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ASSESSMENT OF THE *DELIA RADICUM* (L.) POPULATION AND ITS DAMAGE IN AN AUTUMN CABBAGE CROP

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Abstract. The cabbage root fly, Delia radicum (L.), is a pest of cruciferous crops whose larvae damage the crown and root system of plants. This study aimed to assess the infestation and damage caused by this species in three autumn cabbage hybrids: Autumn King, Beverly Hills, and Grand Kross. The research was conducted in 2025 at the Lovrin Agricultural Research and Development Station, Timiș County, Romania. Assessments were carried out on 31 October and 7 November, with 10 plants examined per hybrid at each date. The plants were collected, transported to the Plant Protection Laboratory of the “King Mihai I” University of Life Sciences in Timișoara, and examined individually. The number of larvae and pupae present in the crown and root area, the length of larval feeding galleries, and changes in the affected tissues were recorded. At the first assessment, the mean number of larvae was 16.33 per plant in Autumn King, 15.00 in Beverly Hills, and 9.00 in Grand Kross. The mean number of pupae ranged from 1.00 per plant in Grand Kross to 3.33 per plant in Beverly Hills. At the second assessment, the mean number of larvae was lower, ranging from 3.33 to 7.10 per plant. The mean length of larval feeding galleries ranged from 1.93 to 2.57 cm at the first assessment and from 0.87 to 1.55 cm at the second assessment. Under the conditions of this study, Grand Kross had the lowest mean number of larvae at both assessments. The results provide information on the infestation of the three hybrids and the characteristics of the damage caused by D. radicum under the conditions at Lovrin.

Keywords: Delia radicum, autumn cabbage, larvae, pupae, larval feeding galleries, infestation.

INTRODUCTION

In Romania, *Delia radicum* occurs in vegetable-growing areas, with records in cabbage crops in Transylvania, Banat, Crișana, Oltenia, Muntenia and Moldova. Infestations are more frequent in areas with fertile soils and high moisture where Brassicaceae crops are grown repeatedly. Although detailed population distribution data are limited, observations from plant health networks and research stations indicate the regular occurrence of the species in most vegetable-growing regions of the country (EPPO, 2024). The economic importance of the species reflects its widespread distribution and adaptability to different farming systems. Under intensive cultivation, D. radicum may cause substantial economic losses even where crop protection measures are applied. It is therefore considered an important pest of Brassicaceae crops (Barzman et al., 2015; CABI, 2024). Larvae feed on the roots and lower stems of cruciferous plants. Feeding wounds may facilitate the entry of disease-causing organisms and further tissue deterioration (Lowenstein and Groves, 2019). Damage severity depends on the host crop, growth stage and growing conditions. Recently transplanted plants are more vulnerable because their root systems are less developed. Severe damage may cause wilting or plant death (AHDB, n.d.).
The study aimed to quantify larvae and pupae, characterise feeding galleries and assess damage severity in Autumn King, Beverly Hills and Grand Kross under the conditions at Lovrin.

MATERIAL AND METHOD

1. FIELD SAMPLING
Lovrin, 2025 • 3 hybrids
31 October and 7 November
10 plants/hybrid/date

2. LABORATORY EXAMINATION
Plant Protection Laboratory
USV Timișoara
Root cleaning and crown sectioning

3. MEASUREMENTS
Count larvae and pupae per plant
Measure feeding galleries (cm)
Record changes in affected tissues

4. DAMAGE ASSESSMENT
Examine each plant individually
Assess galleries and root destruction
Assign a damage score (0–4)

Damage severity was assessed from gallery severity, root destruction and tissue changes. The 0–4 scale below was used to calculate the Townsend–Heuberger index. Mean damage scores were also determined for each hybrid.

Table 1. Scale used to assess damage severity

Score	Damage severity
0	No visible damage
1	Very slight damage
2	Slight damage
3	Moderate damage
4	Severe damage

$$I\ (\%) = [\Sigma(n_i \times i) / (N \times Imax)] \times 100$$

n_i = number of plants in class i; i = damage score; N = total number of plants assessed; Imax = 4. Mean scores were calculated for each hybrid. Rotting, slimy and browned tissues were also recorded.

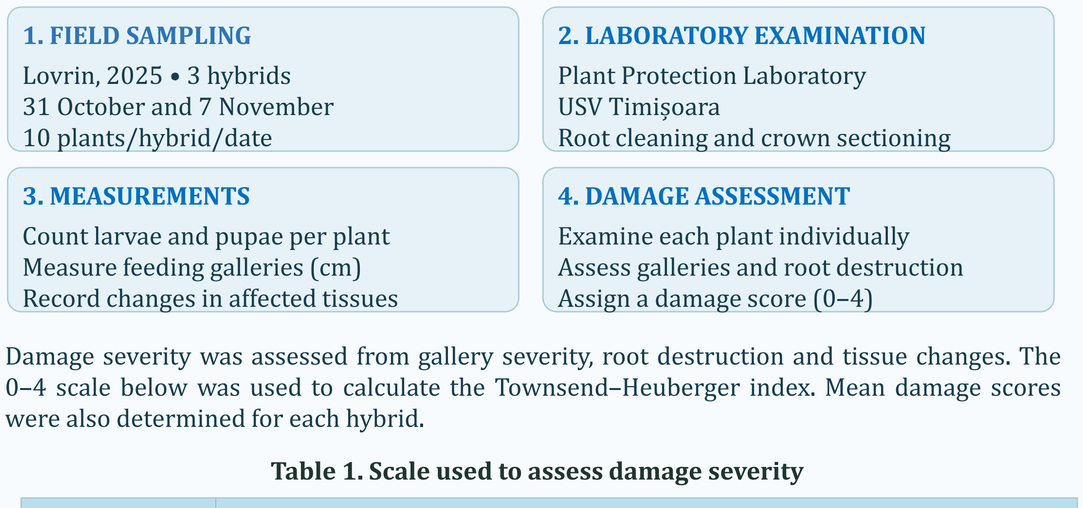


Figure 1. Field sampling, laboratory examination, root damage and immature stages

RESULTS AND DISCUSSION

On 31 October 2025, Autumn King had the highest mean number of larvae (16.33 per plant), followed by Beverly Hills (15.00) and Grand Kross (9.00). At the second assessment, means were 7.10, 4.55 and 3.33 larvae per plant, respectively (Fig. 2).

Mean larval numbers were lower at the second assessment in all hybrids. Relative decreases were 56.5% in Autumn King, 69.7% in Beverly Hills and 63.0% in Grand Kross. These values compare the means of the two samples.

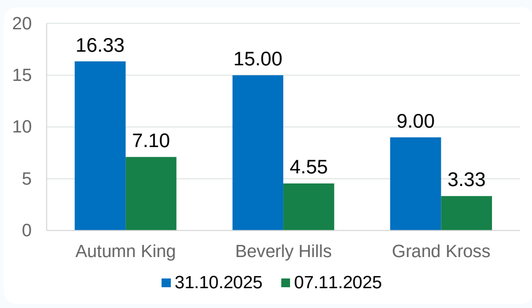


Figure 2. Mean number of larvae per plant

At the first assessment, mean pupal numbers were 3.00 per plant in Autumn King, 3.33 in Beverly Hills and 1.00 in Grand Kross. On 7 November, means were 0.30 and 0.73 pupae per plant in the first two hybrids, whereas no pupae were found in Grand Kross (Fig. 3).

The lower number of pupae in the second sample provides additional information on the observed population. These data do not allow the temporal differences to be attributed to a single biological mechanism.

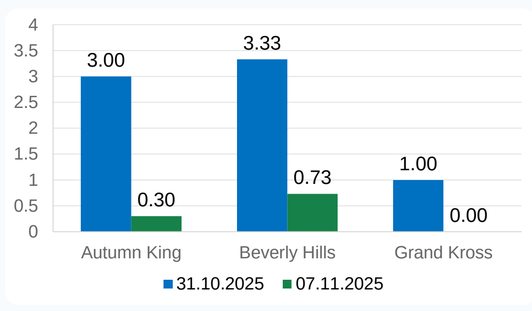


Figure 3. Mean number of pupae per plant

Mean gallery length ranged from 1.93 to 2.57 cm at the first assessment. The highest value occurred in Beverly Hills, followed by Grand Kross and Autumn King.

At the second assessment, mean lengths were 0.87 cm in Autumn King, 1.30 cm in Beverly Hills and 1.55 cm in Grand Kross (Fig. 4). Thus, the lowest larval numbers did not consistently correspond to the shortest feeding galleries.

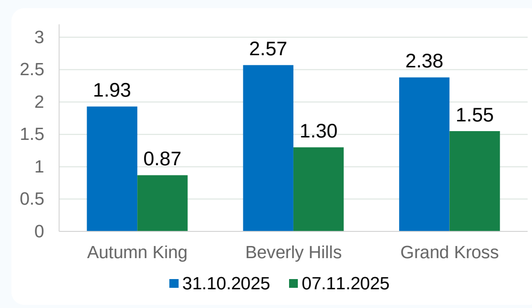


Figure 4. Mean feeding gallery length (cm)

Table 2. Larval density (mean ± SD, larvae per plant)

Hybrid	31.10.2025	07.11.2025
Autumn King	16.33 ± 3.51	7.10 ± 5.48
Beverly Hills	15.00 ± 4.00	4.55 ± 5.01
Grand Kross	9.00 ± 2.45	3.33 ± 3.78

Table 3. Feeding gallery length (mean ± SD, cm)

Hybrid	31.10.2025	07.11.2025
Autumn King	1.93 ± 0.35	0.87 ± 1.85
Beverly Hills	2.57 ± 1.04	1.30 ± 1.10
Grand Kross	2.38 ± 0.38	1.55 ± 2.22

Table 4. Damage severity: mean score (0–4 scale)

Hybrid	Mean score ± SD	CV (%)
Autumn King	2.67 ± 0.58	21.7
Beverly Hills	2.67 ± 0.58	21.7
Grand Kross	2.50 ± 0.58	23.1

Rotting, slimy and browned tissues were observed.

Conclusions

Grand Kross had the lowest mean number of larvae at both assessments. On 7 November 2025, all hybrids had fewer larvae and pupae and shorter feeding galleries. Mean damage scores were 2.67 in Autumn King and Beverly Hills and 2.50 in Grand Kross. Combining larval density, gallery dimensions and damage scores provides a more complete description of infestation. The observed differences require confirmation before conclusions can be drawn regarding resistance or tolerance.

Selected references: AHDB (n.d.). Cabbage root fly biology and management in brassica crops. ahdb.org.uk/knowledge-library/cabbage-root-fly-biology-and-management-in-brassica-crops
Lowenstein D., Groves R. (2019). Cabbage Maggot. University of Wisconsin–Madison Extension, XHT1030. hort.extension.wisc.edu/articles/cabbage-maggot/