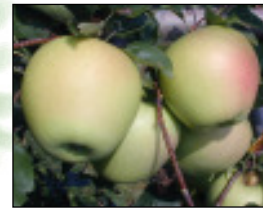


European Network Chemical Thinning Fruit Crops

Protocol Thinning Trials 2009

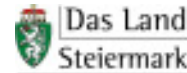


Elstar Elanared®
Golden Reinders
Golden clone B



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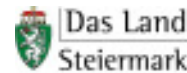
Thinning trial on Elstar Elanared 2009

subject:	Efficacy of chemical thinning with Metamitron on Elstar (long term study)
aim:	Evaluation of the efficacy of Metamitron applied at different fruitlet diameters (6/8, 10/12 and 14/16 mm)
trial site:	Research Centre Haidegg
cultivar:	Elstar Elanared
plot:	1142/401 - 420
year of planting:	2003
planting distance :	3,4 m x 1,0 m (2.941 trees/ha)
rootstock :	M 9
planting system:	Single row, slender spindle
spray equipment:	Experimental orchard sprayer, 1.000 l/ha
design:	5 treatments, every treatment included 3 trees with 4 replications (12 trees)



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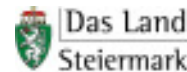
Thinning trial Elstar Elanared 2009 - material and methods

1. **Untreated**
2. **Hand thinned** (6 fruits/cm² TCSA)
3. **Metamitron 420ppm** (Goltix 700 SC 0,06% + Tween 20 0,05%) **at 6 - 8 mm fruit diameter** (BBCH 70)
4. **Metamitron 420ppm** (Goltix 700 SC 0,06% + Tween 20 0,05%) **at 10 - 12 mm fruit diameter** (BBCH 71)
5. **Metamitron 420ppm** (Goltix 700 SC 0,06% + Tween 20 0,05%) **at 14 - 16 mm fruit diameter** (BBCH 71)

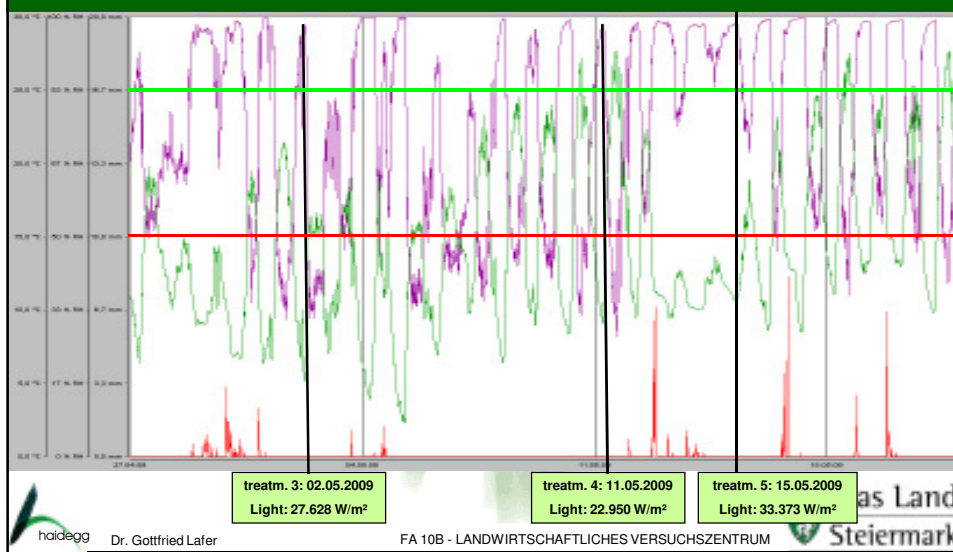


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Meteorological conditions - 2009



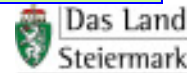
Meteorological conditions - 2009

	3.	4.	5.
Application Date:	02.05.2009	11.05.2009	15.05.2009
Time of Day:	08:30	10:00	11:00
Application Method:	SPRAY	SPRAY	SPRAY
Application Placement:	FOLIAR	FOLIAR	FOLIAR
Applied By:	GS	GS	TR
Air Temperature, Unit:	13,9° C	20,9° C	13,4° C
Growing Degree hours (15°C)	173,9	284,2	530,9
% Relative Humidity:	62	61	85
Wind Velocity, Unit:	0,7 KPH	0,6 KPH	1,1 KPH
Wind Direction:	W	NNW	SE
Dew Presence (Y/N):	N	N	N
% Cloud Cover:	324,8	431,1	165,1
Next Rain Occurred On:	03.05.2009	12.05.2009	16.05.2009

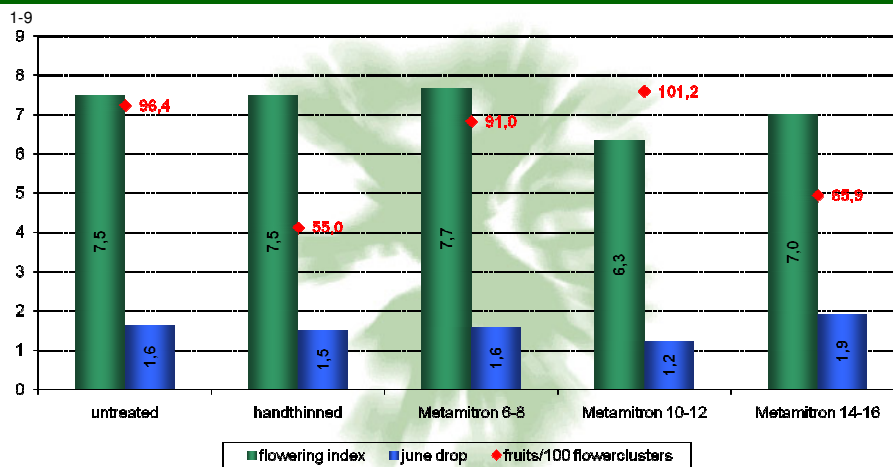


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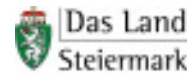


Thinning trial Elanared 2009 - flowering index, junedrop

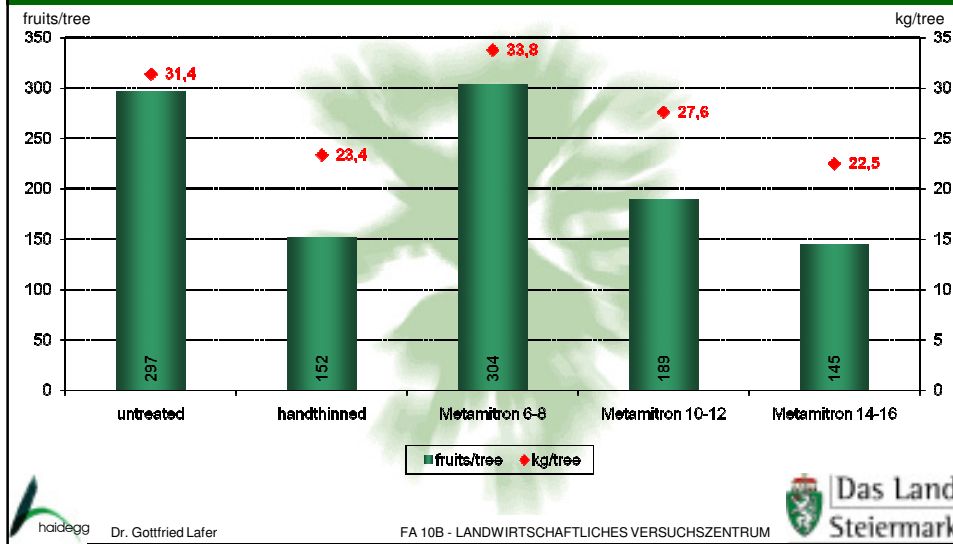


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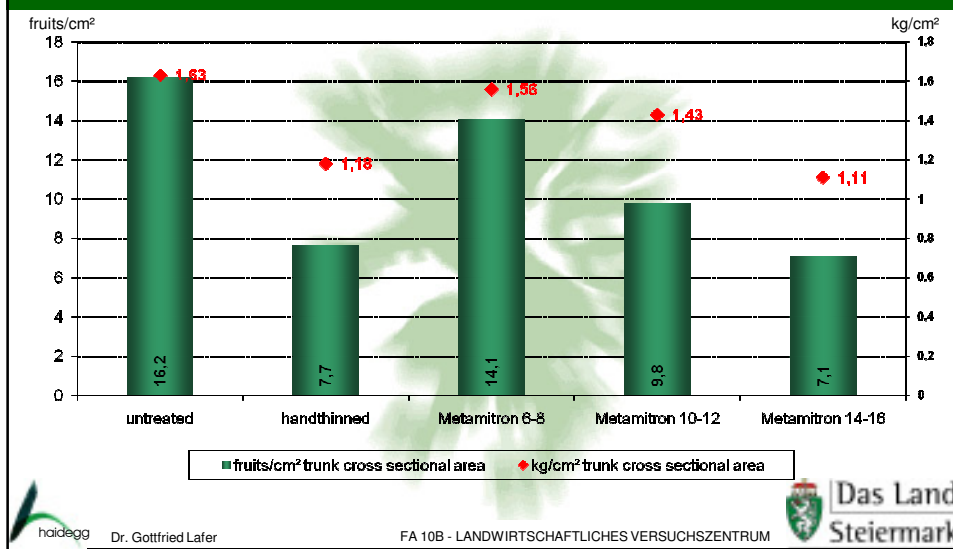
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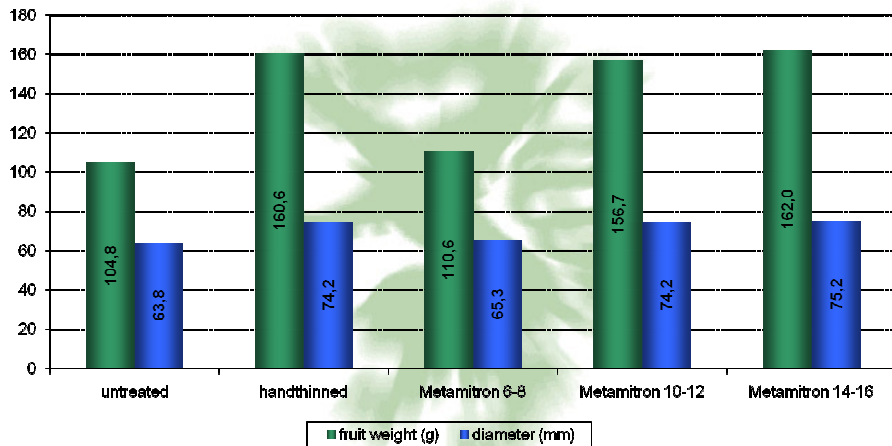
Thinning trial Elanared 2009 - yield data



Thinning trial Elanared 2009 - yield capacity



Thinning trial Elanared 2009 - fruit weight

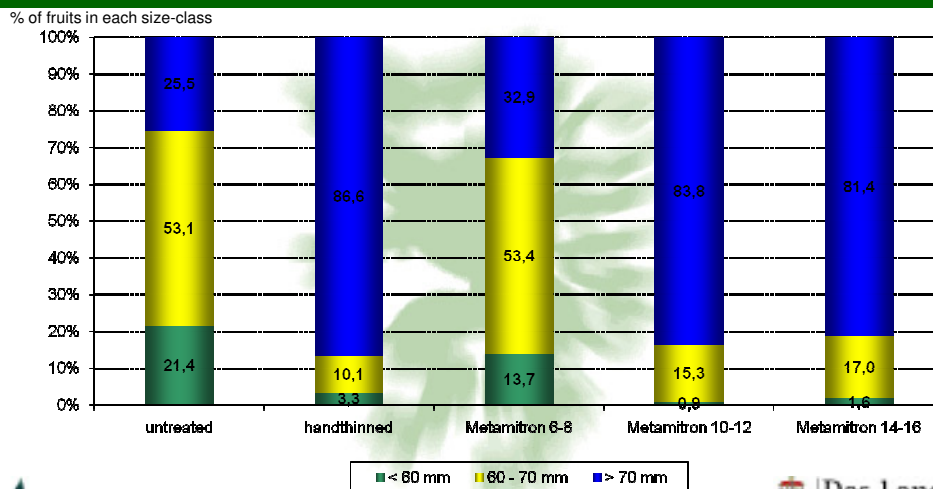


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Thinning trial Elanared 2009 - size grading

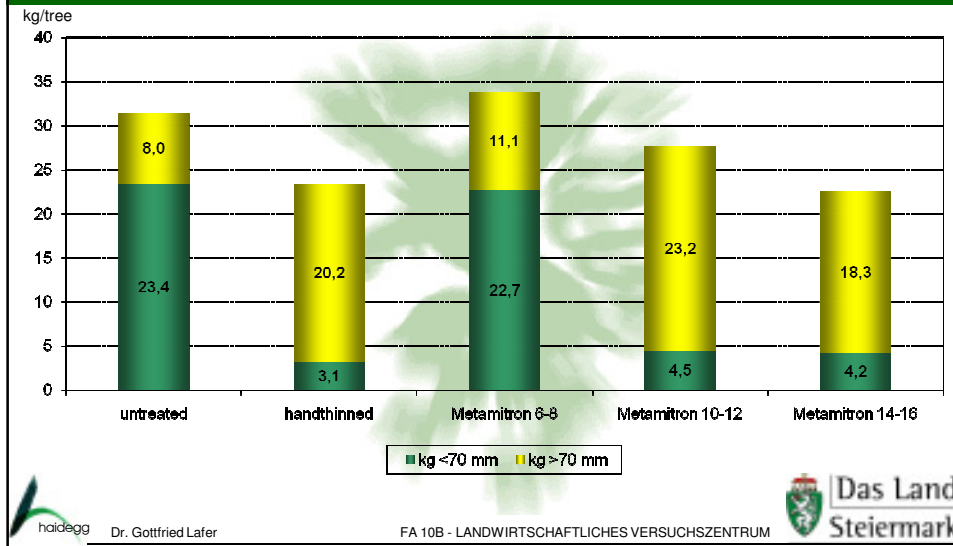


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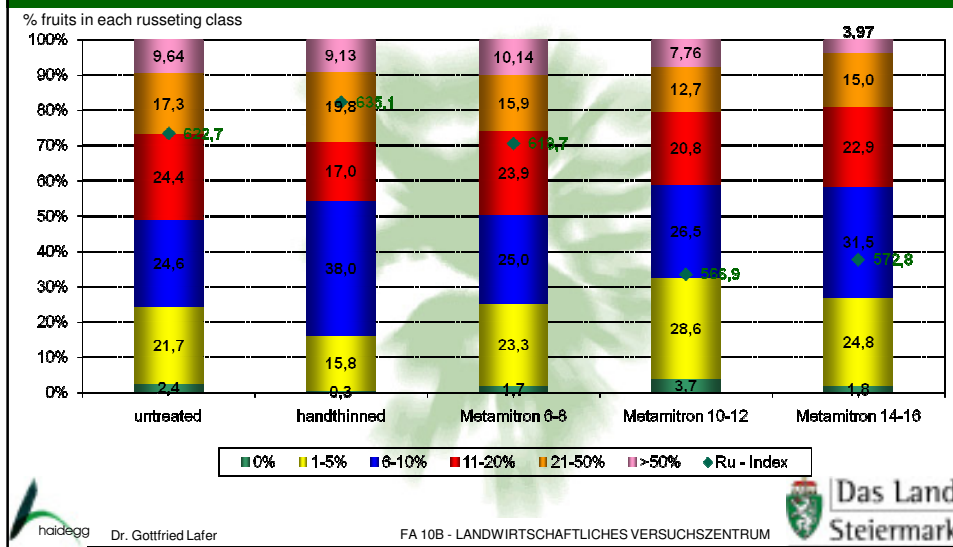
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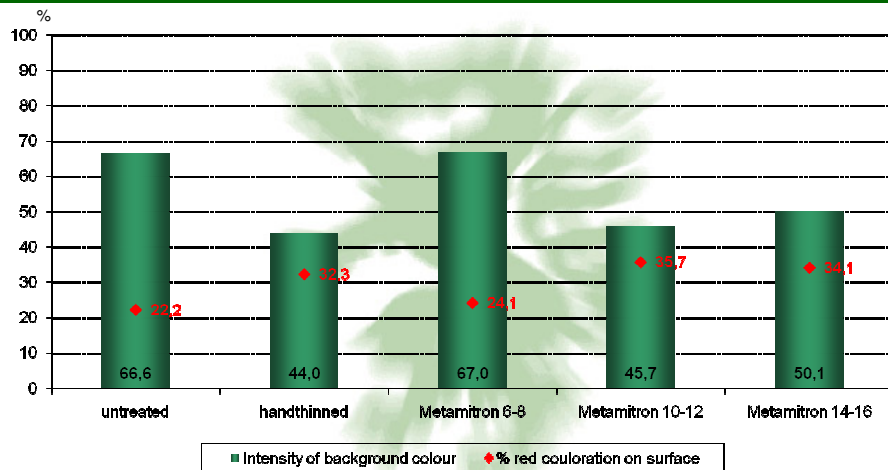
Thinning trial Elanared 2009 - size grading (kg/tree)



Thinning trial Elanared 2009 - russetting grade



Thinning trial Elanared 2009 - fruit colour

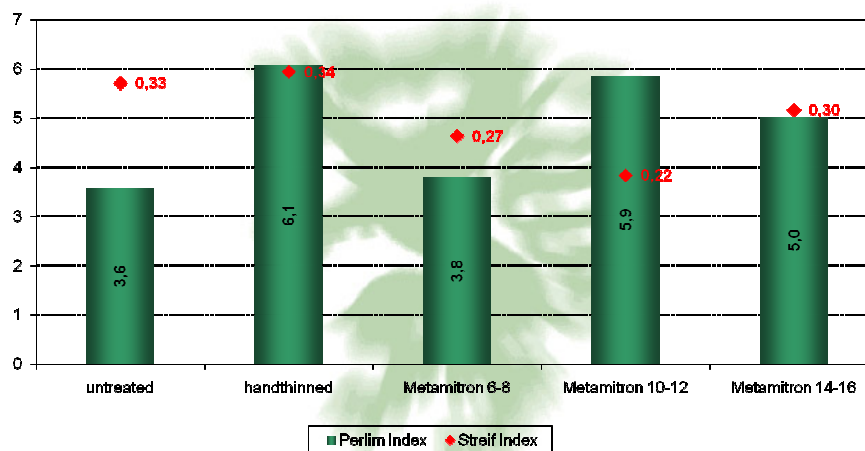


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Thinning trial Elanared 2009 - internal quality and ripeness

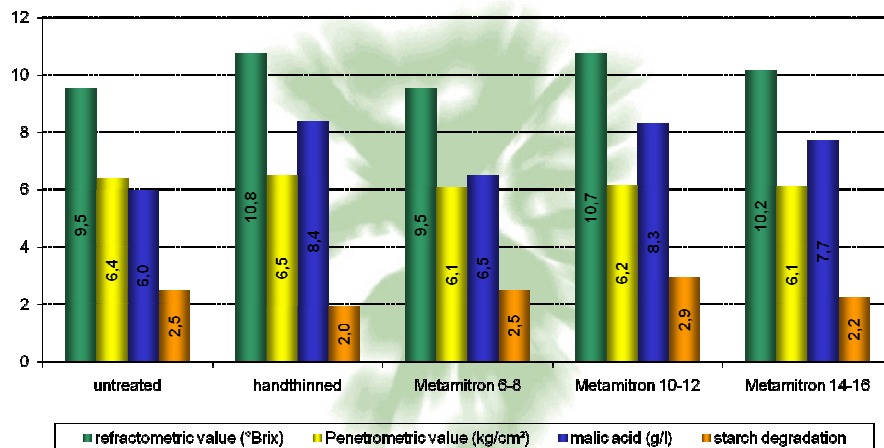


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Thinning trial Elanared 2009 - internal quality and ripeness



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Thinning trial Elstar Elanared 2009 - conclusion

- Metamitron 420 ppm at 14 - 16 mm showed a strong thinning effect (similar to the results of hand thinning).
- Application of Metamitron 420 ppm at fruitlet diameter 10 - 12 mm reduced crop load significantly too.
- Early application of Metamitron 420 ppm at fruitlet diameter 6 - 8 mm was not effective.
- Thinning efficacy of Metamitron was affected by the temperature (GDH 15°C)
- The higher the growing degree hours (15°C) the higher was the thinning efficacy (GDH_{15°C} = 500)



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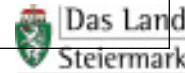
Thinning trial Elstar Elanared 2009 – conclusion

- No influence of light intensity on thinning efficacy of Metamitron
- No phytotoxic effects (leaf and fruit damages) were observed.
- Fruit russeting did not increase
- Positive effects on fruit colouration caused by lower crop loads
- Fruit ripening was not influenced by Metamitron
- Fruit quality (TSS, acidity etc.) increased according to the reduction of crop load
- **Adaptation of dosage on temperature conditions** in the first week after application seems to be necessary for optimising the thinning efficacy of Metamitron (further trials by Eufirin working group).

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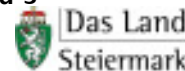
Thinning trial on Golden Reinders 2009

subject:	Comparison of application time of BA
aim:	Evaluation of the efficacy of BA applied at different fruitlet diameters (6 – 16 mm)
site:	Research Station Haidegg
cultivar:	Golden Reinders
plot:	1145/501 - 620
year of planting:	2004
planting distance :	3,4 m x 1,0 m (2.941 trees/ha)
rootstock :	M 9
planting system:	Single row, slender spindle
spray equipment:	Experimental orchard sprayer, 1.000 l/ha
design:	9 treatments, every treatment included 3 trees with 4 replications (12 trees)

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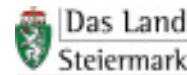
Thinning trial Golden Reinders 2009 – material and methods

1. **Untreated**
2. **NAAm 100ppm (Dirigol 0,02% + ProNetAlfa 0,1%) 12 days after full bloom**
3. **a) NAAm 100ppm (Dirigol 0,02% + ProNetAlfa 0,1%) 12 days after full bloom**
b) BA 100ppm (MaxCel 0,5%) at 6–8 mm fruit diameter
4. **a) NAAm 100ppm (Dirigol 0,02% + ProNetAlfa 0,1%) 12 days after full bloom**
b) BA 100ppm (MaxCel 0,5%) at 8–10 mm fruit diameter
5. **a) NAAm 100ppm (Dirigol 0,02% + ProNetAlfa 0,1%) 12 days after full bloom**
b) BA 100ppm (MaxCel 0,5%) at 10–12 mm fruit diameter
6. **a) NAAm 100ppm (Dirigol 0,02% + ProNetAlfa 0,1%) 12 days after full bloom**
b) BA 100ppm (MaxCel 0,5%) at 12–14 mm fruit diameter
7. **a) NAAm 100ppm (Dirigol 0,02% + ProNetAlfa 0,1%) 12 days after full bloom**
b) BA 100ppm (MaxCel 0,5%) at 14–16 mm fruit diameter
8. **NAA 15ppm (Luxan Late Val 0,015% + ProNetAlfa 0,1%) 12 days after full bloom**



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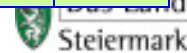
Application description – Golden

treatments	2	3 + 8	4	5	6	7
Application Date:	02.05.2009	05.05.2009	08.05.2009	11.05.2009	13.05.2009	15.05.2009
Time of Day:	08:45	10:00	07:45	10:30	11:30	11:00
Application Method:	SPRAY	SPRAY	SPRAY	SPRAY	SPRAY	SPRAY
Application Placement:	FOLIAR	FOLIAR	FOLIAR	FOLIAR	FOLIAR	FOLIAR
Applied by:	GS	GS	GS	GS	TR	TR
Air Temperature, Unit:	14.7°C	13.3°C	12.8°C	21.9°C	11.6°C	13.4°C
Growing Degree hours (15°C)	177.0	437.6	402.2	285.9	326.5	539.6
% Relative Humidity:	43	43	83	52	81	85
Wind Velocity, Unit:	4,2 KPH	4 KPH	0 KPH	3 KPH	0,7 KPH	1,1 KPH
Wind Direction:	NW	NW	E	WSW	NE	SE
Dew Presence (Y/N):	N	N	Y	N	Y	N
Light intensity (W/m²):	27.796	32.828	26.153	22.927	25.019	33.655
% Cloud Cover:	363,1	530,3	203,1	546,3	247,9	165,1
Next Rain Occurred On:	03.05.2009	12.05.2009	12.05.2009	12.05.2009	13.05.2009	16.05.2009

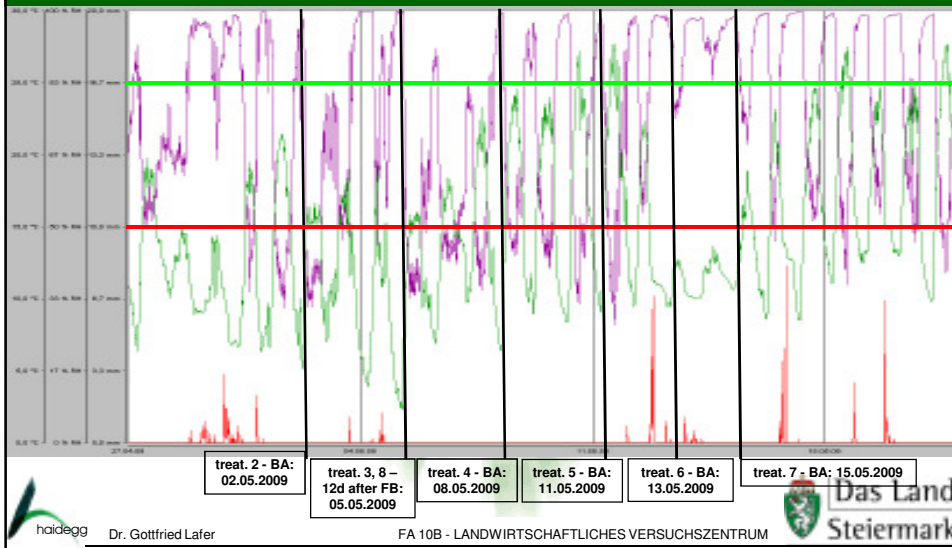


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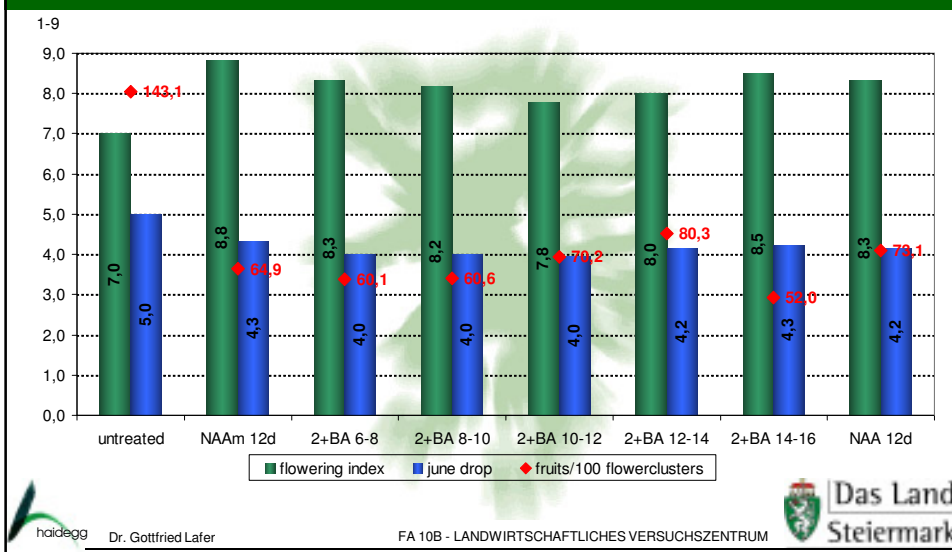
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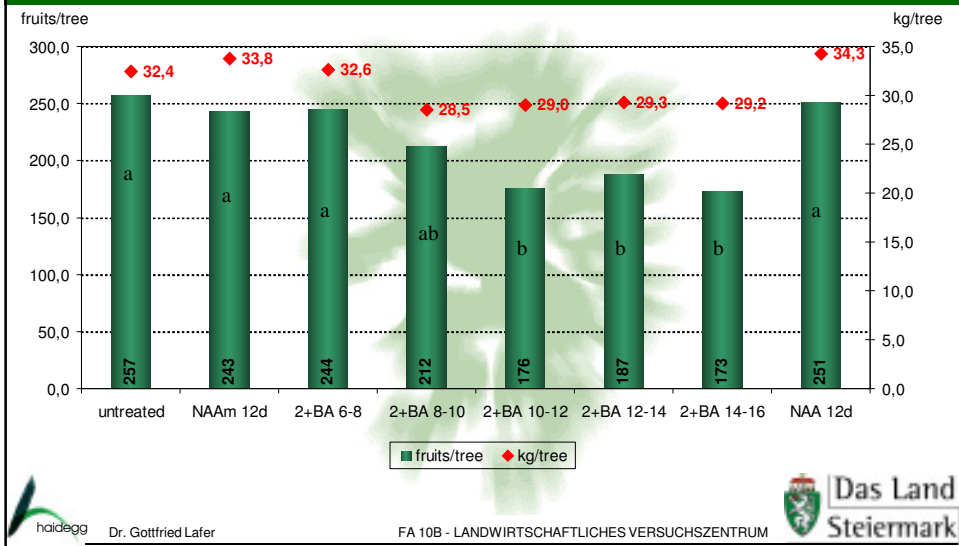
Meteorological conditions - 2009



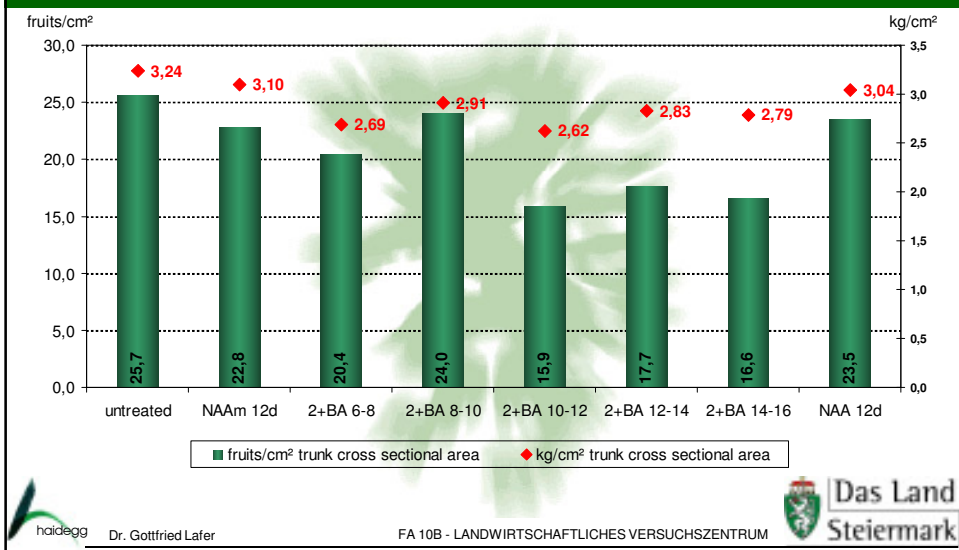
Thinning trial Golden Reinders 2009 - flowering index, junedrop



Thinning trial Golden Reinders 2009 – yield data



Thinning trial Golden Reinders 2009 – yield capacity



Thinning trial Golden Reinders 2009 - crop load

Multiple Regression Analysis

Dependent variable: yield rel

Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	114,762	44,0087	2,60772	0,2331
TEMP15	0,0983385	0,0762458	1,28976	0,4199
LIGHT	-0,00046042	0,00181216	-0,254072	0,8416
stage	-5,6899	2,7741	-2,05108	0,2888

Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	548,211	3	182,737	1,43	0,5278
Residual	128,041	1	128,041		
Total (Corr.)	676,252	4			

R-squared = 81,0661 percent
R-squared (adjusted for d.f.) = 24,2643 percent
Standard Error of Est. = 11,3155
Mean absolute error = 4,04559
Durbin-Watson statistic = 3,43512



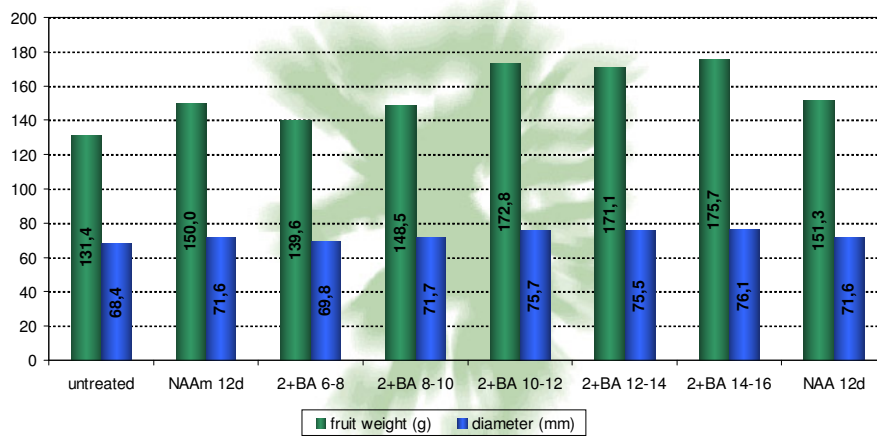
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Thinning trial Golden Reinders 2009 - fruit weight



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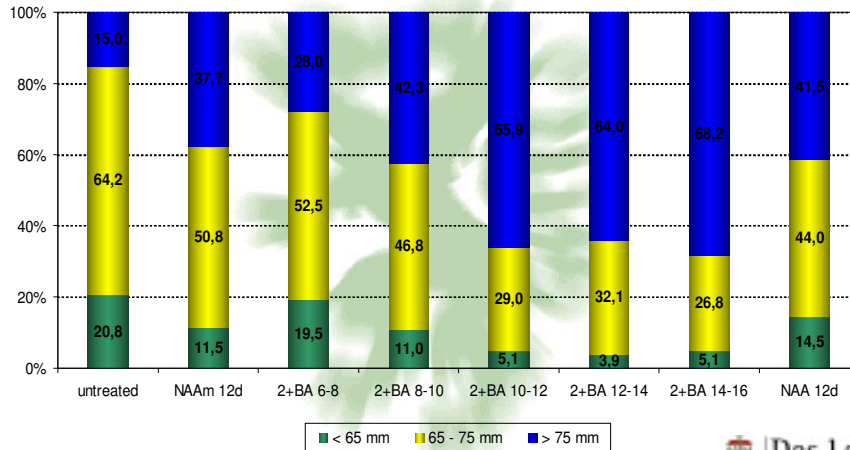
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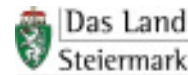
Thinning trial Golden Reinders 2009 - size grading

% of fruits in each size-class



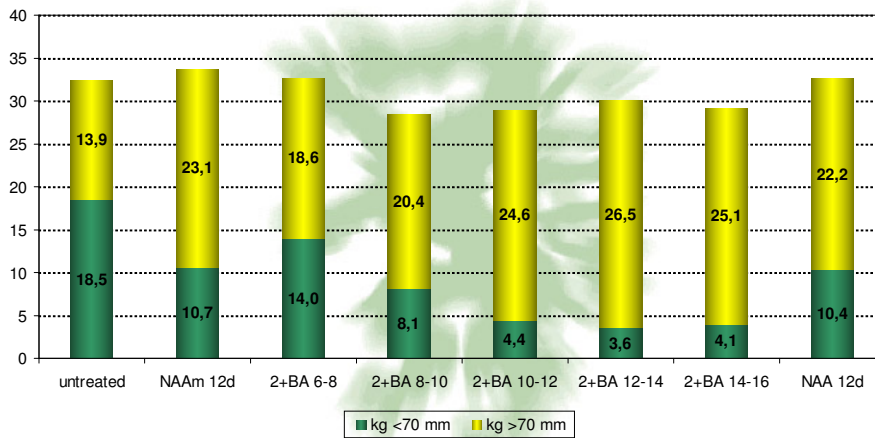
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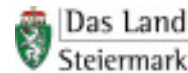
Thinning trial Golden Reinders 2009 - size grading (kg/tree)

kg/tree

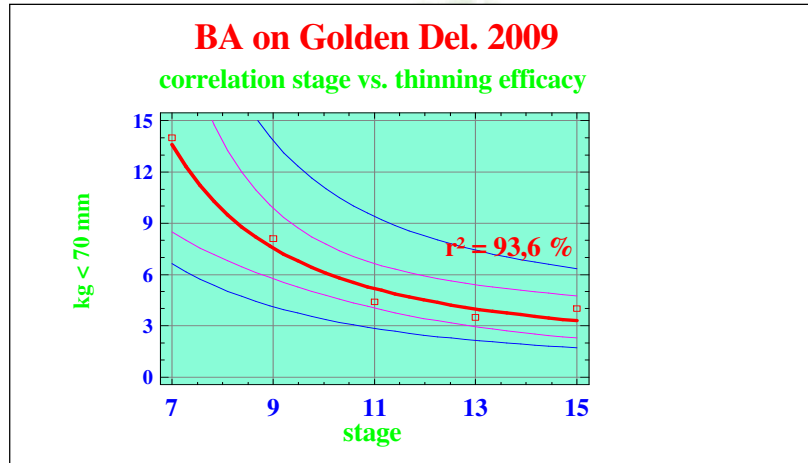


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Thinning trial Golden Reinders 2009 - fruit size



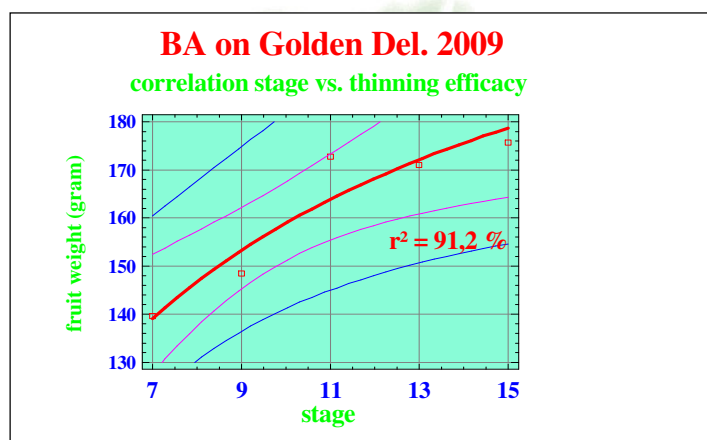
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Thinning trial Golden Reinders 2009 - fruit size



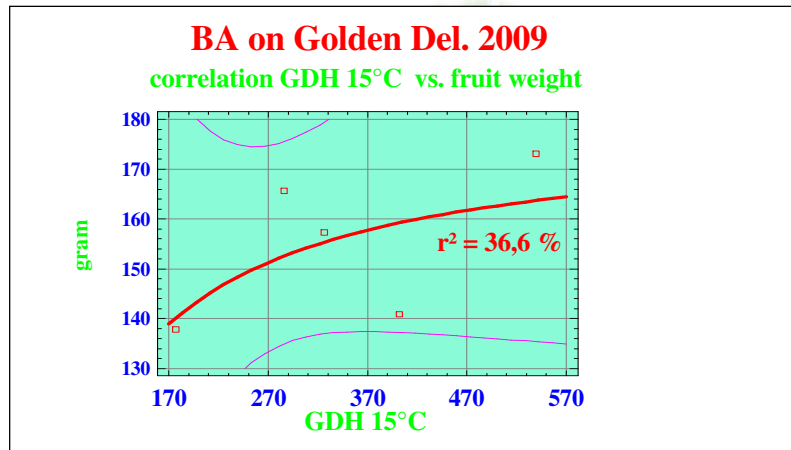
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Thinning trial Golden Reinders 2009 - fruit size



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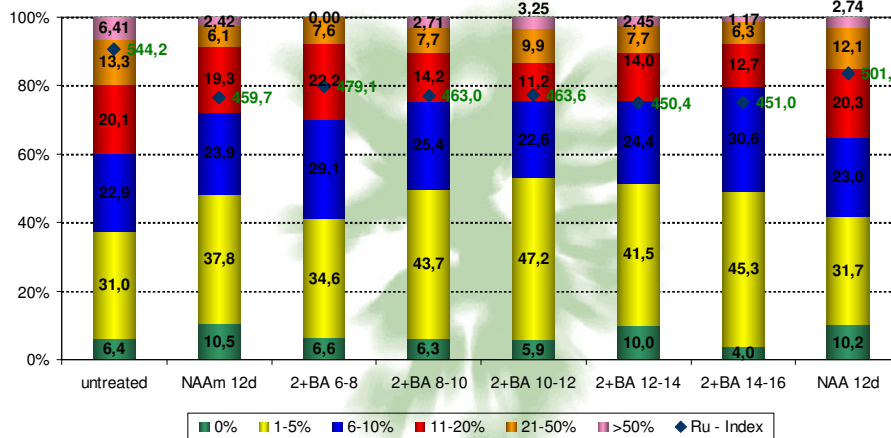
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Thinning trial Golden Reinders 2009 - russeting grade

% fruits in each russeting class



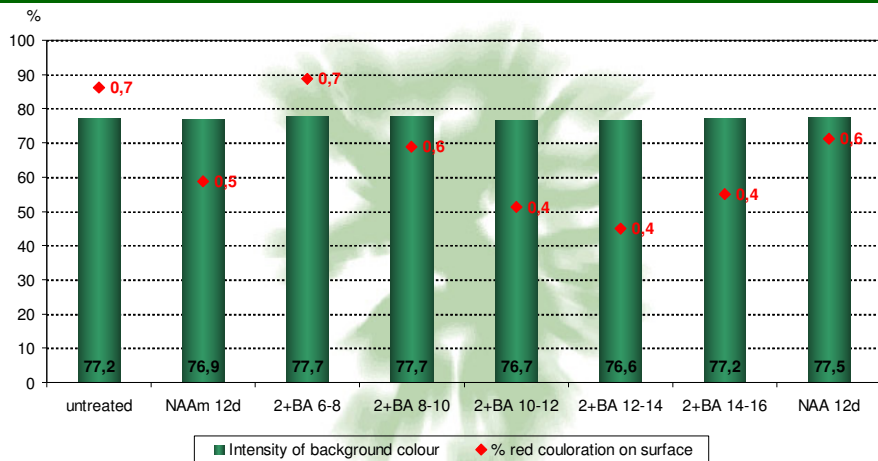
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Thinning trial Golden Reinders 2009 - fruit colour

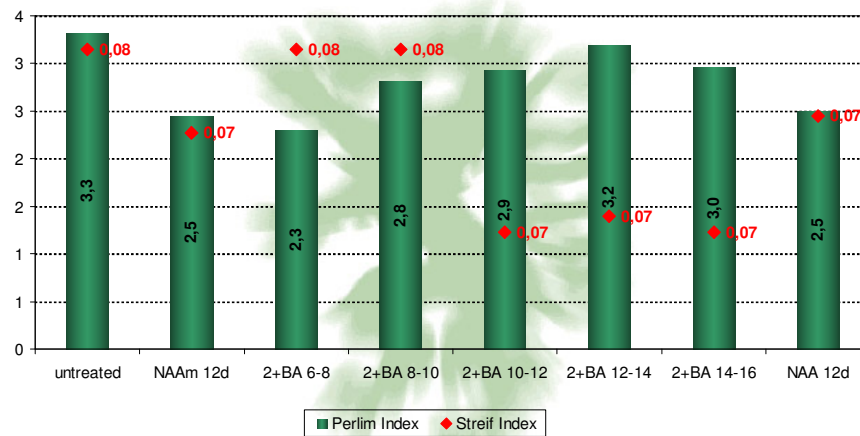


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Thinning trial Golden Reinders 2009 - internal quality and ripeness

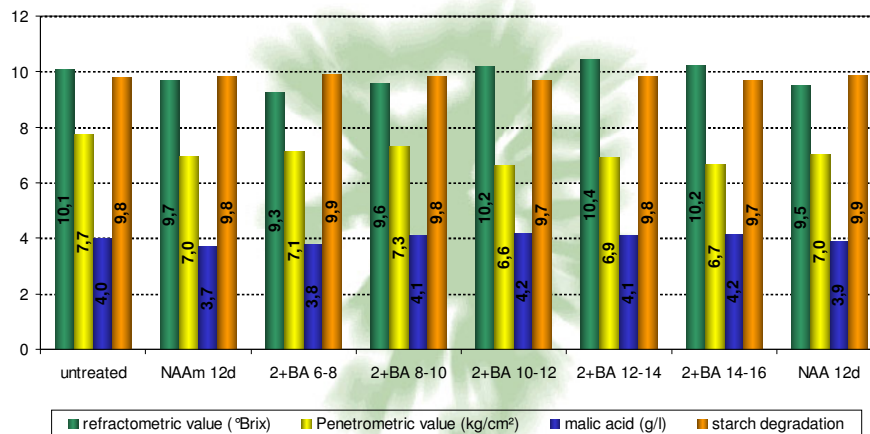


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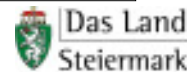


Thinning trial Golden Reinders 2009 - internal quality and ripeness



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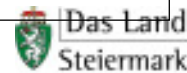
Thinning trial Golden Reinders 2009 - conclusion

- Application time had a strong influence on thinning efficacy of BA. Yield in number of fruits per tree and yield capacity (fruits/cm² TCSA) were influenced by the different application times of BA.
- The different combinations of NAAm followed by BA at 10/12, 12/14 and 14/16 mm were effective in fruit thinning and for improving fruit quality parameters.
- A significant thinning effect, expressed as final set (number of fruits per tree and fruits per cm² TCSA) was obtained only with BA 10/12, 12/14 and 14/16 mm fruitlet diameter.
- NAAm and NAA alone 12 days after full bloom and BA at 6/8 mm followed by NAAm performed no thinning activities.
- BA at 8/10 mm showed only a slight thinning activity, but was insufficient too.



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Thinning trial Golden Reinders 2009 – conclusion

- NAAm applied 12 DAFB followed by BA at 10 – 16 mm the showed best performance as a thinning agent (standard recommendation for BA application).
- Single applications of NAAm and NAA 12 DAFB were not effective.
- Multiple regression analyses showed no significant effect of different factors (light, temperature, stage) on thinning efficacy of BA. Only size effects of BA application times were observed.
- BA at 6/8 mm and 8–10 mm did not improve fruit size.
- Unfavourable meteorological conditions after BA application at 6/8 mm fruitlet diameter (GDH15°C = 177,0)
- Optimal temperatures only after BA treatments 4, 6 and 7 (8/10, 12/14 and 14/16 mm)

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Thinning trial Golden Reinders 2009 – conclusion

- Russeting, fruit colour, internal quality and fruit maturity were not affected by any treatment.
- Fruit quality (size, TSS, acidity etc.) was improved according to the reduction of crop load.

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Thinning trial on Golden Klon B 2009

subject:	Comparison of different mixtures of BA + NAA
aim:	Evaluation of the efficacy of the tank mix BA and NAA applied with different concentrations (BA 75 - 150 ppm, NAA 5 - 15 ppm)
trial site:	Research Centre Haidegg
cultivar:	Golden Klon B
plot:	1145/701 - 820
year of planting:	2004
planting distance :	3,4 m x 1,0 m (2.941 trees/ha)
rootstock :	M 9
planting system:	Single row, slender spindle
spray equipment:	Experimental orchard sprayer, 1.000 l/ha
design:	9 treatments, every treatment included 3 trees with 4 replications (12 trees)



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Thinning trial Golden Klon B 2009 - material and methods

1. Untreated
2. BA 100ppm + NAA 5ppm (MaxCel 0,5% + Late Val 0,005%)
at 10-14 mm fruit diameter
3. BA 150ppm + NAA 5ppm (MaxCel 0,75% + Late Val 0,005%)
at 10-14 mm fruit diameter
4. BA 75ppm + NAA 10ppm (MaxCel 0,375% + Late Val 0,01%)
at 10-14 mm fruit diameter
5. BA 100ppm + NAA 10ppm (MaxCel 0,5% + Late Val 0,01%)
at 10-14 mm fruit diameter
6. BA 150ppm + NAA 10ppm (MaxCel 0,75% + Late Val 0,01%)
at 10-14 mm fruit diameter
7. BA 75ppm + NAA 15ppm (MaxCel 0,375% + Late Val 0,015%)
at 10-14 mm fruit diameter
8. BA 100ppm + NAA 15ppm (MaxCel 0,5% + Late Val 0,015%)
at 10-14 mm fruit diameter
9. BA 150ppm + NAA 15ppm (MaxCel 0,75% + Late Val 0,015%)
at 10-14 mm fruit diameter



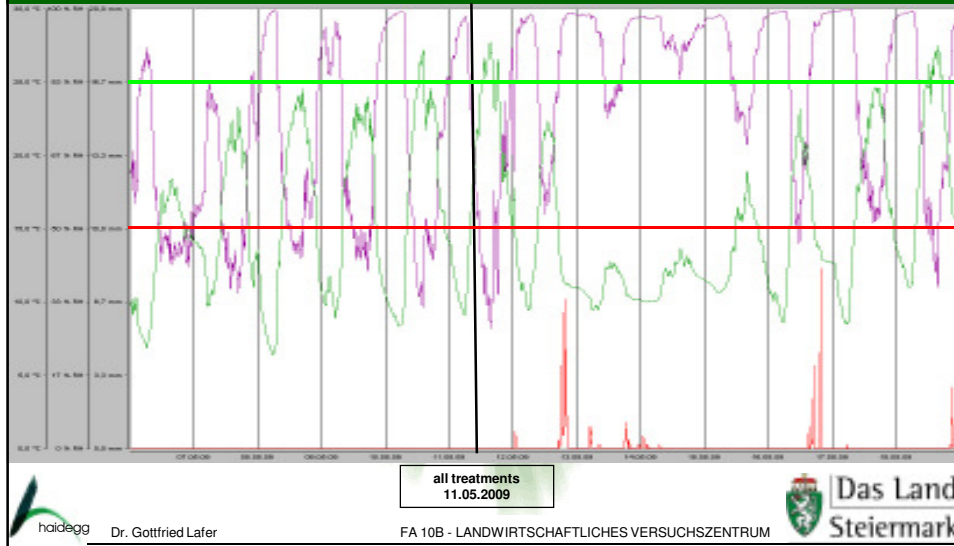
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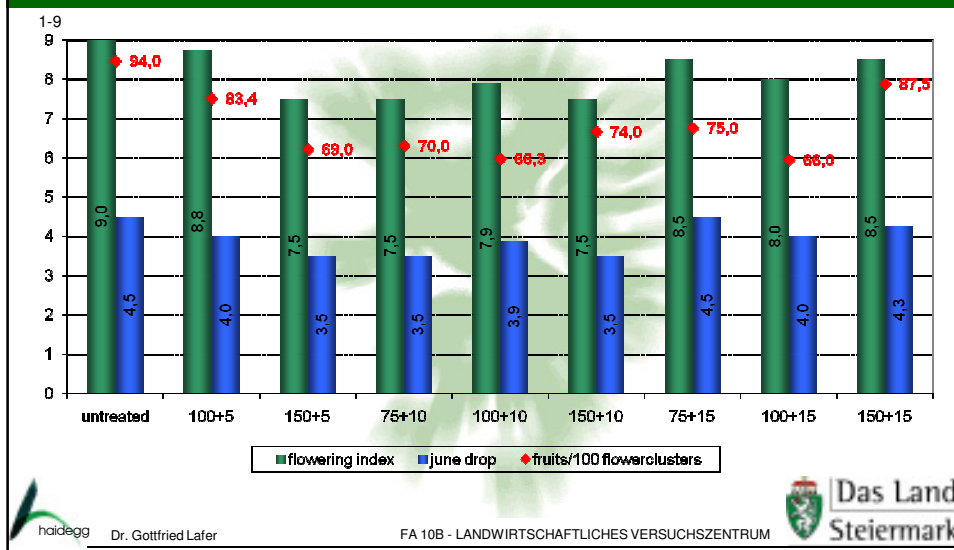


Das Land Steiermark

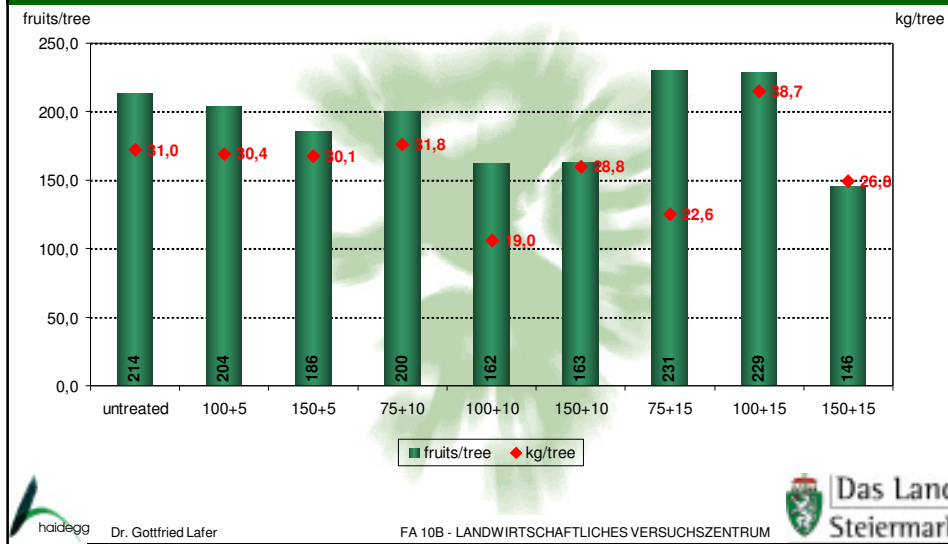
Meteorological conditions - 2009



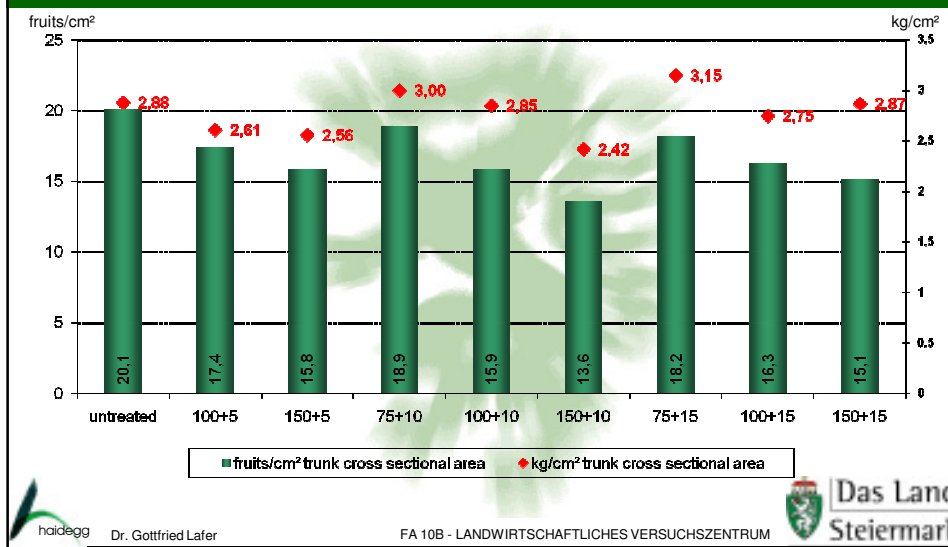
Thinning trial Golden Klon B 2009 - flowering index, junedrop



Thinning trial Golden Klon B 2009 – yield data



Thinning trial Golden Klon B 2009 – yield capacity



Thinning trial Golden Klon B 2009 - crop load

Multiple Regression Analysis				
Dependent variable: crop load rel				
Parameter	Estimate	Standard Error	T Statistic	P-Value
CONSTANT	102,73	4,29557	23,9154	0,0000
NAA_conc	-0,0584074	0,363403	-0,160723	0,8776
BA_conc	-0,185674	0,0395623	-4,69321	0,0033

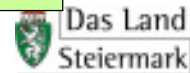
Analysis of Variance					
Source	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Model	666,142	2	333,071	13,90	0,0056
Residual	143,727	6	23,9545		
Total (Corr.)	809,869	8			

R-squared = 82,253 percent
R-squared (adjusted for d.f.) = 76,3374 percent
Standard Error of Est. = 4,89434
Mean absolute error = 3,64231
Durbin-Watson statistic = 1,85853



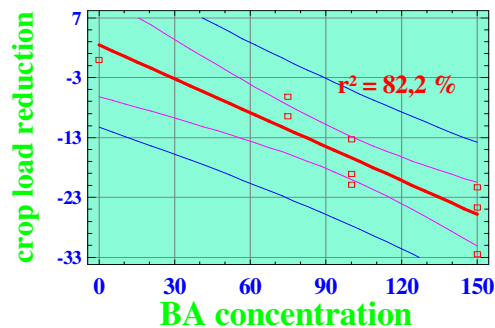
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Thinning trial Golden Klon B 2009 - crop load

Golden Del. - thinning study 2009
correlation BA conc. vs. crop load

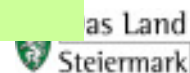


$$\text{crop load reduction} = 2,45111 - 0,1884 \times \text{BA-conc}$$

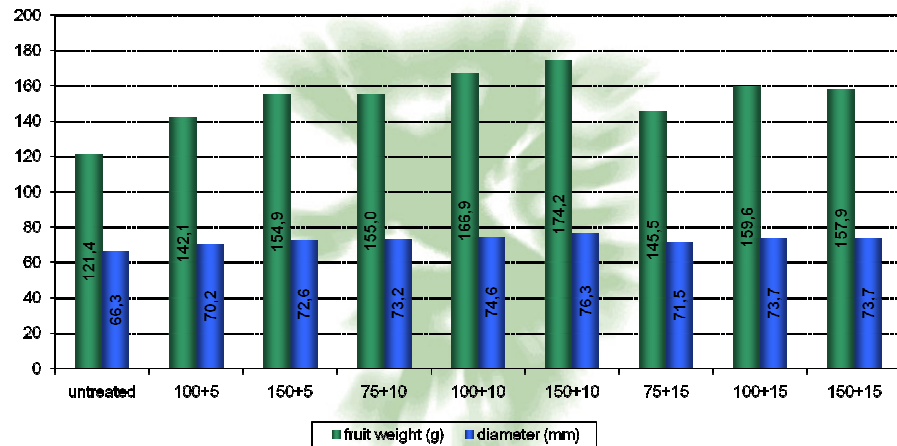


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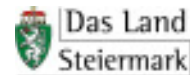


Thinning trial Golden Klon B 2009 - fruit weight

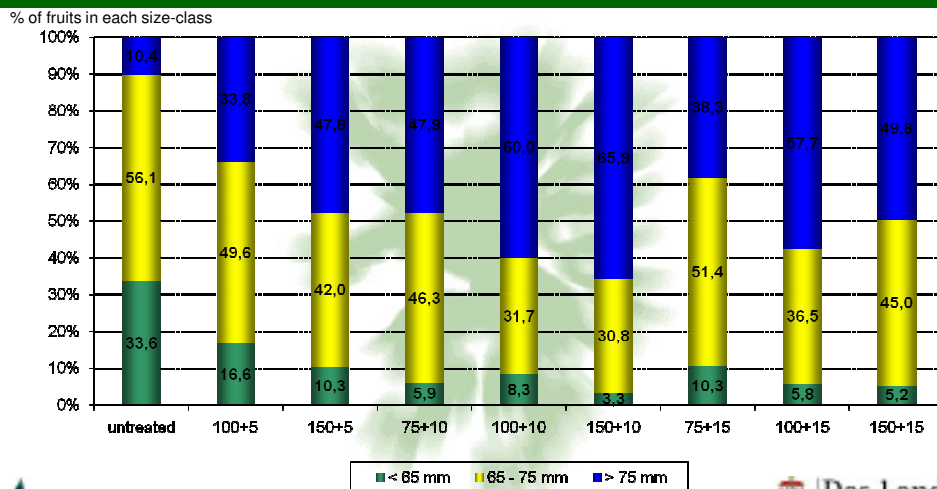


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Thinning trial Golden Klon B 2009 - size grading

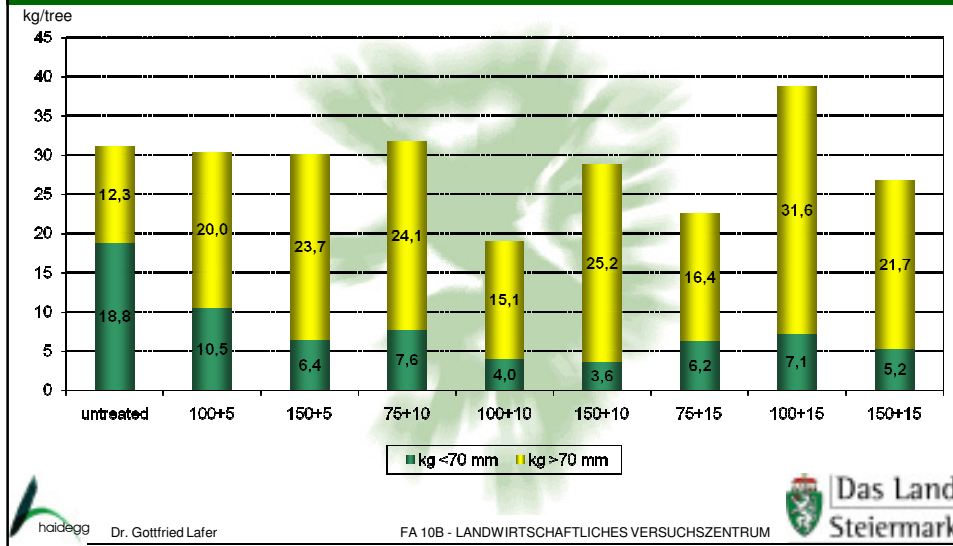


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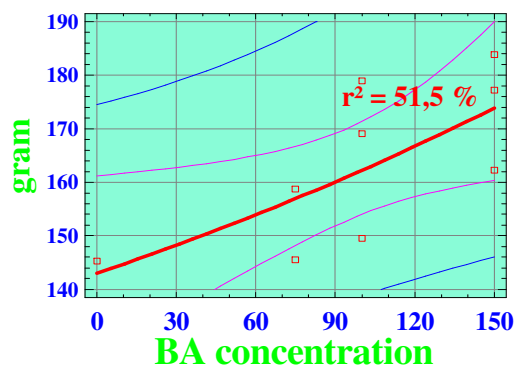
Thinning trial Golden Klon B 2009 - size grading (kg/tree)



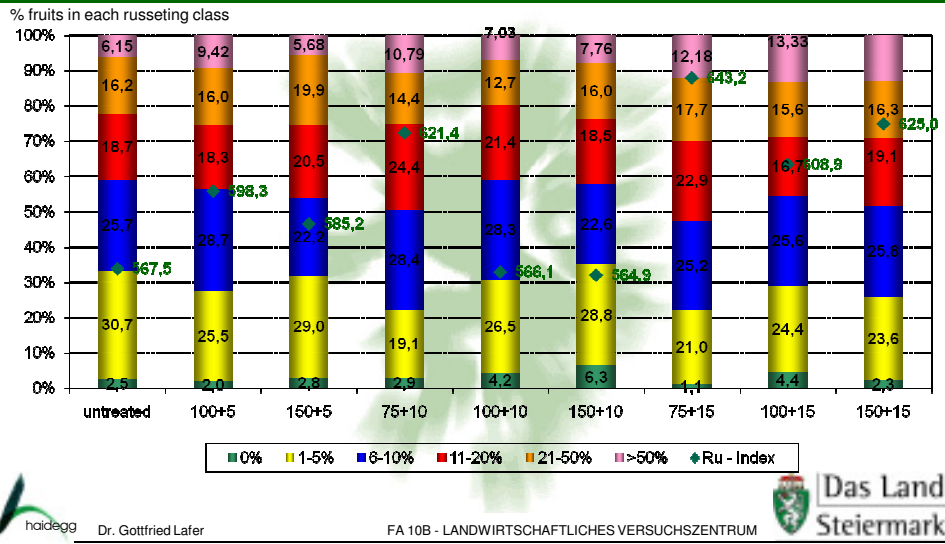
Thinning trial Golden Klon B 2009 - crop load

Golden Del. - thinning study 2009

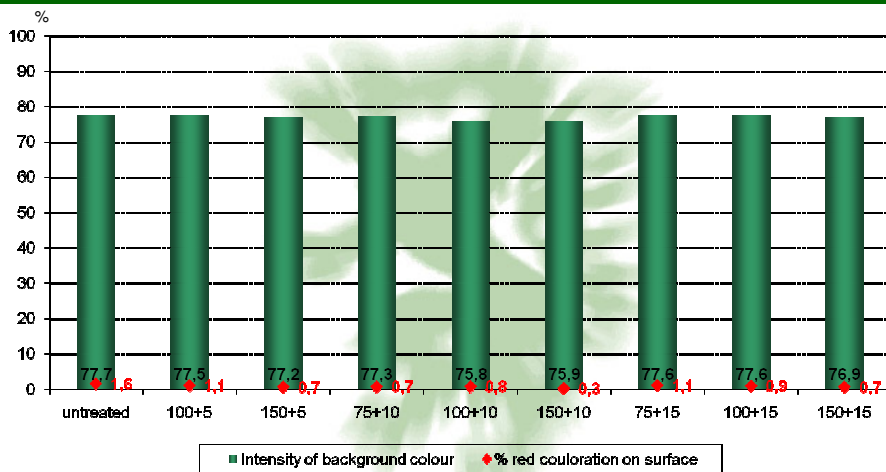
correlation BA conc. vs. fruit weight



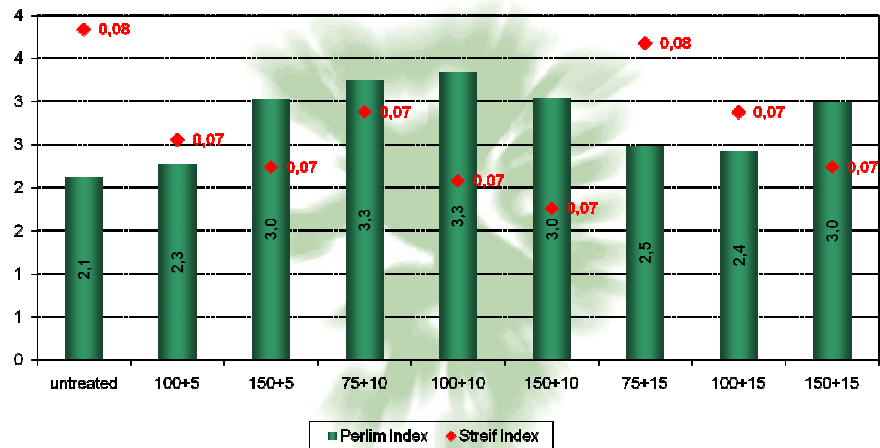
Thinning trial Golden Klon B 2009 - russeting grade



Thinning trial Golden Klon B 2009 - fruit colour



Thinning trial Golden Klon B 2009 - internal quality and ripeness

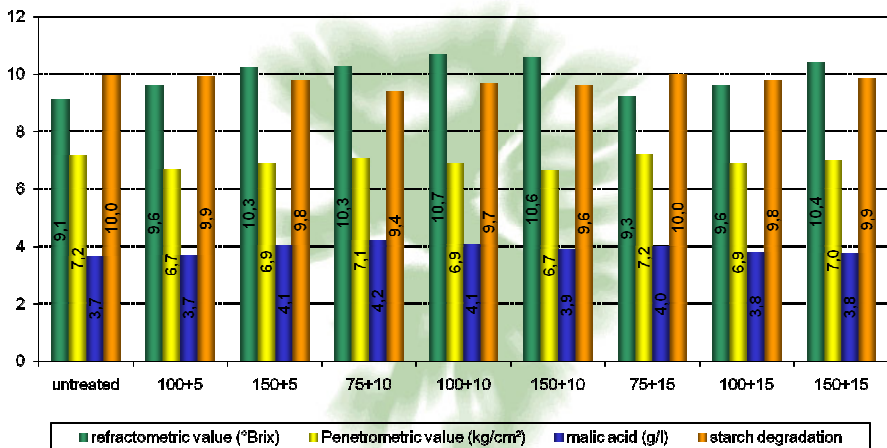


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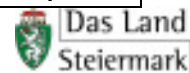


Thinning trial Golden Klon B 2009 - internal quality and ripeness



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Thinning trial Golden Klon B 2009 – conclusion

- **Concentration of BA** (75 – 150 ppm) had a strong influence on thinning efficacy of the different mixtures of BA and NAA.
- Thinning efficacy of the tank mix BA + NAA at 10 – 14 mm was improved only by an **increasing dosage of BA**.
- Yield in number of fruits per tree and yield capacity (fruits/cm² TCSA) were reduced significantly by the higher concentrations of BA.
- A **significant thinning effect**, expressed as final set (number of fruits per tree and fruits per cm² TCSA) was obtained only with **BA 150 ppm**
- **No additional thinning effects of NAA** (5 – 15 ppm) were observed.
- BA at 100 ppm showed a slight but insufficient thinning activity.
- Multiple regression analyses indicates a **significant dosage effect only for BA**
- The higher the dosage of BA (75 ⇒ 150 ppm), the stronger the crop load reduction (**+ 25 % BA = - 10 % fruit load**)
- BA improved fruit size slightly (**+ 25 % BA = + 10 gram**) .
- Russetting, fruit colour, internal quality and fruit maturity were not affected by any treatment.
- Fruit quality (size, TSS, acidity etc.) was improved according to the reduction of crop load.