

MAIN PESTS ATTACK ON POTATO AND SUGAR BEET CROPS IN THE CONDITIONS OF THE CENTRAL AREA OF MOLDOVA (ROMANIA)

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Abstract

*During 2024-2025, under the conditions of the Central area of Moldova, the purpose of the research carried out was to establish the harmful organisms to sugar beet and potato crops, but also the degree of attack produced. The results obtained over the two years show that in sugar beet, the number of recorded pests varied, with nine insect species and two pathogens identified in 2024, and 12 species and two pathogens in 2025. The soil pest complex has been attacking since the emergence of the plants, with the highest attack rate observed in 2024, when adults of the *Bothynoderes punctiventris* species were present, at 16.5%. In 2025, the attack rate was 7.2% due to the presence of *Cheatoecema* sp. species. In potatoes, the most widespread pests were *Leptinotarsa decemlineata*, with the degree of attack between 0.7% and 22.3% in 2024 and between 10.9% and 100% in 2025, and the pathogen *Phytophthora infestans* produced attacks from 7.9% to 27.6% in 2024 and between 12.5% and 28.5% in 2025.*

Key words: potato, beet, attack, entomofauna, pathogens, climatic conditions.

INTRODUCTION

Sugar beet and potato crops provide, through their primary yield, raw materials for the production of goods used in human nutrition, animal feed, and various industrial sectors (Hermeziu & Adam, 2024; Górska-Warsewicz et al., 2021; Devaux et al., 2021). Both the quality and quantity of sugar beet and potato yields are significantly reduced by the attack of harmful organisms (pests, pathogens, and weeds), which require appropriate control measures to maintain their populations below the economic threshold of damage (ETD). At the same time, these measures must ensure the production of safe food while protecting the environment and human health (Alyokhin, 2007; Adekanmbi et al., 2023).

Chemical interventions using pesticides should be applied only when pest and pathogen pressure exceeds the economic threshold and when alternative control measures prove ineffective (Mohamed, 2023). Climatic conditions represent another major factor influencing crop productivity. In recent decades,

these conditions have negatively affected agricultural systems through uneven precipitation distribution, alternating periods of extreme heat and cool temperatures during the growing season, as well as shifts in seasonal patterns and climatic parameters (Skendzić et al., 2021; Memari et al., 2022).

Along with climatic conditions that reduce production and cultivated areas, there are also changes in agricultural policy, higher impact of pests and disease, variations of imports/exports or shifts in farmer preferences toward other crops (Struik & Wiersema, 1999; Memari et al., 2022). This context highlights the need for innovative approaches to revitalize potato farming in Romania (Cojanu et al, 2025; Paul et al., 2017). Simultaneously, the dynamics of harmful organisms are continuously evolving. In recent decades, the spectrum of pests affecting sugar beet has expanded, including aphid infestations due to the absence of seed treatments with insecticides, as well as the emergence of leafhopper species such as *Cixius wagneri*, *Hyalesthes obsoletus*, and *Pentastiridius leporinus*, which act as vectors of

stolbur phytoplasma and the γ -3 proteobacterium associated with SBR disease (Behrmann et al., 2022; Bressan et al., 2008). These are accompanied by a wide range of soil-borne pathogens (*Macrophomina phaseolina*, *Phoma betae*, *Aphanomyces cochlioides*, *Pythium aphanidermatum*, *Phytophthora drechsleri*, *Rhizopus stolonifer*, *Sclerotium rolfsii*, *Fusarium oxysporum*, *F. solani*, *F. avenaceum*) responsible for root blackening and rot in sugar beet (Puiu et al., 2023). In potato crops, alongside major pathogens such as *Phytophthora infestans* and *Alternaria* spp., and the most destructive pest, *Leptinotarsa decemlineata*, aphids and other secondary pests have also become increasingly significant (Vernon, 2022).

The present study reports results obtained in 2024-2025 on the inventory of harmful organisms and the assessment of damage levels in sugar beet and potato crops under the environmental conditions of Central Moldova (Romania).

MATERIALS AND METHODS

Location

The research was conducted at the Agricultural Research and Development Station Secuieni - Neamț (Romania), located at 26°5' E longitude and 46°5' N latitude, in a hilly region with altitudes reaching up to 250 m above sea level (a.s.l.). The regional topography consists of interfluvial plains, grasslands, and terraces (Trotuş et al., 2020). The area is characterized by a temperate continental climate (Dfb according to the Köppen-Geiger classification), with short springs, relatively cool summers, and cold winters (Kottek et al., 2006).

Experimental design

Sugar beet and potato trials were established in the experimental field of the Plant Protection Laboratory on a typical cambic chernozem soil, with the following characteristics: pH (H₂O) = 6.29, humus content = 2.3%, nitrogen index = 2.1, available phosphorus (P₂O₅) = 39 ppm, and potassium (K₂O) = 161 ppm.

Monitoring methodology

Pest occurrence, distribution, and population dynamics were monitored periodically using soil sampling with a 25 × 25 cm frame, barber

pitfall traps, yellow sticky traps installed in the field.

Observations were carried out from crop emergence until harvest.

Damage assessments were performed visually on plants (25 plants × 10 replicates). The intensity of attack was scored on a 0-6 scale, where 0 = no attack and 6 = more than 75% of the plant affected. Based on the scores awarded, the degree of attack was calculated for each pest ($GA\% = F\% \cdot I\% / 100$).

Climatic conditions

Climatic data were recorded using a Wireless Vantage Pro 2 Plus weather station (SC Rom Tech SRL, Sibiu, Romania) located near the experimental field.

To characterize the years from a climatic point of view, we used data on the average air temperature (°C) recorded at 2 m height and recorded precipitation Σ (mm).

RESULTS AND DISCUSSIONS

Climatic conditions

Analysis of climatic data over the two experimental years showed that monthly average temperatures exceeded the multiannual average by 0.8°C to 4.1°C (Figure 1).

The spring months are characterized by an increase in temperatures in March and April, followed by a cooling in May, when temperatures dropped by -1.1°C, which made it difficult for plants to emerge and develop. The summer months were warm and very warm from a thermal point of view, which determined faster plant growth and development, with average temperatures recorded as 2.4°C (June) and 3°C (August) above the multiannual average (Figure 1).

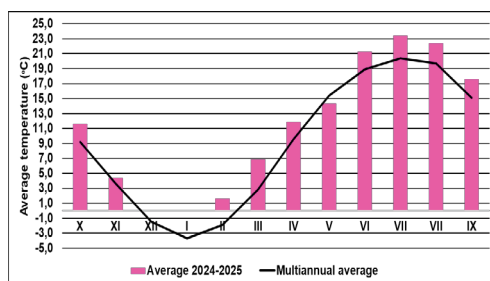


Figure 1. Average monthly temperatures, 2024-2025 average, Secuieni - Neamț

From a pluviometric perspective, both annual and monthly rainfall sum were deficient and unevenly distributed. April was particularly dry (–22 mm compared to the multiannual average), affecting soil preparation, sowing/planting, and crop emergence, and the months of March and May were rainy, recording 10.3 mm (March) and 11.9 mm (May) above the multiannual average (Figure 2).

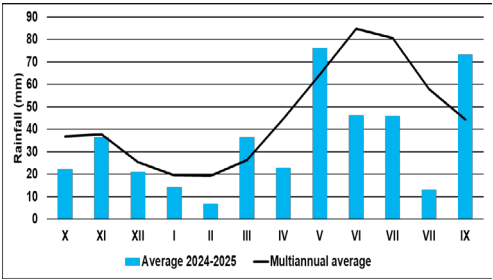


Figure 2. Monthly precipitation, average 2024-2025, Secuieni - Neamț

An increase in the average monthly temperature, respectively the multiannual average in the area of influence, is observed. Also, the uneven rainfall distribution in the area of influence is observed (Isticioaia et al., 2020). In the two years of experimentation, it is observed that spring begins with high temperatures in March and April and cools down in May. The lack of

precipitation leads to uneven emergence of the crop, and extreme temperatures during the summer accelerate the evolution of the crop; the plants reach maturity faster, but the yields were small and of poor quality.

Potato crop

Following the entomofauna inventory in potato crops, three species were identified: *Agriotes* spp., *Leptinotarsa decemlineata* and *Harpalus* spp., which were included in the order Coleoptera. We found that, of the three species, *Leptinotarsa decemlineata* was present from the emergence to the senescence of the plants, totaling 153 specimens. The number of specimens identified increases from the beginning of June (36 specimens), and the density of this pest remains high until harvest (12 specimens) (Table 1). The *Agriotes* species was present at the beginning of the potato growing season, with 6 specimens recorded. *Harpalus* spp. were recorded throughout the growing season, summing up 85 specimens captured. This species does not pose a threat to the future tuber harvest, being spread across the entire surface of the experimental fields; respectively, it is part of the entomofauna structure identified from other crops in the Moldavian area (rapeseed, cereals, corn, sunflower) (Troțuș et al., 2017).

Table 1. Entomofauna harmful to potato crops inventoried in the period 2024 - 2025, Secuieni – Neamț

Species/Order	V			VI			VII			VII	Σ
	I	II	III	I	II	III	I	II	III	I	
Coleoptera											
Agriotes spp	0	0	0	2	4	0	0	0	0	0	6
Leptinotarsa decemlineata	1	3	3	27	22	26	34	31	3	5	153
Harpalus spp.	0	0	2	8	9	15	19	14	12	7	85
Σ = three species, one order	1	3	5	36	34	40	53	45	15	12	243

The most widespread and abundant species in both years of experimentation was *Leptinotarsa decemlineata*. As a series of results indicate (Cingel et al., 2016; Hermezi u and Adam, 2024), the attack produced by larvae and adults is difficult to control, with a wide range of insecticides being applied that aimed to limit their spread and attack. Under the conditions in Secuieni, it was found that in 2024, the number

of adults/plant varied from 0.3 adults/plant to 2.6 adults/plant, and that of larvae was between 3 and 8 larvae/plant (Figure 3a). In contrast, in the following year, the most widespread stage was the larval stage, with up to 33 larvae/bush recorded, and the density of the egg and adult stages was lower compared to the previous year (Figure 3b).

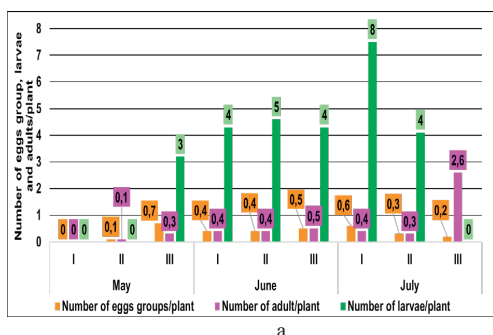
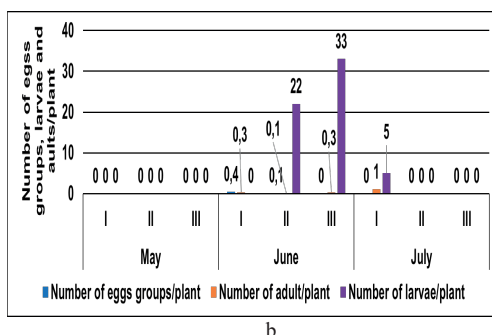


Figure 3. Density of the *Leptinotarsa decemlineata* species in potato crops, Secuieni 2024 (3a - left) - 2025 (3b right)

The high density of larvae led to an attack rate of between 10.9% and 100% in 2025 compared to the previous year, when the attack ranged from 0.7% to 22.3% (Figure 4).

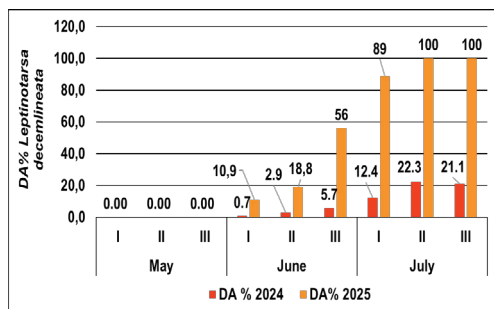


Figure 4. The degree of attack produced by the *Leptinotarsa decemlineata* species on potatoes, Secuieni 2024-2025

Pathogen attack leads to production losses, one of the most important agents being *Phytophthora infestans* (Haas et al., 2009). The attacks recorded in both years of experimentation ranged between 7.9% and 27.6% in 2024 and between 12.5% and 28.4% in 2025 (Figure 5).

Although the attack did not have a high impact on the plant, being recorded at the end of the vegetation period, monitoring the appearance and spread of the pathogen must be carried out carefully, and, when necessary, chemical treatments must be applied.

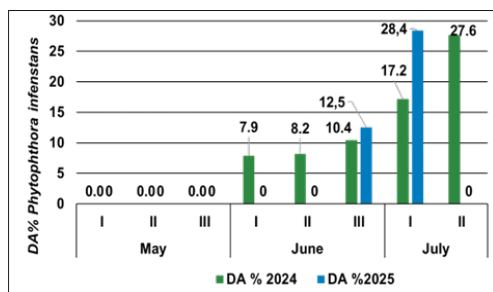


Figure 5. The degree of attack produced by the pathogen *P. infestans* on potatoes, 2024-2025, Secuieni - Neamț

Sugar Beet crop

The structure of the entomofauna in sugar beet crops was different in the two years of experimentation, both in terms of the number of species identified and in terms of their density. In 2024, nine species belonging to three systematic orders were identified, and in 2025, we found that the number of species identified in the beet crop increased to 12 species that were classified in four systematic orders (Coleoptera, Lepidoptera, Homoptera, and Diptera), totaling 760 specimens and 42 colonies (Table 2).

The highest density values were recorded for the species *Chaetocnema* spp. (242 specimens) which had density values ranging between 1 and 62 specimens, totaling 242 specimens/m² (Table 2). In 2025, *Pegomyia betae* and *Lixus junci* were additionally identified in the beet crop, which recorded 36 specimens/m² and 64 specimens/m² (Table 2).

Table 2. Entomofauna harmful to sugar beet crops inventoried during the period 2024-2025, Secuieni - Neamț

Species/Order	IV	V			VI			VII			VIII			IX			Σ
	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	
Coleoptera																	
<i>Agriotes</i> spp*	2	2	0	0	0	4	4	4	5	5	3	0	0	0	0	0	29
<i>Tanymecus</i> spp*.	3	3	3	2	4	1	1	0	0	0	0	0	0	0	0	0	17
<i>Opatrum sabulosum</i> L.*	4	13	10	4	7	2	0	0	0	1	0	0	0	0	0	0	41
<i>Gonocephalum pusillum</i> L.*	0	1	2	1	3	1	1	0	0	0	0	0	0	0	0	0	9
<i>Bothynoderes punctiventris</i> L.*	3	10	13	6	10	3	3	1	1	2	0	0	0	0	0	0	52
<i>Chaetocnema</i> spp*	3	3	4	2	1	5	4	8	5	6	22	19	45	62	33	20	242
<i>Psylliodes chrysocephala</i> L.**	0	0	2	2	3	8	10	7	6	3	10	5	12	5	13	7	93
<i>Lixus junci</i> Boh.**	0	0	0	0	0	1	7	8	12	10	4	5	2	7	3	5	64
<i>Harpalus</i> spp*	0	8	13	12	21	5	8	13	12	10	12	13	12	8	10	5	162
Lepidoptera																	
<i>Autographa gamma</i> L.*	0	0	2	3	1	1	1	1	0	0	0	0	0	6	0	0	15
Homoptera																	
<i>Aphis fabae</i> Scopoli*	0	0	2	2	5	5	8	3	3	4	0	0	0	0	5	5	42
Diptera																	
<i>Pegomyia betae</i> Curtis **	0	0	0	0	6	3	3	5	4	5	0	0	0	0	5	5	36
Σ = four orders; 12 species	15	40	49	32	56	34	42	47	45	42	51	42	71	88	64	42	760 sp + 42 col

*Species present in 2024 and 2025

**Specie present in 2025

During the growing season of beet, the attack produced by five harmful organisms was identified in 2024, and seven in 2025. The attack produced by harmful organisms was recorded throughout the growing season. From emergence to the development of the leaf rosette, the main pests were adults of the species *B. punctiventris* and *Chaetocnema* spp., respectively aphids, as well as, in the second part

of the growing season, the pathogens *Phoma betae* and *Cercospora beticola*. The highest attack was produced by the species *Aphis fabae* of 28.5% (BBCH 31), followed by *B. punctiventris* L., which recorded an attack rate of 21.6% (BBCH 10-12), and the attack rate produced by *Chaetocnema* spp. varied between 2.2% and 5.7% (Figure 6).

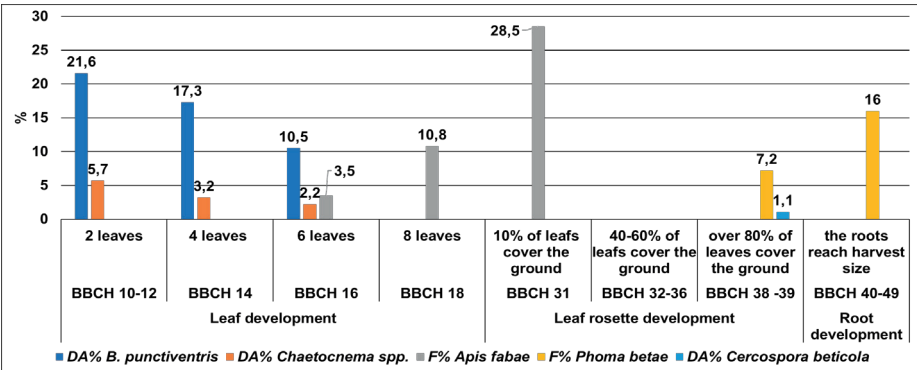


Figure 6. Dynamics of pest attack on sugar beet, 2024, Secuieni - Neamț

The dynamics of the attack produced by harmful organisms on sugar beet in 2025 show that five insect species and two pathogens were responsible for the recorded attacks. From

emergence to the development of the eight leaves, the attack varied between 1% and 9% in the species *B. punctiventris* L., the degree of attack produced by *Chaetocnema* spp. was

between 5.3% and 9.4%, the frequency of plants attacked by mining larvae of the species *Pegomia betae* was 11.4% - 18.8%, and that produced by *A. fabae* was 18.8%. During the leaf rosette development period, beet plants were affected by aphids (*Aphis fabae*), which recorded attack frequencies ranging from 18.7% to 20.6%, flea beetles (*Chaetocnema* spp.), which had an attack rate of 6.8-7.1%, the attack frequency produced by leafminer larvae ranged

from 5% to 12.3%, and adults and larvae of *Lixus junci* had an attack rate of 78.8%. The pathogens *Phoma betae* and *Cercospora beticola* were recorded in beet crops, the frequency of attacked plants was 7.7% and increased to 16.7% towards the end of the vegetation period (BBCH 40-49), and the attack rate of *Cercospora* was 3%, increasing to 5.1% at BBCH 40-49 (Figure 7).

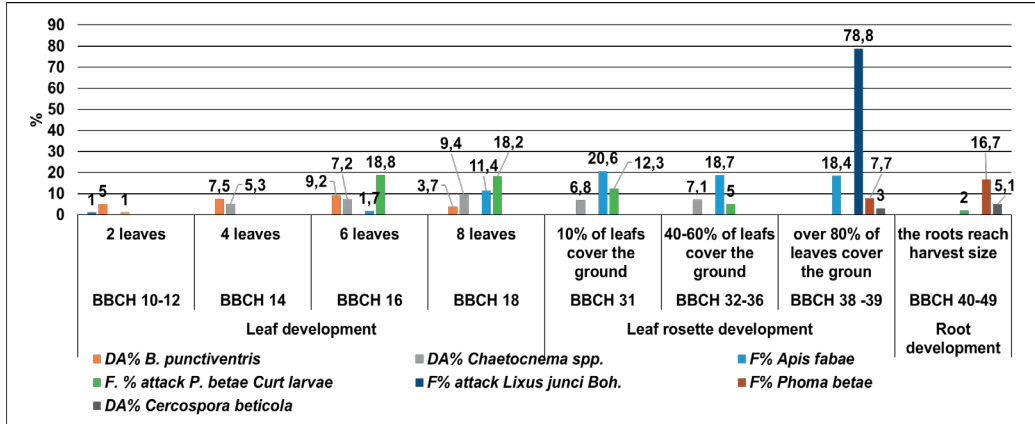


Figure 7. Dynamics of pest attack on sugar beet, 2025, Secuieni - Neamț

CONCLUSIONS

In sugar beet, the number of recorded pests varied, with five insect species and two pathogens identified in 2024, and 12 species and two pathogens in 2025.

The entomofauna harmful to the beet crop during the growing season was made up of 12 species, belonging to the orders Coleoptera, Lepidoptera, Homoptera, and Diptera.

The soil pest complex produced attacks from the emergence of plants, the highest being the attack produced by adults of the *Bothynoderes punctiventris* species in 2024, the DA was 16.5%, and in 2025, by the *Cheatoconema* sp. species, the DA was 7.2%.

In potatoes, the most widespread pests were *Leptinotarsa decemlineata* and the pathogen *Phytophthora infestans*.

The *Leptinotarsa decemlineata* species was present from emergence to plant maturity, the degree of attack produced ranged from 0.7% to 22.3% in 2024 and between 10.9% and 100% in 2025.

Phytophthora infestans produced attacks from 7.9% to 27.6% in 2024 and between 12.5% and 28.5% in 2025.

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