

SEED DAMAGE OF SOME PEA CULTIVARS
(*PISUM SATIVUM* L.) BY LARVAE OF PEA MOTH
(*LASPEYRESIA NIGRICANA* STEPH.)
(LEPIDOPTERA, TORTRICIDAE)

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Abstract: Field studies were carried out in the years 2001–2003 on the susceptibility of 11 pea cultivars (Ametyst, Cyrkon, Diadem, Kujawiak, Kolia, Komandor, Perła, Piast, Rola, Set, Stig) to damage by larvae of pea moth. Pods of cv. Stig, Perła and Kolia were heavily damaged by pea moth, ranging from 9.2% to 41.7%. The lowest per cent of damaged pods was shown for the cv. Set (7.0%) in the year 2001; cv. Cyrkon (3.7%) in the 2002 and in cv. Ametyst (12.0%) in the growing season 2003. The average yield of pea cultivars ranged from 26.1 dt/ha to 35.6 dt/ha. Cultivars of semi-leafless pea produced the highest yields, and their average yield amounted to 33.4 dt/ha.

Key words: pea, pea moth, seeds, damage, cultivars, injury

INTRODUCTION

Deficiency of protein feeds can be limited among other factors by increasing cropping area and the level of yield of leguminous plants. One of the main reasons of their low yield is a improper nutrition and the lack of protection against pests (Burnoville 1991; Książak 2004; Nalborczyk 1993; Sypniewski 1986; Williams et al. 1995; Wnuk and Pobożniak 2003).

The insects which frequently damage pea plantations are: weevils, aphids, thrips, bean weevils and pea moth. Pea seeds are mainly damaged by pea moth (*Laspeyresia nigricana* Steph.) and bean weevils (*Bruchus pisorum* L.). Pea moth attacks a dozen or so plant species from the family of papilionaceous plants, especially willingly pea, field pea, vetch, more seldom broad bean and bean (Kagan 1962, 1969a; Niezgodziński 1986; Walczak 2001). This species is common in Poland, and occurs in a large number in the southern and south-eastern regions of the country (Kagan 1985; Niezgodziński 1986; Walczak 2001). Its caterpillars overwinter in soil. In

spring after pupation depending on weather, butterflies usually begin their flights by the end of May or in the beginning of June. The females lay their eggs on the leaves, leafstalks and in pods. Hatched caterpillars bite into pods, where they feed outside seeds. Damage of pea plants depends on the species and on weather conditions. In warm and dry years the damage is higher.

Harmfulness of pea moth can be reduced by intensive chemical protection or by growing less susceptible cultivars. Studies on the selection of resistant/tolerant varieties of pea have been conducted to a limited extent on the territory of our country (Chodulska-Filipowicz 1992; Kagan 1969a; Wiatr 1999; Wiatr et al. 1989).

The aim of the conducted studies was to determine the degree of damage of some pea cultivars by pea moth in the region of south-eastern Poland.

MATERIALS AND METHODS

The studies were carried out in 2001–2003 on the experimental field in Boguchwała. Spring cereals were a previous crop to pea. The applied mineral fertilization were as follows: N – 39 kg, P₂O₅ – 64 kg, K₂O – 95 kg/ha. Agrotechnical treatments were applied according to the IUNG recommendations. Seeds before sowing were dressed with Sarfun T 65 DS at the dose 400 g/100 kg of seeds, Wisar 70 WG was applied to control weeds at 0.4 kg/ha in the mixture with Command 480 EC at the dose of 0.2 l/ha. Pea seeds were sown on the brown soil of class IIIa. The studies covered 11 edible pea cultivars: Ametyst, Cyrkon, Diadem, Kujawiak, Kolia, Komandor, Perła, Piast, Rola, Set, Stig. The experiment was conducted according to the method of random block design in four replications. The area of one plot was 16.5 m². Before pea harvest, 100 pods were collected from each plot for seed analysis of damage caused by pea moth. Grain yield for analysis was collected separately from each plot. The significance of differences between average damage caused by pea moth and the seed yield was estimated by t-Student's test at the level of probability 0.05.

RESULTS AND DISCUSSION

The weather conditions during the vegetation seasons 2001–2003 were favourable for the development of pea plants (Fig. 1). It was especially visible in the analyses of leaf fall. In the years 2001–2003 during the spring months, i.e. in April, May and June the total precipitation was similar to the average of the long-term and amounted to: 235.2 mm, 230.9 mm and 247.0 mm, respectively. In the period of the highest demand of pea plants for water, i.e. from sowing to grain maturity, the amount of precipitation was satisfactory.

Cultivar susceptibility to pea moth

The per cent of damage of pea pods by pea moth in 2001–2003 is presented in Table 1.

In 2001 damage of pea pods constituted from 7.0% to 15.7%. The most damaged by pea moth were pods of the cv. Rola (15.7% of damaged pods). The least injuries were found in the pods of the cv. Set (7.0%).

The signs of feeding of pea moth larvae on pea cultivars were more diverse in 2002, when the pod damage ranged from 3.7% to 22.3%. The lowest per cent of damaged pods was found for the cv. Cyrkon (3.7% of damaged pods). Higher per

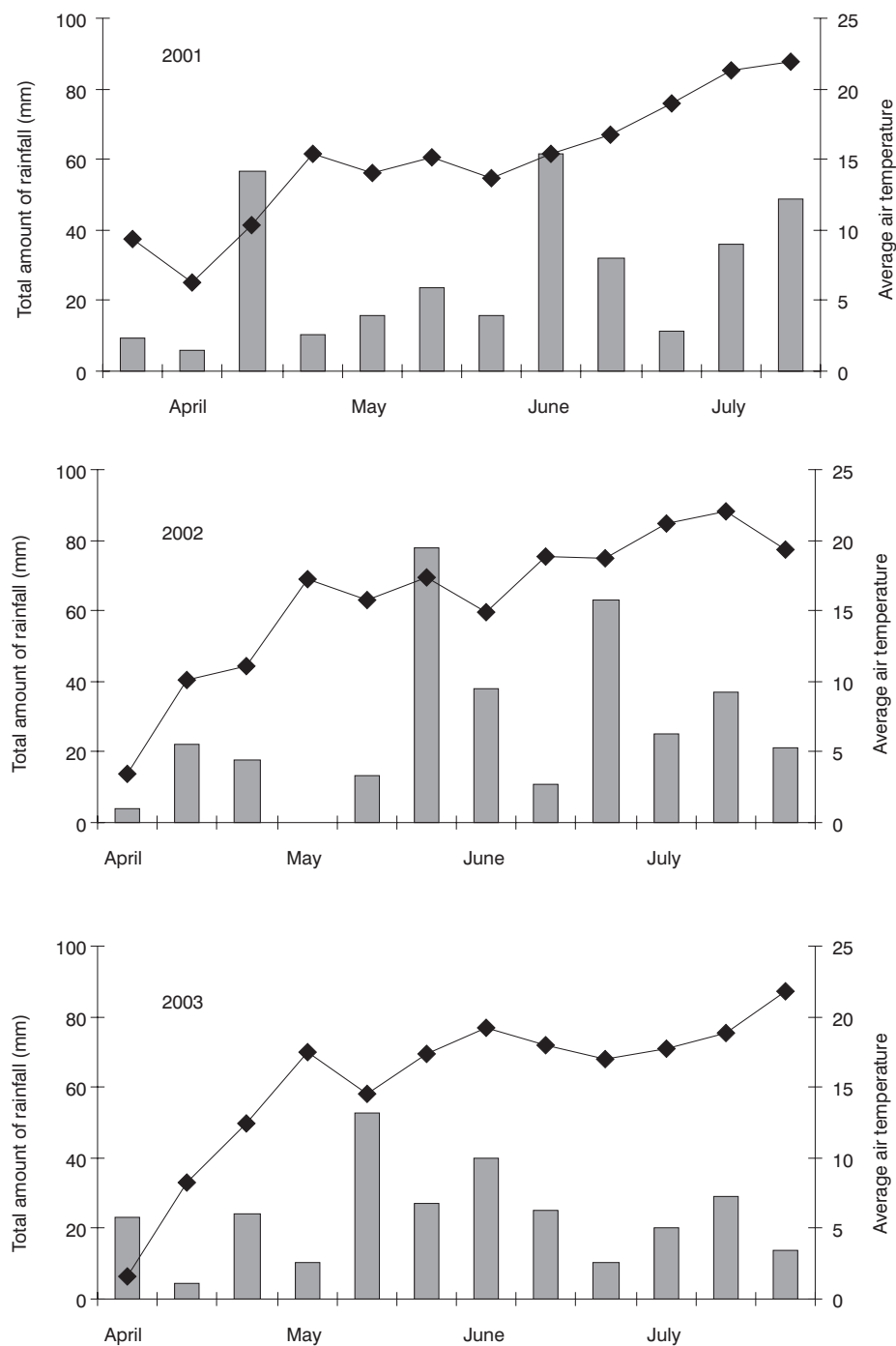


Fig. 1. Average decade air temperature and total amount of rainfall in the months: April–July 2001–2003

Table 1. Injury of pea pods by pea moth (*Laspeyresia nigricana* Steph.) in 2001–2003

No.	Cultivar	% of pods injured			
		2001	2002	2003	Average in 2001–2003
1.	Ametyst	13.2	10.5	12.0	11.9
2.	Cyrkon	8.2	3.7	17.5	9.8
3.	Diadem	12.5	13.2	23.5	16.4
4.	Kujawiak (w)	7.2	11.2	22.0	13.4
5.	Kolia	13.5	9.2	29.0	17.2
6.	Komandor (w)	7.5	10.7	21.0	13.0
7.	Perła	13.5	22.3	29.2	21.6
8.	Piast (w)	13.7	10.0	20.5	14.7
9.	Rola	15.7	4.7	21.7	14.0
10.	Set	7.0	11.2	27.0	15.0
11.	Stig	13.2	12.0	41.7	22.3
	LSD (0.05)	6.64	7.96	14.70	8.37

(w) – semi-leafless pea

cent of damage was noted on the cultivars: Set, Kujawiak and Stig – 11.2%, 11.2% and 12.0%, respectively. The highest per cent of damaged seeds was found for pods of the cv. Perła (22.3%) (Table 1).

In 2003, all analyzed cultivars were damaged to a significantly higher per cent in comparison with the two previous years of the studies. The highest pod damage was noted for the cv. Stig, which amounted to 41.7%. A high per cent of damaged pods was noted for the cvs. Set (27.0% of damaged pods), Kolia – (29.0%) and Perła – (29.2%). The cvs. Ametyst (12.0%) and Cyrkon (17.5%) were found to have the lowest pod damage.

Damage of pea seeds by larvae of pea moth is common under production conditions. Some authors found that this damage can constitute from 0.2% to 20.0% and in extreme cases it can reach 90.0% (Chodulska-Filipowicz 1992; Kagan 1962, 1969a; Niezgodziński 1969).

According to Walczak (2001), pea moth in the last dozen of years or so have not had economic importance on pea plantations. On the basis of the accumulated data the average pod damage according to the author constituted 4.3%. This pest was more dangerous in the south-eastern part of the country: in Podkarpacie – 6.3%.

In the period of 3-year of our studies conducted in Podkarpacie the average pod damage was markedly higher and amounted to 15.3%.

Studies on the susceptibility of cultivars to seed damage by pea moth were conducted in several regions of the country in the past years (Chodulska-Filipowicz 1992; Kagan 1969b; Wiatr et al. 1989). According to these authors the damage caused by pea moth was diverse between the cultivars used for the study. Wiatr et al. (1989) carrying out investigations in the vicinities of Poznań found, that seeds of pea species were damaged by pea moth from 1.09% to 9.13%. The highest damage of edible pea was found for the cv. Opal (5.14%), whereas the lowest damage – in the cv. Perkun (3.15%) and Ikar (3.17%). Results of the presented herein studies indicate that pod damage of edible pea in Podkarpacie was significantly diverse and ranged from 3.7% to 41.7%. The lowest average pod damage

Table 2. Yields of pea cultivars in 2001–2003

No.	Cultivars	Yield of pea seeds in dt/ha			
		2001	2002	2003	Average in 2001–2003
1.	Ametyst	25.7	29.8	39.6	31.7
2.	Cyrkon	26.5	18.3	31.5	25.4
3.	Diadem	25.8	21.3	35.1	27.4
4.	Kujawiak (w)	30.7	34.0	38.2	34.3
5.	Kolia	26.0	27.6	36.6	30.0
6.	Komandor (w)	33.1	31.0	31.1	31.7
7.	Perła	22.0	21.1	35.8	26.3
8.	Piast (w)	32.4	32.9	37.7	34.3
9.	Rola	32.6	21.7	35.5	29.9
10.	Set	25.0	28.0	32.7	28.5
11.	Stig	29.8	21.9	38.2	29.9
	LSD (0.05)	1.44	2.79	3.03	6.07

(w) – semi-leafless pea

was noted for the cv. Cyrkon – 9.8%, whereas the highest one – for the cv. Stig – 22.3% and in Perła – 21.6%.

The data obtained also indicated that a systematic increase of pod damage caused by larvae of the pea moth was observed from year to year.

Effect on yield

The highest average seed yields were harvested from the semi-leafless pea cultivars: Piast (34.3 dt/ha), Kujawiak (34.3 dt/ha) and Komandor (31.7 dt/ha). The lowest average seed yields in the period of the 3-year studies were obtained from the cultivars: Cyrkon (25.4 dt/ha) and Perła (26,3 dt/ha) (Table 2).

Seed yields of the 2002 growing season had a lower average weight (26.1 dt/ha) than those obtained in 2001 (28.1 dt/ha). The highest average seed yield from the studied cultivars was noted in 2003 (35.6 dt/ha).

The reasons for diverse seed damage caused by the pea moth larvae in the studied years as well as significant differences in seed yields could be weather conditions during the vegetation seasons of pea.

According to Jasińska and Kotecki (1993), Kotecki (1990) and Podsiadło et al. (2002) the level of pea yields depends first of all on the course of weather conditions in June, when plants come to flower and pod filling. Due to favourable weather and moisture conditions in this period plants set more nodes with pods, more pods and seeds, which led to satisfactory yields.

CONCLUSIONS

1. The presented herein studies showed that all analyzed pea cultivars were damaged by larvae of pea moth, but to a different degree.
2. Average pod damage by pea moth in the studied period was the highest in 2003 (24.1%) and the lowest in 2002 (10.7%).
3. Pod damage was the highest in the case of the cvs.: Stig (22.3%), Perła (21.6%) and Kolia (17.2%).

4. The highest seed yields were obtained from the cultivars Piast, Kujawiak, Komandor: 34.3 dt/ha, 34.3 dt/ha and 31.7 dt/ha.

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POLISH SUMMARY

USZKODZENIA NASION BADANYCH ODMIAN GROCHU (*PISUM SATIVUM* L.) PRZEZ LARWY PACHÓWKI STRĄKÓWECZKI (*LASPEYRESIA NIGRICANA* STEPH.) (*LEPIDOPTERA*, *TORTRICIDAE*)

W latach 2001–2003 przeprowadzono badania nad podatnością odmian grochu na uszkodzenie strąków powodowane przez larwy pachówki strąkóweczki w Boguchwale.

Badaniami objęto 11 odmian grochu jadalnego: Ametyst, Cyrkon, Diadem, Kujawiak, Kolia, Komandor, Perła, Piast, Rola, Set, Stig. Doświadczenie założono metodą losowanych bloków w czterech powtórzeniach. Przed zbiorem grochu z każdego poletka pobrano po 100 sztuk strąków do analizy nasion uszkodzonych przez pachówkę strąkóweczkę.

Najwyższy procent uszkodzonych strąków zanotowano w roku 2001 r. na odmianie Rola (15,7%), a w 2002 r. na odmianach Perła (22,3% i Diadem (13,2%). Najniższy procent uszkodzonych strąków zanotowano w 2002 r. na odmianie Cyrkon (3,7%) i Rola (4,7%). W 2003 r. najwyższy procent uszkodzonych strąków stwierdzono na odmianie Stig (41,7%), a najniższy na odmianach: Ametyst (12,0%) oraz Cyrkon (17,5%). Średni plon grochu w analizowanym okresie wahał się od 26,1 dt/ha do 35,6 dt/ha. Odmiany wąsolistne plonowały wyżej, a średni plon tych odmian wyniósł 33,4 dt/ha.