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Rapid detection of phosphine resistance in *Rhyzopertha dominica* (Coleoptera: Bostrichidae) from China using tetra-primer ARMS-PCR

Yujie Lu[1*], Chenguang Zhang[1], Zhenyan Wang[1], Xiaoping Yan[2], Robert N Emery[3]

[1]School of Grain Science and Technology, Jiangsu University of Science and Technology, Zhenjiang, 212100, China.
[2]Sinograin Chengdu Grain Storage Research Institute, Chengdu, 610091, China.
[3]Biosecurity and Regulation, Entomology Branch Agriculture and Food, Department of Primary Industries and Regional Development Western Australia, Perth, WA 6151, Australia.
*Corresponding author's email: luyjlyj71@just.edu.cn

ABSTRACT

Strong resistance against the fumigant phosphine (PH_3) is becoming a serious problem in the control of *Rhyzopertha dominica* (F.) in grain storage system worldwide. The main molecular mechanism of strong resistance is caused by point genetic variants in the gene (*rph2*) encoding dihydrolipoamide dehydrogenase (DLD). The strong resistance population of R. dominica have been diagnosed mainly by the discrimination dose of phosphine (FAO recommended), which is always time consuming, inefficient and laborious.

To establish a suitable method for rapid identification of the P49S mutation in *R. dominica*, an efficient and simple molecular method was developed based on tetra-primer ARMS PCR. The method was involving in a set of four designed and optimized primers for distinguishing specially the different genotypes within one step. All the process of resistance detection only took 2 h. Using this method, 10 strong phosphine resistant populations of *R. dominica* field collected in China, were identified based on P49S mutation frequency of the populations.

This novel method was proven to be useful as an early warning system for resistance outbreaks of *R. dominica* to phosphine collected from field. This study highlighted the utility in accurate and rapid determination of strong phosphine resistant population of *R. dominica* in China for the first time. Application this method over larger scope would help in identifying rapidly resistance problems and making right pest management decisions.

Keywords: Phosphine, Resistance, *Rhyzopertha dominica*, Tetra-primer ARMS-PCR, Dihydrolipoamide dehydrogenase (DLD)