

THE RESULTS OF THE RESEARCH ON THE REPELLENT EFFECT OF *TANACETUM VULGARE* L. ON COLORADO POTATO BEETLE (*LEPTINOTARSA DECEMLINEATA* SAY)

Zdzisław Przybylski

Institute of Plant Protection in Poznań, Regional Experimental Station
Langiewicza 28, 35-101 Rzeszów, Poland

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Abstract: The research on the repellent effect of *Tanacetum vulgare* L. on Colorado potato beetle (*Leptinotarsa decemlineata* Say) was conducted in 1997–2000. The results, which were obtained from the laboratory and field examinations, showed a good effectiveness against beetles as well as their individual development stages. Powdered leaves and flowers of the plant both in powdered form and in water slurry were used in the experiments. Due to the lack of its toxic effect on man, *T. vulgare* can be used in small potato plantations near settlements as well as in ecological farms.

Key words: *Tanacetum vulgare* L., repellents, Colorado potato beetle

INTRODUCTION

Chemical substances found in plants possess numerous repellent properties against insects (Gombos 1988). A good example of this plant is *Azadirachta indica*, whose water extracts and powdered leaves and fruits are used in plant protection against insects. Water extracts of some plants also possess fungistatic properties (Burgiel 1995). A number of experiments concerned the possibility of using plant extracts in potato protection against Colorado potato beetle. The extracts from *Umbelliferae* family (Muckensturm et al. 1983) have a strong repellent effect on this insect. Alcoholic extract from the plant *Quercus alba* hampers the feeding of beetle and larva of this insect (Drummond and Casagrande 1985). A similar effectiveness against Colorado potato beetle is shown by *Azadirachta indica* (Britski 1982). Active antifeedants against this insect are the extracts from *Chrysothamnus nauseosus* and *Artemisia tridentata* (Jermy et al. 1981). The examples of the Colorado potato beetle repellents, which are mentioned above apply mostly to plant extracts obtained by using organic solvents. In most cases water slurries of these plants are not very effective. This also applies to *T. vulgare*. Due to this fact practical application of this re-

pellent on this beetle has not been detected in the available literature. In the Polish literature *T. vulgare* is mentioned as a plant used to destroy worms in the men stomach (Biegański 1948). Also, in Nawrot's extensive compilation (1984) on the natural plant protection products, in the chapter on plant insecticides, the author mentioned that *T. vulgare* in its powdered form was used to fight pediculosis in people.

The aim of the research was to check the repellent effectiveness in the powdered and liquid form of *T. vulgare* against Colorado potato beetle as well as the possibility of practical use of this plant in potato protection.

MATERIAL AND METHODS

Powdered leaves and flowers of *T. vulgare* in their powdered form and in water slurry were used in the research on the repellent effect of the plant against Colorado potato beetle. This plant is a cheap and accessible material since as a common weed it grows by the roads, in orchards and in gardens. According to Sherer (1984), *T. vulgare* contains about 56 compounds including 26.6% of camphor, 24.7% of umbellulone, 6.8% of thymol and 6.0% of sabinene, which are strong repellents against Colorado potato beetle. Collected leaves and upper parts of the plant together with the flowers were dried and powdered in an electrical coffee grinder. The size of powder particles was about under 8 microns.

Several year examinations were conducted in the laboratory of the Regional Experimental Station of Institute of Plant Protection in Rzeszów and on the potatoes grown in the experimental field of the Regional Plant Protection Inspectorate in Rzeszów. In the full appearance of Colorado potato beetle, three Petri dishes covered with damp blotting paper were prepared for both the examination subject and the control one. Top sides of potato leaves assigned to the examination subject were covered with the powdered or water slurry formula. Following this procedure, 10 beetles or larvae of this insect were put to each platter. Identical examinations were conducted in one subject, i.e. on a Petri dish there were not only leaves covered with the repellent but control leaves as well. These examinations were conducted on potato sprouts placed in laboratory flask (Fig. 5). In field examinations, potato larvae in the development stage L_3 and L_4 were collected in potato plantations and 60 of them were put in each shrub. Each experiment included an experimental field where the potato shrubs and the field were covered with the repellent. Each field consisted of three rows of potatoes with five shrubs in each row.

RESULTS

The research carried out in 1997–2000 on the repellent effectiveness of *T. vulgare* against Colorado potato beetle were conducted simultaneously in the laboratory and in the experimental field. The obtained results from the test on Petri dishes showed a strong effect of the repellent both in the powdered form and in the water slurry against the beetles and larvae of this insect. Within several hours the potato leaves in the control subject were completely eaten up, whereas the leaves protected by the repellent usually stayed untouched (Figs. 1, 2). In the case when there were the control leaves and experimental ones in one platter the latter ones were avoided by Colorado potato beetles (Fig. 3). The similar results were obtained

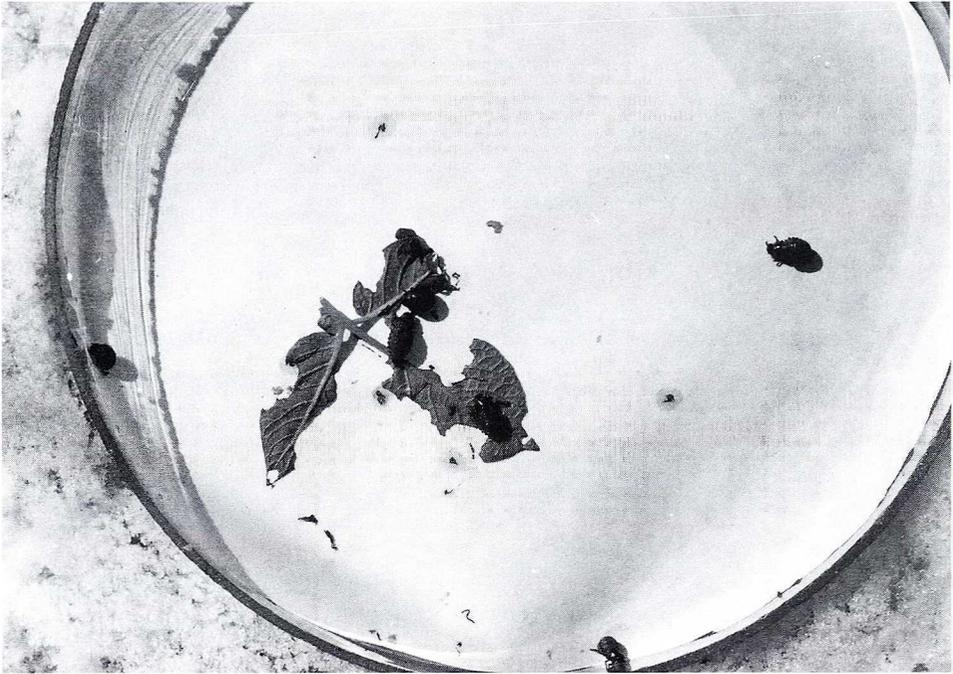


Fig. 1. Potato leaves not protected by the repellent

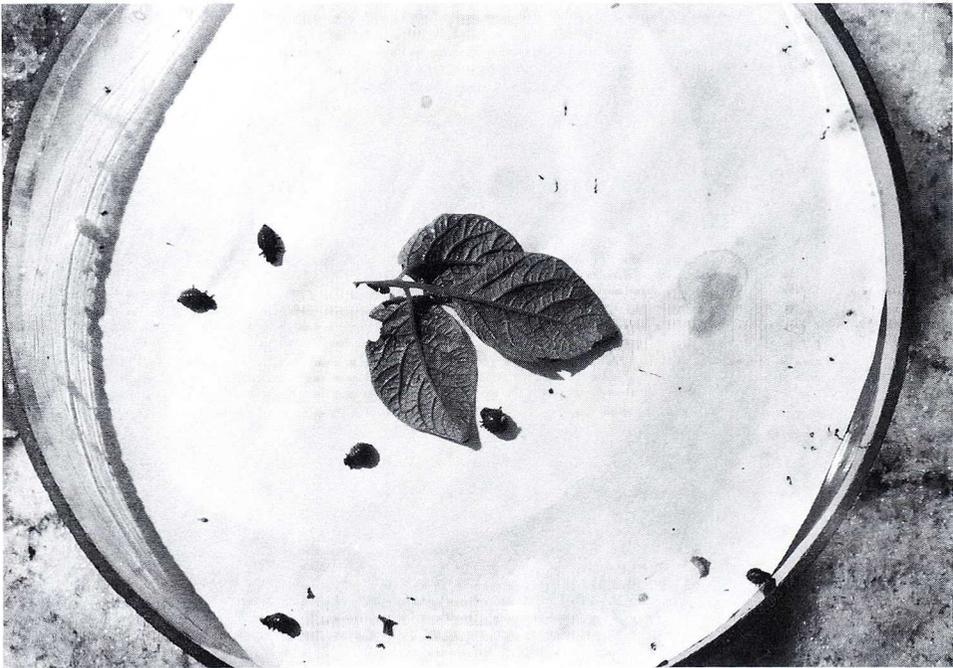


Fig. 2. Potato leaves protected by the repellent



Fig. 3. Potato leaves both protected and not by the repellent



Fig. 4. The repellent effect on potato sprouts



Fig. 5. The potato shrubs both protected and not by the repellent in the experimental field

when potato sprouts were placed in laboratory flasks put on large glass saucers. Larvae placed on leaves covered with the repellent were gradually leaving the plant falling onto the dish. In the control subject the larvae stayed on the potato sprouts completely damaging them (Fig. 4).

The aim of the research in the experimental field was to learn about the repellent effectiveness of the formula against Colorado potato beetles in natural conditions. Larvae in the development stage L_3 and L_4 were used in the experiments. Figure 5 is a good illustration of the obtained results. Apart from the shrubs free from damages, there are plants completely damaged by the insect. It should be noted that during the experiments there were some precipitation, however they did not completely wipe out the repellent. This does not only demonstrate a good adherence of the formula to the potato leaf surface but also shows a strong repellent effectiveness of even a small amount of the formula. Similarly to the laboratory experiments, larvae went to the bottom side of a leaf after the completed treatment and consequently fell onto the ground dispersing in the field. This absolutely did not threaten the neighboring potato shrubs.

CONCLUSION

1. The experiments showed that *T. vulgare* is a good repellent against the Colorado potato beetle both in the powdered form and in water slurry.
2. A good repellent effectiveness applies not only to beetles but to all larva stages of this insect as well.

3. Water extracts of this plant are not a good repellent against the Colorado potato beetle.
4. *T. vulgare* is an easily accessible material and stored in powdered form does not lose its effectiveness even after several years.
5. This formula could be used in potato protection especially in small plantations near settlements, in gardens and in ecological farms.

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POLISH SUMMARY

WYNIKI BADAŃ NAD REPELENTNYM DZIAŁANIEM *TANACETUM VULGARE* L. NA STONKĘ ZIEMNIACZANĄ (*LEPTINOTARSA DECEMLINEATA* SAY)

Celem pracy były badania nad repelentnym działaniem *Tanacetum vulgare* L. na stonkę ziemniaczaną. Obejmowały one doświadczenia laboratoryjne i poletkowe. *T. vulgare* to roślina dziko rosnąca przy drogach, miedzach, nasypach kolejowych oraz na nieużytkach rolnych. Do zabiegów przeciw stonce ziemniaczanej stosowano sproszkowane liście oraz kwiatostany tej rośliny, w formie opylania i opryskiwania zawiesiną wodną. Otrzymane wyniki badań wykazały niezwykle skuteczne ich działanie na poszczególne stadia larwalne i chrząszcze tego szkodnika.