Aspects of the production of fast growing tree species in Austria

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Facts renewable energy in Austria

- Kyoto agreement 1998: until the period 2008 – 2012 reduction of discharge of CO_2, CH_4, N_2O around 13 % to 1990
- 1990 emission 77 Mio.t/year CO_2 equivalent ⇨ 1998 80 Mio.t, ⇨ 2013 83 Mio.t; goal of the Kyoto agreement are 67 Mio.t/year……**16 Mio.t reduction of gasemission requested**
- → Renewable bioenergy needed
- Defile in timber production and increasing demand

	prediction 2010
Demand 1997 → 2002…….+ 23 % sawn timber	
+ 8 % pulp and paper industry	+ 27 %
+ 47 % wood board	+ 50 %

Increasing demand 2 – 2.5 Mio. cubic metre timber for bio energy

Fast growing tree species (poplar, willow)

➔Production of timber on arable land

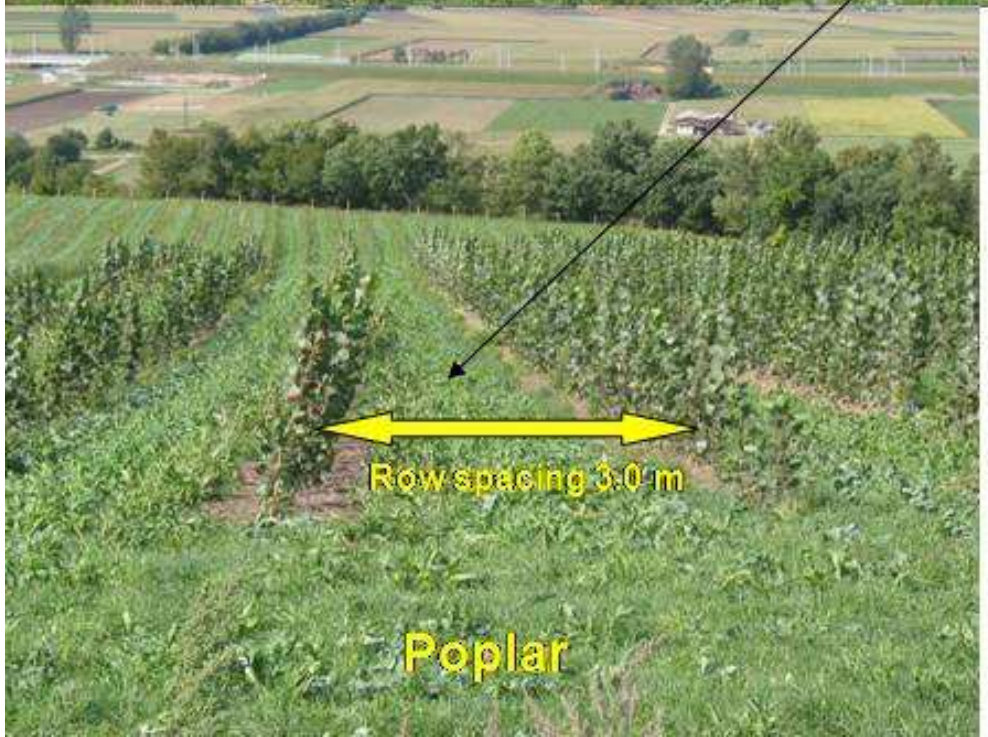
- Austria 1.800 ha fast growing trees – poplar and willow – 900 ha in yield
- 2 – 2.5 kg timber replaces 1 kg heating oil
- Harvest full mechanized
- Recultivation possible and aimed at
- Renewable energy with high potential of yield
- Energy production with hold open of the countryside
- Long term change to BTL (biomass to liquid) – produced from organic matter like timber
- **Energy balance – energy input:output**

Ethanol from wheat	1:2.7
Etahnol from sugar beets	1:1.6
Rape-seed oil	1:3.4
Rape methylic ester	1:3.1
Cereal – total plant	1:12 – 14
Fast growing trees	1:16 - 24

Cover crops to prevent soil erosion

Xeric grassland communities

Grooming to save soil moisture



Test of varieties willow and poplar August first year after planting

2nd year after plantation

Dry and hot period – damage on willow

Growth 1st year

Growth 1st year after 3rd harvest

Willow 2nd year

Poplar 2nd year

Willow 10 years old, 1st year after harvest

Willow 10 years old, 4th year after harvest
⇨harvest next winter

Poplar 10 years old, 4th year after harvest ⇨harvest next winter

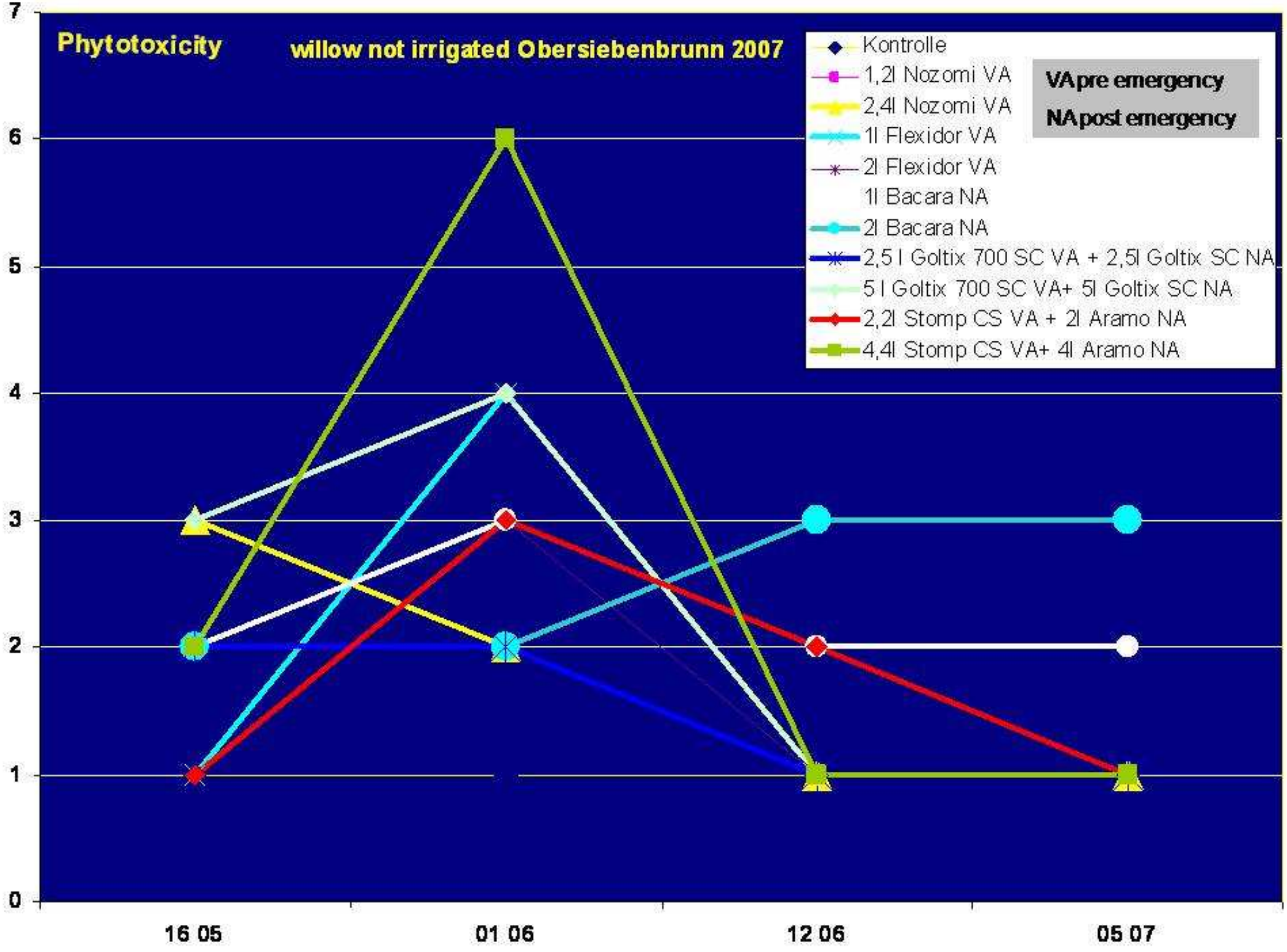
Wood shavings

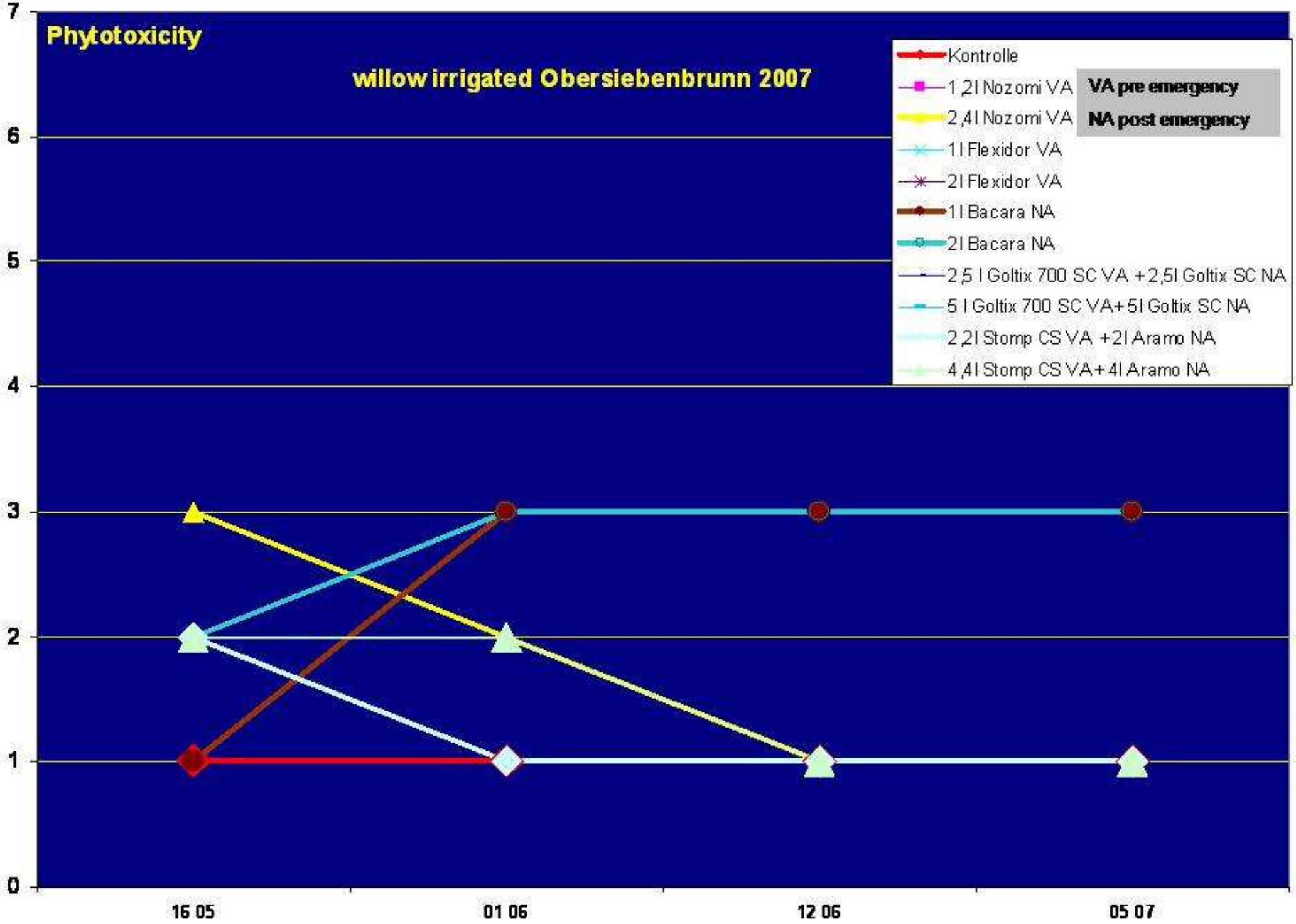
Herbicide tests

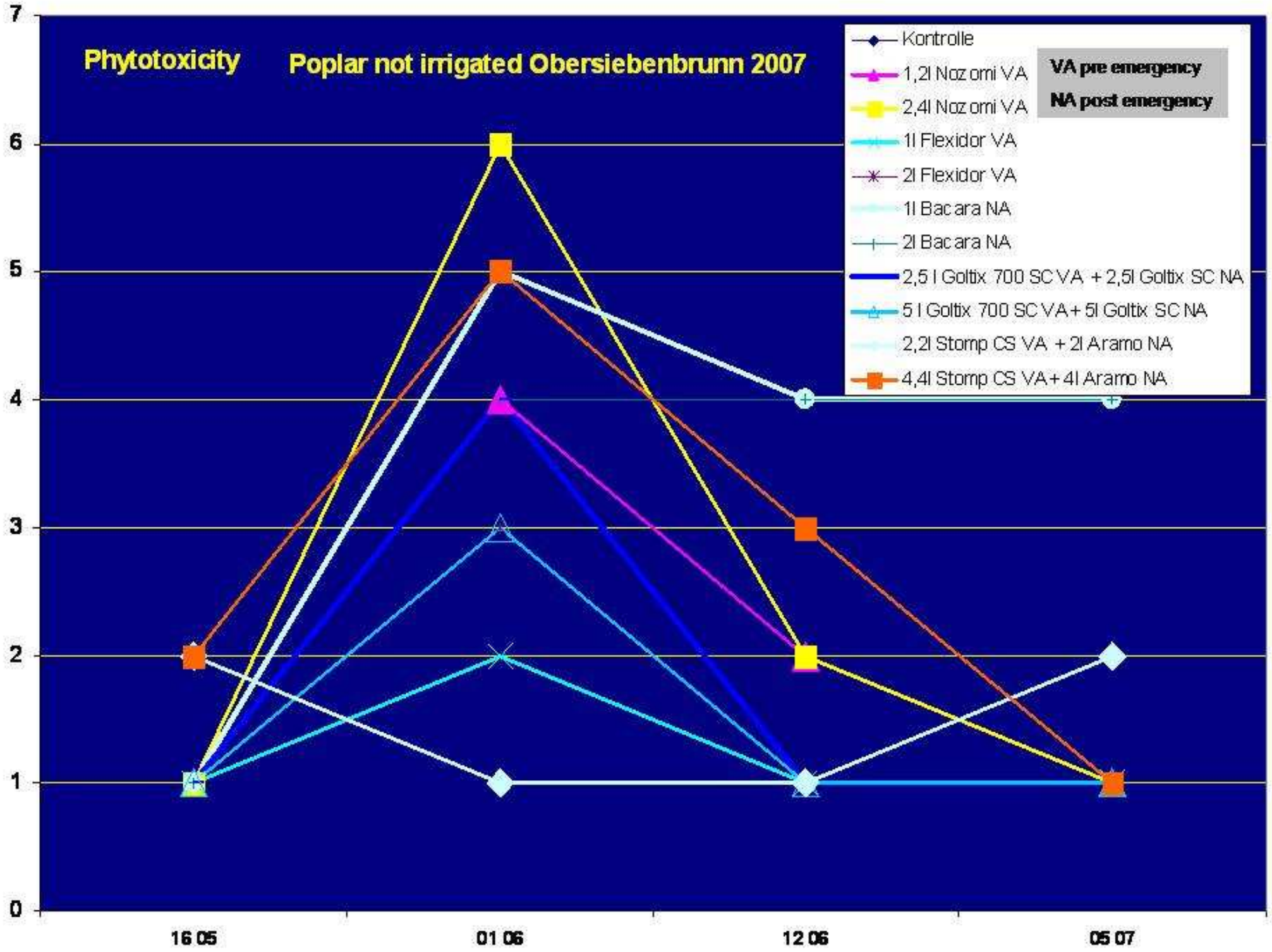
Plot sprayer with special spray booms and band spraying

Herbicide test 2007 Hungarian – dry - climate

Herbicide	appointment	active substance	application rate	efficiency of herbicid % effect			Phyto toxicity		1 no Phytotox
				Lamium	Amaranthus	Echonochloa	1 to 9		9 total
				amplexicaule	retroflexus	crus galli	Willow	Poplar	perishing
Nozomi	pre emergency	Flumioxazin	1.2 kg	98	100	62	1	1	
Flexidor	pre emergency	Isoxaben	1.0 kg	54	33	57	1	1	
Callisto	pre emergency	Mesotrione	1.5 kg	92	22	25	1	1	
Chikara +	pre emergency	Flazasulfuron	0.2 kg	88	75	88	1	1	
Break Thru		adjuvant	0.3 l						
Chikara +	pre emergency	Flazasulfuron	0.15 kg	80	72	83	1	1	
Break Thru		adjuvant	0.3 l						
Bacara	BBCH 14	Diflufenican +		100	68	50	3	4	
		Flurtamone	1 l						
Lontrel	BBCH 25	Clopyralid	1.2 l	33	22	28	1	1	
BAS 65903	pre emergency	Pendimethalin	4 l	50	22	52	1	1	
Stomp CS	pre emergency	Pendimethalin	4.4 l	78	47	78	1	1	
Goltix SC +	pre emergency	Metamitron	2.5 l						
Goltix SC	BBCH 14	Metamitron	2.5 l	88	58	52	1	2	
Stomp CS +	pre emergency	Pendimethalin	3 l						
Aramo	BBCH 25	Tepraloxydim	2 kg	77	63	100	1	1	


Phytotoxicity
willow not irrigated Obersiebenbrunn 2007
Kontrolle
1,2l Nozomi VA
2,4l Nozomi VA
1l Flexidor VA
2l Flexidor VA
1l Bacara NA
2l Bacara NA
2,5 l Goltix 700 SC VA + 2,5l Goltix SC NA
5 l Goltix 700 SC VA+ 5l Goltix SC NA
2,2l Stomp CS VA + 2l Aramo NA
4,4l Stomp CS VA+ 4l Aramo NA
VA pre emergency
NA post emergency
7
6
5
4
3
2
1
0
16 05
01 06
12 06
05 07


Phytotoxicity
willow irrigated Obersiebenbrunn 2007
Kontrolle
1,2 l Nozomi VA
2,4 l Nozomi VA
1 l Flexidor VA
2 l Flexidor VA
1 l Bacara NA
2 l Bacara NA
2,5 l Goltix 700 SC VA + 2,5 l Goltix SC NA
5 l Goltix 700 SC VA + 5 l Goltix SC NA
2,2 l Stomp CS VA + 2 l Aramo NA
4,4 l Stomp CS VA + 4 l Aramo NA
VA pre emergency
NA post emergency
7
6
5
4
3
2
1
0
16 05
01 06
12 06
05 07


Phytotoxicity
Poplar not irrigated Obersiebenbrunn 2007
VA pre emergency
NA post emergency
Kontrolle
1,2l Nozomi VA
2,4l Nozomi VA
1l Flexidor VA
2l Flexidor VA
1l Bacara NA
2l Bacara NA
2,5 l Goltix 700 SC VA + 2,5l Goltix SC NA
5 l Goltix 700 SC VA+ 5l Goltix SC NA
2,2l Stomp CS VA + 2l Aramo NA
4,4l Stomp CS VA+ 4l Aramo NA
7
6
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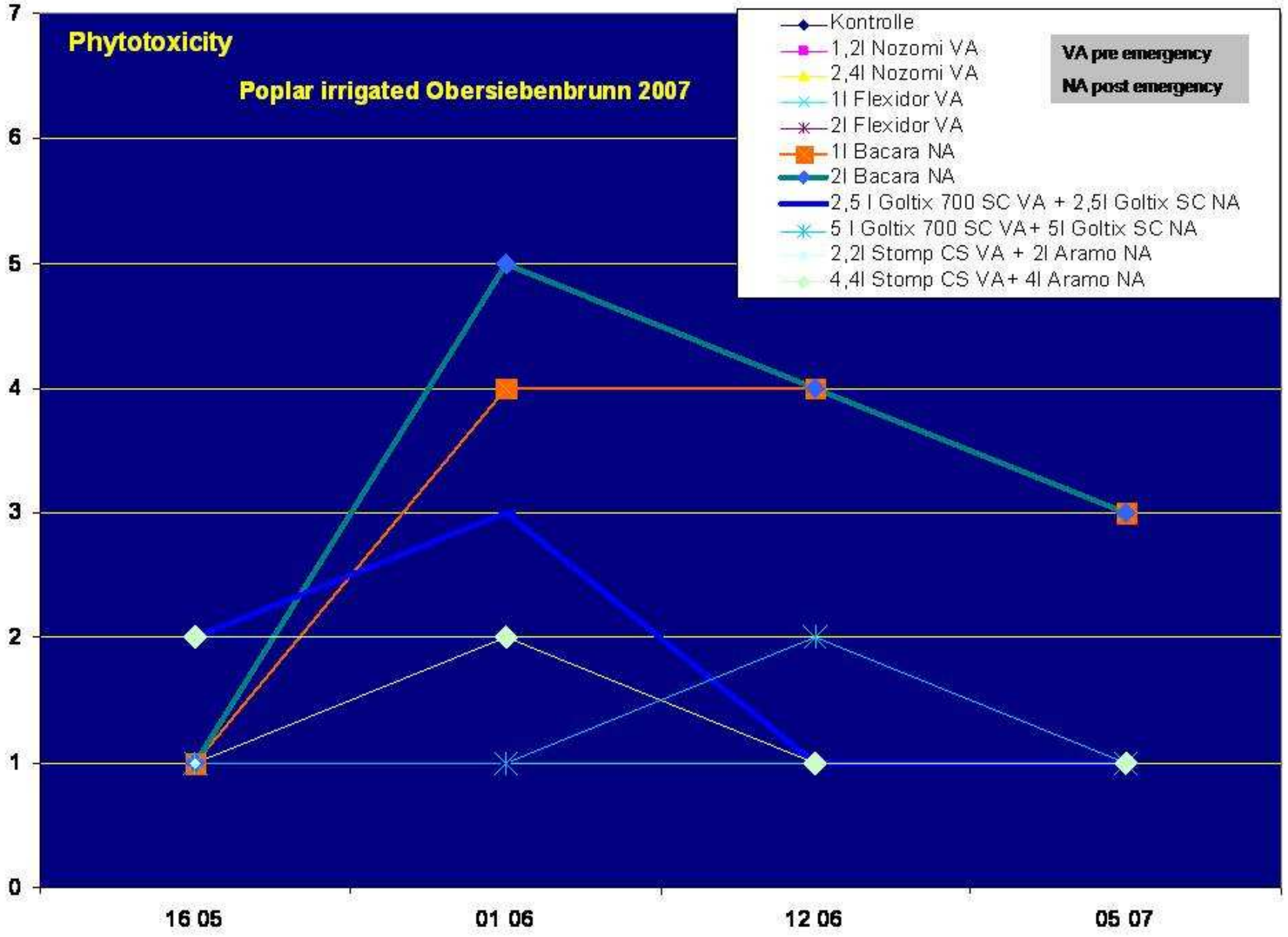
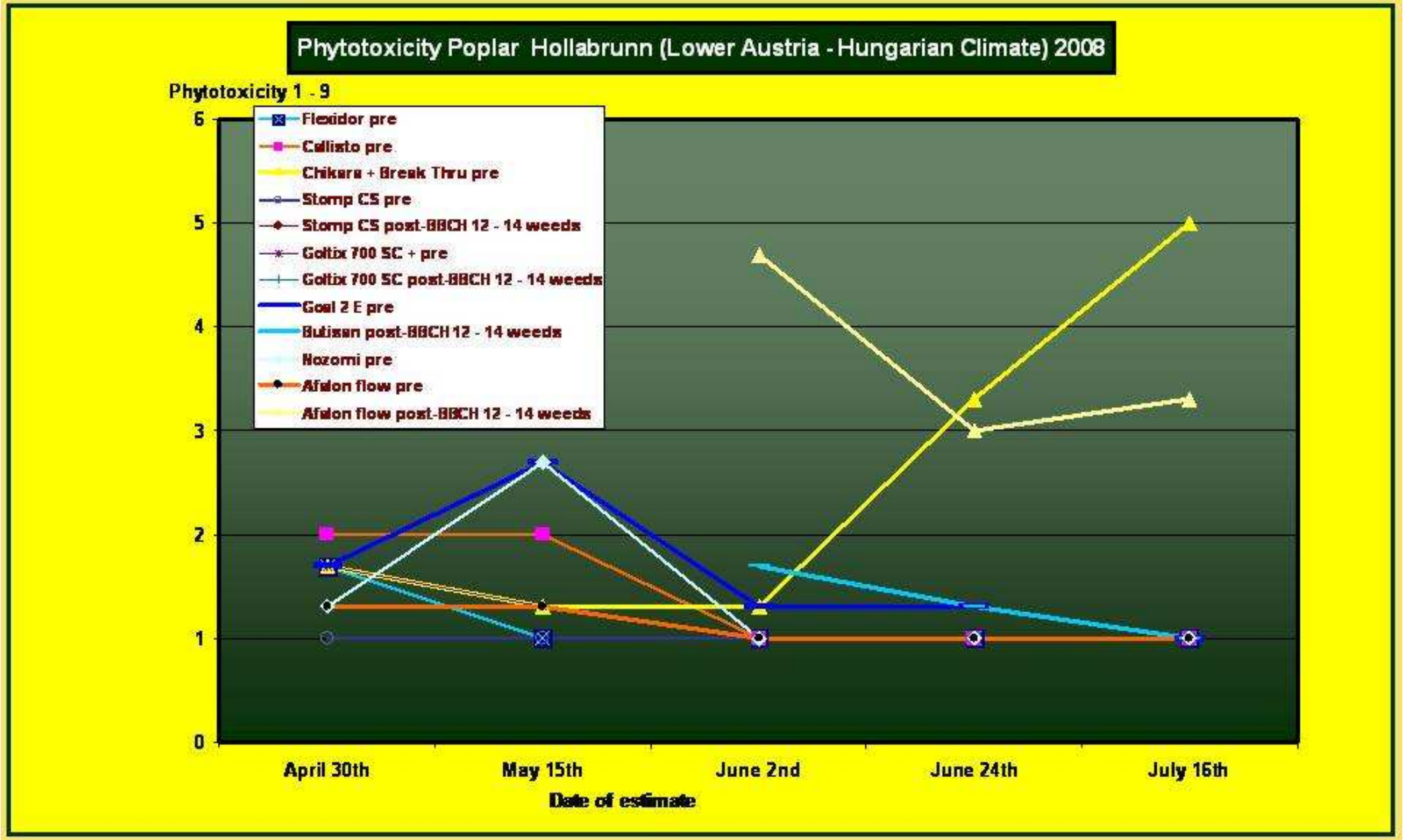
2
1
0
16 05
01 06
12 06
05 07


Phytotoxicity
Poplar irrigated Obersiebenbrunn 2007
VA pre emergency
NA post emergency
Kontrolle
1,2l Nozomi VA
2,4l Nozomi VA
1l Flexidor VA
2l Flexidor VA
1l Bacara NA
2l Bacara NA
2,5 l Goltix 700 SC VA + 2,5l Goltix SC NA
5 l Goltix 700 SC VA+ 5l Goltix SC NA
2,2l Stomp CS VA + 2l Aramo NA
4,4l Stomp CS VA+ 4l Aramo NA
7
6
5
4
3
2
1
0
16 05
01 06
12 06
05 07

Herbicide test 2008

Herbicide	appointment	Active substance	Appli-cation	efficieacy of herbicid % effect end of June 2008		
			rate			
				Fallopia		
				convolulus	Chenopodium album	Medicago sativa
Flexidor	Pre emergency	Isoxaben	1 l	33	0	11
Callisto	Pre emergency	Mesotrione	1,5 l	68	100	54
Chikara + Break Thru	Pre emergency	Flazasulfuron	0,2 kg 0,3 l	73	33	75
Stomp CS	Post emergency BBCH 12 - 14 UK	Pendimethalin	3 l	0	16	0
Goltix 700 SC +	Pre emergency	Metamitron	2,5 l			11
Goltix 700 SC	Post emergency BBCH 12 - 14 UK	Metamitron	2,5 l	33	33	
Goal 2 E	Pre emergency	Oxyfluorfen	3 l	92	33	58
Butisan	Post emergency BBCH 12 - 14 UK	Metazachlor	2 l	25	16	11
Nozomi	Pre emergency	Flumioxazin	1,2 kg	100	100	61
Afalon flow	Pre emergency	Linuron	1 kg	43	33	33
Butisan	Pre emergency	Metazachlor	2 l	11	0	11


Phytotoxicity Poplar Hollabrunn (Lower Austria - Hungarian Climate) 2008
Phytotoxicity 1 - 9
Flexidor pre
Callisto pre
Chikara + Break Thru pre
Stomp CS pre
Stomp CS post-BBCH 12 - 14 weeds
Goltix 700 SC + pre
Goltix 700 SC post-BBCH 12 - 14 weeds
Goal 2 E pre
Butisan post-BBCH 12 - 14 weeds
Nozomi pre
Aflalon flow pre
Aflalon flow post-BBCH 12 - 14 weeds
6
5
4
3
2
1
0
April 30th
May 15th
June 2nd
June 24th
July 16th
Date of estimate

Phytotoxicity Bacara
Poplar

Bacara 1l/ha

2l/ha

Phytotoxicity Willow

Control with Glyphosinate (Basta) under leaf spraying

Clematis vitalba

Deseases and Pests

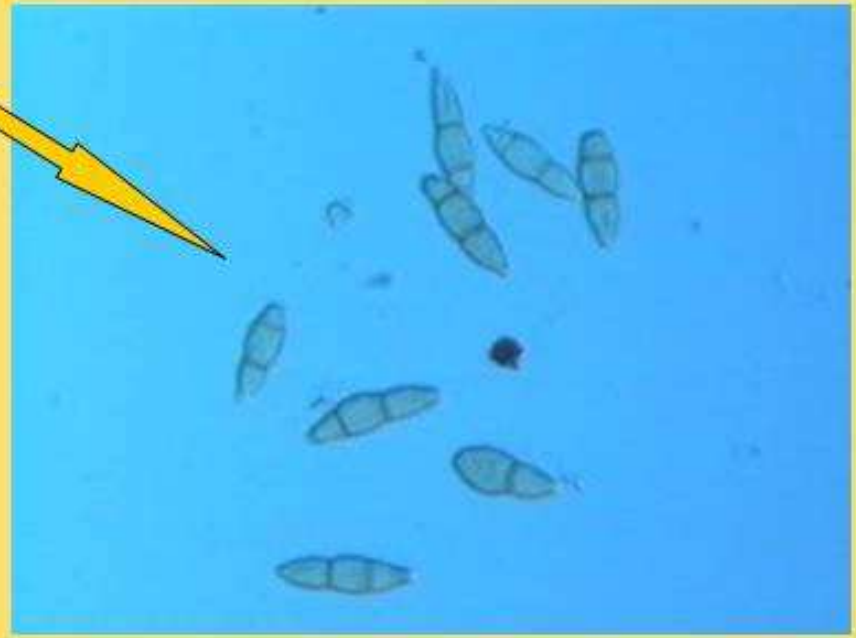
Pollaccia saliciperda

(variant Venturia Saliciperda)

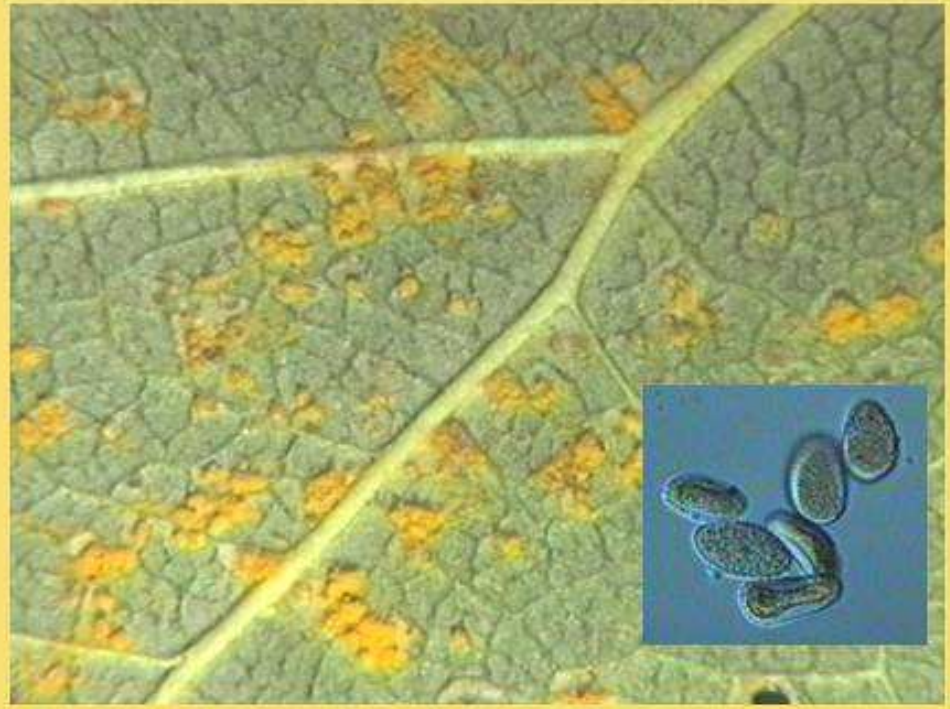
- Perishing of the tips of the sprout
- Infection in springtime 1. by Ascospores – from leafes on the soil or 2. infected tips from last year with Konidia, encouraged by wet conditions

Konidia

Pollaccia



Poplar rust



Uredospurs **Melampsora larici populina** in summer

→Increasing desease in increasing cultivation of fast growing poplar

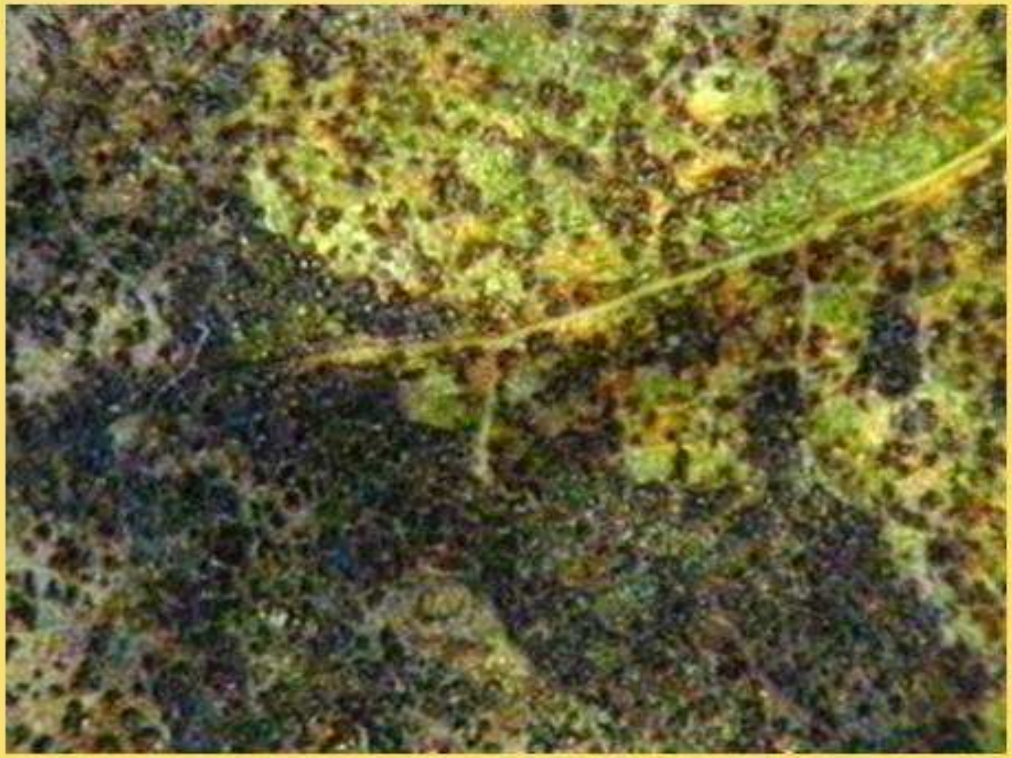
Uredospurs adaxial surface of the leaf, **Polpar rust** – spurs produced in summer → **early leaf -full** at the end of August

explosive dispersal → decreasing new wood - and roots growth

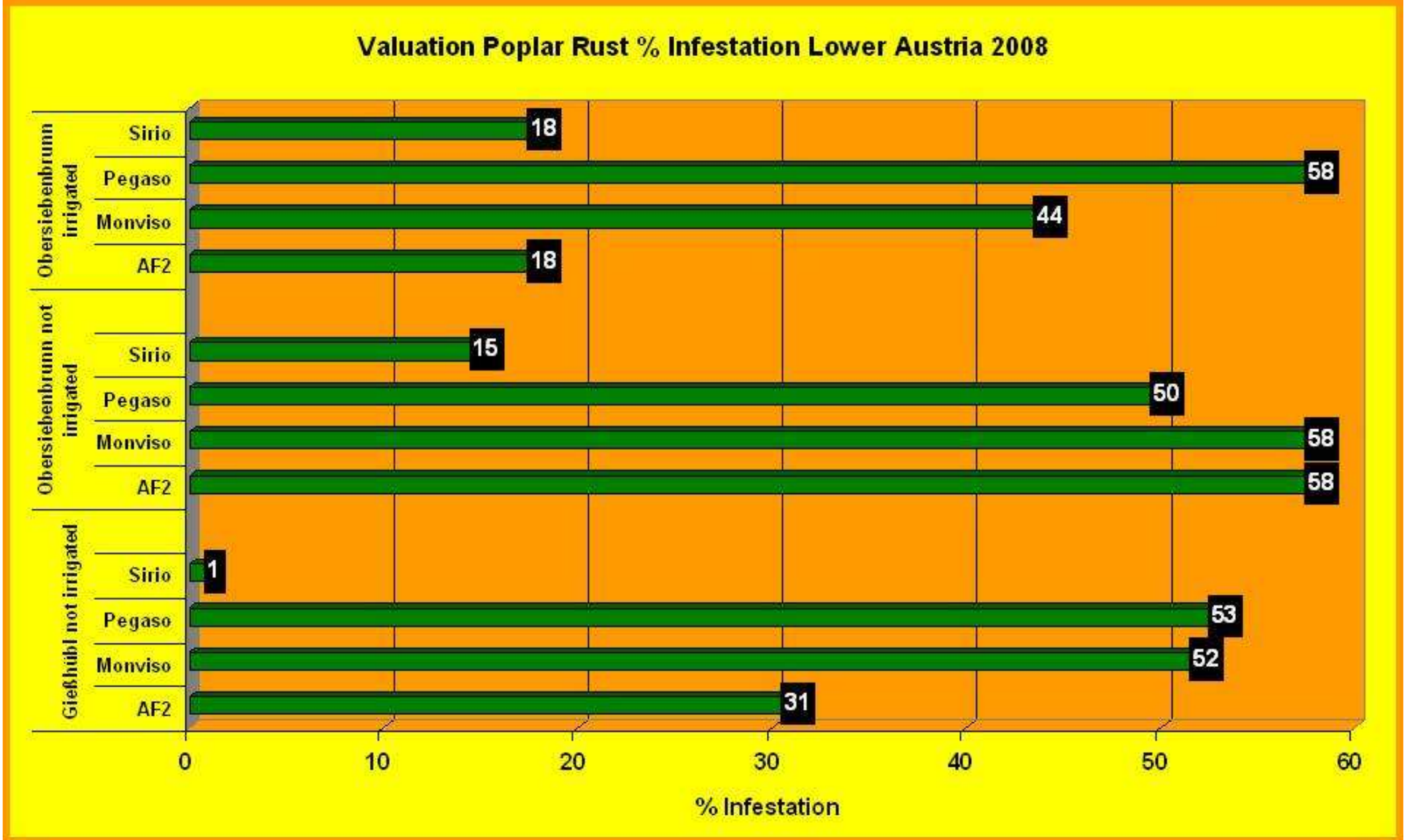
Teleutospurs **Poplar rust** produced in fall on the abaxial surface of the leaf.

In spring Basidiospures infect needles of larch (intermediate host) → poplar

No registered fungicide




Different sensisibility of the
varieties estimated



Obersiebenbrunn 20 km northeast Vienna, < 600 mm, 11.0 °C Hungarian Climate
Gießhübl Amstetten 100 km west Vienna > 700 mm 9.5 °C Semihumid Climate

Willow weevil

(Chrysomelidae)
feeds on leafes

Damage by game (deer) – game bite ⇨ fence

Aphids on stems of willow

conclusion

- Renewable bio energy has limits in available agricultural land
- Fast growing trees (polar, willow) have an enermous positive energy balance
- 2.0 – 2.5 kg timber replaces 1 kg heating oil
- Hybrids have a higher potential than varieties from conventional natural selection
- Plant protection is necessary, especial weed control in early growth and against Clematis vitalba, also the control of diseases
- Harvest full mechanized
- Recultivation after 10 – 20 years with rotary cultivator practicable
- Rivalry food – feed – renewable energy in the future