

THE OCCURRENCE OF *CURCULIONOIDEA* ON ALFALFA  
(*MEDICAGO SATIVA* (L.) CROPS IN SOUTH-EASTERN POLAND

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Abstract. The research on the occurrence of *Curculionoidea* carried out in 1990-1995, in south-eastern Poland showed that *Sitona humeralis* Steph. was the most numerous species. Its participation among all the collected *Curculionoidea* was 69.4%. Other species occurring on alfalfa crops were: *Hypera postica* (Gyll.) – 7.7%, *Sitona lineatus* (L.) – 5.0%, *Sitona hispidulus* (Fabr.) – 4.7% and *Apion tenue* Kirby 4.4% of the entire entomological material. In the spring, the highest numbers of adult *Curculionoidea* appeared in mid May and in the second half of September.

Key words: *Curculionoidea*, *Sitona humeralis* Steph., *Hypera postica* (Gyll.), *Sitona lineatus* (L.), *Sitona hispidulus* (F.), *Apion tenue* Kirby, alfalfa, intensity of appearance

I. INTRODUCTION

Alfalfa (*Medicago sativa* L.) is one of the perennial plants of the *Papilionaceae* family. Its life span and yield are determined by many environmental (e.g. microclimate, soil, pest numbers) and relevant to the technique of field-crop production factors (e.g. mowing date).

Pests on alfalfa crops consist mainly of adult *Coleoptera* of *Apionidae* and *Curculionidae* families (Romankow 1960; 1961; Wengris 1961; Gondek et al. 1966).

The research on *Curculionoidea* on alfalfa crops in south-eastern Poland started in the 1980's. Cmoluch and Minda-Lechowska (1981), and Czerniakowski (1988) determined species composition. However, in the Polish bibliography there is still no detailed data about the harmful *Curculionoidea*, especially the representatives of *Sitona* spp. genus, which is considered to be a very dangerous pest for alfalfa crops in the Ukraine (Petrucha 1970). Therefore, it seemed useful to investigate the species composition of *Curculionoidea* on alfalfa crops used as green fodder in the neighbouring south-eastern Poland. The intensity and dynamics of their occurrence during the growing season were determined, and thus, the time in which they were a greatest threat for alfalfa crops could be estimated.

II. MATERIAL AND METHODS

The research on *Curculionoidea* was carried out in 1990–1995, in ten plantations of alfalfa crops, located in the Podkarpackie region. The foot-hills space under observation were the following: „Podgórze Rzeszowskie” – five plantations, „Pogórze Dynowskie” – one plantation and „Doły Jasielsko – the Sanockie” region – four plantations.

The cultivation plots covered from 0.20 to 0.75 ha. Most plantations were mown three times in the beginning of the blooming stage, while the rest was mown twice.

The material for testing was sampled by entomological net method from all plantations. 4 x 25, i.e. 100 sweeps of the entomological net were accepted as a representative sample. Insects were collected every three days in windless sunny weather throughout the season of alfalfa growth. In total 667 samples were collected.

From the entomological material, adult *Coleoptera* were selected from *Curculionoidea*, which were determined with reference to genus and species, using entomological keys issued by Smreczyński (1965; 1966; 1968; 1974). The review of species has been made in accordance with the nomenclature in the "Catalogue of Fauna in Poland" (Burakowski et al 1992; 1993; 1995; 1997).

The species composition, as well as the intensity and dynamics of occurrence of *Curculionoidea* were determined, and relative density and individual dominance were calculated for each species. For the observation of relative density, i.e. the mean size of specific species, the number of individuals per 25 sweeps of the entomological net, called a basic sample, was examined. For a descriptive presentation of the value of D index, the following classes of individual dominance were adopted after Petryszak (1982):

D <sub>5</sub> – eudominants; above 10%	} individuals on site
D <sub>4</sub> – dominants; from 5,1 to 10%	
D <sub>3</sub> – subdominants; 2,1 do 5%	
D <sub>2</sub> – recedents; from 1,1 do 2,0%	
D <sub>1</sub> – subrecedents; below 1%	

### III. RESULTS AND DISCUSSION

The analysis of entomological material collected in south-eastern Poland, in 1990-1995 showed that the species composition of *Curculionoidea* in ten plantations of alfalfa was similar. In total, 28,636 specimens of *Curculionoidea* belonging to 2 families: *Apionidae* and *Curculionidae* were collected. That number included 28 species that were determined.

Adults from *Sitona* spp. genus were the most numerous. They constituted 80.34% of all the weevils caught. Nine species were identified in, or isolated from, the collected material: *Sitona crinitus* (Herbst), *S. hispidulus* (Fabr.), *S. humeralis* Steph., *S. lepidus* Gyll. = *S. flavescens* (Marsh.), *S. lineatus* (L.), *S. longulus* Gyll., *S. puncticollis* Steph., *S. sulcifrons* (Thunb.) and *S. waterhousei* Walt. (Tab.).

In addition to the species mentioned above, Romankow (1963), Ruszkowska (1961), Cmoluch et al. (1982), found other species of the genus: *S. griseus* (Fabr.), *S. inops* Schoenh., *S. cylindricollis* (Fabr.), *S. suturalis* Steph. in alfalfa fields. Similar species composition of *Sitona* spp. in alfalfa plantations was observed by Rotrekl (1976) in former Czechoslovakia, Petrucha (1970) in former Soviet Union, Tanasjevic (1974) in Serbia, and Cantot (1976) in France.

Table

Species of adults of *Curculionoidea* family collected on alfalfa crops in 1990-1995

N°	Species/Genus	Number	%
1	<i>Apion hookeri</i> Kirby, 1808	143	0.50
2	<i>A. seniculus</i> Kirby, 1808	12	0.04
3	<i>A. loti</i> Kirby, 1808	15	0.05
4	<i>A. tenue</i> Kirby, 1808	1,272	4.44
5	<i>A. pisi</i> (Fabricius, 1801)	261	0.91
6	<i>A. spencii</i> Kirby, 1808	1	0.003
7	<i>A. viciae</i> (Paykull, 1800)	41	0.14
8	<i>A. cerdo</i> Gerstaecker, 1854	3	0.01
9	<i>A. subulatum</i> Kirby, 1808	4	0.01
10	<i>A. virens</i> Herbst, 1797	143	0.50
11	<i>A. apricans</i> Herbst, 1797	278	0.97
12	<i>A. filirostre</i> Kirby, 1808	289	1.01
13	<i>A. fulvipes</i> (Geoffroy in Fourcroy, 1785)	86	0.30
14	<i>A. trifolii</i> (Linnaeus, 1768)	116	0.41
15	<i>Otiorhynchus ligustici</i> (Linnaeus, 1758)	52	0.18
	<i>Phyllobius</i> spp. Germar, 1824	95	0.33
16	<i>Sitona crinitus</i> (Herbst, 1795)	37	0.13
17	<i>S. hispidulus</i> (Fabricius, 1776)	1,351	4.72
18	<i>S. humeralis</i> Stephens, 1831	19,883	69.43
19	<i>S. lepidus</i> Gyllenhal in Schönherr, 1834	11	0.04
20	<i>S. lineatus</i> (Linnaeus, 1758)	1,421	4.96
21	<i>S. longulus</i> Gyllenhal in Schönherr, 1834	12	0.04
22	<i>S. puncticollis</i> Stephens, 1831	7	0.03
23	<i>S. sulcifrons</i> (Thunberg, 1798)	252	0.88
24	<i>S. waterhousei</i> Walton, 1846	32	0.11
25	<i>Tychius crassirostris</i> Kirsch, 1871	62	0.22
26	<i>T. quinquepunctatus</i> (Linnaeus, 1758)	36	0.13
27	<i>Hypera nigrirostris</i> (Fabricius, 1775)	19	0.07
28	<i>H. postica</i> (Gyllenhal, 1813)	2,211	7.72
	<i>Ceutorhynchus</i> spp. Germar, 1824	491	1.72
Total		28,636	100.00

In my own investigation, *S. humeralis* was characterised by the highest numbers. In total, 19, 883 individuals of this species, i.e. 69.43% of all *Curculionoidea* (Tab.) and 86.43% of the collected *Sitona* spp. were caught. It was encountered in ten investigated sites where it was reckoned among eudominants (Fig.1). *S. humeralis*, which was particularly numerous and frequent, occurred on alfalfa crops in its third and fourth year of the mowing usage.

The highest number of *S. humeralis* among *Curculionoidea* collected on alfalfa crops was reported by Minda-Lechowska (1980) and Czerniakowski (1988), while Błażejewska and Wawrzyniak (1977), and Czerniakowski (1991) reported it to be the most numerous of the *Sitona* spp. Schnell (1955) and Nadasy (1983) consider monofagous on alfalfa crops.

Aeschlimann (1980), who examined the region of southern Europe enumerated 20 species of *Sitona*. However, he counted only two of them: *S. humeralis* and *S. lineatus* among

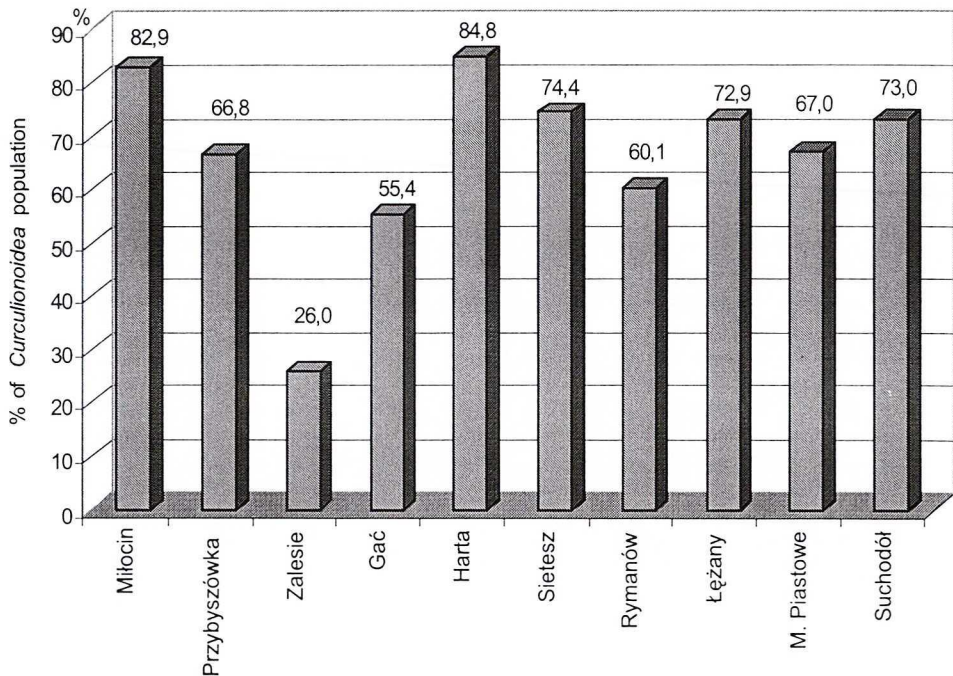


Fig. 1. Number of *Sitona humeralis* on individual plantations of alfalfa

dominants. In Scandinavia *S. decipiens* Lindb. occurs as the most numerous species (Nilsson 1968; Marrkula and Köppa 1960). On the other hand, the American authors mentioned *S. hispidulus* and *S. lineatus* (Barney and Armbrust 1980; Hoebeke and Wheeler 1985; Underhill et al. 1955).

The relative density of *S. humeralis* varied from 2.24 to 13.34 individuals (in Zalesie and Miłocin, respectively), the mean was 7.45 individuals.

*S. lineatus* was the second most numerous species which occurred in all the sites. Through most of the growing season it was characterised by low intensity and its numbers increased only in August and September. Totally 1,421 individuals of the species were found, which amounted to 4.96% of the collected *Curculionoidea* and 6.18% of the *Sitona* spp. (Tab.). In Gać, Rymanów and Suchodół, it was one of the more numerous insects, and therefore was reckoned among dominants (8.91–20.92%) in those plantations. However, in the majority of plantations the percentage of share of alfalfa crops occupation by *S. lineatus* was between 2.11 to 4.39% and, therefore it was qualified into subdominants (Fig. 2). Its relative density was higher in Gać and Suchodół (1.27 and 1.18 individuals, respectively); the mean was 0.53 individuals.

*S. hispidulus* was other species caught in every plantation of alfalfa. It showed rather a steady tendency of the population growth at the end of the alfalfa growth, with peak numbers in September or October. Altogether 1,351 individuals of *S. hispidulus* were collected. It constituted 4.72% of all the *Curculionoidea*, and 5.87% of the *Sitona* spp.

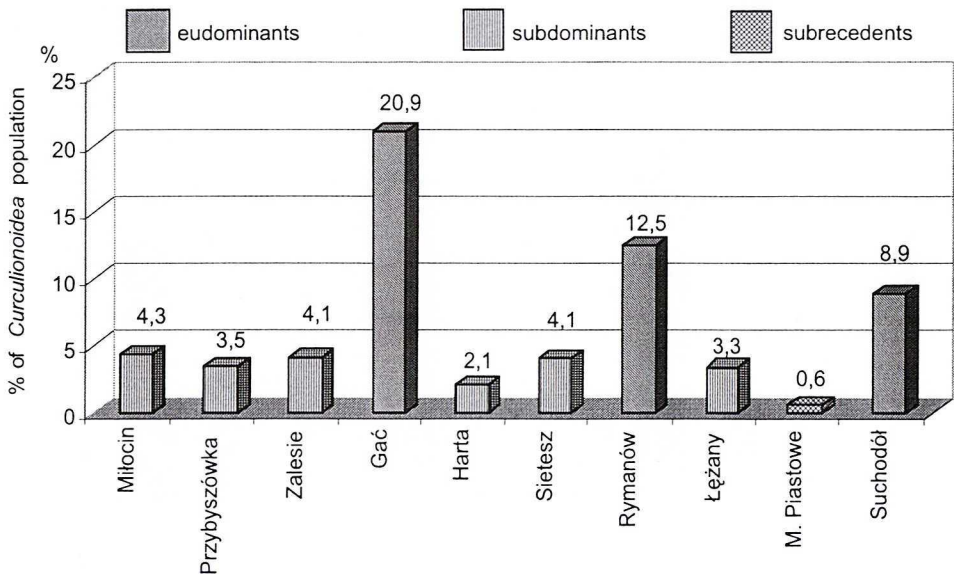


Fig. 2. Number of *Sitona lineatus* on individual plantations of alfalfa

(Tab.). In five plantations it occurred in high numbers and was counted among the dominating species (with the share of above 5% in plantation occupation) (Fig. 3). The mean relative density of these species was low – 0.51 individuals.

The second species in number ranking was the *Apion* spp. Altogether 2,664 individuals of the *Apion* spp. were collected, i.e. 9.31% of all the *Curculionoidea*. This genus

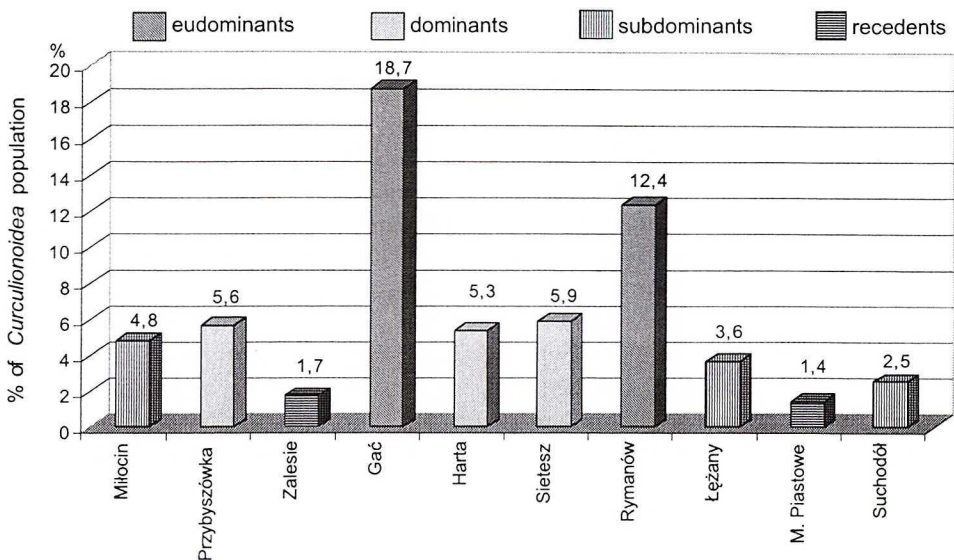


Fig. 3. Number *Sitona hispidulus* on individual plantations of alfalfa

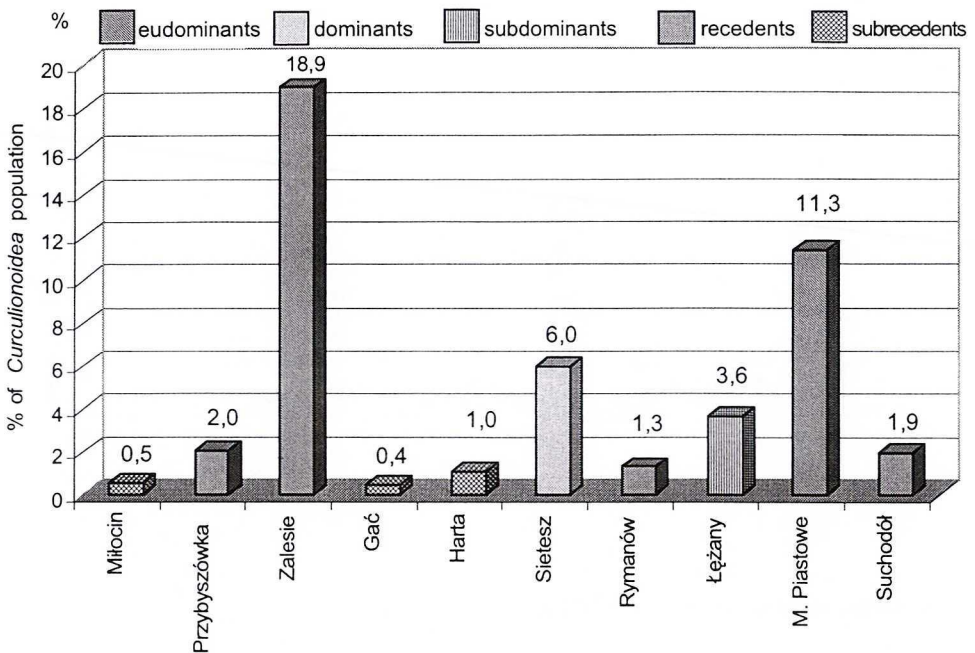


Fig. 4. Number of *Apion tenue* on individual plantations of alfalfa

was represented by the largest number of species, but *A. tenue* Kirby was responsible for almost half of them. Apart from this insect, 13 other species of the *Apion* spp. were also encountered (Tab.).

*A. tenue* occurred in all ten plantations but its increased numbers in the growing season could be determined only in the spring before the first mowing (May, early June). Totally, 1,272 specimens of this species were caught, i.e. 4.44% of all the *Curculionoidea* and 47.74% of the *Apion* spp. caught (Tab.).

*A. tenue* varied considerably in its numbers. In Zalesie and Miejsce Piastowe it was among eudominants (19 and 11.4% of weevils collected, respectively), in Sietesz it was a dominating species – 6%, in Łężany – it was subdominant (3.7%), while in the remaining places it was less numerous (Fig. 4). The mean density of this species was 0.48 individuals.

On alfalfa crops, in south-eastern Poland *A. filirostre* Kirby and *A. pisi* (Fabr.) occurred in nine sites, from early May until mid September. Gać was the only site in which the species were not recorded. Each of them constituted 1.0% of all the *Curculionoidea* found on alfalfa crops and 10.0% of the *Apion* spp. (Tab.). In most sites *A. filirostre* and *A. pisi* occurred in low intensity. Their mean relative density was 0.11 individuals.

*A. apricans* Herbst with total numbers close to those of the two earlier presented *Apion* spp. (278 individuals) occurred in all sites, most often in May or September.

Apart from *Curculionoidea*, which are biologically linked with papilionaceous plants, the *A. hookeri* Kirby species infesting pyrethrum and dog-fennel (mayweed) were caught,

especially in older plantations – (Burakowski et al. 1992). In one basic sample the mean of 0.05 insects was collected (Tab.).

The *Hypera* genus was characterized by similar numbers to that of the *Apion* spp. Altogether 2,230 individuals of this genus were collected, i.e. 7.79% of all *Curculionoidea*. The species of *H. postica* (Gyll.) and *H. nigrirostris* (Fabr.) were isolated. In addition to the above, Opyrchalowa (1957) and Romankow (1963) also mentioned the following: *H. punctatus* (Fabr.), *H. meles* (Fabr.), *H. murinus* (Fabr.) and *H. pedestris* Payk. (Tab.). However, they both have stressed that these species were rare and occurred only in small numbers.

*H. postica* was among typical species for alfalfa crops. It occurred in all the sites. After hibernation, the first individuals of this species appeared in plantations in the third decade of April. The higher numbers were recorded only until the first decade of June. Therefore, *H. postica* may be considered typical for the spring.

Depending on the sampling location, its share in alfalfa crop occupation was within the range of 24.5 to 2.1% (Fig. 5). It attained the highest relative density in Zalesie (2.1 individuals) and in Miejsce Piastowe (1.16) while in other sites the values of this parameter were less than one. The mean relative density for *H. postica* was 0.83 individuals (Fig. 5).

The study of numerical composition of weevils collected on alfalfa crops in south-eastern Poland during its growing season leads to conclude that most numerous catches took place in May (33.5% on mean), and in September (20.3% on average). The intensity of adult occurrence was the lowest in April and July. It averaged at 4.1% and 5.8%, respectively. In the remaining months their share in the occupation of plants averaged at 10.2%, 10.6%, and 15.2% of weevils in June, August and October, respectively (Fig. 6).

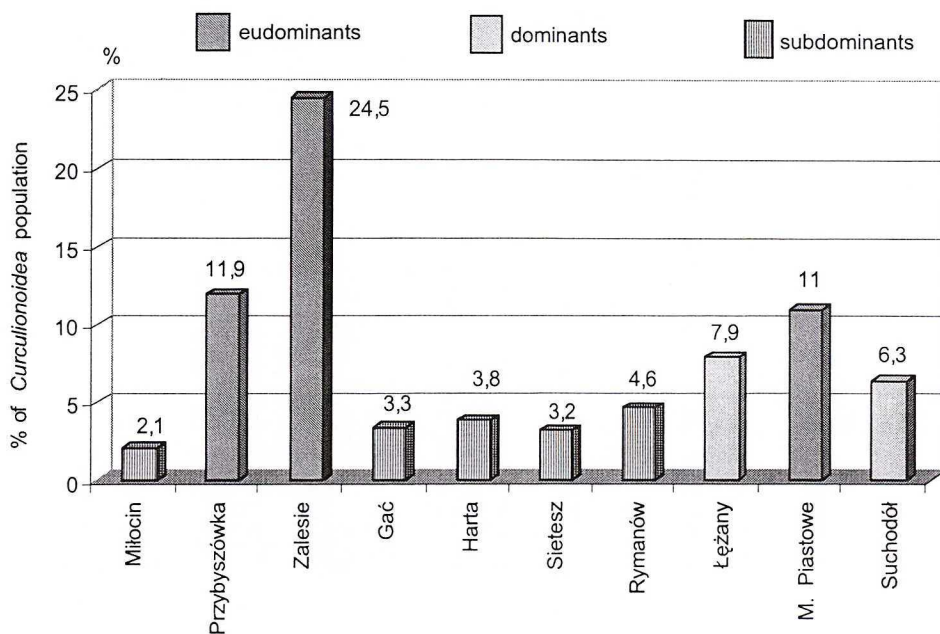


Fig. 5. Number *Hypera postica* on individual plantations of alfalfa

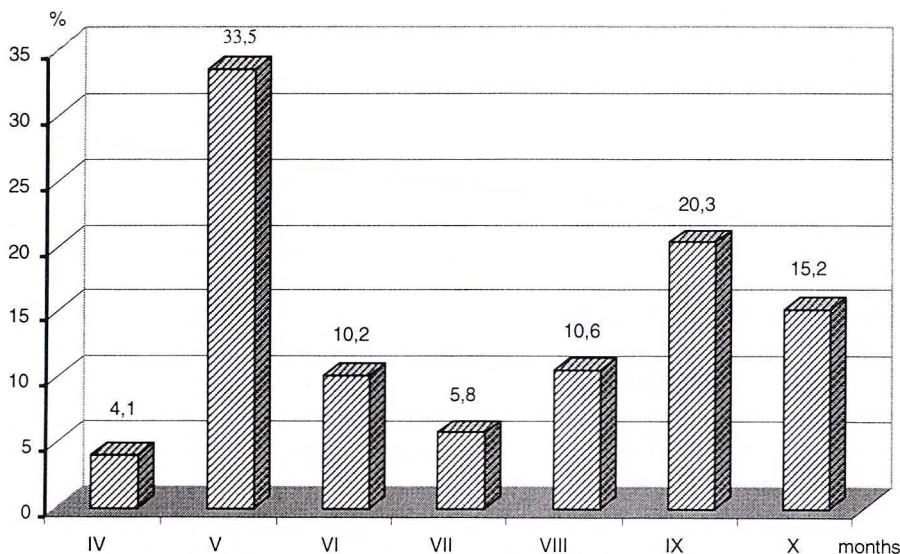


Fig. 6. Percentage share of *Curculionoidea* number collected on alfalfa crops in individual months of the growing period

The qualitative analysis of weevils throughout the growing season showed that most species were caught in May (90%) and least in April and October (25%). In the remaining months the share of species in plant infestation was between 44 to 52% (Fig. 7).

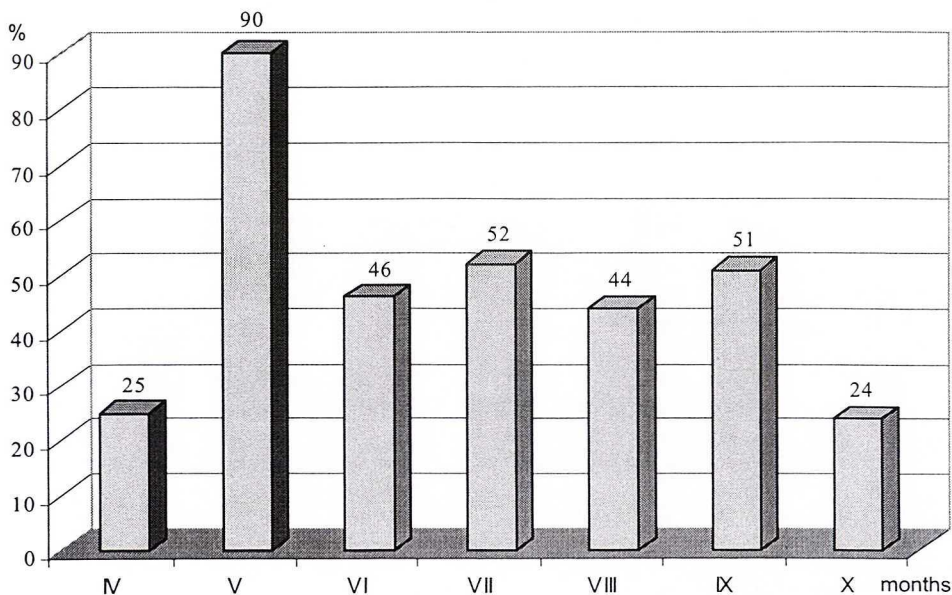


Fig. 7. Percentage share of species of *Curculionoidea* collected in alfalfa crops, in individual months of the growing season



It has been commonly accepted in the agricultural practice that one mowing during the growing period should be postponed until the flowering stage and the beginning of the pod forming. It is connected with the accumulation of nutrients in roots of alfalfa plants which takes place in the beginning of flowering. It is also well known that the greater the reserves of substances stored in root neck and in the upper section of taproot, the quicker and stronger the sprouting from rootstocks, and the better the plant wintering (Fordoński and Paprock 1978). My research showed that mowing of the first growth in the period of plant flowering cessation made favourable conditions for full development of such species as *A. tenue* and *H. postica*, and for their higher intensities in the autumn and subsequent years.

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## WYSTĘPOWANIE *CURCULIONOIDEA* NA UPRAWACH LUCERNY SIEWNEJ W POŁUDNIOWO-WSCHODNIEJ POLSCE

### STRESZCZENIE

Przeprowadzone w latach 1990-1995, w południowo wschodniej Polsce badania nad występowaniem *Curculionoidea* wskazały, że gatunkiem najliczniejszym był *S. humeralis*. Stanowił on 69,4% wszystkich zebranych *Curculionoidea*.

Na lucernie również licznie spotykano *H. postica* – 7,7%, *S. lineatus* – 5,0%, *S. hispidulus* – 4,7% i *A. tenuis* 4,4% całego materiału entomologicznego.

Wiosną największe nasilenie liczebności dorosłych *Curculionoidea* przypadało na połowę maja, jesienią zaś w drugiej połowie września.