

Reduction of Mycotoxins in corn with fungicide spraying in minimum tillage systems

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Abstract

In Austria more than 400.000 ha arable land are seriously endangered by soil erosion. Soil loss, nutrient loss, water runoff and pesticide loss are environmental risks. Minimum tillage systems can significantly reduce soil erosion and all the negative consequences. The covering of the soil surface with crop residues implicate the risk of *Fusarium* sp. and in case of corn stubbles remain on the surface European Corn Borer also is naturally occurring.

ZEA Reduction 2013 from 42 – 91 %, 2014 from 43 – 92 % appeared; DON Reduction 2013 from 41 – 92 %, 2014 from 31 - 90 % was measured.

Introduction

No tillage and zero tillage research had been performed for more than 20 years in Lower Austria. Less traffic on the arable land, less fuel consumption (70-80%), less time for cultivation are economic advantages; ecological interests are higher microbiological activity, better C sequestration, humus constitution and prevention of soil erosion.

The disadvantages are the appearance of *Fusarium* sp. and European Corn Borer; the control with Fungicides and Insecticides was effectively tested.

Material and Methods

The studies were operated in 2 climates – dry semi-arid Pannonian and semi-humid Climate in a crop rotation Corn – Corn or Winter - Wheat – Corn. In the Corn - stage of growth 31 – 65 Fungicides were applied, the Corn Borer control took place at the beginning of July corresponding to the electronic prediction system proPlant. The spraying was operated by a high boom sprayer.

The results demonstrate a significant reduction of Mycotoxines ZEA and DON in the years 2013 and 2014. 2013 DON was reduced by Fungicides from 1812 ppb in the untreated control to less than 1000. 2014 the DON – value in the control was 4014. With Fungicide spraying in EC 59 this value could be reduced to 665 – 1023 ppb.

The insecticide trials for the control of European corn borer showed also good options. These trials were applied with assistance of light traps catches in comparison to the prediction model proPlant. A yield – increase from 9 – 26 % appeared and a reduction of DON 2013 was investigated. The lodging of corn could be reduced significantly and the quality of the harvest ensured.

Conclusion

Erosion control with Minimum Tillage and No Tillage is demonstrably possible. The occurrence of *Fusarium* sp. and European corn borer is detected; the control is actually with registered pesticides highly effective but less introduced into practice. DON and ZEA are acutely poisonous and have to be eliminated.

Results 2013 – 2014

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Key words: *Soil Erosion, Mycotoxins, Insecticides, Fungicides, Minimum Tillage, European corn borer*

Plot Number	Trial variant	ZEA ppb		DON ppb	
		2013	2014	2013	2014
1	seeddressing Maxim XL (Metalaxyl M + Fludioxinil) - untreated control VS	542	1038	1812	4014
2	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 31	315	430	813	2273
3	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 51	148	247	580	2379
4	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 59	132	209	526	1023
5	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 65	139	142	610	448
6	Prosaro Prothioconazol + Tebuconazol 1 l EC 31	105	450	454	2764
7	Prosaro Prothioconazol + Tebuconazol 1 l EC 51	233	350	1076	2283
8	Prosaro Prothioconazol + Tebuconazol 1 l EC 59	114	99	592	870
9	Prosaro Prothioconazol + Tebuconazol 1 l EC 65	141	198	430	400
10	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 31	133	504	442	2961
11	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 51	108	588	413	1776
12	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 59	62	164	209	1350
13	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 65	86	80	245	1023
14	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol 1 l EC 31		335		3082
15	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol 1 l EC 51		255		1026
16	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol 1 l EC 59		114		665
17	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol 1 l EC 65		192		866
18	Seeddressing Prothioconazole + Retengo plus (Opera) 1.5 l EC 59	51	307	209	1807
19	Seeddressing Prothioconazole + Propulse 1.0 l EC 59	64	254	263	1452
20	Seeddressing Prothioconazole + Retengo plus (Opera) 1.5 l + Prosaro 1.0 l EC 31 + EC 65	32	163	138	404
21	Seeddressing Beizung Prothioconazole + Quilt Xcel 1.0 l EC 59		240		941
22	Seeddressing Prothioconazole + Retengo plus 1.5 l + Quilt Xcel 1.0 l EC 31 + EC 65		160		846



Fusariummycelium on corn ear induce Mycotoxins

DON Reduction Tulln		2013	2014
1	seeddressing Maxim XL (Metalaxyl M + Fludioxinil) - untreated control VS	0	0
2	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 31	55	43
3	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 51	68	40
4	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 59	70	74
5	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 65	66	89
6	Prosaro Prothioconazol + Tebuconazol 1 l EC 31	75	31
7	Prosaro Prothioconazol + Tebuconazol 1 l EC 51	41	43
8	Prosaro Prothioconazol + Tebuconazol 1 l EC 59	67	78
9	Prosaro Prothioconazol + Tebuconazol 1 l EC 65	76	90
10	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 31	76	26
11	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 51	77	56
12	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 59	88	66
13	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 65	86	75
14	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol) 1 l EC 31		23
15	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol) 1 l EC 51		74
16	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol) 1 l EC 59		83
17	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol) 1 l EC 65		78
18	Seeddressing Prothioconazole + Retengo plus (Opera) 1.5 l EC 59	88	55
19	Seeddressing Prothioconazole + Propulse 1.0 l EC 59	85	64
20	Seeddressing Prothioconazole + Retengo plus (Opera) 1.5 l + Prosaro 1.0 l EC 31 + EC 65	92	90
21	Seeddressing Beizung Prothioconazole + Quilt Xcel 1.0 l EC 59		77
22	Seeddressing Prothioconazole + Retengo plus 1.5 l + Quilt Xcel 1.0 l EC 31 + EC 65		79

ZEA Reduction Tulln		2013	2014
1	seeddressing Maxim XL (Metalaxyl M + Fludioxinil) - untreated control VS	0	0
2	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 31	42	59
3	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 51	73	76
4	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 59	76	80
5	Retengo plus (Opera) Pyraclostrobin + Epoxiconazol 1.5 l EC 65	74	86
6	Prosaro Prothioconazol + Tebuconazol 1 l EC 31	81	57
7	Prosaro Prothioconazol + Tebuconazol 1 l EC 51	57	66
8	Prosaro Prothioconazol + Tebuconazol 1 l EC 59	79	90
9	Prosaro Prothioconazol + Tebuconazol 1 l EC 65	74	81
10	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 31	75	51
11	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 51	80	43
12	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 59	89	84
13	Propulse (Fluopyram 125 g + 125 g Prothioconazole) 1 l EC 65	84	92
14	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol) 1 l EC 31		68
15	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol) 1 l EC 51		75
16	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol) 1 l EC 59		89
17	Quilt Xcel (Azoxystrobin 141,4 g/l + 122,4 g/l Propiconazol) 1 l EC 65		82
18	Seeddressing Prothioconazole + Retengo plus (Opera) 1.5 l EC 59	91	70
19	Seeddressing Prothioconazole + Propulse 1.0 l EC 59	88	75
20	Seeddressing Prothioconazole + Retengo plus (Opera) 1.5 l + Prosaro 1.0 l EC 31 + EC 65	94	84
21	Seeddressing Beizung Prothioconazole + Quilt Xcel 1.0 l EC 59		77
22	Seeddressing Prothioconazole + Retengo plus 1.5 l + Quilt Xcel 1.0 l EC 31 + EC 65		85

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