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The Weevils (*Coleoptera*, *Curculionoidea*: *Attelabidae*,
Apionidae, *Curculionidae*) of Persian clover (*Trifolium
resupinatum*)

Ryjkowcowate (*Coleoptera*, *Curculionoidea*: *Attelabidae*, *Apionidae*, *Curculionidae*)
koniczyny perskiej (*Trifolium resupinatum*)

SUMMARY

In the present paper the results of research on weevil fauna (*Coleoptera*, *Curculionoidea*) were presented. The research was conducted in the years 1995–1997 on three cultures of Persian clover (*Trifolium resupinatum*) situated in the Lublin Voivodship. 52 weevil species were gathered, distinguished out of a set of 2,432 individuals. Two species: *Apion virens* and *Sitona sulcifrons* were the most numerously caught, and mainly they shaped the numerical dynamics of weevils. After an ecological analysis it was found that in the cultures investigated meadow elements dominated, oligophages living on various species of papilionaceous plants. In case of their mass-occurrence they can cause damage to the growth of the green matter, also of Persian clover.

Palaearctic forms were the most numerously represented among the zoogeographic elements distinguished, both as regards quality and quantity. The Holarctic and Eurosiberian elements were characterised by a high number of species too.

STRESZCZENIE

W niniejszej pracy przedstawiono wyniki badań nad fauną ryjkowcowatych (*Coleoptera*, *Curculionoidea*). Badania prowadzono w latach 1995–1997 na trzech uprawach koniczyny perskiej (*Trifolium resupinatum*) zlokalizowanych w województwie lubelskim. Zebrano tu 52 gatunki ryjkowcowatych wyróżnione ze zbioru 2432 osobników. Najliczniej odławiano dwa gatunki: *Apion virens* i *Sitona sulcifrons* i one głównie kształtowały krzywą liczebności ryjkowców. Przeprowadzając analizę ekologiczną stwierdzono, że na badanych uprawach dominowały elementy łąkowe, oligofagi żyjące na różnych gatunkach roślin motylkowatych. Przy licznych pojawach mogą one powodować szkody w przyroście zielonej masy także koniczyny perskiej.

W obrębie wyodrębnionych elementów zoogeograficznych najliczniej pod względem jakościowym i ilościowym reprezentowane były formy palearktyczne. Wysoką liczbą gatunków charakteryzował się także element holarktyczny i eurosyberyjski.

Key words: *Curculionoidea*, quantitative structure, species composition.

INTRODUCTION

Persian clover is an efficient fodder plant. It is a source of large amounts of green forage, with low content of fibre and high content of protein (around 19%) and free amino acids. This allows its use in feeding swine and young cattle for fast growth of body mass.

The research conducted in Poland so far concerned the possibility of growing different varieties of this plant and the production of seeds (5–8, 18). In the accessible literature no works dealing with the insect fauna of Persian clover have been encountered. It seemed therefore purposeful to learn the composition of species and the quantitative structure of weevil fauna, typically phytophagous, one of the most serious papilionaceous plant pest.

MATERIAL AND METHODS

The research on weevil fauna was conducted in the years 1995–1997 on three one-year cultures of Persian clover situated in the present Lublin Voivodship (Komarów, Wólka Gródecka, Jeziernia — Fig. 1). On all plantations the samples were gathered with an entomological net during one vegetative season. One sample consisted of a series of 8×25 seizures with a net.

The analysis of the material included the number of species (N), relative density (n' — mean number of individuals per sample), domination (D). The values of the level of domination obtained were grouped in 4 classes: eudominants (>10%), dominants (5.1–10%), subdominants (2.1–5%) and recedents (<2%) (21). The material gathered was also analysed ecologically and zoogeographically (2, 14).

Fig. 1. A situational delineation of the research area. Stands: I — Komarów, II — Wólka Gródecka, III — Jeziernia

THE COMPOSITION OF SPECIES AND THE DOMINATION STRUCTURE

STAND I — KOMARÓW

The size of the surface of the researched culture was 0.25 ha. Barley and buckwheat adjoined to it. The contaminating plants were mainly: *Stellaria media*, *Thlaspi arvense*, *Polygonum persicaria*, *Fumaria officinalis*.

1,277 weevil specimens of 41 species were gathered in the stand. In the development of the populations of all the insects gathered, one increase in number was observed — in the autumn period. In the spring and early summer few or single weevils were caught (Fig. 2).

Fig. 2. Numerical dynamics of weevils on Persian clover culture in Komarów in 1995

The zoocenological structure of the species gathered was as follows:

eudominants	<i>Apion virens</i> 38.6%, <i>Sitona sulcifrons</i> 27.7%
dominants	<i>Ceutorhynchus floralis</i> 5.4%
subdominants	<i>Ceutorhynchus obstrictus</i> 4.5%, <i>Sitona lepidus</i> 4.1%, <i>Polydrusus inustus</i> 3.8%
recedents	35 species, the domination of which varied from 2.04 to 0.08%, and the relative density from 1.37 to 0.05 specimen/sample.

The core of the association of weevil fauna of this culture consisted of meadow species with *Apion virens* and *Sitona sulcifrons* dominating. They are biologically related, mainly with red clover. They are registered as the pests of this plant (3, 9, 11, 16, 19). *Ceutorhynchus floralis*, a species which lives on plants of the crucifer family (which contaminated the Persian clover), was also caught in relatively large numbers (10, 13).

STAND II — WÓLKA GRÓDECKA

This culture had the surface area of around 0.25 ha. An orchard and cultures of wheat, sugar beets, and potatoes adjoined to it. The main contaminating plants were: *Chenopodium album*, *Raphanus raphanistrum*, *Polygonum persicaria*, *Galium aparine*.

In this stand 775 weevil specimens of 31 species were caught. The numerical dynamics of all species of weevils was similar to that of the first stand. One increase in number, in the autumn period (third decade of September), was also observed here (Fig. 3).

Fig. 3. Numerical dynamics of weevils on Persian clover culture in Wólka Gródecka in 1997

The structure of domination of the species found in the culture was as follows:

eudominants	<i>Apion virens</i> 46.2%, <i>Sitona sulcifrons</i> 17.6%
dominants	<i>Sitona lineatus</i> 6.6%
subdominants	<i>Apion fulvipes</i> 5.0%, <i>Sitona lepidus</i> 4.8%, <i>S. hispidulus</i> 2.3%
recedents	25 species with domination 1.68 to 0.13% and relative density 0.76 to 0.06 specimen/sample.

In this culture, like in the previous one, the class of eudominants was represented by species characteristic of red clover, i.e. *Apion virens* and *Sitona sulcifrons*. *Sitona lineatus* was also caught in relatively large numbers. Both the adult form and the larvae of this species may cause damage in cultures of various papilionaceous plants (1, 4, 12, 15, 17, 20).

STAND III — JEZIERNIA

The surface area of this culture was 0.04 ha. A plantation of strawberries, sugar-beets and red clover adjoined to it. The contaminating plants were primarily: *Chenopodium album*, *Polygonum persicaria*, *Galium aparine*.

20 species were gathered here, distinguished out of a set of 380 individuals. In the stand, the highest numbers of weevils were caught at the end of June, then there was a drop in the number of specimens caught, and then there was another increase in mid-August (Fig. 4).

Fig. 4. Numerical dynamics of weevils on Persian clover culture in Jeziernia in 1996

The domination structure of weevils was as follows:

eudominants	<i>Sitona sulcifrons</i> 52.6%, <i>Apion virens</i> 18.2%
dominants	none
subdominants	<i>Sitona lineatus</i> and <i>S. lepidus</i> 4.7% each, <i>S. hispidulus</i> 4.5%, <i>S. puncticollis</i> 3.9%, <i>Ceutorhynchus floralis</i> 2.6%
recedents	13 species with domination from 1.61 to 0.32% and relative density from 0.67 to 0.11 specimen/sample.

In the weevil association of the culture investigated the eudominants were species characteristic of red clover, the same as in the two previous stands. The remaining numerical classes were represented by few specimens and species.

ANALYSIS OF THE MATERIAL

As a result of the research conducted on three cultures of Persian clover 2,432 weevil specimens were gathered. 52 species were distinguished in that set

(Table 1). Species of the *Apion* Herbst and *Sitona* Germ. genera, which primarily live on various wild and cultivated papilionaceous plants, were the most numerous among them.

Table 1. Species composition and relative density of weevils (*Coleoptera*, *Curculionoidea*) collected in the cultures of Persian clover (*Trifolium resupinatum*)

No.	Species	Stands			Number of individuals
		I	II	III	
1	2	3	4	5	6
<i>Atelabidae</i>					
1.	<i>Deporaus betulae</i> (L.)	0.05			1
<i>Apionidae</i>					
2.	<i>Apion carduorum</i> Kirby	0.05			1
3.	<i>Apion hookeri</i> Kirby	0.10		0.11	3
4.	<i>Apion seniculus</i> Kirby		0.47		8
5.	<i>Apion tenue</i> Kirby	0.05			1
6.	<i>Apion aestimatum</i> Faust	0.05		0.22	3
7.	<i>Apion pavidum</i> Germ.		0.06		1
8.	<i>Apion cracca</i> (L.)		0.12		2
9.	<i>Apion virens</i> Herbst	25.94	21.06	7.66	920
10.	<i>Apion apricans</i> Herbst.	0.05	0.29	0.55	11
11.	<i>Apion fulvipes</i> (Payk.)	0.10	2.30	0.67	47
12.	<i>Apion trifolii</i> (L.)	1.00	0.24		23
<i>Curculionidae</i>					
13.	<i>Otiorhynchus ligustici</i> (L.)			0.33	3
14.	<i>Otiorhynchus raucus</i> (Fabr.)	0.26			5
15.	<i>Otiorhynchus ovatus</i> (L.)			0.11	1
16.	<i>Phyllobius brevis</i> Gyll.	1.21			23
17.	<i>Trachyphloeus bifoveolatus</i> (Beck.)	0.10			2
18.	<i>Polydrusus inustus</i> Germ.	2.58			49
19.	<i>Foucartia squamulata</i> (Herbst)	1.37			26
20.	<i>Sitona crinitus</i> (Herbst.)	0.32	0.65	0.11	18
21.	<i>Sitona hispidulus</i> (Fabr.)	0.95	1.06	1.88	53
22.	<i>Sitona humeralis</i> Steph.	0.05	0.47	0.22	11
23.	<i>Sitona lepidus</i> Gyll.	2.74	2.18	2.00	107
24.	<i>Sitona lineatus</i> (L.)	1.16	3.00	2.00	91
25.	<i>Sitona puncticollis</i> Steph.	0.26	0.65	1.67	31
26.	<i>Sitona sulcifrons</i> (Thunbg.)	18.58	8.00	22.22	689
27.	<i>Sitona suturalis</i> Steph.		0.06		1
28.	<i>Sitona waterhousei</i> Walt.		0.18		3
29.	<i>Tanymecus palliatus</i> (Fabr.)	0.05	0.06		2
30.	<i>Chlorophanus viridis</i> (L.)	0.10	0.24		6
31.	<i>Tychius picirostris</i> (Fabr.)	0.05	0.12	0.11	4

Ciąg dalszy tabeli 1

1	2	3	4	5	6
32.	<i>Tychius quinquepunctatus</i> (L.)	0.05			1
33.	<i>Hypera arator</i> (L.)	0.05	0.06	0.11	3
34.	<i>Hypera diversipunctata</i> (Schrank)	0.05			1
35.	<i>Hypra nigrirostris</i> (Fabr.)	0.05	0.12	0.44	7
36.	<i>Hypera postica</i> (Gyll.)	0.10			2
37.	<i>Hypera zoilus</i> (Scop.)	0.05			1
38.	<i>Pelenomus waltoni</i> (Boh.)		0.12		2
39.	<i>Rhinoncus bruchoides</i> (Herbst)	0.95	0.71		30
40.	<i>Rhinoncus castor</i> (Fabr.)	0.05			1
41.	<i>Rhinoncus pericarpus</i> (L.)	0.10			2
42.	<i>Rhinoncus perpendicularis</i> Reich.	0.10	0.53		11
43.	<i>Ceutorhynchus assimilis</i> (Payk.)	0.21			4
44.	<i>Ceutorhynchus erysimi</i> (Fabr.)	0.53	0.47	0.55	23
45.	<i>Ceutorhynchus floralis</i> (Payk.)	3.63	0.47	1.11	87
46.	<i>Ceutorhynchus gallorhenanus</i> (Solaris)	0.58	0.35		17
47.	<i>Ceutorhynchus ignitus</i> (Germ.)		0.71		12
48.	<i>Ceutorhynchus obstrictus</i> (Marsh.)	3.00	0.76	0.11	71
49.	<i>Ceutorhynchus pallidactylus</i> (Marsh.)	0.42			8
50.	<i>Hadropontus litura</i> (Fabr.)	0.05			1
51.	<i>Coeliasstes lamii</i> (Fabr.)		0.06		1
52.	<i>Mecinus pyraister</i> (Herbst)		0.06		1
Number of individuals		1277	775	380	2432

Stands: I — Komarów; II — Wola Gródecka; III — Jeziernia

After analysing the numerical dynamics of all species of weevils which lived on Persian clover in two stands (Komarów — st. I, Wólka Gródecka st. — II), one clear maximum was found, and it occurred in the early autumn months (Figures 2, 3). It was due to mainly two species: *Apion virens* and *Sitona sulcifrons*. In the period of spring and early summer only single or few weevils were caught there. This was probably caused by the gradual succession of individuals and species on a one-year culture. The seasonal numerical dynamics of weevils was a bit different in Jeziernia (st. — III). The insects in samples started to appear by the end of June and it was then that the first increase in number was observed, after which there was a drop in the number of specimens caught. The second, repeated increase was noticed in August. A relatively numerous occurrence of weevils in June was due to the close neighbourhood of a red clover culture, after the mowing of which the weevils moved to this one-year culture (Fig. 4).

Apion virens and *Sitona sulcifrons* represented the class of eudominants and they were the most frequently caught in the cultures investigated. 1,609 individuals

were counted among them, constituting 66.16% of all individuals gathered. They were also characterised by a high relative density reaching on average 7.6 to 25.4 specimen/sample (Table 1). Because these two species damage the vegetative parts of papilionaceous plants, they can cause damage to the growth of the green matter of persian clover in case of their mass-occurrence.

Two taxa: *Sitona lineatus* and *Ceutorhynchus floralis* were counted among the class of dominants. The first of them lives on various species of papilionaceous plants, yet it prefers vetch, pea and bean, and the other is biologically related to crucifer plants.

Only 26.5% of 48 species of the individuals belonged to the class of subdominants and recedents on the cultures investigated. These were mostly accidental forms, related biologically to plants which contaminated the cultures investigated.

Table. 2. Percentage of ecological elements in weevils fauna of Persian clover (*Trifolium resupinatum*). N — number of species; n — number of specimens

Species	N	%	n	%
Habitat selectivity				
Forest	5	9.6	84	3.5
Xerothermophilous	2	3.8	29	1.2
Meadow	33	63.5	2088	85.9
Hydrophilous	2	3.8	3	0.1
Other	10	19.2	228	9.4
Fagism				
Polyphages	10	19.2	94	3.9
Oligophages	40	76.9	2324	95.5
Monophages	2	3.8	14	0.6

5 ecological elements were distinguished in the material gathered, after an analysis of the ecological membership of particular species of weevils in specific types of environment (Table 2). In all stands, forms characteristic of meadow associations (from *Arrhenatheretalia* order) were the most numerous, both as regards the number of individuals and species. All species of the eudominant and dominant classes constituted a meadow element.

The next position was occupied by forms named "other". Species living on plants which grow in different types of environment were numbered there. These were mainly weevils living on plants which contaminated the cultures. It should be stressed, that their relative number in the cultures investigated was very small.

Oligophages, species which live on plants belonging to one family, were characterised by the highest percent share in the cultures of Persian clover

(Table 2). The majority of them were biological forms related to various species of papilionaceous plants. The remaining phagous types (mono- and polyphagous) were represented by few species and individuals.

Table 3. Percentage of zoogeographic elements in weevils fauna of Persian clover (*Trifolium resupinatum*). N — number of species, n — number of specimens

Species	N	%	n	%
Holarctic	12	23.1	225	9.3
Palaearctic	21	39.6	1240	51.0
Eurosiberian	11	21.1	815	33.5
European	7	13.5	145	5.9
Submediterranean	1	1.9	7	0.3

The weevils gathered in the cultures investigated represented 5 zoogeographic elements, among which taxa of Palaearctic range were the most numerous, both as regards the number of species as well as individuals. The share of the species of Holarctic and Eurosiberian range was also large. Other zoogeographic elements were scarcely or singly found (Table 3).

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