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Short communication

DIABROTICA VIRGIFERA LE CONTE IN POLAND IN 2005–2007 AND REGULATIONS IN THE CONTROL OF THE PEST IN 2008

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Abstract: *Diabrotica virgifera* Le Conte has been present in Poland since 2005. The range of its distribution increased in 2006 and 2007. *D. virgifera* is known from areas of nine voivodeships in Southern and partially Central Poland. Current control strategy is based on containment measures to limit the spread of the pest from regions where it has occurred. This strategy includes the application of specific phytosanitary measures in defined parts of the country.

Key words: *Diabrotica virgifera*, Poland, occurrence, maize, control, phytosanitary measures

INTRODUCTION

Diabrotica virgifera Le Conte is one of the most hazardous maize pest. It is the most important maize pests in the USA and Canada. It causes significant yield losses amounting to one billion dollars annually, when the cost of chemical treatment is considered (Metcalf 1986). After pest's introduction into Europe, it has became real threat to maize crops in this continent, as well.

D. virgifera originates from North America. It was introduced to Europe in 90's of the 20th century. First individuals of this pest were discovered in 1992 in Serbia on maize fields located near international airport in Belgrade (Bača 1994). Its distribution range has increased dynamically over next few years covering new areas that till then had not been colonized. Until 2007, *D. virgifera* has been recorded in following countries: Serbia, Hungary, Croatia, Romania, Bosnia and Herzegovina, Bulgaria, Italy, Slovakia, Switzerland, Ukraine, Austria, Czech Republic, France, Great Britain, Slovakia, the Netherlands, Belgium, Poland and Germany (EPPO 2007).

Such a rapid expansion of western corn rootworm in Europe should be attributed to its life history characteristics. Following factors are among the most important moderators of the pest's spread rate:

- long-distance flight capacity, beetles can fly even over the distance of 100 km per day,
- high probability of the pest's accidental transmission (eggs, larvae, pupae and beetles) with land, air and water transport means into any place in the world, particularly during a plant material barter,
- high ability of adaptation to new environmental conditions,
- high reproduction rate (one female produces 100 to 1000 eggs),
- the insufficient number of the natural enemies capable to efficiently reduce the pest population to the level below the economic threshold for maize.

DISTRIBUTION IN POLAND

In Poland, first individuals of *D. virgifera* were found in the south-eastern part of the country in voivodeship podkarpackie at the end of August and in September 2006 in three outbreaks, near Dukla, Łąka and Jasionka, where six adults were collected. (Sahajdak *et al.* 2006a)

The most probable hypothesis concerning the outbreak on the territory of Poland is the penetration of the pest from the neighbouring countries: Slovakia and/or Ukraine. Two pathways are considered: natural migration of insects and the human activity: motor or plane transport – outbreaks are near to main roads and Rzeszów–Jasionka international airport (Sahajdak *et al.* 2006b).

Official control measures against *D. virgifera* were introduced immediately after first records. The State Plant Health and Seed Inspection Service (SPHSIS) is responsible for the supervision of detection, recording and preventing the spread of the pest on the territory of Poland. Research work on this pest has been started in the Institute of Plant Protection – National Research Institute in Poznań (IPP – NRI).

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Fig. 1. The distribution range of *Diabrotica virgifera* Le Conte in Poland in 2005–2007

In 2006, as a result of very intensive monitoring based on pheromone sticky traps and visual examination of maize plants in the field, *D. virgifera* was also detected, but on a much larger scale than in 2005. Its range of distribution included the territory of voivodeship podkarpackie and some areas of neighbouring voivodeships: lubelskie, świętokrzyskie, małopolskie, mazowieckie, śląskie, opolskie and dolnośląskie. Very high speed of the pest's colonization was connected with the increase of the number of pest's population. According to SPHSIS's data, *ca*. 17 500 beetles were collected in *ca*. 200 outbreaks. Outbreaks in the largest number – 112 were located in voivodeship podkarpackie and *ca*. 14 500 beetles were collected there.

Further extension of the pest's distribution range was observed in 2007. *D. virgifera* was recorded on the territory of nine voivodeships: the same 8 as in 2006 and voivodeship łódzkie additionally. *D. virgifera* is known from Southern and partially Central Poland now (Fig. 1).

Results of the monitoring activities in 2005–2007 seem to confirm the theory that the presence of *D. virgifera* in Poland is a consequence of its natural spread from Balkans and Central-Eastern Europe northward. It seems that the pest has been established on some areas where it has been present for the last three years. Numerous outbreaks are not isolated foci of limited geographical range, but they together are the manifestation of wide, progressive and irreversible expansion of the pest that will take effect of its permanent establishment in Poland (Konefał *et al.* 2007).

Unlike some European countries, in Poland the total eradication of *D. virgifera* is not possible, but appropriate control measures can reduce the number of the pest and avert the risk of serious loses in maize production. Presumably, the first loses caused by larvae (the most affected to yield's scale) can arise after 5–6 years since beetles have been recorded for the first time in given area (Kiss *et al.* 2005). Early undertaken measures are very important to effective control of *D. virgifera*. Control strategy should

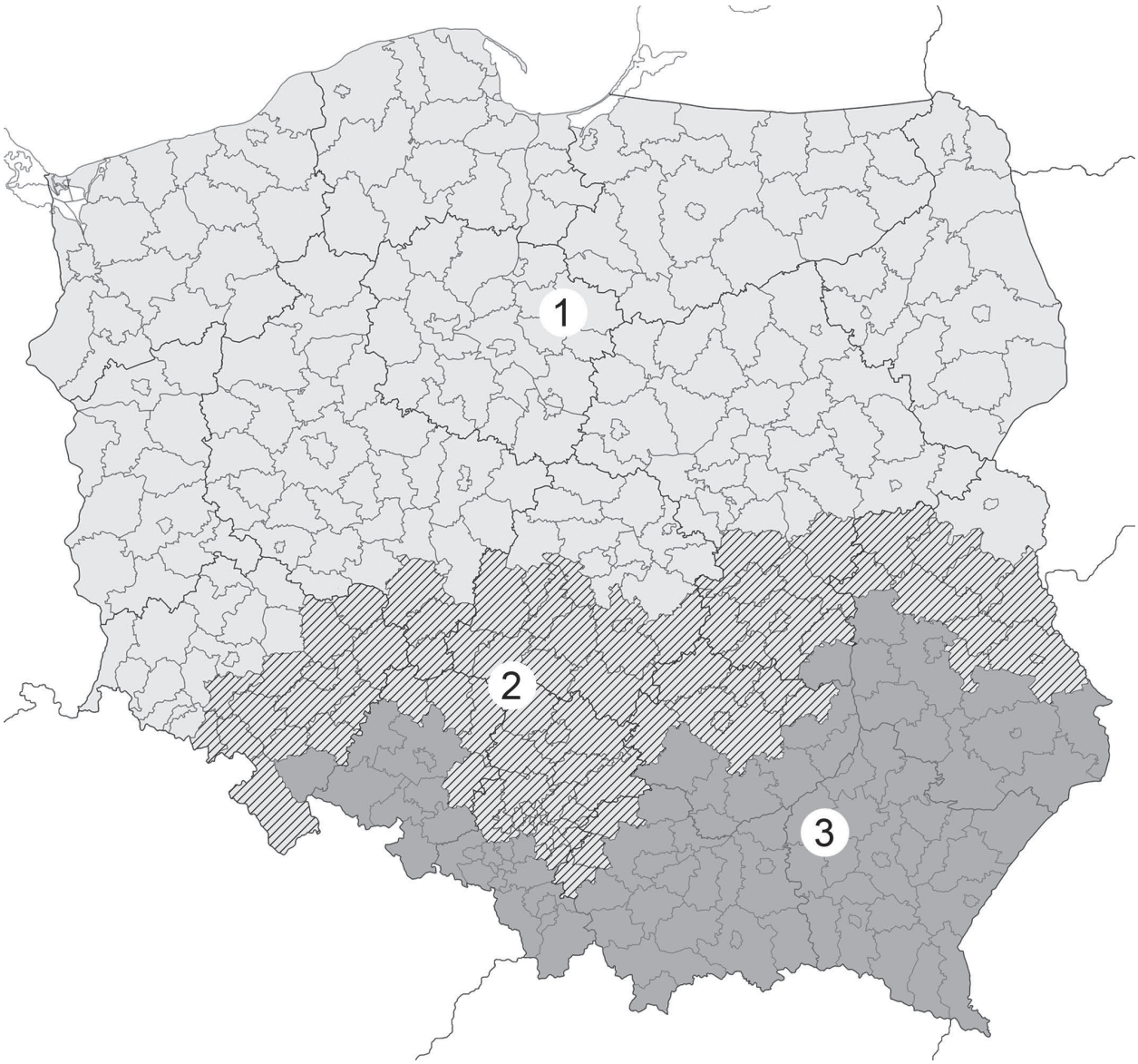

Fig. 2. Designated zones (2008): 1 – non-infested area, 2 – containment zone, 3 – infested zone

include various control options: crop rotation, foliar, seed and soil chemical treatments.

D. virgifera is recognized as a quarantine pest in all countries of the European Community, including Poland. Present strategy of the control of the pest in Poland is based on containment measures. It is connected with the application of specific phytosanitary measures in defined parts of the country.

In 2006, European Commission changed EU legal regulations on the control of *D. virgifera* and issued the Commission Decision of 11 August 2006 amending Decision 2003/766/EC on emergency measures to prevent the spread within the Community of *D. virgifera* (Decyzja 2006). The Commission Recommendation of 11 August 2006 on containment programmes to limit the further spread of *D. virgifera* in Community areas where its presence is confirmed was issued as well (Zalecenie 2006). These acts create the possibility to apply control measures in the other way than defined in previous law (Decision 2003/766/EC), but on the condition that the pest has been proven to be established in the given area and its total eradication is not possible.

Poland has used the above mentioned solution and the control program of *D. virgifera* has been prepared and brought into effect. It is described in the Regulation of the Ministry of Agriculture and Rural Development of 21 August 2007 on the control and prevention of the spread of *D. virgifera* (*Official Gazette* Dz. U. of 2007 No. 154, item 1087 and later changes) (Rozporządzenie 2007). According to this regulation, three zones have been designated on the territory of Poland (Fig. 2, Tab. 1, 2): an infested zone, a containment zone and a non-infested area. Specific phytosanitary measures are applicable in each zone. Infested zone is the part of Poland where *D. virgifera* is established. Containment zone is the area highly threatened with the spread of the pest by a direct neighborhood with the infested zone. Non-infested area is the rest of Poland where the pest is not detected.

Table 1. Administrative unit included in the infested zone

Voivodeship	Administrative unit
Dolnośląskie	ząbkowicki
Lubelskie	biłgorajski, hrubieszowski, janowski, krasnostawski, kraśnicki, lubelski, opolski, puławski, tomaszowski, zamojski, administrative unit – towns: Lublin and Zamość
Małopolskie	bocheński, brzeski, dąbrowski, gorlicki, krakowski, limanowski, miechowski, myślenicki, nowosądecki, nowotarski, proszowicki, suski, tarnowski, tatrzański, wadowicki, wielicki, administrative unit – towns: Kraków, Nowy Sącz and Tarnów
Mazowieckie	lipski
Opolskie	brzeski, głubczycki, kędzierzyńsko-kozielski, krapkowicki, nyski, opolski, prudnicki, administrative unit – towns: Opole
Podkarpackie	bieszczadzki, brzozowski, dębicki, jarosławski, jasielski, kolbuszowski, krośnieński, leski, leżajski, lubaczowski, łańcucki, mielecki, niżański, przemyski, przeworski, ropczycko-sędziszowski, rzeszowski, sanocki, stalowowolski, strzyżowski, tarnobrzeski, administrative unit – towns: Krosno, Przemyśl, Rzeszów and Tarnobrzeg.
Śląskie	bielski, cieszyński, mikołowski, pszczyński, raciborski, rybnicki, wodzisławski, żywiecki, administrative unit – towns: Bielsko-Biała, Jastrzębie Zdrój, Rybnik and Żory.
Świętokrzyskie	buski, jędrzejowski, kazimierski, opatowski, pińczowski, sandomierski, staszowski

Table 2. Administrative unit included in the containment zone

Voivodeship	Administrative unit
Dolnośląskie	dzierżoniowski, jaworski*, kamiennogórski*, kłodzki, milicki*, oleśnicki*, oławski, strzeliński, średzki*, świdnicki*, trzebnicki*, wałbrzyski*, wrocławski*, administrative unit – towns: Wrocław*
Lubelskie	chełmski, lubartowski, łęczyński, łukowski*, parczewski*, radzyński*, rycki, świdnicki, włodawski*, administrative unit – towns: Chełm
Łódzkie	bełchatowski*, łaski*, opoczyński*, pabianicki*, pajęczański*, piotrkowski*, radomszczański*, sieradzki*, wieluński*, wieruszowski*, zduńskowolski*, administrative unit – towns: Piotrków Trybunalski*
Małopolskie	chrzanowski, olkuski, oświęcimski
Mazowieckie	białobrzeski*, garwoliński*, grójecki*, kozienicki, przysuski*, radomski, szydłowiecki*, zwoleński, administrative unit – towns: Radom
Opolskie	kluczborski, namysłowski, oleski, strzelecki
Śląskie	będziński*, bieruńsko-lędziński, częstochowski*, gliwicki, kłobucki*, lubliniecki*, myszkowski*, tarnogórski*, zawierciański, administrative unit – towns: Bytom, Chorzów, Częstochowa*, Dąbrowa Górnicza*, Gliwice, Jaworzno*, Katowice, Mysłowice*, Piekary Śląskie, Ruda Śląska, Siemianowice Śląskie, Sosnowiec*, Świętochłowice, Tychy and Zabrze
Świętokrzyskie	kielecki, konecki*, ostrowiecki, skarżyski*, starachowicki, włoszczowski, administrative unit – towns: Kielce
Wielkopolskie	kępiński*, ostrowski*, ostrzeszowski*

Control measures in designated zones

Infested zone

Crop rotation is the main and most effective control measure. Two variants of crop rotation are allowed in the infested zone from 2007 till 31 December 2009:

- in the given field, maize is cultivated only once in three consecutive growing seasons, or
- in the given field, maize is cultivated twice in three consecutive growing seasons if chemical treatment against the pest is applied in one growing season at least, or maize is sowed after 1 July.

Containment zone

Two variants of maize cultivation are allowed in the containment zone from 2007 (from 2008 for administrative units marked in the table 2) till 31 December 2009:

- in the given field, maize is cultivated only once in two consecutive growing seasons, or
- in the given field, maize is cultivated in monoculture, if chemical treatment against the pest is applied in each growing season.

Additional obligations in infested and containment zones

Other measures are obligatory on the area of both zones from 2007 (from 2008 for administrative units marked in table 2) till 31 December 2009:

- volunteer maize plants are destroyed,
- in the maize field, deep plough preceded by precise shredding of debris after harvest is carried out in the end of each growing season,
- agricultural machinery used on maize fields is cleaned of all plant debris and soil before leaving zones,
- there is no movement of soil or other growing media out of these zones, if soil or other growing media come from maize fields,
- there is no movement of fresh maize plants and their parts out of these zones in each growing season before 15 October – this prohibition is not applicable if this movement takes place in the area of the same place of production.

All above mentioned measures are not applicable to entities that cultivate maize in monocultures in the frame of research programs and for the examination of plant protection product's efficacy.

The rest of the territory of Poland

In the case of pest's occurrence on the rest of Poland where the pest is not detected (the territory not listed in tables 1 and 2), two zones shall be designated: a focus zone around the field where the pest has been captured, of at least 1 km radius and a safety zone around the focus zone of at least 5 km radius. Additionally, a buffer zone may be defined around focus and safety zones.

On the territory of Poland not listed in tables 1 and 2, Voivodeship Inspectors shall define zones around airports at least 2.5 km radius around the area of the airport to prevent the spread of the pest.

Obligations in focus, safety and buffer zones

In the focus zone following measures are obligatory:

- in the given field, maize is cultivated only once in three consecutive growing seasons starting next season after the year that the zone was designated, or
- in the given field, maize is not cultivated in two consecutive growing season starting next season after the year that the zone was designated, and
- chemical treatment against the pest is applied before 15 October in the year that the zone was designated and next growing season,
- volunteer maize plants are destroyed starting next season after the year that the zone was designated,
- maize is not harvested before 15 October in each growing season starting in the year that the zone was designated,
- agricultural machinery used on maize fields is cleaned of all plant debris and soil before leaving zones starting in the year that the zone was designated,
- there is no movement of fresh maize plants and their parts out of the zone in each growing season before 15 October starting in the year that the zone was designated,
- there is no movement of soil or other growing media out of the zone, if soil or other growing media come from maize fields starting in the year that the zone was designated.

In the safety zone following measures are obligatory:

- in the given field, maize is cultivated only once in two consecutive growing seasons starting next season after the year that the zone was designated,
- chemical treatment against the pest is applied in the year that the zone was designated and next growing season.

In the buffer zone and the zone adjacent to the airport, in the given field, maize is cultivated only once in two consecutive growing seasons starting next season after the year that the zone was designated.

Chemical treatments against *D. virgifera* in 2008

In 2008, one plant protection product against larvae of *D. virgifera* is allowed to use: Poncho Pro 600 FS (chlotianidyne) – seed dressing product. It is temporary registered in the period: 22nd February–29th April 2008.

Moreover, the Minister of Agriculture and Rural Development on the application of IPP issued the permition for single registration of two plant protection products against adults of *D. virgifera*: Karate Zeon 050 CS (lambda-cyhalotryne) and Calypso 480 SC (tiachlopryde), that allow to use the product in the period: 1st July–28th October 2008.

Karate Zeon 050 CS or Calypso 480 SC should be used once (only one product) in the growing season. In the case two treatments are required in one season, these two products should be used alternately. On the territory of infested and containment zones (Tab. 1, 2) two treatments are recommended – first one in the period: second half of July – a half of August, second one: 7–14 days later. Moreover, in the case of pest's occurrence at the rest of the country, in designated focus and safety zones, one treatment should be carried out immediately that zones have been designated.

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POLISH SUMMARY

WYSTĘPOWANIE *DIABROTICA VIRGIFERA* LE CONTE W POLSCE W LATACH 2005–2007 ORAZ PRZEPISY REGULUJĄCE ZWALCZANIE SZKODNIKA W 2008 ROKU

Zachodnia kukurydziana stonka korzeniowa (*Diabrotica virgifera* Le Conte) występuje w Polsce od 2005 roku. W latach 2006–2007 szkodnik zwiększył zasięg swojego występowania. Do końca 2007 roku chrząszcze *D. virgifera* notowane były na obszarze 9 województw leżących na obszarze południowo-wschodniej, południowej, południowo-zachodniej i centralnej Polski. Aktualna strategia walki z tym szkodnikiem w Polsce opiera się na powstrzymywaniu jego rozprzestrzeniania się z rejonów na których już występuje na pozostały obszar kraju. Wiąże się to z zastosowaniem określonych środków fitosanitarnych w wyznaczonych rejonach kraju.