International Symposium: Current Trends in Plant Protection
Proceedings

UDK: 632.651.32

DETECTION OF *DITYLENCHUS DESTRUCTOR* IN POTATO DURING THE GROWING SEASON AND IN STORAGE

SIGAREVA DINA[1], ZHYLINA TATJANA[2], GALAGAN TATJANA[1]

[1] Institute of Plant Protection NAAS of Ukraine, 33, Vasilkovskaya str., Kiev-022, 03022, Ukraine,

[2] Chernihiv State Pedagogical University named after Taras Shevchenko, Hetmana Polubotka str. 53, Chernihiv, 14038, Ukraine
galaganta@mail.ru

The research on detection of *Ditylenchus destructor* in growing plants of potato and in stored tubers was carried out. It showed that during vegetative growth visual symptoms of disease are almost imperceptible and can be observed only at a high-level infestation (100%) of seed material. Even the cutting of seed potatoes cannot always reveal the symptoms of a disease which is latent. Cutting of tubers 30 days before planting appeared to be an improving method. The best preventive measure included sprouting of tubers for 30 days, with sorting them out before and after sprouting.

Key words: potato, *Ditylenchus destructor*, detection

INTRODUCTION

Potato tuber nematode *Ditylenchus destructor* Thorne, 1945, which is categorized in Ukraine as a regulated non-quarantine organism, is a major pathogen of potato crop. It degrades product characteristics and causes large losses during storage. It especially causes great damage to seed potato farms. This is due to the fact that, when infected by stem nematode, a lot of potatoes become unfit for calibration. Harmfulness of *D. destructor* is amplified by secondary infections of other phytopathogenic microorganisms (fungi, actinomycetes, bacteria, viruses) which accelerate and complete the process of potato tuber rotting (Paramonov, Bryushkova, 1956).

Ditylenchosis in potato in Ukraine was detected as early as in 1920s (Belova, 1939; Zynovev and Volodchenko, 1967). *Ditylenchus destructor* is a very common pathogen today in all regions of Ukraine and causes significant losses of food and seed potatoes during storage.

MATERIAL AND METHODS

A research to establish the degree of stem nematode infestation was conducted for 4 years, with different varieties and maturity of seed potato sowed in spring (March-April).

According to GOST 11859-89, the study was conducted with three batches, each weighing 0.8 tons. From each batch, a sample of 200 tubers was selected for detailed analysis.
In the selection process, we used a visual method to pick the tubers with symptoms of III and IV stages of infestation by *Ditylenchus*, and the method of skin removal - for detection of tubers apparently healthy, with I and II early stages of the disease.

In order to test the effectiveness of preventive measures we carried out the field research, which had 10 variants, including 3 controls. In the first variant of the control, all planted tubers were healthy, in the second - all tubers were infested with *Ditylenchus*, in the third - the tubers, without sorting. The other 7 variants included use of preventive measures. Thus, in the fourth variant – the tubers were halved and the diseased tubers were discarded; in the fifth - potatoes were washed in water and then the diseased tubers were eliminated; in the sixth – the tubers were sprouted (for 15 days) and planted without additional sorting out; in the seventh - tubers were sprouted (for 30 days) and planted after being sorted out again; in the eighth – the planted potato tubers were peeled; in the ninth - the planted tubers were infested, with the stolon removed on the day of planting, in the tenth-the planted tubers were infested, with the stolon removed 20 days before planting, followed by sprouting of tubers. Phenological observations carried out in the experiment included: period of sprouting and quality of shoots, the number of stems and height during flowering, and foliage characteristics of healthy and diseased plants.

RESULTS AND DISCUSSION

Results of phenological observations indicated that, during the growing season, infested potato plants in most variants did not differ in appearance from healthy ones, with the exception of variant with 100% *Ditylenchosis* (about 30% of tubers were severely affected). Some plants (about 30%) in this variant had shortened stems, deformed leaves with curved top outer edge.

Concerning the period of sprouting, the best results were observed when tuber sprouting was included in preventive measures (especially for 30 days). Obviously, the recommended measure is heating and sprouting of tubers before planting. During the first two counts (20 and 25 days after planting), there were evident differences between variants with and without sprouting. However, the last two counts showed almost 100% germination in all variants of the experiment, except in control variant with all infested tubers which had germination up to 20% less than other variants of the experiment.

Thus, our study shows that external signs of ditylenchosis are almost imperceptible at low level of infestation and may occur only at high infestation levels (100% infestation by *D. destructor* with the presence of very sick tubers).

Ditylenchosis is a disease, which develops during the storage of potato tubers. The pathogenesis of this disease is a gradual process, which can be divided into five stages.
The first stage (shown in Fig.1) is characterized by a hidden invasion (subtle off-white spots under the skin of apparently healthy tubers). In the second stage (Fig.2), light, subtle, brilliant lead-gray spots appear.

The darkening of the skin and the formation of pressed pits at the edges of healthy part is typical for the third stage (Fig.3). These pressed pits i.e. sunken lesions are formed by appearance of small cavities ("pockets") in skin that appear as a result of nematodes feeding on tuber tissue (Duggan and Moore 1963). "Pockets" are small cavities, which gradually increase in size, darken and merge together, forming a mesh system of caverns and passages in the fourth stage (Fig.4). And the fifth (Fig.5) - last stage of tuber rot is

when tuber is already rotten, with small remaining areas of healthy tissue. These stages a visually different. Only the first stage is hidden and therefore often ignored.

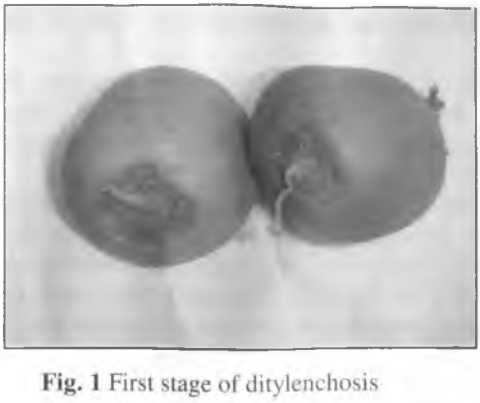

Fig. 1 First stage of ditylenchosis

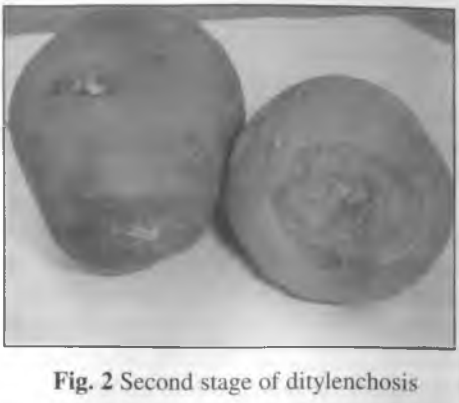

Fig. 2 Second stage of ditylenchosis

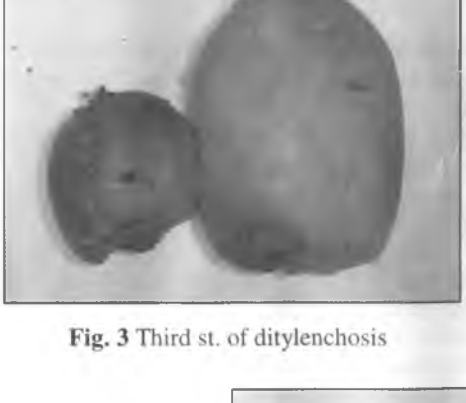

Fig. 3 Third st. of ditylenchosis

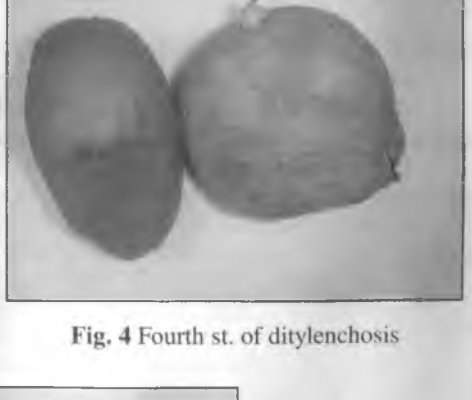

Fig. 4 Fourth st. of ditylenchosis

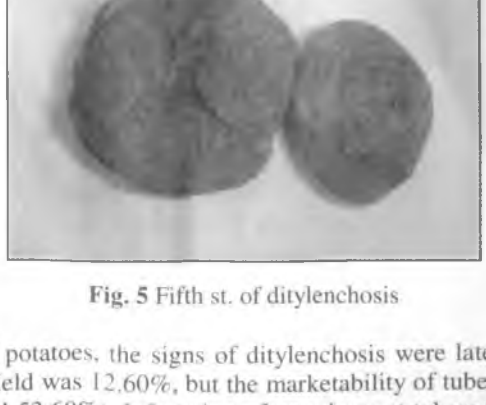

Fig. 5 Fifth st. of ditylenchosis

In case of seed potatoes, the signs of ditylenchosis were latent. After a single-step selection, the loss of yield was 12.60%, but the marketability of tubers increased to 63.40% (compared with control 53.60%). Infestation of new harvest tubers by the stem nematode, although reduced by 6.80%, still remained high (15.60%). Washing of tubers before

selection allowed more careful culling of infested tubers, which reduced the percentage of final infestation by 11.10%, when compared with controls.

Loss of harvest was also reduced (9.50%) and marketability increased (69.10%). The latent form of disease is more noticeable if tubers are sprouted at 15-16 ^{0}C for 30 days prior to planting.

As a result of this measure, symptoms of ditylenchosis become more visible and tubers with these features are discarded during the additional sorting out, which significantly reduces the infestation of new potato crop (6.50%), reduces crop losses (2.40%) and increases the crop quality (80.20%).

Thus, the best results were obtained when tubers were sorted out before and after sprouting that lasted for 30 days. Our results show that the above measures cannot fully eliminate pest from seed material, yet make it possible to significantly reduce stem nematode infestation of new harvest tubers. They can be applied for homestead lands if no other measures can be applied to obtain healthy seed potatoes. However, in cultivation of commodity and seed potatoes on commercial farms it is necessary to adhere strictly to all phytosanitary requirements and norms.

REFERENCES

Belova, A.D. (1939): Results of survey and field experiments in studying of a stem nematode in potatoes. Collection of papers on nematodes of agricultural plants, "Sel'khozgiz" Moscow-Leningrad, 142-149. (In Russian)

Duggan, J.J., Moore, J.F. (1963): Observations on tuber-rot eelworm (*Ditylenchus destructor* Thorne, 1945). Irish Journal of Agricultural Research, 2, (1): 75-86.

Paramonov, A.A., Bryushkova, F.I. (1956): The Potato Rot Nematode and its control. Moscow: Academy of sciences of the USSR, 111 pp. (In Russian)

Zinoviev, V.G., Volodchenko, Z.G. (1967): Materials to the study of distribution of phytohelminthes in Ukraine. Collection of materials to the scientific conference of All-union society of helminthologists, Moscow, 170-175. (In Russian)