

1998–1999 Detection Survey Results of *Diabrotica virgifera virgifera* LeConte in Non-infested European Countries

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In 1998–1999 a detection survey on the presence of the western corn rootworm (WCR) *Diabrotica virgifera virgifera* Le Conte was conducted in Austria, Germany, France, Slovakia and Slovenia. In these countries, the primary monitoring tool was the Hungarian pheromone trap.

According to the results, no WCR adults were detected in these countries. It is assumed that Austria, Germany, France, Slovakia and Slovenia are probably free of this destructive maize pest.

Keywords: *Diabrotica virgifera virgifera*, western corn rootworm.

The western corn rootworm (WCR) (*Diabrotica virgifera virgifera* LeConte) population spread relatively quickly from its initial point of infestation (near Belgrade, Yugoslavia) towards north (Roy and Berger, 1995), (OEPP/EPPO, 1996) and (OEPP/EPPO, 1997). Princzinger (1996) reflects the observation of WCR in Hungary during the first year after its introduction into the country. The most effective way to monitor WCR when the population densities are low, is with pheromone traps (Tóth et al., 1996). WCR monitoring net has been established outside of infested countries.

Materials and Methods

Slovak Republic

The detection survey focuses on searching for WCR adults in Slovakia. Currently, the WCR population density is low in Europe (except Serbia). Therefore Hungarian pheromone traps were selected as the primary detection tool. These traps were used together with Multigard traps.

WCR observation points (within maize fields) were established along the Slovakian Hungarian border (Cereal production in the Slovak Republic 1996–1997, see Fig. 1). Observation points were chosen based on field acreage. Maize fields cultivated for grain

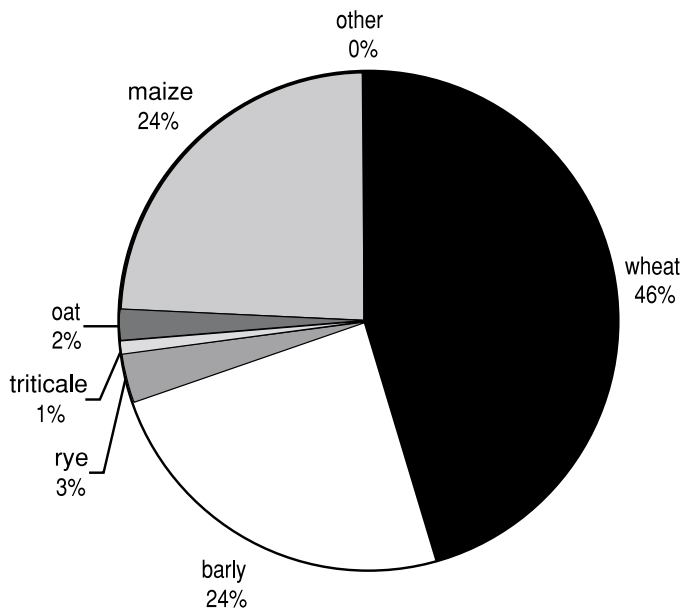


Fig. 1. Cereal production in the Slovak Republic, 1996–1997

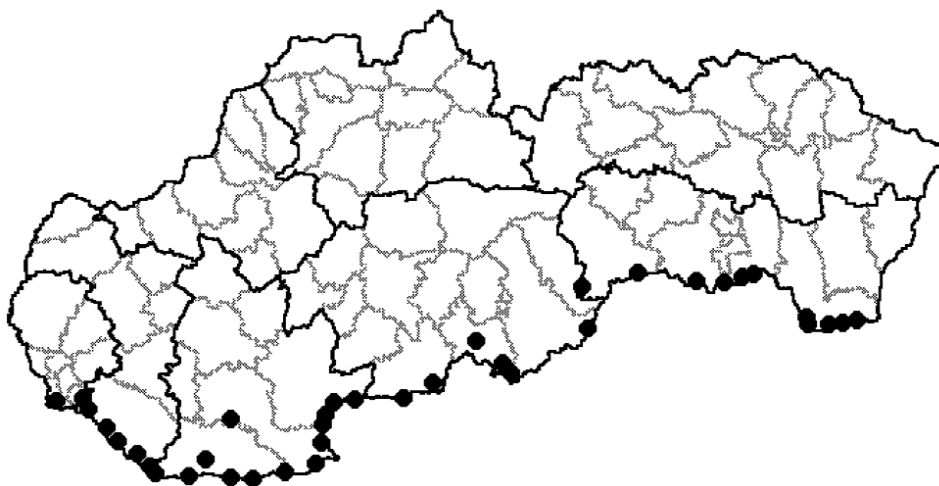


Fig. 2. The review of the *Diabrotica virgifera* LeConte observation points in the Slovak Republic in 1998

● observation point

purpose were preferred. A few observation points were located at different testing stations (Agricultural Institute of Slovenia) near the airport in Bratislava and Kosice in 1999. In both monitoring years, one observation point was near a main road close to Nove Zamky.

In 1998, as well as in 1999, 37 locations were selected. At 10 observation points, Multigard traps were set in 1998 and 1999. The arrangement of WCR observation points is illustrated in Figs 2, 3 (1998) and (1999) as well as recorded in Table 1.

Table 1

The arrangement view of observation points for the detection survey for *Diabrotica virgifera virgifera* LeConte in the Slovak Republic in 1998–1999

Region	District	1998			1999		
		Loc. Number	Observation points with trap number		Loc. Number	Observation points with trap number	
			Pheromone	Multigard		Pheromone	Multigard
Bratislavský	Bratislava	2	2	–	2	2	1
Trnavský	Dunajská Streda	5	5	2	5	5	2
Nitrianský	Komárno	5	6	2	5	6	2
	Nové Zámky	4	5	2	4	5	2
	Levice	4	4	–	2	2	–
Banskobystrický	Veľký Krtíš	2	2	–	2	2	–
	Lučenec	2	2	–	2	2	–
	Rimavská Sobota	2	2	–	2	2	–
	Rožňava	2	2	–	2	2	–
Košický	Košice	4	5	2	5	5	1
	Trebišov	5	5	2	5	5	2

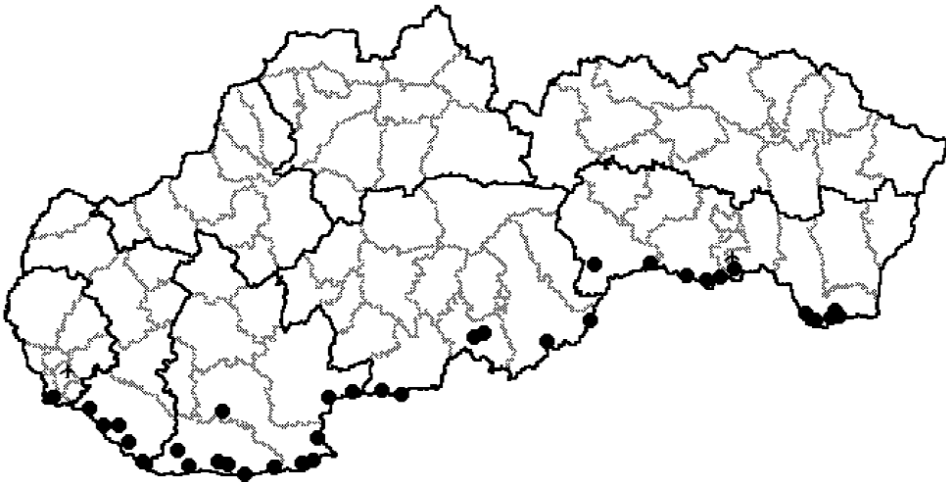


Fig. 3. The review of the *Diabrotica virgifera* LeConte observation points in the Slovak Republic in 1999

● observation point ↗ observation point near an airport

The phytosanitary inspectors, who are specialist in the Plant Protection Department of the Central Control and Testing Institute of Agriculture, conducted the survey. At each observation point, one set of pheromone traps was established. A pair of Multigard traps was established at 10 observation points. The pheromone traps were positioned so that the pheromone plumes were readily present in and around maize fields. The traps were checked on a weekly basis. Trap installation in 1998 occurred in the first week of July, and in 1999, the second week of July. The traps were replaced at each observation point twice, after 30-days intervals. The survey results, date of installation, and dates of traps replacement were recorded.

Austria

The WCR population density in Europe is low. Therefore, Hungarian pheromone traps (Tóth, 1996) were selected to detect the presence of WCR adults. The observation points were established along the Austrian-Hungarian border. Additionally, traps were placed around the Vienna International Airport (Schwechat). In 1998, 60 pheromone traps were installed at 11 locations in Austria. However, in 1999 only 21 pheromone traps were used at 11 locations (Fig. 4, Table 2). A few of the trapping locations from 1998 changed in 1999, due to crop rotation on the relevant fields.



Fig. 4. The monitoring sites for *Diabrotica virgifera virgifera* LeConte in Austria in 1998 and 1999

Table 2Monitoring of *Diabrotica virgifera virgifera* in Austria, 1998–1999

County	District	Location	No. of pheromone traps		
			1998	1999	
Burgenland	Wien-Umgebung	Fischamend		3	
		Nickelsdorf		2	
	Oberpullendorf	Deutschkreutz	5	2	
		Lutzmannsburg	5	1	
		Unterloisdorf	5	1	
	Oberwart	Schachendorf	5	1	
		Jennersdorf	Kulm		1
			Heiligenkreuz		2
	Güssing	Neuhaus	5	1	
		Königsdorf	5		
		Magersdorf	5		
		Hagensdorf	5		
Styria	Radkersburg	Sicheldorf	10	5	
		Zelting	5		
	Leibnitz	5	2		

Although crop rotation in maize is not readily implemented around the Fischamend location, crop rotation is being implemented around Nickelsdorf. In the districts Oberwart, Oberpullendorf and Jennersdorf, rotation in maize is implemented on 42% of arable land. In the districts of Radkersburg and Leibnitz, the percent (65%) of rotation on arable land increases (*Table 3*). The selection of the places were made by staff members of the local chambers of agriculture in co-operation with the local farmers and landowners according to share of maize in areas of crop rotation and had to be reduced in 1999, due to reduction of maize in the rotation in the relevant area. Also the locations of the traps had to be changed for that reason in 1999.

Table 3

Share of maize (grain corn, CCM, silage) in arable crops

Fed. Country	District	Arable land in hectare	Maize* in hectare	In % of arable land
Styria	Leibnitz	20.487	13.340	65
	Radkersburg	14.549	9.492	65
Burgenland	Güssing	17.413	3.729	21
	Jennersdorf	8.985	3.761	42
	Mattersburg	9.937	1.482	15
	Neusiedl/See	55.929	5.298	10
	Oberpullendorf	25.643	1.857	7
	Oberwart	24.859	4.445	17

*Grain Corn, CCM, Green Corn

Table 4

An overview and geographical definition of the control points used for monitoring of western corn rootworm *Diabrotica virgifera virgifera* in Slovenia in 1998

Area	UTM-Code	Location	Micro-location of plot
Prekmurje	WM-97	Martjanci	Near the road MS-Dobrovnik at the signpost Martjanci
	WM-97	Tešanovci	Near the road MS-Dobrovnik at the signpost Tešanovci
	XM-07	Bukovnica	Near the firing range at the beginning of forest
	XM-07	Motvarjevci	In front of the small bridge
	XM-08	Prosenjakovci	At the end of the village between the two signposts
	XM-08	Domanjševci	Near the state border at the turning to Hodoš
	XM-07	Kobilje	In front of the border at the signpost
	XM-06	Kamovci	At the road in front of the signpost Kamovci
	XM-16	Mostje	In front of the signpost Mostje
	XM-16	Dolga vas	At the border-crossing Dolga vas
	XM-16	Dolga vas	At the road Dol. Vas-Lendava in front of the little bridge
	XM-15	Benica	At the beginning of the village near the signpost
	XM-15	Benica	At the silos
	XM-05	Kot	At the signpost Kot
	WM-95	Mota	At the road Razkrižje-Krapje; in front of the linden-tree
	WM-95	Pristava	At the end of the village near the signpost Pristava
	Dravsko polje	WM-54	Pragersko
WM-64		Kungota	Behind the signpost – in front of the forest
WM-63		Lovrenc	At the playground
WM-64		Turnišče	At the walls to the left
WM-74		Moškanjci	At the airport
WM-74		Gorišnica	At the hunters' observation post
WM-84		Mihovci	At the bridge to the right
WM-94		Središče ob Dravi	Passing Droga 1
Krško polje	XM-04	Središče ob Dravi	At the border-crossing
	WL-59	Gregovce	To the left of the oak-tree
	WL-58	Loče-Rigonce	At the line of trees
	WL-57	Obrežje	At the border-crossing Obrežje
	WL-48	Skopice	At the road Ljubljana – Zagreb
	WL-38	Velika vas	At the road Ljubljana – Zagreb

Monitoring began between 1 July and 8 July in 1998 and on 21 June in 1999. Traps were changed three times during the monitoring period. The number of beetles/trap was supposed to be recorded every other week. The pheromone capsules attached to the traps were replaced each time the traps were replaced. The sticky panels of the traps were replaced if too much debris and/or too many insects were present on these panels. WCR monitoring ended between 19 August and 21 August in 1998 and between 31 August and 2 September in 1999. Staff from the Federal Office and Research Institute of Agriculture installed, checked, and replaced traps throughout the monitoring period.

Slovenia

In Slovenia a high percentage of maize is growing along the northeastern border. Neighboring the northeastern Slovenia are the countries of Hungary and Croatia. Since WCR population are present in these countries, monitoring the northeastern part of Slovenia is pertinent. In 1998 WCR populations were detected in Italy for the first time. Therefore, since Italy borders western Slovenia, this area was monitored in 1999.

Monitoring for the presence of WCR in Slovenia was coordinated by the Agricultural Institute of Slovenia, with the cooperation from the inspectorate of the Republic of Slovenia for Agriculture and the Agricultural Advisory Service.

In 1998, Hungarian pheromone traps and Multigard traps were placed at 30 locations along the Hungarian border and the Croatian border. Monitoring checkpoints were geographically distributed using UTM network (*Table 4*). The accuracy of checkpoint locations was recorded with a GPS_{3000 XL} device (magellan).

Thirty pheromone traps and 30 Multigard traps were used to monitor the presence of WCR adults. The distance between pheromone traps and Multigard traps was 50 to 100 m. Monitoring began during the first week of July ended on 8 September. During this time, traps were checked at 10-days intervals. At the beginning of August pheromone traps were replaced. The Multigard traps had to be replaced every ten days.

In 1999, the number of checkpoints increased to 50 (*Table 5*). Since WCR adults were found near the Venice Airport, monitoring checkpoints were established along the western border. In northeastern Slovenia, monitoring continued as in 1998. Ten new checkpoints were placed along the Italian border, most of them in maize fields near the border, some along major roads. Eight checkpoints were set up around the international airport Brnik. All checkpoints – monitoring points were geographically distributed using UTM network and checkpoints were recorded with a GPS_{3000 XL} device.

Fifty pheromone traps and 50 Multigard traps were used to monitor the presence of WCR adults. Monitoring began during first week of July and ended during the first week of September.

Results and Discussion

In 1998 and 1999 no WCR adults were collected in the Slovak Republic. Therefore, we can say that *Diabrotica virgifera* is not present in territory of the Slovak Republic. The results of our detection survey in 1998 and 1999 are in accordance with surveys result of in the neighboring countries of Hungary and Austria as noted in OEPP/EPPO (1998).

In 1998 and 1999 *Diabrotica virgifera virgifera* were not detected in Austria, too. Based on this data, WCR beetles are more than likely not present in the surveyed Federal countries Lower Austria, Burgenland and Styria. Although WCR adults were not detected, monitoring will continue in these areas in 2000. The possibility of the presence of WCR in other Federal countries (Upper Austria and Kärnten), where maize occurs frequently and favorable climates for WCR exists, is still low. However, parts of Upper Austria and Kärnten also will be monitored for the presence of WCR in 2000. The results of the detec-

Table 5

An overview and geographical location of the checkpoints used for monitoring WCR
Diabrotica virgifera virgifera LeConte in Slovenia in 1999

Area	UTM-Code	Location	Microlocation of plot	
Prekmurje	WM-97	Martjanci	At the road 200 m behind the signpost Martjanci	
	WM-97	Moravske toplice	Near the road at the signpost	
	XM-07	Bukovnica	At the turning for Trnavski breg	
	XM-07	Motvarjevci	In front of the small bridge	
	XM-08	Prosenjakovci	At the end of the village near elementary school	
	XM-08	Domanjševci	Near the state border at the turning to Hodoš	
	XM-17	Kobilje	At the border-crossing	
	XM-06	Kamovci	At the dairy plant	
	XM-16	Mostje	In front of the signpost Mostje	
	XM-16	Dolga vas 1	At the border-crossing	
	XM-16	Dolga vas 2	Near the brook Borosna	
	XM-15	Benica 1	At the end of the village near the signpost	
	XM-15	Benica 2	At the silos	
	XM-05	Kot	At the signpost Kot	
	WM-95	Mota-Razkrižje	At the road Razkrižje-Mota; in front of linden-tree	
	WM-95	Pristava	At the turning to Pristava	
	Dravsko polje	WM-44	Leskovec	At the drain
		WM-64	Draženci	At the state farm
		WM-64	Turnišče	Right to the walls
WM-74		Moškanjci	Near the airport	
WM-74		Mezgovci	At the asphalt platform	
WM-94		Središče ob Dravi 1	Passing Droga 1	
XM-04		Središče ob Dravi 2	At the border-crossing	
XM-04		Središče ob Dravi 3	Passing the stables near asphalt platform	
Krško polje		WL-57	Obrežje	At the border-crossing Obrežje
	WL-58	Ribnica	Near the road in front of the signpost Lašič	
	WL-58	Podgračeno	Behind the signpost Cerjak to the left	
	WL-59	Gregovce	To the left of the oak-tree	
	WL-58	Loče–Rigonce	At the line of trees	
	WL-38	Velika vas 1	In the village at the last farm	
	WL-38	Velika vas 2	At the road Ljubljana – Zagreb; near the poplar	
	WL-38	za Veliko vasjo	At the road Ljubljana – Zagreb; behind the bridge	
	Airport Brnik	VM-52	Voglje 1	At the end - left at the railings
VM-52		Voglje 2	In the middle - left at the railings	
VM-52		Voglje 3	At the beginning - left at the railings	
VM-62		Vopovlje	Before Vopovlje at the side road	
VM-52		Spodnji Brnik 1	At the beginning - right at the railings	
VM-52		Spodnji Brnik 2	In the middle – right at the railings	
VM-52		Šenčur 1	At the KŽK laboratory	
VM-52		Šenčur 2	At the mechanical workshop	
North. Primorska		UL-98	Šempeter 1	At the traffic sign for side road
	UL-98	Šempeter 2	Opposite to Technical Control	
	UL-98	Orehovlje-Bilje 1	Discount shop Disgro; near the fence	
	UL-98	Orehovlje-Bilje 2	Between the two traffic signs	
	UL-98	Vogrsko 1	To the right below the highway viaduct	
	UL-98	Vogrsko 2	To the left below the highway viaduct	
	UL-98	Okroglica-Ozeljan	At the irrigation system station	
	VL-18	Cesta-Ajdovščina	At the bus-stop	
	VL-18	Ajdovščina	Opposite to Mlinotest	
VL-17	Vipava	At the turning to Slap		

tion surveys in 1998 and 1999 are in accordance with the survey results from neighboring countries, such as Slovakia and Slovenia, which have a common border with countries where WCR populations are present.

In Slovenia during 1998 and 1999, WCR beetles were not detected. Nevertheless, monitoring will continue in 2000, following the same procedure as in 1999. However, monitoring for the beetles will more than likely intensify in northeastern and western Slovenia.

In 1998, monitoring for WCR in France did not occur. However, studies on the biological cycle of the WCR, with the use of recent climatic data, are underway. In order to confirm the absence of *Diabrotica* in France, a network of 16 traps was established in 1999. Primary maize production areas and fields near international airports were selected. Pheromone traps were installed at the beginning of July. No captures of WCR adults were made in France throughout 1999.

In Germany (Baden Württemberg), Hungarian pheromone traps were used to monitor the presence of WCR adults in 1998. A total of 24 traps at 12 locations were established. The traps were placed in maize fields, army camps, highway stations, and in maize breeding stations.

In 1999, the number of locations and traps increased. Altogether 179 traps at 53 locations were established (Table 6). Pheromone traps (161) and MCA attractant traps (p-methoxy-cinnamaldehyde) (18) were used. The traps were again placed in maize fields, border crossings, airports, harbors, railway and truck stations, army camps, highway stations and in maize breeding stations.

Table 6

Monitoring of WCR (*Diabrotica virgifera virgifera* LeConte)
in Germany in 1999

1999	Baden-Württemberg	Bavaria	Saxonia	Nordrhein-Westfalen
Number of pheromone traps	28	100	23	10
Number of MCA-traps	18	0	0	0
Number of locations	17	12	21	3
Maize fields	X	X	X	X
Border-Crossings	X	X	X	
Airports		X	X	
Harbors		X		
Railway- and truckstations	X	X	X	
Army Camps	X	X		
Highway stations	X			
Maize-Breeding stations	X			

In 2000, monitoring will continue throughout Europe. The number of Federal Countries participating in this survey will more than likely increase in the near future.

Acknowledgement

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