APPLICATION OF NAA IN DETERMINING
THE INORGANIC CONTENTS OF THE FRUIT FLY
(CERATITIS CAPITATA WIED.)
AND ITS ARTIFICIAL FOOD

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The neutron activation analysis (NAA) was applied to the multielement analysis of the mediterranean fruit fly, Ceratitis capitata Wied., taken from a stock produced at the Tropical Scientific Research Institut (ICT) in Lisbon, and to its artificial food. Dry samples were irradiated in the OSIRIS reactor, within a work performed at the Laboratoire d'Analyse par Activation Pierre Sue (CEA/CEN-Saclay). The contents of Ca, K, Mg, Cl, Na, Fe, Zn, Al, Mn, Ba, Rb, Br, Co and Cs for the cases of Ceratitis capitata Wied. eggs, larvae, pupae, males and females and of its artificial food are reported.

Introduction

The Ceratitis capitata Wied. remains a major pest of citrus and deciduous fruit throughout the world. In the past four decades the mediterranean fruit fly has gained world-wide recognition on account of its widespread presence and its own high reproductive potential. A great number of plant species which are attacked have a great economic importance in relation to the agriculture of many countries.

In order to reduce the damage it is necessary to find alternative methods to control this pest without altering the parameters which maintain the stability of the agro-ecosystem. Attention is devoted especially to the study of the biological action of ionizing radiations, and the sterile insect technique is one of those. Its important approach to biological control as an alternative to chemical control was amply demonstrated. One of the most important requirements for successful use of the sterile male method is the ability to produce strong insects with any loss in vigour, combined with a high fertility and a reasonable longevity.

With this objective the authors attempt to improve the knowledge of the composition of the larvae diet for raising the mediterranean fly through the determination of the elements present in the different stages of the development of this pest.
In recent years an increasing interest has been shown in the determination of trace elements in biological materials in connection with biological and environmental studies. In this respect NAA with high resolution Ge(Li) spectrometers plays an important role due to its sensitivity and accuracy. The analysis of some insects such as the olive fruit fly, Dacus oleae, benthic insects, mosquito and tsetse fly, and of their food by NAA is described in a number of papers 1-6. The authors have no notice on analysis of Ceratitis capitata Wied. or its food by NAA or some other technique.

In the present work 14 elements in the fruit fly Ceratitis capitata Wied., and 8 elements in the artificial food of larvae were determined by NAA.

The biological material used in the present study consisted of eggs, larvae, pupae and adults obtained from a permanent culture maintained at the Centre of Zoology of IICT. The NAA was made in the Laboratoire d'Analyse par Activation Pierre Sûe (CEA/CEN-Saclay).

Experimental

Sample preparation

Each sample was oven-dried at 80°C before use. Fractions of about 100-150 mg each of dried sample were weighed and sealed in polyethylene cans for short irradiations and in quartz-ampoules for long irradiations.

Standards

The biological standard Orchard Leaves from the National Bureau of Standards (NBS), a solution of aluminium and a solution of bromine were used as standards. Weighted or measured amounts of the standards were packaged in the same way as the biological samples. Each set in the short irradiations included the following (cf. Table 1): for $\Phi_{th}=3.10^{12}$ neutrons.cm$^{-2}$.s$^{-1}$, one biological sample and two standards (in this case the neutron flux was monitored by using $^{42}$K and $^{56}$Mn activities induced on the standard Orchard Leaves itself); for $\Phi_{th}=2.10^{14}$ neutrons.cm$^{-2}$.s$^{-1}$, one biological sample, one standard and a sodium solution as the neutron flux monitor. Each set in the long irradiations included two different biological samples, the standard Orchard Leaves and a foil of 0.1%Co-Al alloy as the neutron flux monitor.

Irradiations

All irradiations were done in the OSIRIS reactor from the C.E.N.-Saclay at $3.10^{12}$ and $2.10^{14}$n.cm$^{-2}$.s$^{-1}$ thermal neutron fluxes for short and long irradiations, respectively. Four irradiations were made on each sample; Table 1 shows the irradiation scheme used.