants and other crops. They are able to produce a wide variety of mycotoxins under favorable conditions of temperature and humidity (Chulze et al., 1995). Cereal grains are frequently contaminated with various *Alternaria* species, particularly *A. alternata* (Conner and Thomas, 1985). They occur naturally in sunflower seeds (Pozzi et al., 2005), wheat, corn (Aziz et al., 2006) and rice (Broggi et al., 2007), among others.

MATERIAL AND METHODS

The study was performed exposing paraffin blocks, grains, pellets, extruded blocks and sunflower formulations of rodenticides, which was evaluated during spring. The establishment of such periods was based on diversity climatic conditions of temperature and rainfall. In rodent control various methods are used to control the main one being the use of bait boxes door-baiting and monitoring. The official recommendation demands that baiting and monitoring are performed in a maximum interval of 30 days.

Baiting

The different formulations of rodenticides were placed inside traps around 4 perimeter buildings (laboratories) in the internal perimeter of the Instituto Biológico/APTA. Before this experiment, was baiting realized in the experimental area to avoid external rodent. This study was performed within 0, 30, 60 and 90 days during spring, evaluating 10 samples of each formulation.

Evaluation of Fungal Contamination

The isolation of fungi from samples of baits was performed by direct plating of grains or fragments using potato dextrose agar for each treatment. A total fungal frequency in percentage was counted after 7 days at 25ºC and was visually and microscopically examined for the fungal growth. Taxonomic identification of genera and species was made according to macroscopic and microscopic criteria based on visual mycelium, conidial form, and hyphae structures, with appropriate keys (Pitt and Hocking, 1997).

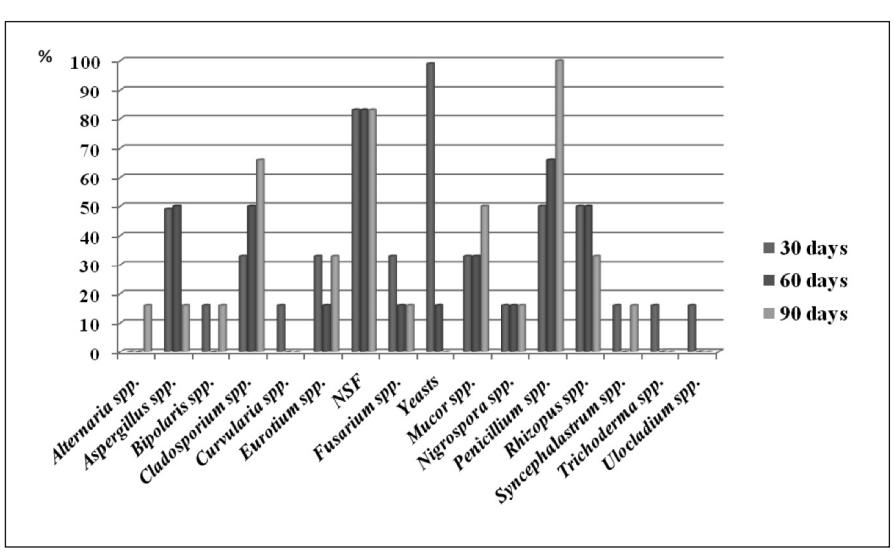

Figure 1. Total frequency of fungal genera in all samples during 30, 60 and 90 days.

RESULTS AND DISCUSSION

The frequency of fungi genera varied according to periods (Figure 1) and were isolated 15 different genera in all samples analyzed. The prevalent fungi genera were *Penicillium*, Yeasts, *Cladosporium*, *Aspergillus*, *Rhizopus* and not Sporulated Fungi (NSF). Data showed that the samples of pellets, grains, extruded blocks (without paraffin) and Sunflower were contaminated with moulds in control group. It is explained by composition of baits with cereals and grains that already has fungal burden in pre and post-harvest crops (Julian et al., 1995). The only sample that did not show moulds in control samples was paraffin blocks, but once exposed to environmental conditions it was attacked by moulds after 30 days (Figure 2). Sunflower, grains and pellets samples had a decrease of fungal counting after 60 days and extruded blocks at 30 days (Figures 3, 4, 5 and 6). It is explained because was the sunny days period in spring without rain.

Temperature and relative humidity (RH) are atmosphere conditions that influence the fungal growth. The UV light is a fungicide and the spores did not develop in exposition, besides the RH is an important factor that interferes in fungal development (Johnson et al., 2003). In high RH the fungal growth increase and it was observed when the samples were exposed after 60 and 90 days (in rainy days). This present study the data demonstrated that

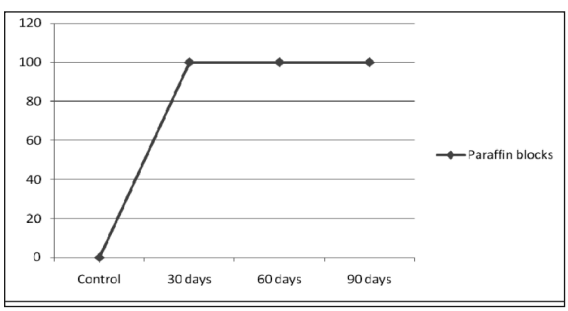

Figure 2. Total fungal contamination (%) in paraffin blocks at different periods.

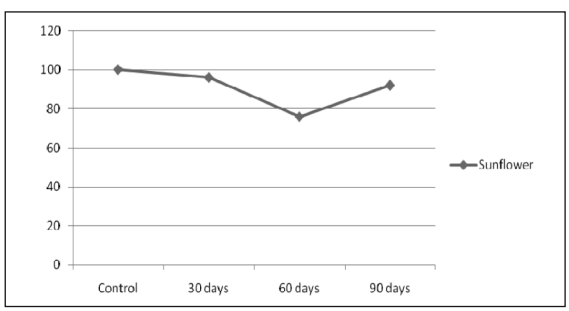

Figure 3. Total fungal contamination (%) in sunflower at different periods.

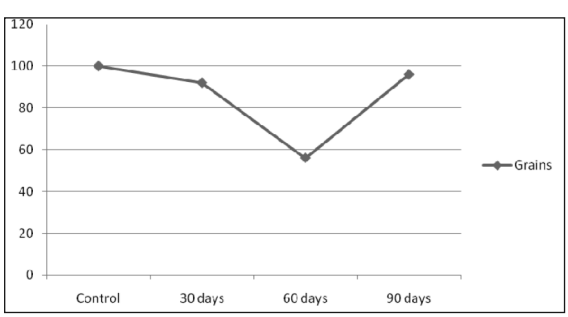

Figure 4. Total fungal contamination (%) in grains at different periods.

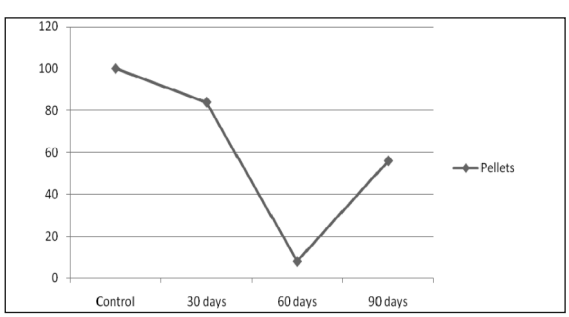

Figure 5. Total fungal contamination (%) in pellets at different periods.

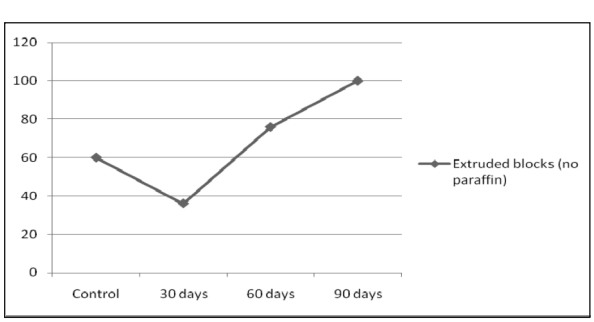

Figure 6. Total fungal contamination (%) in extruded blocks at different periods.

environmental factors and fungal burden of compounds of baits can lead the degradation of products in different forms before 90 days.

REFERENCES CITED

Aziz, N.H, Souzan, R.M, and Azza, A.S 2006. Effect of gamma irradiation on the occurrence of pathogenic microorganisms and nutritive value of four principal cereal grains. Appl. Radiat. Isot. 64: 1555–1562.

Braghini, R., Pozzi, C.R., Aquino, S., Rocha, L.O., and Corrêa, B. 2009. Effects of gamma radiation on the fungus *Alternaria alternata* in artificially inoculated cereal samples. Applied Radiation and Isotopes 67: 1622–1628.

Broggi, L.E., González, H.H.L., Resnik, S.L., and Pacin, A. 2007. *A. alternata* prevalence in cereal grains and soybean seeds from Entre Ríos, Argentina. Rev. Iberoam. Micol. 24: 47–51.

Christensen, C.M. and Kaufmann, H.H. 1969. Grain Storage: The Role of Fungi Quality Loss. University of Minnesota Press, Minneapolis.

Chulze, S., Torres, A.M., Dalcero, A.M., Etcheverry, M.G., Ramirez, and M.L., Farnochi, M.C. 1995. Alternaria mycotoxins in sunflower seeds: incidence and distribution of the toxins in oil and meal. J. Food Protect. 58: 1133–1135.

Conner, R.L. and Thomas, J.B. 1985. Genetic variation and screening techniques for resistance to black point in soft white spring wheat. Can. J. Plant Pathol. 7: 402– 407.

Frisvad, J.C. and Samson, R.A. 1991. Filamentous fungi in foods and feeds: ecology, spoilage and mycotoxins production. *In*: Arora, DK, Mukerji, KG, Marth, EH, eds. Handbook of Applied Mycology: Foods and Feeds, vol. 3. Marcel Dekker, New York, pp. 31–68.

Fundação Nacional de Saúde (FUNASA) 2002. Manual de controle de roedores. Brasília: Ministério da Saúde, Fundação Nacional de Saúde. 129 p.

Johnson, M.L., Berger, L., Philips, L., and Speare, R. 2003. Fungicidal effects of chemical disinfectants, UV light, desiccation and heat on the amphibian chytrid *Batrachochytrium dendrobatidis*. Dis Aquat Org, 57 (3): 255-260.

Julian, A.M., Wareing, P.W., Phillips, S.I., Medlock, V.F., MacDonald M.V. and del Río L.E. 1995. Fungal contamination and selected mycotoxins in pre- and post- harvest maize in Honduras. Mycopathologia.129 (1): 5-16.

Nowak, R. M. 1999. Walker's Mammals of the World, Vol. 2. Johns Hopkins University Press, London.

Pitt, J.I. and Hocking, A.D. 1997. Fungi and food spoilage. Blackie Academic and Professional, London.

Pozzi, C.R., Braghini, R., Arcaro, J.R.P., Zorzete, P., Israel, A.L., Otsuk, I.P., Denucci, S., and Corrêa, B. 2005. Mycoflora and occurrence of alternariol and alternariol monomethyl-ether in Brazilian sunflower from sowing to harvest. J. Agri. Food Chem. 53: 5824-5828.

World Health Organization (WHO) 1987. Vector control series: Rodents - Training and information guide. (WHO/VBC/87.949). 107 p.