VI. SPECIAL REPORTS

A. The Onion Fly - M. Loosjes (De Groene Vlieg, The Netherlands)

This paper describes the origin, practical application, problems in application and prospects of control of the onion fly, Delia antiqua (Diptera: Anthomyiidae), in the Netherlands by the Sterile Insect Technique (SIT).

The larva of the onion fly is a severe pest in onions in temperate regions. Development of resistance of the onion fly against insecticides caused research on the SIT to be started by the Dutch Government in 1965. This research was on mass-rearing, long-term storage of pupae, sterilization, and release and ratio assessment techniques. By 1979 sufficient information had been collected to enable practical application, which was then turned over to any interested private company. In the case of the onion fly the SIT can be applied like a control treatment instead of chemical control to individual onion fields. This is due to the limited dispersal activity of the flies and the scattered distribution of onion fields in the Netherlands, with 5 - 10% of the onion growing areas planted with onions.

In 1980 we started a private company for application of the SIT for onion fly control.

During September - May onion flies are mass-reared at over 150 million flies per year. Pupae are stored at 3°C for up to one year. New strains are regularly collected in the field. Their offspring are released some years later as 5th to 9th laboratory generations. In the winter we make contracts with the onion growers.

Onion fly pupae are sterilized shortly before fly emergence with 3 Krad gamma radiation from a ^{60}Co source in Wageningen. Next, the pupae are mixed with daylight fluorescent powder. All emerging flies are covered with powder. Later, they clean themselves but the dye is retained in the retracted ptilinum. As soon as the flies can fly their positive phototaxis is used to move them into a cold room where they are put into gauze screen release containers by weight. These are sets of two. The flies are transported to the onion fields by car and released by emptying the required number of containers while walking along the edges of the onion fields.

At the same time, field trap contents are collected. At every field there is at least one group of three traps situated near a corner. These traps consist of a white plastic coffee cup, filled with water, polyethylene glycol and detergent and placed in a similar cup fixed to the soil surface by a bamboo stick. Trap contents are checked for onion flies. For all suspected onion flies the ptilinum is squeezed out and checked for presence of dye at 60x magnification and under UV light. Of the flies without dye, species determination is checked to exclude several very similar flies. The ratio of sterile to fertile flies should be about 20:1.

During the first six years of application most of the releases were made from aircraft, flying 20 m high at 180 km/h. This method has been abandoned both for logistic reasons and because we missed data on the distance between release and trapping sites, reducing the value of the information from trap catches.

Wild onion flies emerge from hibernating pupae in May and June. As their longevity is only a few weeks, sterile flies are released every 1 - 2 weeks during this period on each field. The data from the catches are used to adjust and optimize the distribution of the next batch of sterile flies. A second flight is in July and August, generally causing no damage. Sterile flies are also released against this generation to get a further population reduction and also to get a rough estimate of their offspring, the hibernating pupae. In the spring the flies redistribute themselves over the newly sown onion fields.

Apart from some growing pains in mass-rearing and release techniques, the main problems in application arose near fields where onion maggots were chemically controlled but the fly populations were not sufficiently reduced. This was due to use of an insufficient dose and/or use of non-effective insecticides. Sometimes no control was applied. Increased populations on such fields spread the next spring to surrounding fields of our customers. We excluded customers if advanced fly population estimates exceeded levels that we could afford to control by sterile flies. In cases where we were taken by surprise, sometimes some damage resulted when we could not, or not in time, achieve a sufficient over-flooding of sterile flies. In both cases, this impaired the reliability of the sterile insect technique in the farmer's view. Therefore, participation did not exceed about 60%. More importantly, the planned population reduction could only regionally or temporarily be achieved, so we missed the expected cost reduction. Thus, the acreage treated remained around 1,200 ha/year from 1983 up till now, 1989, and the method is still unprofitable.

From 1970 onwards, onion maggots were effectively controlled by trichloronate, however, its production was stopped a few years ago. Now some carbamates are used which are somewhat less effective. Moreover, some of these are rapidly broken down by soil bacteria after a few applications. If this should happen also to benfuracarb, which is now the only insecticide available for use against the onion fly for the majority of the Dutch onions, the SIT will be very seriously threatened. In areas where participation is well below 100%, onion fly populations will become too high. Our prices are at present lower than those of the chemical alternatives, but because we will have to raise them, a high level of participation does not seem probable.

Thus the prospects for use of sterile onion flies remain uncertain due to present and expected problems.

B. Nuclear Strategies in Food and Agriculture - 25 Years of Progress, 1964-1989

Björn Sigurbjörnsson, Director, Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture

Healthy and abundant food supplies is a goal for every nation in the world. Nuclear techniques have played a fundamental role in solving some of the obstacles to attaining this goal which existed in the 1960s. New trends and approaches in food and agricultural production have had a tangible impact on the quality of life of people worldwide.