

SELECTION OF THE RED FLOUR BEETLE (*TRIBOLIUM CASTANEUM* HERBST) FOR RESISTANCE TO A COMBINATION OF PHOSPHINE PLUS CARBON DIOXIDE AND BIOLOGICAL OBSERVATIONS ON THE RESISTANT STRAIN

EL-LAKWAH, F.A., DARWISH, A.A., KHATTAB, M.M., and ABDEL-LATIF, A.M.

*Plant Protection Department, Faculty of Agriculture at Moshtohor, Takh, Kalyubia, Egypt.*

The main objective of this work was to study the development of resistance in the red flour beetle *Tribolium castaneum* (Herbst) to a combination of phosphine plus carbon dioxide and to investigate some biological characteristics of the resistant strain in comparison to the parental stock.

Adult populations of *T. castaneum* were exposed in the laboratory for 16 generations to a mixture of 40 vpm PH<sub>3</sub> + 46% CO<sub>2</sub> for varying exposure periods at 26±1°C and 6±1°C in order to select for a resistant strain. Selection pressure was carried out at the median lethal time inducing mortalities that ranged from 50-70%.

Results showed that the lethal time (LT) values recorded to obtain a given mortality were significantly higher for the 16th generation at the two test temperatures than for the parental strain. At the 16th generation *T. castaneum* adults showed a 19.4-fold resistance to the mixture of phosphine-carbon dioxide mixture at 26±1°C, and a 18.5-fold resistance at 6±1°C when compared with the parental stock at the LT<sub>50</sub> level. This result indicated clearly that *T. castaneum* adults have the genetic potential to develop resistance to an atmosphere containing a combination of phosphine plus carbon dioxide.

Results of the biological characteristics of the resistant strain revealed that the resistant strain laid a significantly higher number of eggs than the laboratory strain. However no significant differences were found in the average pre-oviposition period and sex ratio. The average incubation period and the total developmental period were clearly longer for the laboratory strain than for the resistant strain.

Larval mortality and average hatching rate of the eggs increased significantly for the resistant strain. The emergence rate of the adults was unaffected and amounted to 100% for the two strains.