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AN INVESTIGATION INTO THE OCCURRENCE OF PHOSPHINE RESISTANCE IN STORED PRODUCT INSECTS COLLECTED AT VARIOUS GRAIN STORAGE FACILITIES IN MOROCCO

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INTRODUCTION

The most commonly used method for the control of insect infestations in stored commodities in Morocco is fumigation with phosphine (PH₃) gas. Despite heavy dependence on PH₃, the resistance status of insect pests to this fumigant was largely unknown. Some control failures had been reported in the past (Boughdad, 1982), and two field strains of *Sitophilus oryzae* collected at a warehouse in Meknes were found to be highly resistant to PH₃ (Ben Halima, 1988).

THE SURVEY

In the present study, 48 out of a total 148 samples of wheat collected at different grain storage facilities in Morocco were found to be infested with one or more species of insects. The first generation adult insects from each field population were subjected to the FAO discriminating dose test for phosphine resistance. The results (Figs 1 and 2), showed that, out of the 51 samples of *Rhyzopertha dominica*, *Tribolium castaneum*, and *Sitophilus oryzae* tested, only one population of *S. oryzae* was susceptible to PH₃.

Some of the insect populations were treated at higher concentrations of PH₃ and/ or for longer exposure periods. The results (Figs 3 and 4), showed that most of the insects tested had a high degree of resistance to PH₃.

Treatment with [³²P]-radiolabelled PH₃ showed that resistant populations of the three insect species tested absorbed only a fraction of the fumigant compared to their susceptible counterparts. The results are in agreement with similar observations on other stored-product insects from different parts of the world (Chaudhry, 1997), and indicate that the mechanism of resistance involves a lower uptake of PH₃. Recently, Mills and Athie (2000) have found evidence of an additional mechanism of PH₃ resistance in *S. oryzae*.

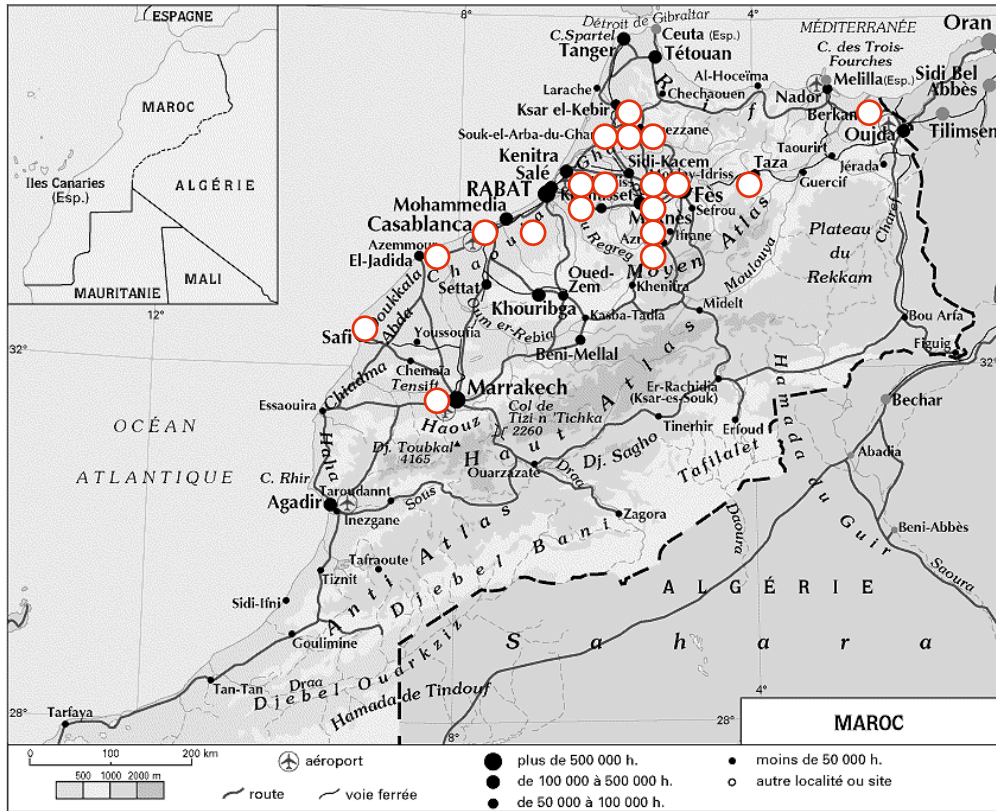


Fig 1: Locations from where wheat samples were collected in Morocco.

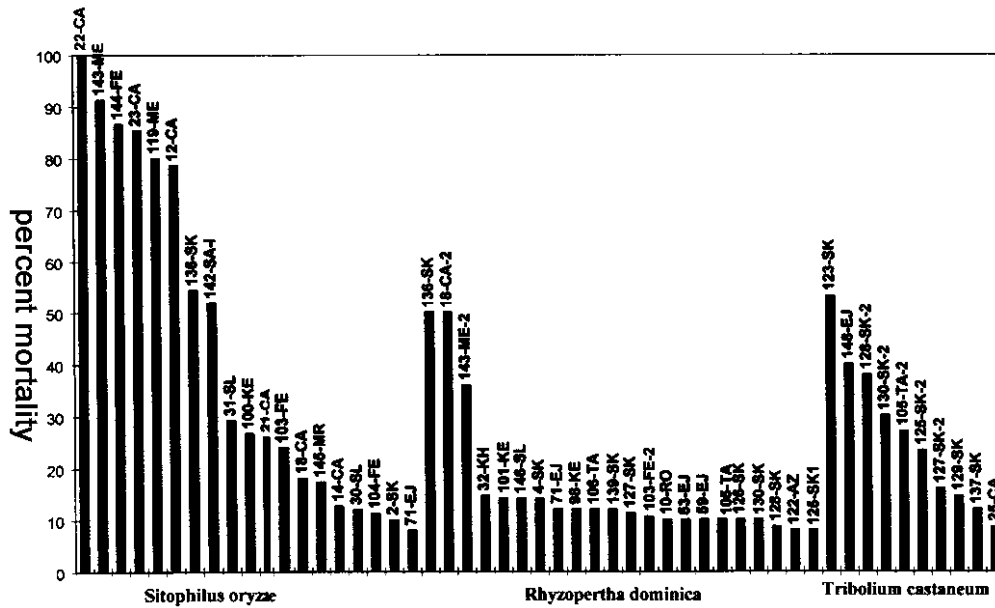


Fig. 2. The response of field populations of major stored-product insects collected in morocco to the discriminating dose of PH₃.

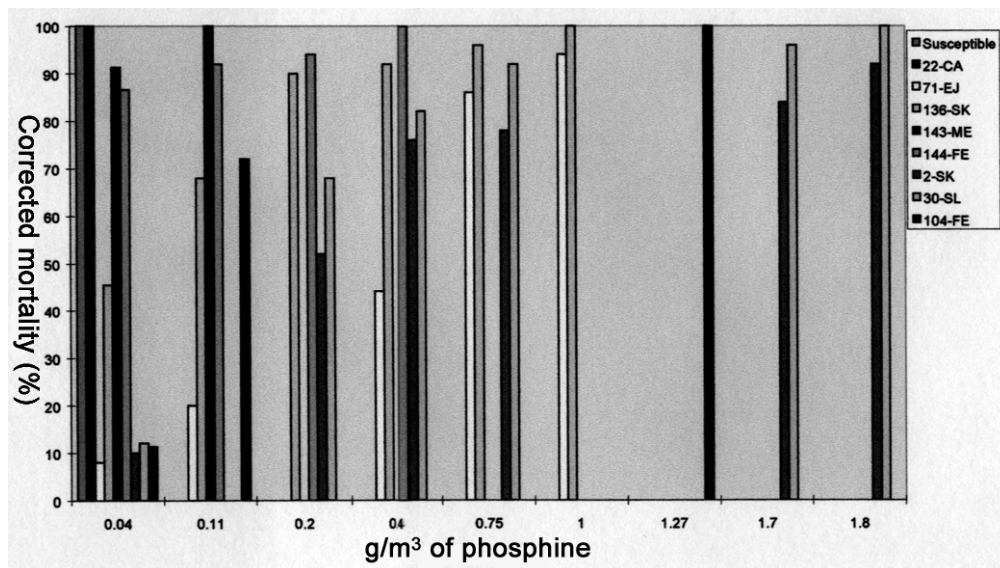


Fig. 3. mortality in field populations of *Sitophilus oryzae* after 20 h exposure to different concentrations of PH₃ at 25°C.

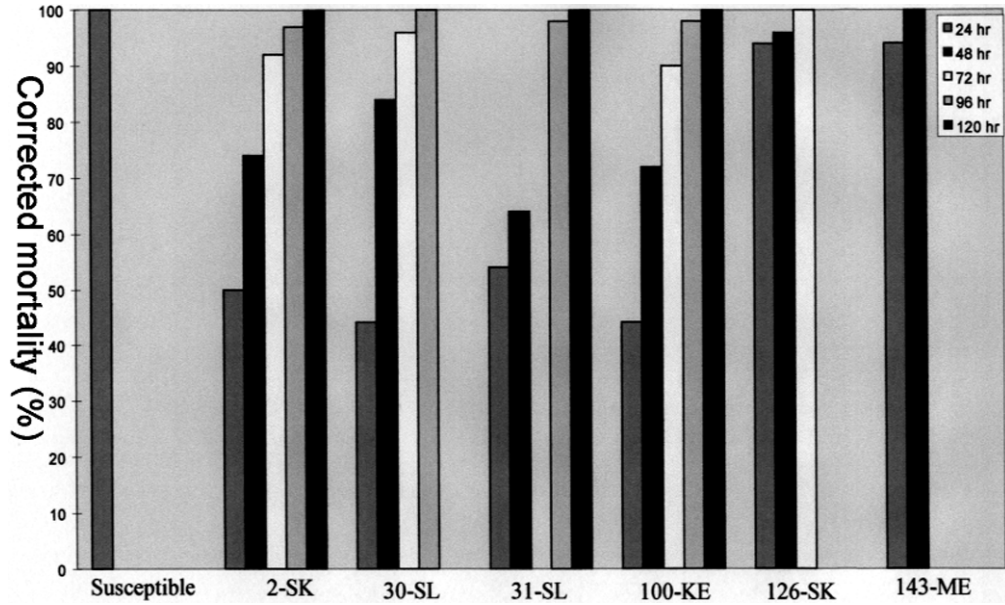


Fig. 4. Mortality in different strains of *Sitophilus oryzae* after exposure to 0.18g/m³ PH₃ for different lengths of time at 25°C.

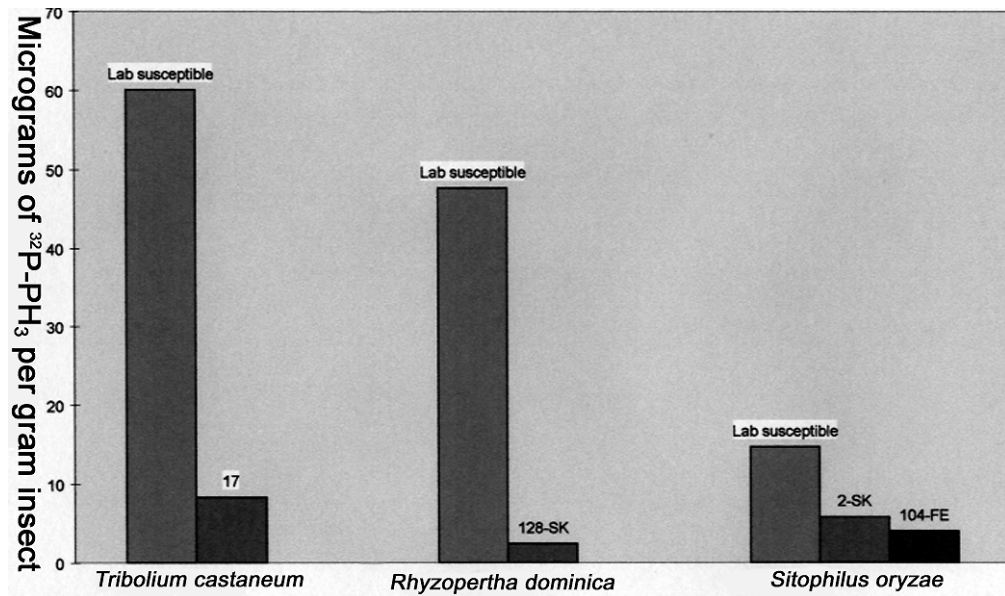


Fig. 5. The uptake of ³²P by insects after exposure to 0.7 g/m³ of ³²P-radiolabelled PH₃ for 5 h at 25°C.

CONCLUSIONS

Phosphine resistance appears to be quite widespread in stored-product insects in Morocco

High levels of resistance appear to have already been selected in some regions, which reflects upon the lack of proper fumigation procedures, and indicates a likelihood of more control failures in the future.

There is an urgent need for a thorough review of procedures currently used for management of stored commodities, and to devise effective strategies for the control of resistant pest populations.

ACKNOWLEDGEMENT

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