Field Movement of Radioactively Labelled Adults of 
*Dasyneura brassicae* Winn. (Dipt., Cecidomyiidae)

**By EDVARD SYLVEN**
National Swedish Institute for Plant Protection, 171 07 Solna 7, Sweden

**Abstract**
With the use of the radioisotope marking technique, comprehensive studies on the short range dispersal of the Brassica Pod Midge (*Dasyneura brassicae* Winn.), a serious pest of oil turnip and rape, were carried out in Central Sweden. Thousands of midge-infested pods each year were labelled, and later placed in the experiment area. In studying the spread of the resulting radioactive adults of the midge sweep net samples were taken; net traps fixed firmly at different levels above ground were also used.

Above fallow areas, as well as in the open air above the vegetation in e.g. cereal areas, the dispersal in both sexes takes place mainly or entirely in the direction of the wind, even when the midges are exposed to air movements showing a velocity as low as 1 or 2 m per sec. or perhaps still less. In the males, and sometimes also in the females, there is a similar relationship between the dispersal and the wind down in the vegetation. However, in wind-sheltered spaces, e.g. in the upper part of the vegetation layer, large numbers of females frequently approach and enter fields suitable for egg-laying more or less against the wind.

From the applied point of view the results are of considerable interest e.g. in connection with prognostic work.

---

**Introduction**
Since the early sixties, extensive studies on the short range dispersal of a gall midge, the Brassica Pod Midge (*Dasyneura brassicae* Winn.), have been carried out in Central Sweden. Several experiments with specimens tagged with $^{32}$P have been performed and constitute the subject of the present paper.

The Brassica Pod Midge (Fig. 1) is known as one of the most serious pests of oil turnip and rape in Sweden. Pods infested by the larvae become swollen, turn more or less yellow, and open prematurely. The midge has several generations a year, and spends the winter in the soil as a fullgrown larva.

The emergence of the midge from the pupa occurs for the most part in the morning or early afternoon (Sylven, 1949; Buhl, 1960). As indicated by cage trials (cf. e.g. Ankersmit, 1956), the length of life of the adults is short, in most cases probably less than 1 or 2 days. Egg-laying takes place in the daytime, from early morning to late afternoon (Sylven, l.c.).

It is well documented that the adult females of the midge move from one field to another (Sylven, l.c.), e.g. in the spring from areas covered with rape during the previous year to rape areas of the current year, or later in the season from winter rape to summer rape areas. However, many problems related to the dispersal power and mode of spread of the adults remain to be solved. It is true that special studies on this subject have been published (Thygesen, 1963; Schütte, 1965), but the data presented are not founded on experiments with marked specimens, and furnish fairly limited information.

As well-known, an extensive literature exists on the use of radioisotopes in entomology (cf. e.g. O'Brien & Wolfe, 1964; IAEA, 1963, 1968). In Sweden, however, only a few studies based on the release of radioactive insects have been carried out (Björing *et al.*, 1951; Eidmann, 1968).

Brief notes of some of the experiments discussed below have been published (Sylven, 1965, 1968).

**Methods**
Radioactive adults of the midge can be obtained by labelling midge-infested plants with $^{32}$P, but a preliminary experiment in 1963 showed this method to be impracticable for
dispersal studies. A great many plants must be treated to obtain a sufficiently large number of labelled midge specimens, and this naturally involves various kinds of difficulty.

For this reason, another method was tried in 1964. Thousands of oil turnip pods showing early symptoms of midge attack were gathered and moistened with the radioactive medium. After tagging, the pods were placed in the experimental field on the soil in a wire net cage (mesh size 3 cm) covering an area of 4 x 4 m. Numerous larvae left the pods, pupated, and large numbers of radioactive adults later emerged.

This last-mentioned method thus proved effective, and it was used in all the experiments discussed below. Each year, about 10,000-15,000 midge-infested winter oil turnip or winter rape pods were collected and tagged in the middle of June. The pods were labelled with $^{32}$P as orthophosphate in a diluted hydrochloric acid solution. A small amount of phosphorus carrier was added. Specific activity per 1000 pods = about 0.6-0.8 mC or (in 1969) about 0.4 mC. By the courtesy of Prof. L. Fredriksson, Uppsala, the radioactive treatment was in all cases carried out by members of the staff of the Dep. of Radiobiology of the Agricultural College of Sweden, Uppsala.

The test crop in most of the field experiments was summer oil turnip. Except in 1968, this crop offered a rich amount of open flowers and young pods during the main flight period of the radioactive midges (late June and/or early July), i.e. was in an attractive development stage for the midge.

In studying the dispersal of the labelled midges, sweep net samples were taken. Fig. 2 shows the type of sweeping net used. The sampling unit constituted five or (in 1969) ten simple strokes with the net, each covering a range of about 2 1/2-3 m.

Net traps were also utilized on a large scale.