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A revision of the species of the genus *Rhizococcus* SIGNORET (*Homoptera, Coccoidea*) occurring in Poland

[Pp. 557—580, 17 text-figs.]

Rewizja czerwów z rodzaju *Rhizococcus* SIGNORET (*Homoptera, Coccoidea*) występujących w Polsce

Ревизия рода *Rhizococcus* SIGNORET (*Homoptera, Coccoidea*) фауны Польши

A b s t r a c t. *Rhizococcus palustris* sp. n. is described and illustrated. The variability of some morphological details in *Rh. insignis* (NEWST.), *Rh. pseudinsignis* (GREEN) and *Rh. herbaceus* DANZIG is discussed. The key to 7 species occurring in Poland is added.

INTRODUCTION

In the Polish literature there is a comparatively large number of monographic publications concerning the particular species, but only a few works deal with the genera or major taxons of *Coccoidea*. These investigations, initiated by KAWECKI (1954, 1961), were continued by KRZYSZTOFOWICZ (1957) and DZIEDZICKA (1968).

The present paper deals with the species of the genus *Rhizococcus* SIGN., which so far is one of the largest genera of *Coccoidea* in the Polish fauna. One species — *Rh. palustris* sp. n., is described and illustrated in detail, three species — *Rh. insignis* (NEWST.), *Rh. pseudinsignis* (GREEN) and *Rh. herbaceus* DANZIG are discussed from the aspect of their variability and taxonomic status, while the remaining three species — *Rh. agropyri* BORCHS., *Rh. confusus* DANZIG and *Rh. inermis* (GREEN) are only mentioned.

The authors are very grateful to Dr E. M. DANZIG of the Zoological Institute, Academy of Sciences in Leningrad, for reexamination of the specimens of *Rh. palustris* sp. n. and for making available her specimens of *Rh. confusus* DAN-

ZIG; they would also like to express their gratitude to Dr E. KOTEJA, of the Botanical Institute, Polish Academy of Sciences in Cracow, for collecting specimens of *Rh. palustris* sp. n. and for determining the host plants.

The holotype will be deposited in the collection of the Institute of Systematic Zoology, Polish Academy of Sciences in Cracow, the paratypes in the British Museum (Natural History) in London and in the Zoological Institute Academy of Sciences in Leningrad.

Genus *Rhizococcus* SIGNORET, 1875

Type: *Rhizococcus gnidii* SIGNORET, 1875

The conception of the genus *Rhizococcus* SIGN. has been changed many times and at present its taxonomic status seems to be insufficiently clarified. In the present paper the interpretation by BORCHSENIUS (1949) is accepted, in which *Rhizococcus* SIGN. is regarded as a distinct genus, different from *Eriococcus* SIGN., *Acanthococcus* SIGN. and *Gossyparia* SIGN., distinguished by the following characters:

Adult female

Body elongate-oval; antennae (6- or 7-segmented) and legs well developed; coxa with translucent pores — at least on the dorsal surface; labium conical, 3-segmented, with 9 pairs of setae; anal lobes distinct, each with apical seta, 3 ventral hair-like setae and 3 dorsal spines; anal opening at posterior apex; anal ring with 6—8 setae and a circle of pores; median ventral setae unmodified — hair-like; marginal setae spine-like, of various size, shape and number, arranged in a row or band on the dorsal surface of the edges of the body; dorsal setae spine-like, varying in size, usually short, never longer than 3/4 length of the large marginal spines, forming transverse rows or bands on the segments; submarginal ventral setae: spine- or hair-like; all the setae are widest at their base, with one basal collar only; quinquelocular pores, with sometimes 3, 4, 6, and 7 loculi, present on the ventral surface only; oval monolocular pores form a wide band around the ventral margin; small tubular microducts present on the dorsal surface; tubular ducts with inflected, sclerotized inner cup enlarged on one side and receiving there a thin inner duct, form transverse bands on the tergites and are scattered on the ventral surface; tubular ducts with oral collar — absent; ovisac elongate-oval, completely enclosing the female.

The build of the body, the antennae, labium, legs, anal lobes, anal ring, spiracles, tubular ducts and disc pores are very similar in the discussed species, so that only the number, shape and size of the spines can be taken into consideration as diagnostic characters. On the other hand, these characters as well as those mentioned above vary markedly within the species, making the distinction between some of them rather obscure.



Fig. 1. Marginal and submarginal spines: 1 — *Rhizococcus inermis*, 2 — *Rh. agropyri*, 3 — *Rh. confusus*, 4 — *Rh. palustris*, 5 — *Rh. herbaceus*, 6 — *Rh. pseudesignis*, 7 — *Rh. insignis*

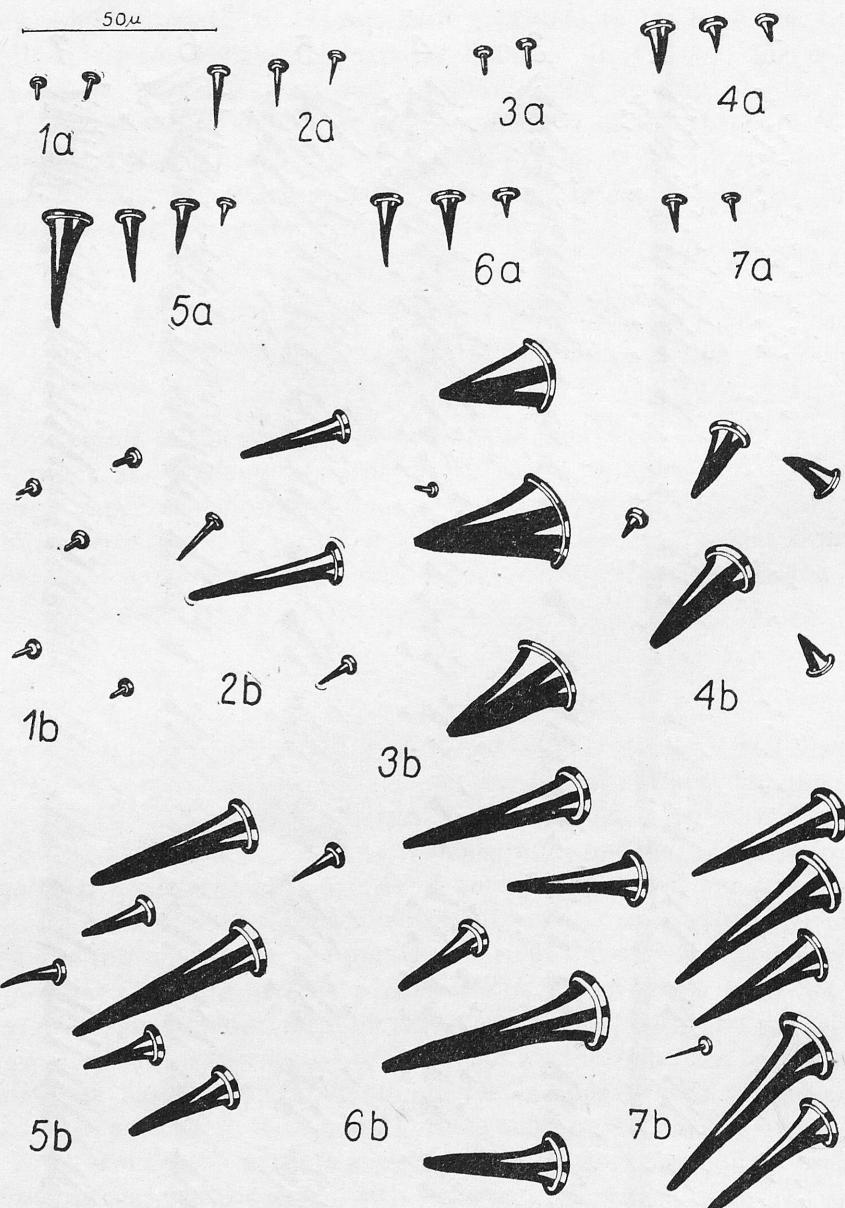


Fig. 2. Marginal and submarginal spines on the 6th abdominal segment and dorsal spines on thorax: 1 — *Rhizococcus inermis*, 2 — *Rh. agropyri*, 3 — *Rh. confusus*, 4 — *Rh. palustris*, 5 — *Rh. herbaceus*, 6 — *Rh. pseudinsignis*, 7 — *Rh. insignis*; a — dorsal spines or spinules, b — marginal spines and spinules

Key to species

- 1(12) Anterior lateral spine on the anal lobes and the marginal spines long (more than 20μ).
2(11) Anterior lateral spine on the anal lobes markedly thicker than the

median one; marginal row on the abdominal segments carries 3—5 strong spines on each segment.

- 3(8) Anterior median spine on the anal lobes equal to, or longer than the subapical one; marginal spines comparatively long and slender.
- 4(5) On dorsum only spinules present; on the ventral submarginal area of abdomen hair-like setae or short spinules present
Rh. *insignis* (NEWST.)
- 5(4) On dorsum and on the ventral submarginal area of abdomen spinules as well as spines present, the latter sometimes as long as half the length of the large marginal spines.
- 6(7) Large dorsal spines occur only on cephalothorax; marginal row on the abdominal segments carries 3—5 spines
Rh. *pseudinsignis* (GREEN)
- 7(6) Large dorsal spines occur on cephalothorax and abdomen; marginal row on abdominal segments carries 3 long spines which are accompanied by some small dorsal and ventral submarginal spines
Rh. *herbaceus* DANZIG
- 8(3) Anterior median spine on the anal lobes about 2 times shorter than the subapical one; marginal spines comparatively short and thick.
- 9(10) Marginal spines form groups on the segments, each group including 2 large spines and a few smaller spines; dorsal and ventral submarginal spinules distinctly conical
Rh. *palustris* sp. n.
- 10(9) Marginal spines form rows, with 3, rarely 2 spines on each segment; dorsal and ventral submarginal spinules cylindrical
Rh. *confusus* DANZIG
- 11(2) Anterior lateral spine on the anal lobes about as thick as the median one; marginal row on the abdominal segments carries 2 subcylindrical, slender spines
Rh. *agropyri* BORCHS.
- 12(1) Anterior lateral spinule on the anal lobes as well as the marginal and dorsal spinules very short (4—8 μ)
Rh. *inermis* (GREEN)

1. *Rhizococcus insignis* (NEWSTEAD)

NEWSTEAD, 1891: 164 (*Eriococcus*); BORCHSENIUS, 1949: 357; SCHMUTTERER, 1952: 407 (*Eriococcus*); ZAHRADNIK, 1959: 539 (*Eriococcus*); DANZIG, 1962a: 840; 1964: 633; HOY, 1963: 95 (*Eriococcus*); KOTEJA, 1964: 178; ŽAK-OGAZA, KOTEJA, 1964: 425; KOTEJA, ŽAK-OGAZA, 1966: 319; ŽAK-OGAZA, 1966: 80; KOMOSIŃSKA, PODSIADŁO, 1967: 684; GÓMEZ-MENOR ORTEGA, 1968: 553 (*Eriococcus*); KOTEJA, ŽAK-OGAZA, 1969: 363; KOTEJA, 1971: 322 *.

Rhizococcus insignis was described by NEWSTEAD (1891) and was later discussed by SCHMUTTERER (1952), DANZIG (1962a), GÓMEZ-MENOR (1968) and other workers. SCHMUTTERER emphasizes the similarity between this

* The references include all the Polish papers and some more important foreign publications.

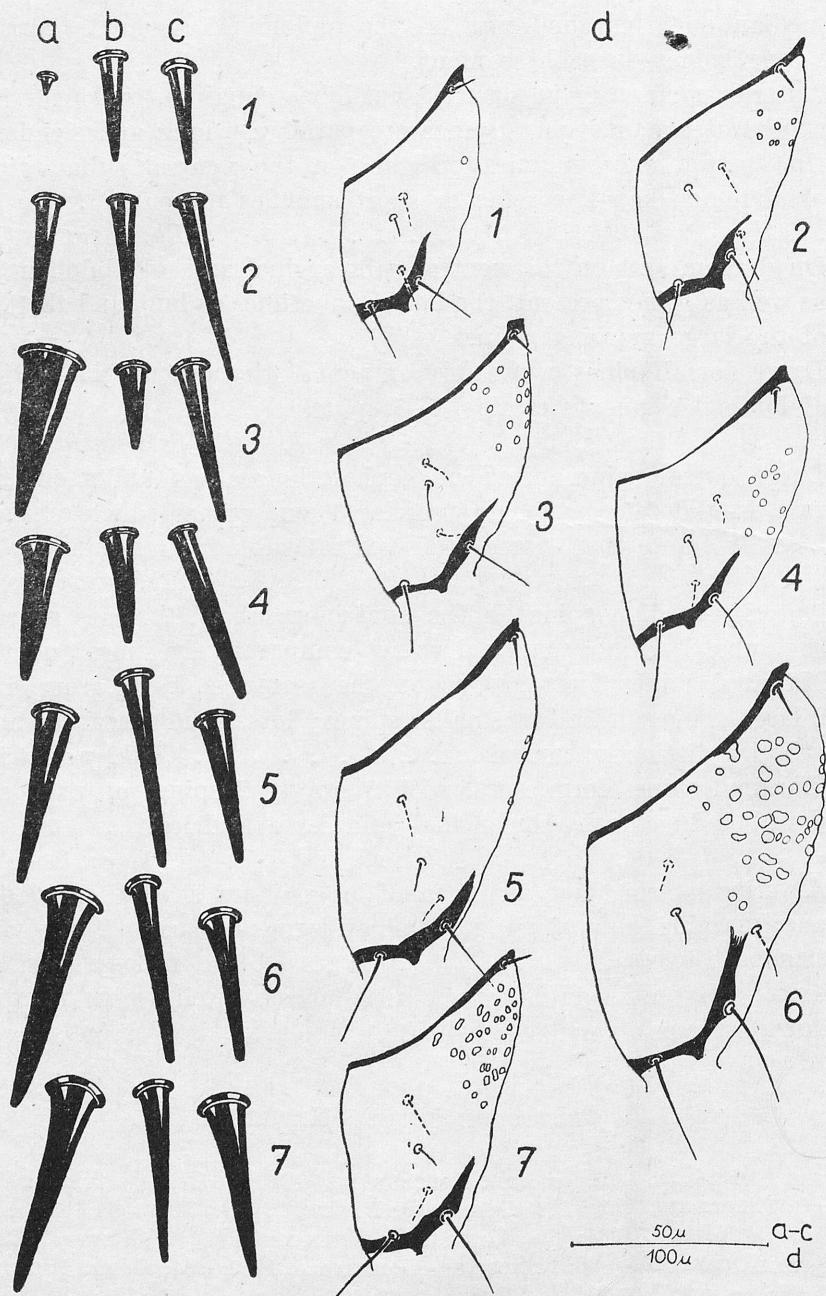


Fig. 3. Posterior coxa and spines on the dorsal surface of anal lobes; 1 — *Rh. inermis*, 2 — *Rh. agropyri*, 3 — *Rh. confusus*, 4 — *Rh. palustris*, 5 — *Rh. herbaceus*, 6 — *Rh. pseudesignis*, 7 — *Rh. insignis*; a — anterior lateral spine, b — anterior medial spine, c — dorsal subapical spine, d — posterior coxa (only the ventral translucent pores are marked)

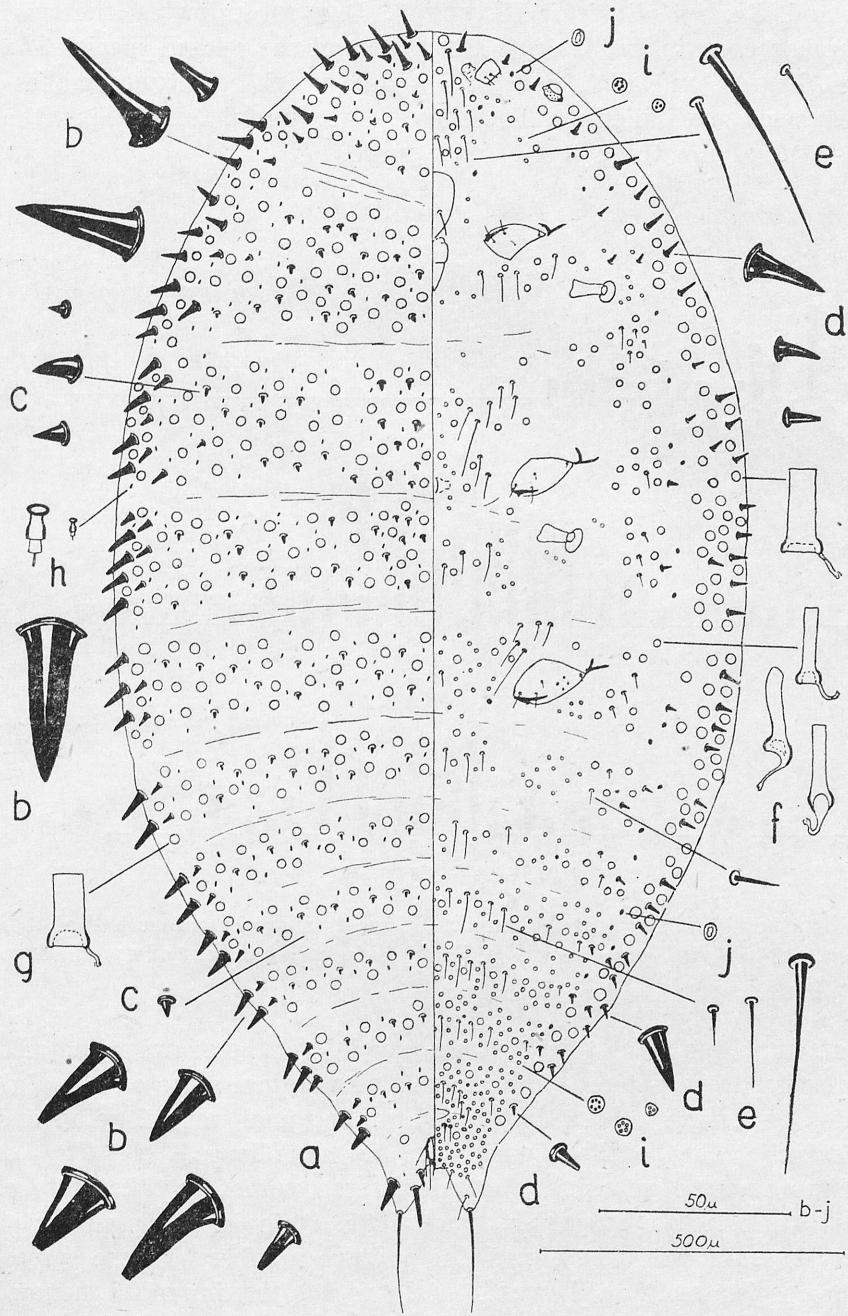


Fig. 4. *Rhizococcus palustris* sp. n.; dorsal and ventral aspects, b — marginal spines, c — dorsal spines, d — ventral submarginal spines, e — unmodified ventral setae, f — ventral tubular ducts, g — dorsal and submarginal ventral tubular ducts, h — minute tubular ducts, i — quinquelocular pores, j — oval monocular pores

species and *Rh. pseudotuberculatus* (GREEN)*. DANZIG indicates the variability of some characters in *Rh. insignis* (NEWST.) and the related species *Rh. pseudotuberculatus* (GREEN) and *Rh. herbaceus* DANZIG, which sometimes makes the limits between them indistinct. Therefore, it was useful to examine the taxonomic status of the three species once more.

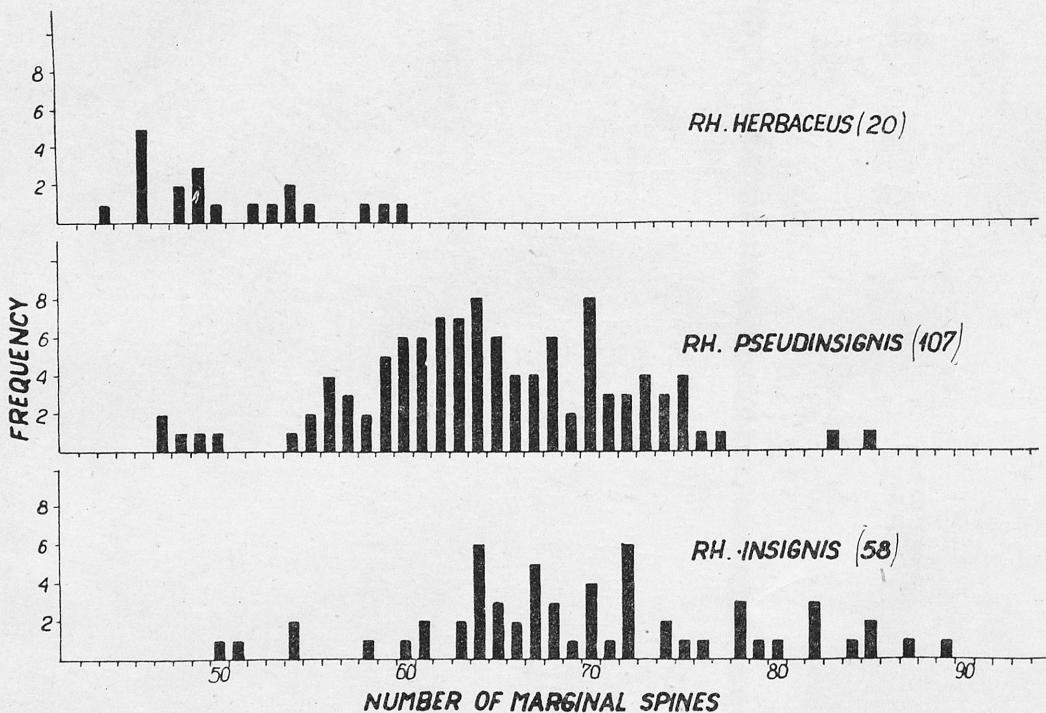


Fig. 5. Frequency distribution of the numbers of marginal spines on one half of the body in *Rhizococcus insignis*, *Rh. pseudotuberculatus* and *Rh. herbaceus*; numbers of examined specimens are given in brackets

An attempt was made to solve this question by the examination of the formerly discussed characters — the number of marginal setae on the abdominal segments, the length of the dorsal and submarginal ventral setae and some other features. The detailed conclusions are as follows:

1. The number of marginal abdominal setae cannot be taken into consideration as a distinctive character between *Rh. insignis*, *Rh. pseudotuberculatus* and *Rh. herbaceus*. As shown in Fig. 6, the average number of these spines varies in all the species: in *Rh. herbaceus* from 2.7 to 3.3 (maximum frequency by 3.0) on each side of abdominal segments, in *Rh. pseudotuberculatus* from 3.1 to 4.4 (maximum frequency by 4.0), in *Rh. insignis* from 3 to 5.3 (maximum frequency by 4.1).
2. The same can be observed as far as the total numbers of marginal spines on the body (Fig. 5) and of the ventral submarginal spines (Fig. 7) are concerned.

* On the basis of this note GÓMEZ-MENOR (1968) regards *Rh. pseudotuberculatus* (GREEN) as a synonym of *Rh. insignis* (NEWST.).

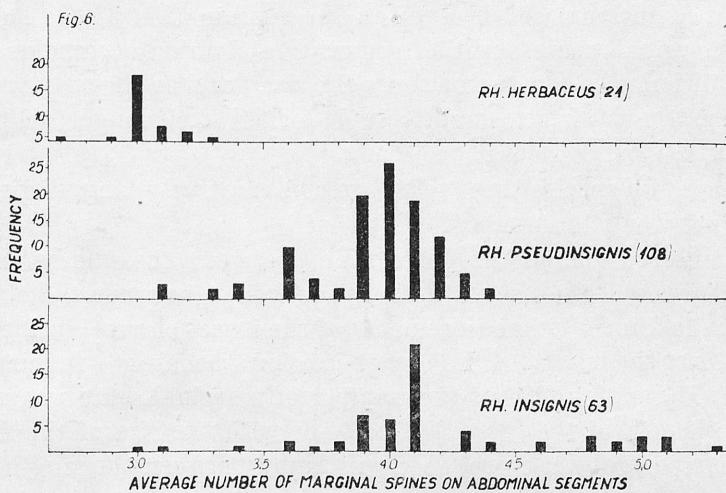


Fig. 6. Frequency distribution of the average numbers of marginal spines on each side of abdominal segments in *Rhizococcus insignis*, *Rh. pseudotinsignis* and *Rh. herbaceus*; numbers of examined specimens are given in brackets

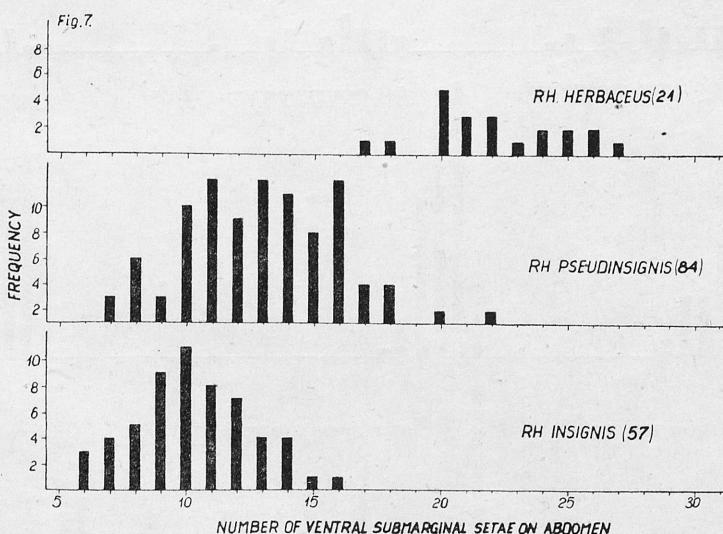


Fig. 7. Frequency distribution of the numbers of ventral submarginal spines or spinules on abdomen in *Rhizococcus insignis*, *Rh. pseudotinsignis* and *Rh. herbaceus*, counted on one side of the body; numbers of examined specimens are given in brackets

3. *Rhizococcus insignis* differs from the other two species in the length of the dorsal spines on the cephalothorax (Fig. 8) and *Rh. herbaceus* from *Rh. pseudotinsignis* in the length of the dorsal spines on the abdomen (Fig. 9), but the maximum length of the spines varies in all three species and determination on the basis of these characters is very difficult in some cases.

4. Similar conditions are observed in the examination of the length of the ventral submarginal setae on the posterior abdominal segments (Fig. 10), but here the differences concern not only the size but also the shape of the setae. In *Rh. insignis* the setae are small, spinule-form and, if longer, with a sharply pointed apex, almost hair-like.

In the other two species these setae are comparatively long, distinctly spine-form, usually with a blunt apex.

5. Some observation on the correlations between the number and size of dermal structures and the size of the body, as well as between these same structures were made. Since the measurements of the insect change during its growth and preparation, the length of the legs (posterior trochanter + femur) was taken into account. It was found that the number of marginal setae was not correlated with the length of the legs (Fig. 13), nor with the size of the dorsal setae (Fig. 15). Unexpectedly, a correlation was found between the length of the legs and that of the marginal setae (Fig. 14), being almost the only distinct correlation of the examined cases.

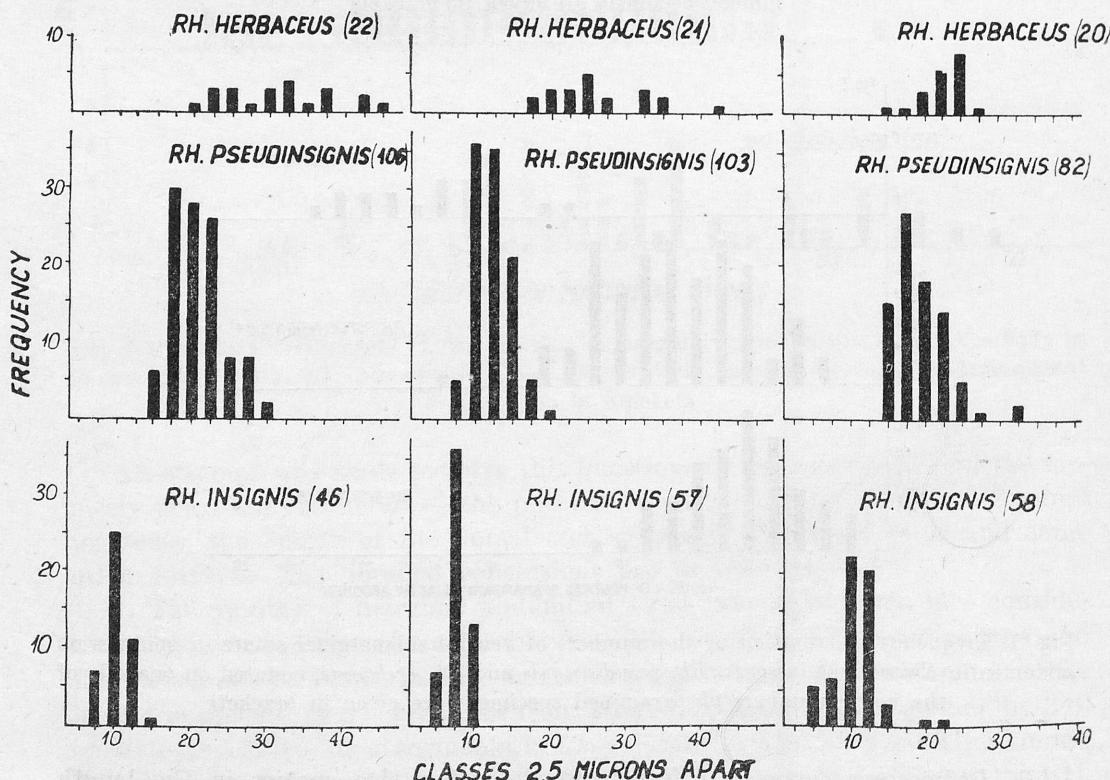


Fig. 8—10. Frequency distribution of the maximum lengths of dorsal spines or spinules on cephalothorax (Fig. 8), abdomen (Fig. 9) and ventral submarginal spines or spinules on three posterior abdominal segments (Fig. 10) in *Rhizococcus insignis*, *Rh. pseudesignis* and *Rh. herbaceus*; numbers of examined specimens are given in brackets

6. Negative results were obtained in the examination of the correlation between the numbers of marginal and dorsal setae (Fig. 11), between the numbers of dorsal setae and dorsal tubular ducts (Fig. 12), and between the lengths of dorsal setae on the cephalothorax and abdomen (Fig. 16).

Generally speaking, on the basis of the present investigation, it is difficult to decide whether the examined specimens belong to three distinct species or to one variable one. For the time being, until more material is available and new taxonomic criteria are applied, e. g. the male characteristics, the three species are regarded as distinct. They may be separated by considering the combined maximum lengths of dorsal setae on cephalothorax and abdomen and the length and shape of the submarginal ventral setae on the posterior abdominal segments, with reference to the number of marginal setae on the abdomen (Fig. 17). In this conception *Rh. insignis* may be characterized as follows:

Anterior lateral spine on the anal lobes similar in shape and size to the marginal spines; anterior median spine on anal lobes longer or as long as the subapical spine; dorsal spinules on cephalothorax and abdomen short (maximum length being 5—15 μ); marginal spines large (maximum length 32—67 μ), the posterior with blunt apex, forming one row on thorax and abdomen, numerous (100—176), on each side of abdominal segments usually 4 (occasionally 2—6) spines present, the averages varying from 3·0 to 5·3, maximum frequency by 4·1; submarginal ventral setae small, on the three posterior abdominal segments 7—25 μ long, the smaller setae are spinule-form, the longer rather hair-like; submarginal dorsal setae, similar to the marginal setae, present on the head only; coxa with numerous translucent pores on both dorsal and ventral surfaces.

Habitat and distribution

Rh. insignis (GREEN) lives on the leaves of numerous grasses. According to SCHMUTTERER (1952) it produces one generation in the year and hibernates as an egg.

This species has been reported from the British Isles, the Channel Islands, Czechoslovakia, France, Germany, Hungary, Italy, Iraq, Sicily and the USSR. In Poland it has been collected on the Baltic Coast, in Białowieża, the Nida Valley, Silesia, the Cracow-Częstochowa Upland, the Beskidy Mts., the Bieszczady Mts. and the Pieniny Mts.

Material examined: Mikoszewo (Nowy Dwór Gdański) *, on leaves of *Calamagrostis epigeios* (L.) ROTH, *Dactylis glomerata* L., *Deschampsia flexuosa* (L.) TRIN., *Festuca* sp. and other undetermined grasses, 28, 31 VII, 7, 12, 16 VIII 1969 — 22 ♀♀ **; Białowieża (Hajnówka), on grass, 3 IX 1969 — 1 ♀; Muchowiec (Katowice) on grass, 7 VIII 1968 — 2 ♀♀; Tenczynek (Chrzanów), on grass, 26 VIII 1967 — 2 ♀♀; Jerzmanowice (Olkusz), on grass, 14 IX 1968 — 3 ♀♀; Błędów (Olkusz), 8 VII 1968 — 3 ♀♀; Młynek near Pieskowa Skała (Olkusz), on grass,

* Names given in brackets are districts.

** The material found by the authors is given without the name of the collector.

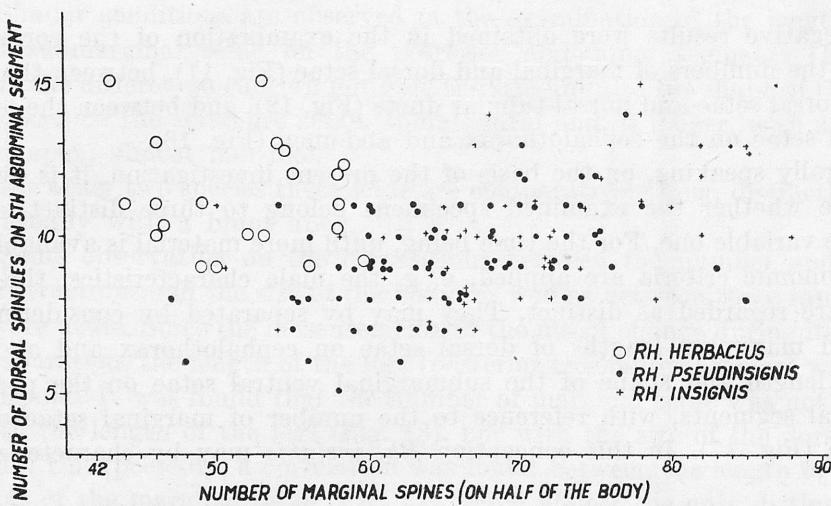


Fig. 11. Correlation between the numbers of dorsal spines on the 5th abdominal segment and the numbers of marginal spines in *Rhizococcus insignis*, *Rh. pseudesignis* and *Rh. herbaceus*

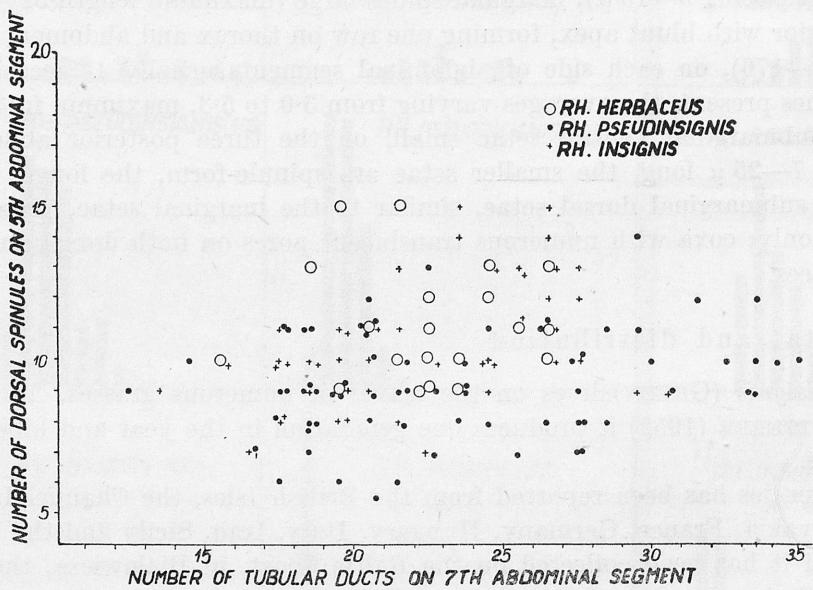


Fig. 12. Correlation between the numbers of dorsal spinules on the 5th abdominal segment and the numbers of dorsal tubular ducts on the 7th abdominal segment in *Rhizococcus insignis*, *Rh. pseudesignis* and *Rh. herbaceus*

22 VIII 1968 — 4 ♀♀; Grodzisko (Olkusz) on *Brachypodium pinnatum* (L.) P. B., *Festuca* sp. and other grasses, 5, 11 VII 1968 — 4 ♀♀; Ojców (Olkusz), 28 VI, 21 VIII, 7 IX 1967 — 10 ♀♀; Kryspinów (Kraków), on grass, 27 VII 1970 — 1 ♀; Skała Kmity (Kraków), on grass, 27 VI 1968 — 1 ♀; Mt. Leskowiec (Sucha), on grass, 2 X 1964 — 1 ♀; Maków Podhalański (Sucha) on grasses, 18 VII 1967, 15 VIII 1968 — 5 ♀♀; Mt. Lubień (Nowy Targ), on grass, 7 VIII 1962 — 1 ♀; Czorsztyn (Nowy Targ), on *Luzula campestris* (L.) DC., 18 IX 1963 — 2 ♀♀; Sromowce

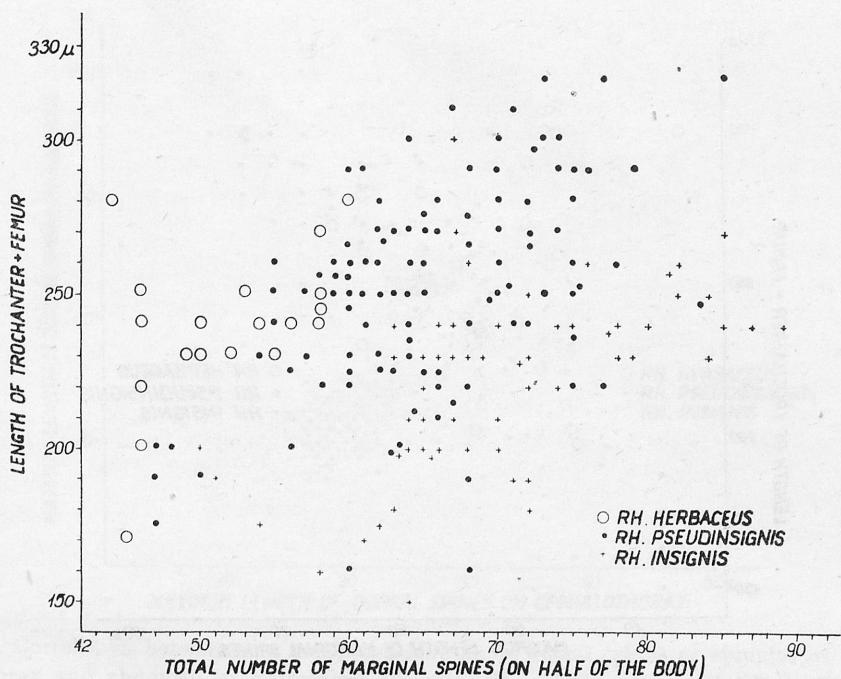


Fig. 13. Correlation between the lengths of posterior trochanter + femur and the numbers of marginal spines counted on one side of the body in *Rhizococcus insignis*, *Rh. pseudinsignis* and *Rh. herbaceus*

Wyżne (Nowy Targ) on grass, 19 IX 1963 — 1 ♀; Mt. Długi Gronik in the Pieniny Mts. (Nowy Targ), on grass, 7 VII 1963 — 1 ♀; Mt. Hulina near Szczawnica (Nowy Targ), on grass, 22 VI 1964 — 1 ♀; Łażne Skalki in the Małe Pieniny Mts. (Nowy Targ), on grass, 9 VII 1964 — 2 ♀♀; Homole Gorge in the Małe Pieniny Mts. (Nowy Targ), on *Agrostis vulgaris* WITH., 23 VI 1964 — 1 ♀; Mt. Jaworzyna Krynicka (Nowy Sącz), on grass, 30 VIII 1970 — 1 ♀; Jasieńka Valley near Mt. Cergowa (Krosno), on *Agrostis vulgaris* WITH., 20 IX 1968 — 5 ♀♀; Zaluz (Sanok), on grass, 18 IX 1968 — 1 ♀; Ustrzyki Górnne (Ustrzyki Dolne), on grass, 17 IX 1968 — 1 ♀.

2. *Rhizococcus pseudinsignis* (GREEN)

GREEN, 1921: 149 (*Eriococcus*); BORCHSENIUS, 1949: 354; SCHMUTTERER, 1952: 407 (*Eriococcus*); OSSIANILSSON, 1959: 195 (*Rh. graminicola*); DANZIG, 1962a: 845; 1964: 663; HOY, 1963: 110 (*Eriococcus*); ŹAK-OGAZA, KOTEJA, 1964: 425 (*Rh. insignis*, partim); KOTEJA, ŹAK-OGAZA, 1966: 319 (*Rh. insignis*, partim); 1969: 364; KOTEJA, 1971: 322.

This species, close to *Rh. insignis* (NEWST.) and *Rh. herbaceus* DANZIG, may be distinguished by the following characters:

Dorsal spines on cephalothorax comparatively large — maximum lengths vary from 15—30 μ ; abdominal dorsal spines smaller — maximum lengths being 7·5—18 μ ; submarginal ventral setae spine-form, comparatively long — maximum length on posterior abdominal segments 15—32 μ ; total number

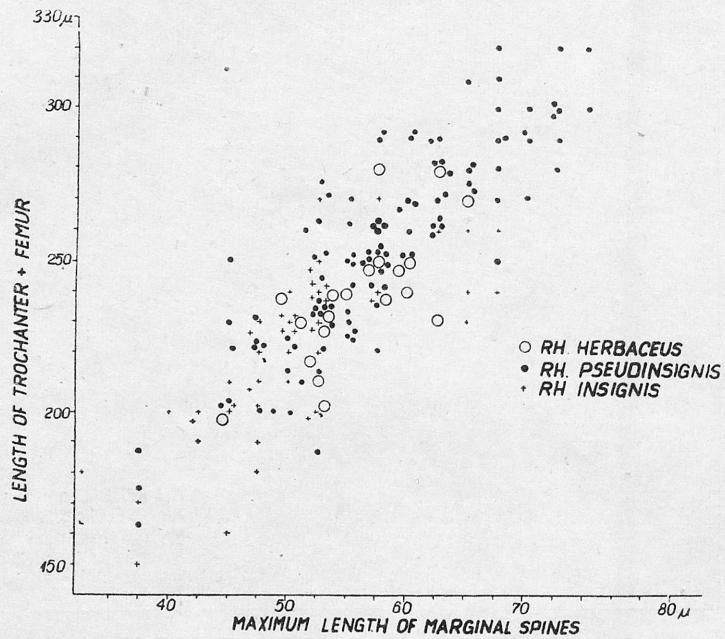


Fig. 14. Correlation between the lengths of posterior trochanter+femur and the maximum lengths of marginal spines in *Rhizococcus insignis*, *Rh. pseudinsignis* and *Rh. herbaceus*

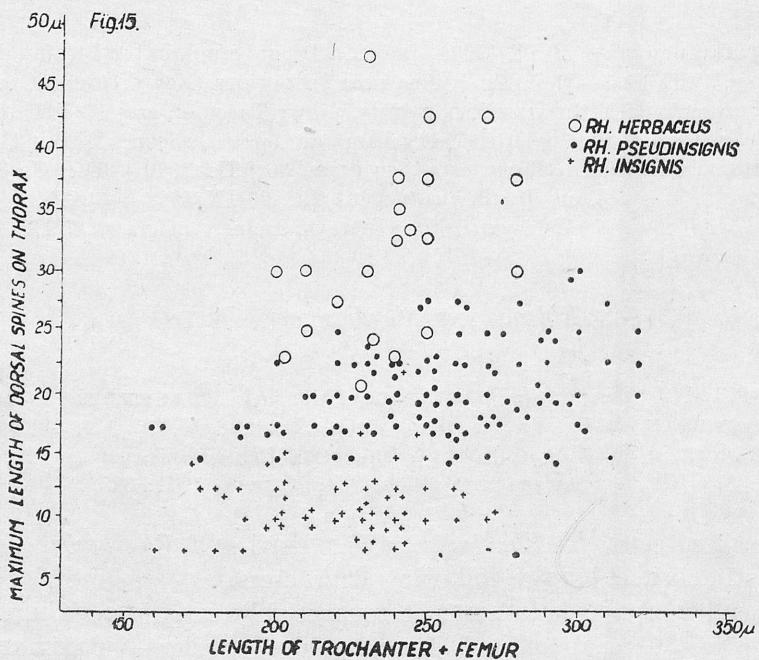


Fig. 15. Correlation between the lengths of posterior trochanter+femur and the maximum lengths of dorsal spines on thorax in *Rhizococcus insignis*, *Rh. pseudinsignis* and *Rh. herbaceus*

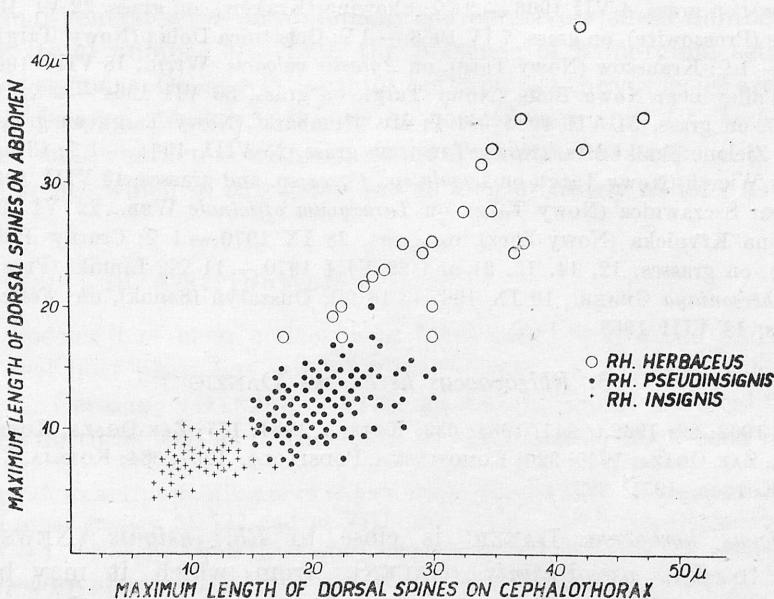


Fig. 16. Correlation between the maximum lengths of dorsal spines or spinules on cephalothorax and abdomen in *Rhizococcus insignis*, *Rh. pseudinsignis* and *Rh. herbaceus*

of marginal spines 94—170, on each abdominal segment 3—5 spines present, the averages varying from 3·1—4·4, the maximum frequency by 4·0.

Further discussion on the variability and taxonomic status of this species is given under *Rh. insignis* (NEWST.).

Habitat and distribution

Rhizococcus pseudinsignis (GREEN) lives on the leaves of various grasses. Its habitat, development and distribution are similar to those of *Rh. insignis* (NEWST.).

This species occurs in Great Britain, Czechoslovakia, Germany*, Sweden and the USSR. In Poland it has been reported from the Baltic Coast, Silesia, the Cracow-Częstochowa Uplands, the Beskidy Mts., the Pieniny Mts. and the Rzeszów Highlands.

Material examined: Mikoszewo (Nowy Dwór Gdańsk), on *Ammophila arenaria* LINK., *Calamagrostis epigeios* (L.) ROTH, *Phragmites communis* TRIN., and other undetermined grasses, 27, 29, 31 VII and 5, 6, 7, 16, 18 VIII 1969 — 60 ♀♀; Muchowiec (Katowice), on grass, 7 VIII 1967 — 1 ♀; Grabowiec (Pińczów) on grass, 5, VI 1969 — 1 ♀; Skorocice (Busko Zdrój), on grass, 6 VI 1969 — 2 ♀♀; Chotel Czerwony (Busko Zdrój), on grass, 4 VI 1969 — 2 ♀♀; Tenczynek (Chrzanów), on grass, 26 VIII 1967 — 2 ♀♀; Jerzmanowice (Olkusz), on grass, 3 IX 1968 — 1 ♀; Czajowice (Olkusz), on grass, 3 IX 1968 — 3 ♀♀; Ojców (Olkusz), on *Agrostis vulgaris* WITH., *Calamagrostis epigeios* (L.) ROTH, and other grasses, 20 VII 1966 and 19 VIII 1967 — 6 ♀♀; Podgórkki Hills (Kraków), on *Anthoxanthum odoratum* L., 26 V 1968 — 2 ♀♀; Bie-

* DANZIG (1962a) supposes that the figures given by SCHMUTTERER (1952) from Germany do not refer to *Rh. pseudinsignis* (GREEN) but to *Rh. herbaceus* DANZIG.

lany (Kraków), on grass, 4 VII 1966 — 2 ♀♀; Skawina (Kraków), on grass, 22 VI 1965 — 1 ♀; Pietrzejowice (Proszowice), on grass, 7 IV 1963 — 1 ♀; Ochotnica Dolna (Nowy Targ), on grass, 21 VI 1963 — 1 ♀; Krauszow (Nowy Targ), on *Agrostis vulgaris* WIT., 18 VIII 1964 — 4 ♀♀; Czerwonka Valley near Nowa Biada (Nowy Targ), on grass, 30 VII 1964 — 2 ♀♀; Dursztyn (Nowy Targ), on grass, 31 VII 1964 — 1 ♀; Mt. Hombark (Nowy Targ), on grass, 18 VIII 1965 — 1 ♀; Zielone Skalki Mts. (Nowy Targ), on grass, 25 VIII 1964 — 1 ♀; Clearing under Mt. Ociemny Wierch (Nowy Targ), on *Luzula* sp., *Carex* sp. and grasses, 13 VIII 1963 — 5 ♀♀; Mt. Groń near Szezawnica (Nowy Sącz), on *Taraxacum officinale* WEB., 22 VI 1964 — 1 ♀; Mt. Jaworzyna Krynicka (Nowy Sącz), on grass, 28 IX 1970 — 1 ♀; Czarny Potok Valley (Nowy Sącz), on grasses, 12, 14, 15, 21 and 29 VIII 1970 — 11 ♀♀; Lipnik (Przeworsk), on *Dactylis Aschersoniana* GRAEB., 19 IX 1967 — 18 ♀♀; Duszytyń (Sanok), on *Festuca* sp. and other grasses, 18 VIII 1968 — 4 ♀♀.

3. *Rhizococcus herbaceus* DANZIG

DANZIG, 1962: 22; 1962a: 847; 1964: 633; KOTEJA, 1964: 177; ŽAK-OGAZA, KOTEJA, 1964: 425; KOTEJA, ŽAK-OGAZA, 1966: 320; KOMOSIŃSKA, PODSIADŁO, 1967: 684; KOTEJA, ŽAK-OGAZA, 1969: 363; KOTEJA, 1971: 322.

Rhizococcus herbaceus DANZIG is close to *Rh. insignis* (NEWST.) and especially to *Rh. pseudinsignis* (GREEN), from which it may be distinguished by the following features: large dorsal setae — on the cephalothorax 18—47 μ long, on the abdomen 18—42 μ ; large, spine-form and numerous

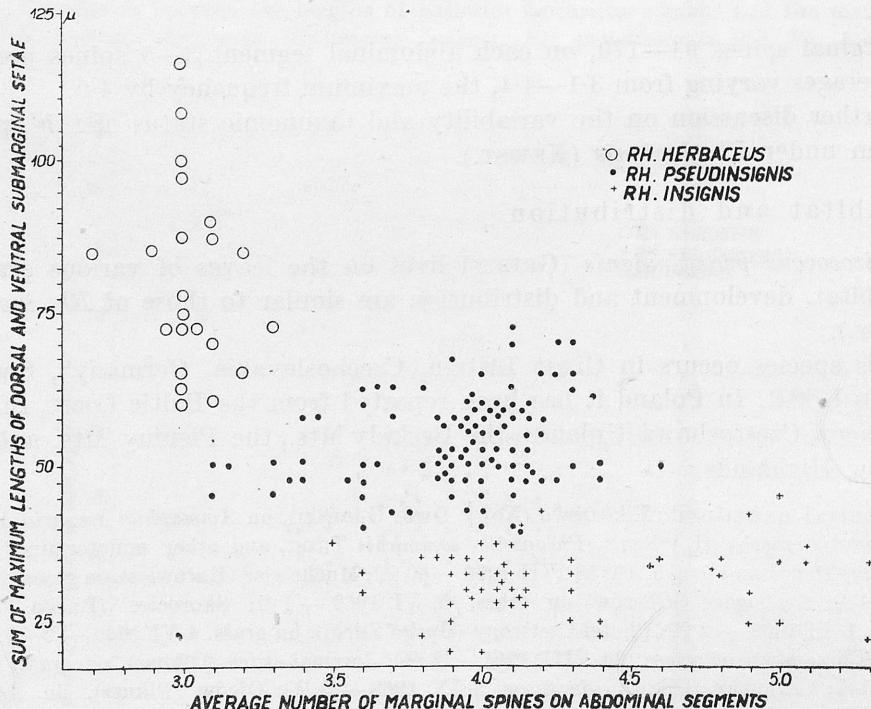


Fig. 17. Correlation between the average numbers of marginal spines on abdominal segments and the sum of maximum lengths of dorsal spines on thorax and abdomen and of the submarginal ventral spines on the three posterior abdominal segments in *Rh. insignis*, *Rh. pseudinsignis* and *Rh. herbaceus*

submarginal ventral setae on abdomen; comparatively small number of marginal setae (total number 80—120), the presence of 3 marginal setae on each abdominal segment. Other relationships between the three species are discussed under *Rh. insignis* (NEWST.). It may be noticed here that *Rh. herbaceus* DANZIG shares some characters with the genus *Acanthococcus* SIGN., e. g. the length of dorsal spines which in this genus are as long or nearly as long as the marginal ones.

Habitat and distribution

This species has been collected on *Gramineae*, *Cyperaceae* and *Juncaceae*, but the real host plant has not been established. It occurs in the USSR and possibly in Germany (DANZIG, 1962a). In Poland about 15 localities, scattered in the north as well as in the south of the country, have been noted.

Material examined: Mikoszewo (Nowy Dwór Gdańsk), on *Calamagrostis epigeios* (L.) ROTH and other grasses, 31 VII and 12 VIII 1969 — 7♀; Białowieża (Hajnówka), on grass, 3 IX 1969 — 1 ♀; Kolonia Lisów (Lubliniec), on grass, 4 VIII 1967 — 2 ♀♀; Grodzisko (Olkusz), on *Brachypodium pinnatum* (L.) P. B., and other grasses, 5 VII and 11 VII 1968 — 3 ♀♀; Ojców (Olkusz), on *Luzula campestris* (L.) DC. and grasses, 20 VII and 10 IX 1966 — 8 ♀♀; Skała Kmity (Kraków), on *Brachypodium pinnatum* (L.) P. B., 27 VI 1968 — 2 ♀♀; Bielany (Kraków), on *Luzula nemorosa* (Poll.) E. MEY, 22 VII 1962 — 1 ♀; Przegorzały (Kraków) on *Luzula nemorosa* (POLL.) E. MEY, 29 VI 1963 — 1 ♀; Pieniński Potok Valley (Nowy Targ), on grass, 24 VI 1963 — 1 ♀; Mt. Długi Gronik in the Pieniny Mts. (Nowy Targ), on grass, 7 VII 1963 — 1 ♀; Clearing under Mt. Ociemny Wierch (Nowy Targ), on *Luzula campestris* (L.) DC., 13 VIII 1963 — 1 ♀; Homole Gorge in the Male Pieniny Mts. (Nowy Targ), on grass, 1 VIII 1965 — 1 ♀; Czarny Potok Valley (Nowy Sącz), on grass, 12 VIII 1970 — 1 ♀.

4. *Rhizococcus palustris* sp. n.

Adult female

Body elongated, anterior end broadly rounded, tapering posteriorly, with distinct anal lobes. Cuticle, with the exception of some parts on the anal lobes — membranous. Mounted specimens 2.1—2.3 mm long, 1.2—1.3 mm wide.

Antennae with membranous tubercle anteromedially at base; 7-segmented, 250—270 μ long; lengths of segments in microns: I — about 40, II — 38—47, III — 47—52, IV — 42—57, V — 19—24, VI — 19, VII — 33—38; widths: I — 57—66, II—IV about 38, V—VII — 24; hair-like setae on respective segments: 4, 2, 0, 2, 0, 3—4, 7; 1 short antennal bristle on segment V, 1 long on segment VI and 3 long ones on segment VII.

Eyes simple, about 15 μ in diameter, with a short, strongly sclerotized basal cone.

Labium conical, 3-segmented, 100—120 μ long, 85—95 μ wide at base; with 2 pairs of setae on basal segment, 1 pair on medial segment and 6 pairs on the apical one.

Legs well developed, posterior pair 570—760 μ long, anterior slightly shorter; measurements of the posterior leg in microns: coxa 95 long and wide,

trochanter + femur 190—240 long, femur about 57 wide, tibia 123—150 long, 35 wide, tarsus 128—140 long, 25 wide, claw 24—33 long; tarsal and ungual digitules dilated apically, 42—50 μ and 28—38 μ long respectively; segments carry setae in the following numbers: coxa — 6, trochanter — 4, including 2 very short ones on basal ridge, femur — 4—5, tibia — 5, including 2 apical spurs, tarsus — 6—7; both surfaces of coxa with some (7—13) translucent loculi.

Spiracles of ordinary shape, no definite pores associated with spiracular opening.

Anal lobes conical, partly sclerotized, 85—100 μ long, about 70 μ wide; apical setae 260—280 μ long; ventral surface with 3 hair-like setae 50—70 μ long and some quinquelocular pores; dorsal surface with three spines — subapical spine 43—48 μ long, anterior median 23—30 μ long, anterior lateral one 30—38 μ long, and with 2 tubular microducts.

Anal ring typical in *Rhizococcus* SIGN., with 8 setae 100—150 μ long and with a circle of pores on the outer margin and occasionally some pores on the inner margin.

Dorsal spines, including the shortest — conical, 5—10 μ long; forming transverse bands on segments of thorax and anterior abdominal segments and rows on the posterior ones.

Marginal spines conical, on the anterior end of the body sharply pointed, on the posterior end with blunt or truncate apex; forming one row situated on the very margin, one row dorsally (dorsal submarginal spines) and one to three rows on the ventral surface (ventral submarginal spines); marginal spines are the largest — 15—33 μ long, the ratio of width to length being 1:2·1—1:2·7, occasionally 1:1·8; dorsal submarginal spines 15—23 μ long, ventral submarginal spines 5—13 μ long, diminishing towards the posterior end and the medial line of the body; total number of dorsal submarginal spines 52—70, that of the ventral submarginal spines 94—116 and marginal spines 72—82; the latter form rows of 2—3 (average 2·23) spines on each side of abdominal segments.

Ventral setae unmodified, hair-like, 10—60 μ long, form groups on cephalothorax and transverse rows on abdomen.

Large tubular ducts 22—25 μ long, about 10 μ wide, form transverse bands on the dorsal surface of each segment and a longitudinal band around the ventral margin; smaller tubular ducts 22—25 μ long and about 5 μ in diameter, scattered on the remaining ventral surface.

Tubular microducts about 2 μ in diameter and 6 μ deep, numerous on the dorsal surface.

Quinquelocular pores 5—7 μ in diameter, with 3—7 loculi, very numerous on posterior abdominal segments, towards the anterior end of the body becoming scattered. On the dorsal surface disc pores absent.

Oval monolocular pores with about the same diameter as that of the quinquelocular pores form a band around the ventral margin.

Ovisac cream or dirty white, completely enclosing the female.

Other developmental stages not known.

Rhizococcus palustris sp. n. is close to *Rh. confusus* DANZIG with which it shares the shape and size of spines on anal lobes and the number and shape of the marginal spines. The two species, however, differ each other in the shape and size of the dorsal spines and the dorsal and ventral submarginal spines.

Habitat and distribution

Rhizococcus palustris sp. n. was collected from the leaves of *Eriophorum vaginatum* L. and *Carex* sp. on the peat-bog „Puścizna Wielka“ near Piekielnik, district Nowy Targ. This species is so far the only one of the genus *Rhizococcus* SIGN. occurring in Poland which lives on the plants of the family Cyperaceae. In August the females were after oviposition.

Material: Piekielnik (Nowy Targ), on *Eriophorum vaginatum* L. and *Carex* sp., 10 VIII 1963 — 8 ♀♀ (leg. E. KOTEJA), 28 VIII 1963 — 3 ♀♀.

5. *Rhizococcus confusus* DANZIG

DANZIG, 1962a: 854; 1964: 634; KOTEJA, 1971: 322.

The description of this species is omitted in the present paper as it was done by DANZIG (1962a). The specimen found in Poland shows some differences in relation to the type material but the evaluation of the range of these differences is somewhat difficult because until now only three specimens, including the Polish one, represent this species.

Habitat and distribution

The host plant of this species and its biology are unknown. The ovisacs have been collected from dry leaves. At present only two localities from the USSR (Leningrad Region) and one from Poland (Baltic Coast) have been reported.

Material examined: Luga (USSR), on dry leaf, 26 VIII 1956 — 1 ♀ (leg. E. DANZIG); Mikoszewo (Nowy Dwór Gdańsk), dry grass, 7 VIII 1969 — 1 ♀.

6. *Rhizococcus agropyri* BORCHS.

BORCHSENIUS, 1949: 359; OSSIANILSSON, 1959: 194; DANZIG, 1962a: 852; 1964: 634; HOY, 1963: 86; KOTEJA, ŹAK-OGASA, 1966: 320.

Rhizococcus agropyri was described by BORCHSENIUS (1949) and subsequently redescribed and illustrated by DANZIG (1962a).

Habitat and distribution

This species lives on *Agropyrum repens* (L.) P. B. and other grasses forming colonies in which the specimens attach themselves to the leaves one near the

other. It has been reported from many localities in the USSR, from Sweden and Hungary. In Poland it occurs in the Małe Pieniny Mts.

Material examined: Łażne Skałki Mt. (Nowy Targ), on leaves of *Agrostis vulgaris* WIT., 9 VII 1964 — 8 ♀♀.

7. *Rhizococcus inermis* (GREEN)

GREEN, 1915: 176 (*Eriococcus*); BALACHOWSKY, 1954: 61 (*Anophococcus*); DANZIG, 1962a: 854; 1964: 634; HOY, 1963: 132 (*Greenisca*); KOTEJA, ŽAK-OGAZA, 1969: 363.

Rhizococcus inermis (GREEN) was redescribed and illustrated by Danzig (1962a).

Habitat and distribution

Rh. inermis (GREEN) lives on grasses with narrow leaves; has been found on British Isles, in France and USSR. In Poland it occurs in Błędów and the Prądnik Valley (Cracow-Częstochowa Uplands). The data given by KOTEJA, ŽAK-OGAZA (1964) from the Pieniny Mts. under „*Greenisca inermis* (GREEN)” should be referred to *Greenisca brachypodii* BORCHSENIUS et DANZIG.

Material examined: Błędów (Olkusz), on *Festuca ovina* L., 8 VII 1968 — 1 ♀ (leg. J. J. KOTEJA); Mlynik near Pieskowa Skała (Olkusz), on *Festuca ovina* L., 22 VIII 1968 — 6 ♀♀.

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STRESZCZENIE

Rodzaj *Rhizococcus* SIGNORET jest reprezentowany w faunie Polski przez siedem gatunków — *Rh. insignis* (NEWST.), *Rh. pseudinsignis* (GREEN), *Rh. herbaceus* DANZIG, *Rh. palustris* sp. n., *Rh. confusus* DANZIG, *Rh. agropyri* BORCHS. i *Rh. inermis* (GREEN).

Przebadane czerwce wykazują duże podobieństwo w budowie ciała, czułków, nóg i innych szczegółów morfologicznych, a z drugiej strony dużą zmienność indywidualną, co stwarza trudności w określaniu i oznaczaniu gatunków. Dotyczy to zwłaszcza *Rh. insignis*, *Rh. pseudinsignis* i *Rh. herbaceus*. U samic tych gatunków porównano całkowitą liczbę kolców brzeżnych, średnią liczbę kolców brzeżnych na segmentach odwłoka, liczbę kolców podbrzeżnych na brzusznej stronie odwłoka, długość kolców brzeżnych, grzbietowych oraz brzusznych podbrzeżnych (Fig. 5—10) oraz zależności między szeregiem cech (Fig. 11—17). Okazało się, że żadna z przebadanych cech, wzięta z osobna, nie pozwala na pewne odróżnienie tych trzech gatunków, natomiast stosunkowo dobrze znaczącą się różnice między nimi, jeśli porównać sumę długości największych kolców na grzbicie głowotułowia i odwłoka i kolców podbrzeżnych na brzusznej stronie odwłoka w zestawieniu ze średnią liczbą kolców brzeżnych na segmentach odwłoka (Fig. 17). Dla rozstrzygnięcia kwestii, czy chodzi tu o trzy niezależne gatunki, czy też tylko o formy jednego, wskazane byłyby dalsze badania. Porównanie samców, badania cytologiczne lub inne dadzą być może bardziej pewne rozwiązanie.

Samica *Rh. palustris* sp. n. została szczegółowo opisana i zilustrowana (Fig. 1—4). Pod względem kształtu i wielkości kolców brzeżnych gatunek ten jest zbliżony do *Rh. confusus* DANZIG, różni się jednak od niego wyraźnie liczbą i rozmieszczeniem kolców brzeżnych i przybrzeżnych oraz kształtem kolców na grzbicie.

Trzy pozostałe gatunki — *Rhizococcus confusus* DANZIG, *Rh. agropyri* BORCHS. i *Rh. inermis* (GREEN) zostały tylko krótko omówione.

Dla wszystkich gatunków podano stanowiska i rośliny żywicielskie oraz rysunki tych szczegółów morfologicznych, na których opiera się klucz do oznaczania samic.

РЕЗЮМЕ

В фауне Польши выступает семь видов рода *Rhizococcus* SIGNORET — *Rh. insignis* (NEWST.), *Rh. pseudinsignis* (GREEN), *Rh. herbaceus* DANZIG, *Rh. palustris* sp. n., *Rh. confusus* DANZIG, *Rh. agropyri* BORCHS., *Rh. inermis* (GREEN).

Проведенные исследования с этими кокцидами показывают большое сходство в строении их тела, усиков, ног и других морфологических структур. Это сходство, а с другой стороны их большая внутривидовая изменчивость доставляют большую трудность в определении видов этого рода. Особенно это касается *Rh. insignis*, *Rh. pseudinsignis*, *Rh. herbaceus*. У самок этих видов было сравнено полное число краевых шипов, среднее число шипов и шипиков наentralной поверхности брюшка, длина краевых, подкраевых и дорсальных шипов (Рис. 5—10), а также зависимость между некоторыми из них (Рис. 11—17). Оказалось, что ни один из исследованных признаков взятых отдельно не позволяет точно отличить

трёх этих видов, но зато относительно хорошо можно заметить разницу между ними, если сравнить сумму длины самых больших шипов на дорсальной поверхности головогруди и брюшка и подкраевых шипов на вентральной поверхности последних сегментов брюшка по отношению к среднему числу краевых шипов на сегментах брюшка (Рис. 17). Для решения вопроса, идёт ли речь о трёх самостоятельных видах, или же только о формах одного, надо бы провести дальнейшие исследования, как например сравнение самцов, цитологические исследования и др.

Самка *Rh. palustris* sp. n. была подробно описана и изображена (Рис. 1—4). По форме и величине краевых шипов этот вид сходен с *Rh. confusus* DANZIG, но однако резко отличается от него количеством и размещением краевых и подкраевых шипов, а также формой дорсальных шипиков.

Три остальных вида — *Rh. confusus* DANZIG, *Rh. agropyri* BORCHS. и *Rh. inermis* (GREEN) были только кратко разработаны.

Для всех видов были поданы местонахождения и кормовые растения, а также рисунки тех морфологических структур, о которых говорится в определителе самок.

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