

Nayak MK, Daghish GJ, Jagadeesan R, Pavic H, Singarayan VT, Nath NS, Ebert PR (2021) First report of strong phosphine resistance in stored grain insects in far northern region of Australia. Page 90. In: Jayas DS, Jian F (eds) Proceedings of the 11<sup>th</sup> International Conference on Controlled Atmosphere and Fumigation in Stored Products (CAF2020), CAF Permanent Committee Secretariat, Winnipeg, Canada.

### **First report of strong phosphine resistance in stored grain insects in far northern region of Australia**

Manoj K. Nayak<sup>1\*</sup>, Gregory J. Daghish<sup>1</sup>, Rajeswaran Jagadeesan<sup>1</sup>, Hervoika Pavic<sup>1</sup>,  
Virgin T. Singarayan<sup>2</sup>, Nisa S. Nath<sup>2</sup>, Paul R. Ebert<sup>2</sup>

<sup>1</sup>Postharvest Grain Protection Team, Department of Agriculture and Fisheries, Ecosciences Precinct, 41 Boggo Road, Dutton Park, QLD 4102, Australia.

<sup>2</sup>School of Biological Sciences, University of Queensland, Brisbane, QLD 4072, Australia.

\*Corresponding author's email: [manoj.nayak@daf.qld.gov.au](mailto:manoj.nayak@daf.qld.gov.au)

#### **ABSTRACT**

Although resistance to fumigant phosphine is being monitored in both farm and bulk grain storages across Australia over nearly three decades, the tropical far northern part of the continent has received little attention. To address this, a study is underway in the Townsville region, a central hub of Northern Queensland, for the first ever phosphine resistance survey in this region, consisting of both phenotypic and molecular screening of storage pests. Although not currently a major grain growing region, production is expected to increase in future. Sampling of several storages including silos, food processing facilities and feedlots was undertaken over two seasons, winter and summer, over a 12-mo period. The main pests being detected were *Tribolium castaneum* (Herbst), *Rhyzopertha dominica* (F.), *Sitophilus oryzae* (L.), *S. zeamais* Motschulsky, *Oryzaephilus surinamensis* (L.), *Cryptolestes ferrugineus* (Stephens), *C. pusillus* (Schönherr), bruchids, and psocids. A major finding of this study was the detection of strong phosphine resistance in samples of *T. castaneum*, *C. ferrugineus*, *R. dominica*, *S. oryzae*, and *O. surinamensis*. These insect samples are currently being subjected to high-throughput molecular resistance screening that relies on detecting genetic variations within the phosphine resistance gene, *rph2*. This will allow accurate estimation of the resistance allele frequency and frequency of resistance allele carriers (i.e., those carrying either one or two copies of the allele). Moreover, the *rph2* screening data will augment the phenotypic resistance testing data, helping us to define the level of risk and for devising successful resistant management strategies of key pest species in this region.

**Keywords:** Stored grain, Phosphine, Strong resistance, Molecular screening