Adjusted mechanical thinning

and additional chemical sprayings

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Ertragsphysiologie

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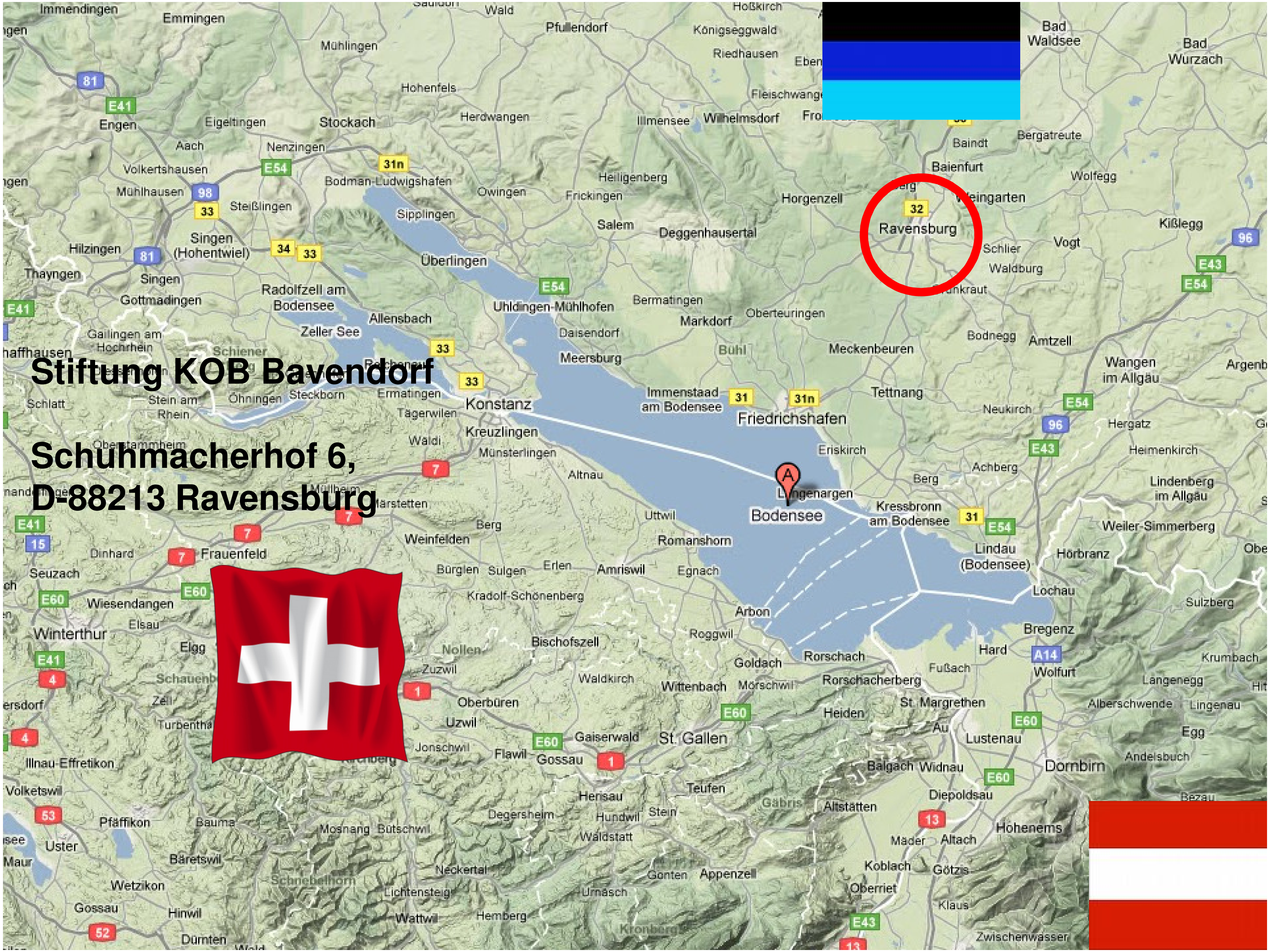

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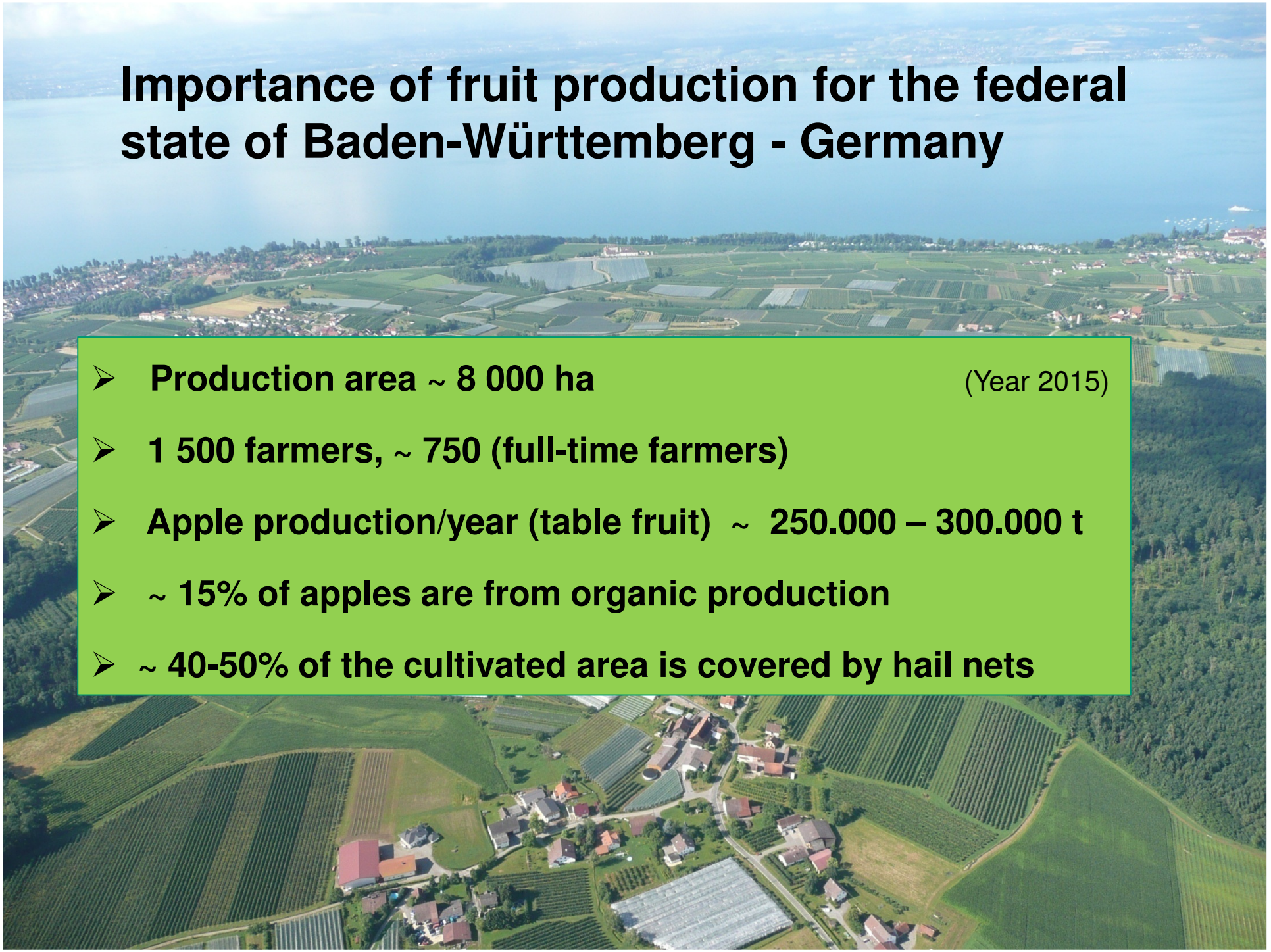
Importance of fruit production for the federal state of Baden-Württemberg - Germany



- **Production area ~ 8 000 ha** (Year 2015)
- **1 500 farmers, ~ 750 (full-time farmers)**
- **Apple production/year (table fruit) ~ 250.000 – 300.000 t**
- **~ 15% of apples are from organic production**
- **~ 40-50% of the cultivated area is covered by hail nets**

Mechanical thinning

- **Are effect levels reachable?**

  soft, medium (strong) thinning effect

- **Additional chemical treatments**

  ATS, Ethephon, 6-BA

- **Additional treatment with Brevis**

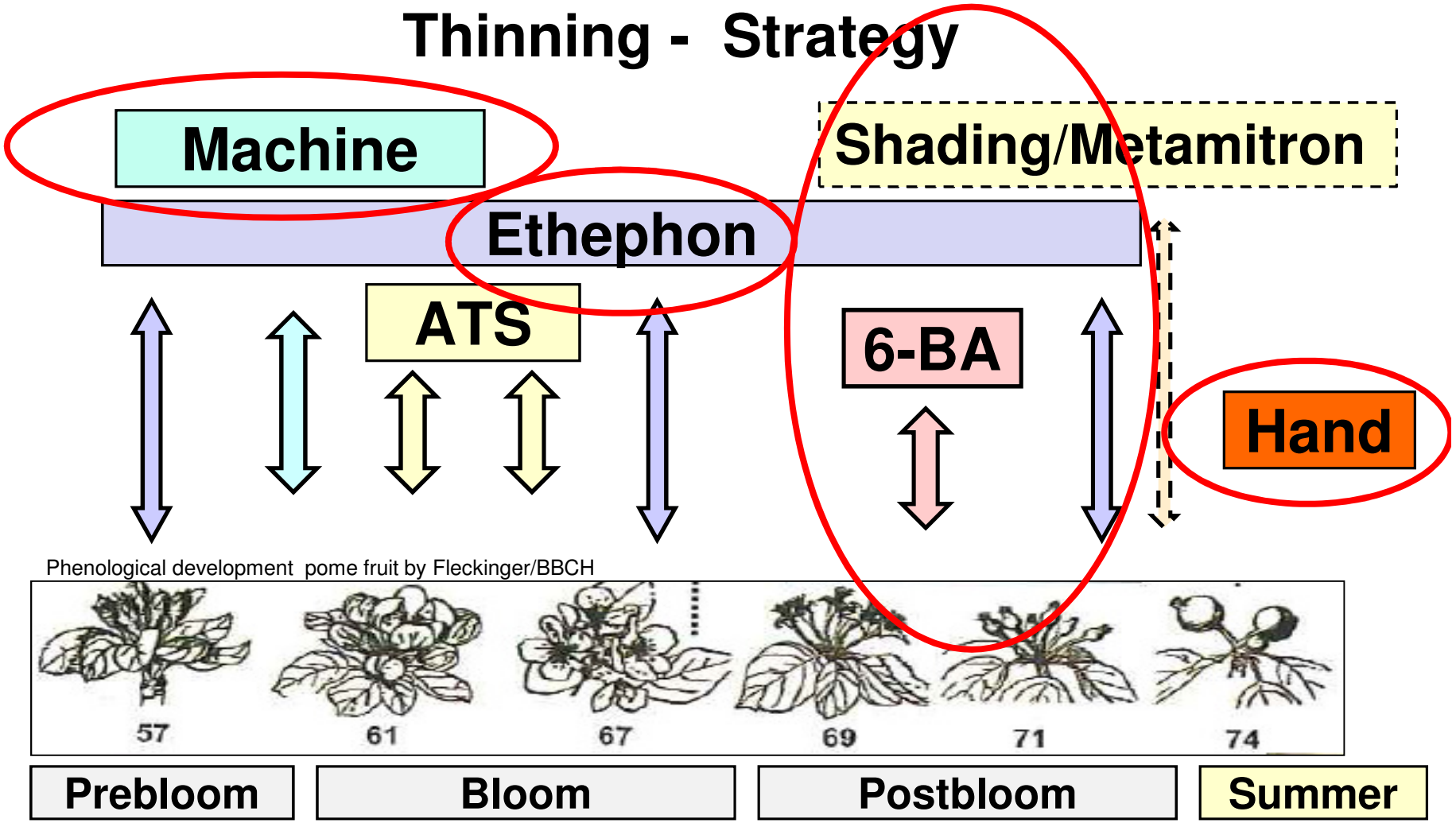
  1,65 kg/ha Brevis / 248 ppm / medium dosis

- **Efficacy?**

  Combinations, results

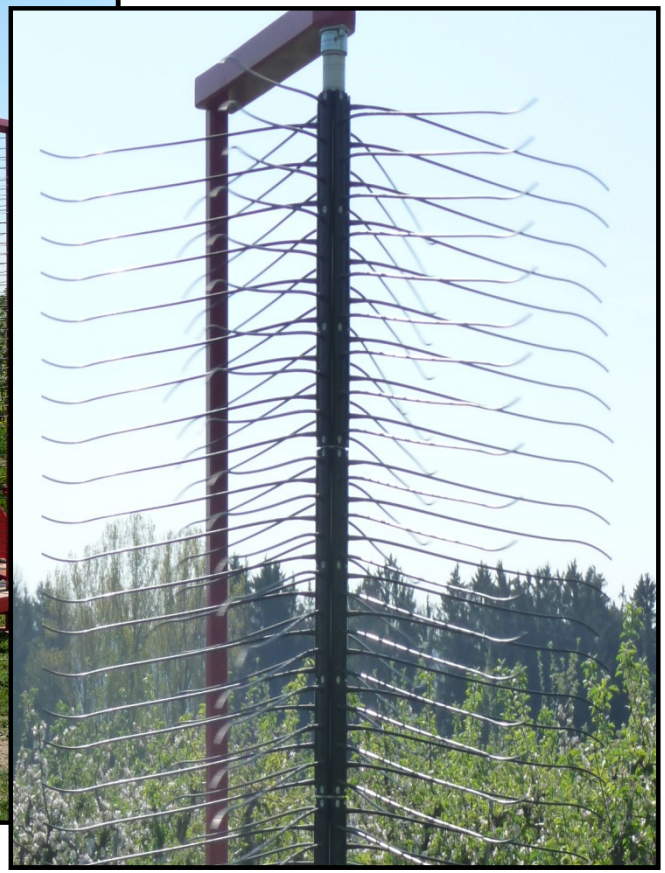
Overview

Thinning - Strategy



Mechanical thinning device

Tree ‚Darwin 250‘ - new filaments



Mechanical thinning

Recommendation on the internet (D)

2016: Recommendation mechanical thinning - Device‚Tree-Darwin' 200/250 cm
(New type of filament/strings; injection molding processing)

Velocity	Settings Strings + Rpm	Soft thinning efficacy (ca. 70% E_{kin} [1])	Medium thinning efficacy (ca. 100% E_{kin} [1])	Remarks
6 km/h	½ (=216 Fäden)	180-190 Rpm	220-230 Rpm	Die Einstellungen der Maschine sind vom Betriebsleiter sortenbezogen und anlagengerecht auszuwählen und vorzunehmen. I.d.R. problemlose Sorten: Braeburn, Gala, Golden Delicious, Pinova, Rubinette Vorsicht bei: Boskoop, Fuji, Jonagold oder in stark wüchsigen Anlagen Sammeln Sie von der sicheren Seite her Ihre eigenen Erfahrungen (= eher schwache Ausdünnwirkung) Schwache maschinelle Ausdünnung und spätere moderate chemische Regulierung lassen sich oft gut kombinieren (Ethephon oder 6-BA)
9 km/h	½ (=216 Fäden)	210-220 Rpm	250-260 Rpm	
12 km/h	½ (=216 Fäden)	240-250 Rpm	280-290 Rpm	

Metamitron

Metamitron = Brevis®

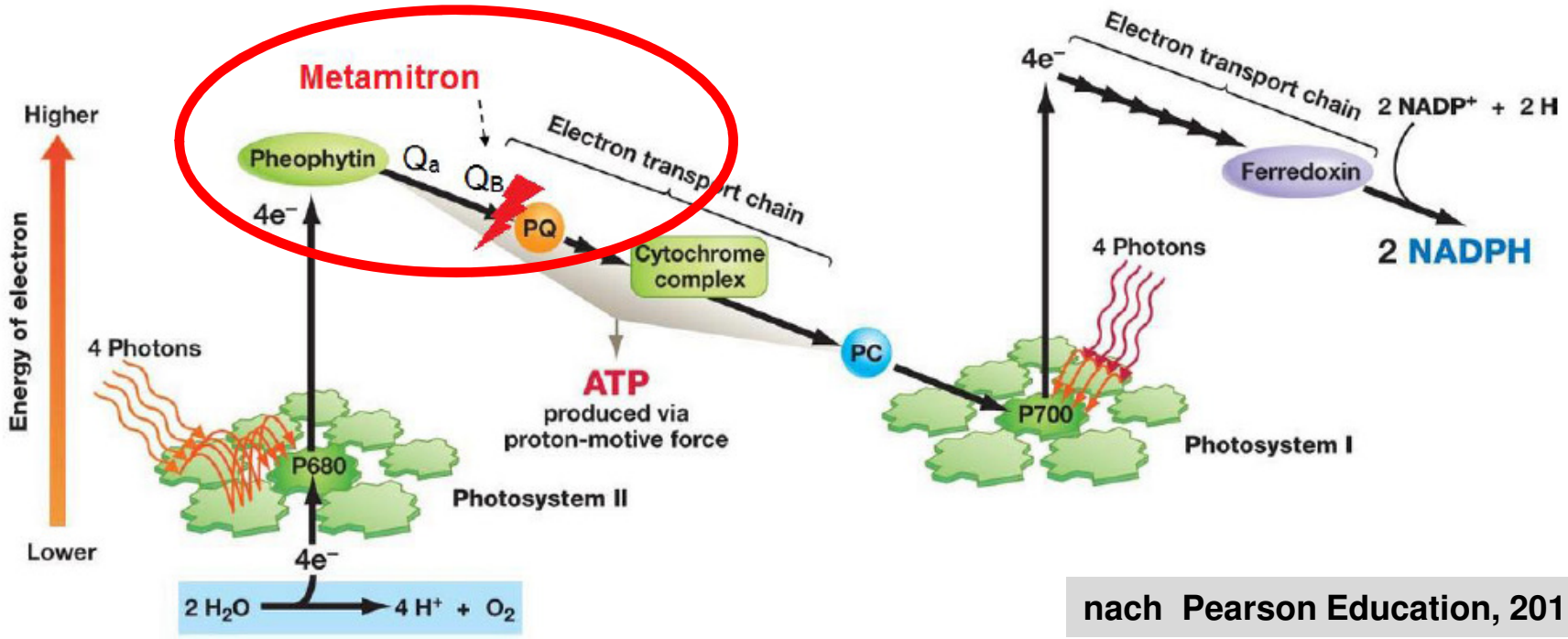
Brevis®
less is more...

ADAMA worldwide

nach ADAMA Italien, 2015

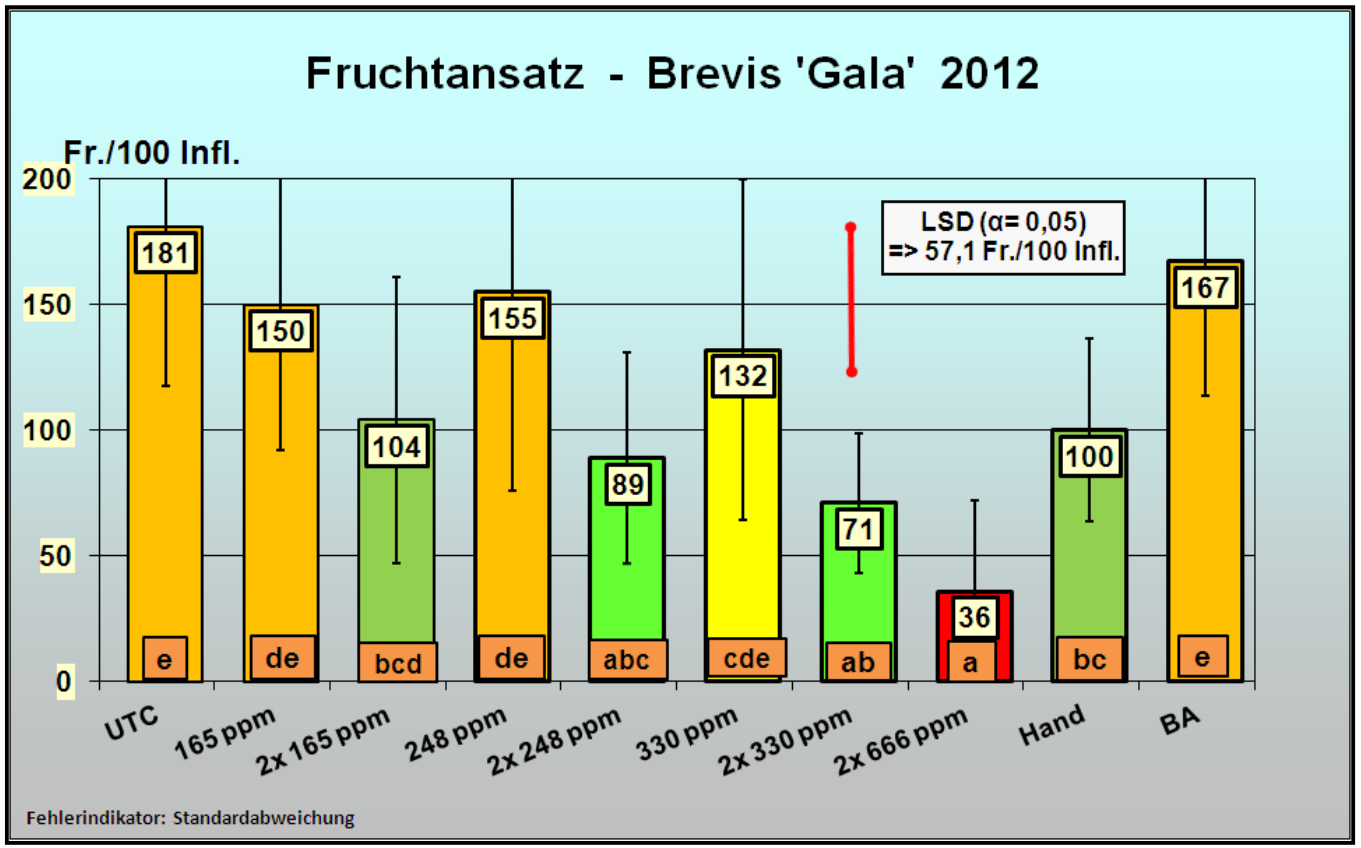
Metamitron

Interrupting electron transport chain – PS II



nach Pearson Education, 2011

Brevis chemical thinning– fruitset 2012



- **Brevis with double treatments was positive.**
- **But: 2x 666ppm was much to strong.**

Phytotoxcity Golden Delicious - 2015

UTC:

without = 1

1,1+1,65kg

soft = 3

1,65+2,2kg

obvious = 4

2,2+2,2kg

obvious = 4

Thinning – machine + chemicals 2012

Description

Trial: **Adjusted mechanical thinning and additional chemical sprayings**

Field orchard **Quartier 02.11** **Runtime: 1 year**

Variety 1:	**Gala**, type **Mondial**	Rootstock	M9
Planting distance:	3,35 x 0,80m	Planting year:	1998
Status:	space filled 100%, vital, healthy		

Variety 2:	**Braeburn**, type **Hillwell**	Rootstock	M9
Planting distance:	3,35 x 0,80m	Planting year:	1998
Status:	space filled 100%, vital, healthy		

Design: 9 treatments x 3 times repeated x 5 trees, randomized setup

Thinning – machine + chemicals 2012

Treatments part 1

No	VAR	Treatment	Used amount g/kg ml/L per Hectar		Application time
1	4 (4)	UTC (Control)	Unbehandelt	-	Untreated
2	4 (8)	Handthinning	Target – no° fruits/tree	-	Target via TCSA / Crown volume
3	4 (12)	a. ATS 20 kg/ha	a. AGRO N FL. 40L/ha	a. 1000 l/ha	1. Termin: VB am 30.04.12, 16:00 wolkig, trocken, 23°C, 43% R.LF
		b. Ethephon	b. FLORDIMEX 420 300ml/ha	b. 1000 l/ha	2. Termin: BE am 04.05.12, 9:25 sonnig, trocken, 17°C, 54% R.LF
		c. BA (ProAgro)	c. MaxCel 7,5 l/ha vor Wärmephase	c. 1000 l/ha	3. Termin: 11mm Ø 17.05.12; 9:00 sonnig, trocken, 8°C, 73% R.LF
4	4 (16)	a. ATS 20 kg/ha	a. AGRO N FL. 40L/ha	a. 1000 l/ha	1. Termin: VB am 30.04.12, 16:00 wolkig, trocken, 23°C, 43% R.LF
		b. Ethephon	b. FLORDIMEX 420 300ml/ha	b. 1000 l/ha	2. Termin: BE am 04.05.12, 9:25 sonnig, trocken, 17°C, 54% R.LF
		c. Ethephon	c. FLORDIMEX 420 100ml/ha	c. 1000 l/ha	3. Termin: 11mmØ 17.05.12; 13:00 sonnig, trocken, 15°C, 38% R.LF
5	4 (20)	a. ATS 20 kg/ha	a. AGRO N FL. 40L/ha	a. 1000 l/ha	1. Termin: VB am 30.04.12, 16:00 wolkig, trocken, 23°C, 43% R.LF
		b. +Brevis 1,65kg/ha	b. 1,65 kg/ha (10mm)	b. 1000 l/ha	2. Termin: 9mm Ø am 14.05. 13:40 sonnig, trocken, 16°C, 34% R.LF

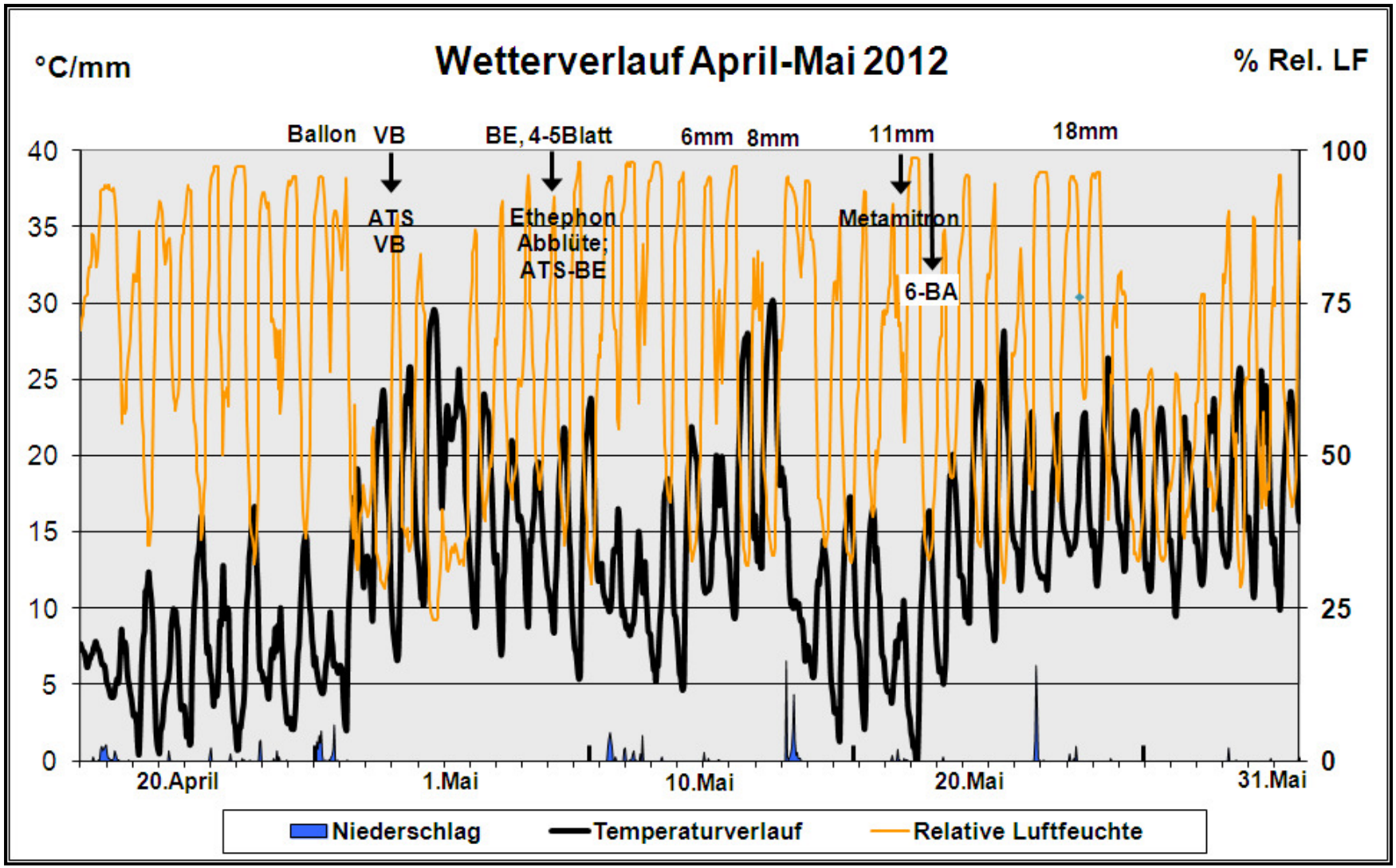
Thinning – machine + chemicals 2012

Treatments part 2

No	VAR	Treatment	Used amount g/kg ml/L per Hectar		Application time
6	3 (23)	a. Darwin schwach (~ 70% Ekin)	a. 6km/h, 180U/m ½ Fadensatz	3 WDH	1. Termin: 1. Mai 2012, 8:50 Uhr sonnig, trocken, 14° C, 65% R.LF
7	3 (26)	a. Darwin medium (~ 100% Ekin)	a. 6km/h, 210U/m ½ Fadensatz	3 WDH	1. Termin: 1. Mai 2012, 8:50 Uhr sonnig, trocken, 14° C, 65% R.LF
8	3 (29)	a. Darwin schwach (~ 70% Ekin) b. BA (ProAgro)	a. 6km/h, 180U/m ½ Fadensatz b. MaxCel 7,5 l/ha vor Wärmephase	a. 3 WDH b. 1000 l/ha	1. Termin: 1. Mai 2012, 8:50 Uhr sonnig, trocken, 14° C, 65% R.LF 2. Termin: 11mm Ø 17.05.12; 9:00 sonnig, trocken, 8°C, 73% R.LF
9	3 (32)	a. Darwin schwach (~ 70% Ekin) b. Brevis 1,65kg/ha	a. 6km/h, 180U/m ½ Fadensatz 1x 1,65 kg/ha (10mm)	a. 3 WDH b. 1000 l/ha	1. Termin: 1. Mai 2012, 8:50 Uhr sonnig, trocken, 14° C, 65% R.LF 2. Termin: 9mm Ø am 14.05. 13:40 sonnig, trocken, 16°C, 34% R.LF

- **Decision machine settings: machine soft ~ 70% E_{kin}**
  - **frost (-damage?) in febuary 2012 (-6°C to -18°C for 10 days)**
  - **frostiness (-3°C) on 8./9. april (Easter); BBCH 57 = red bud**

Thinning – machine + chemicals: weather 2012

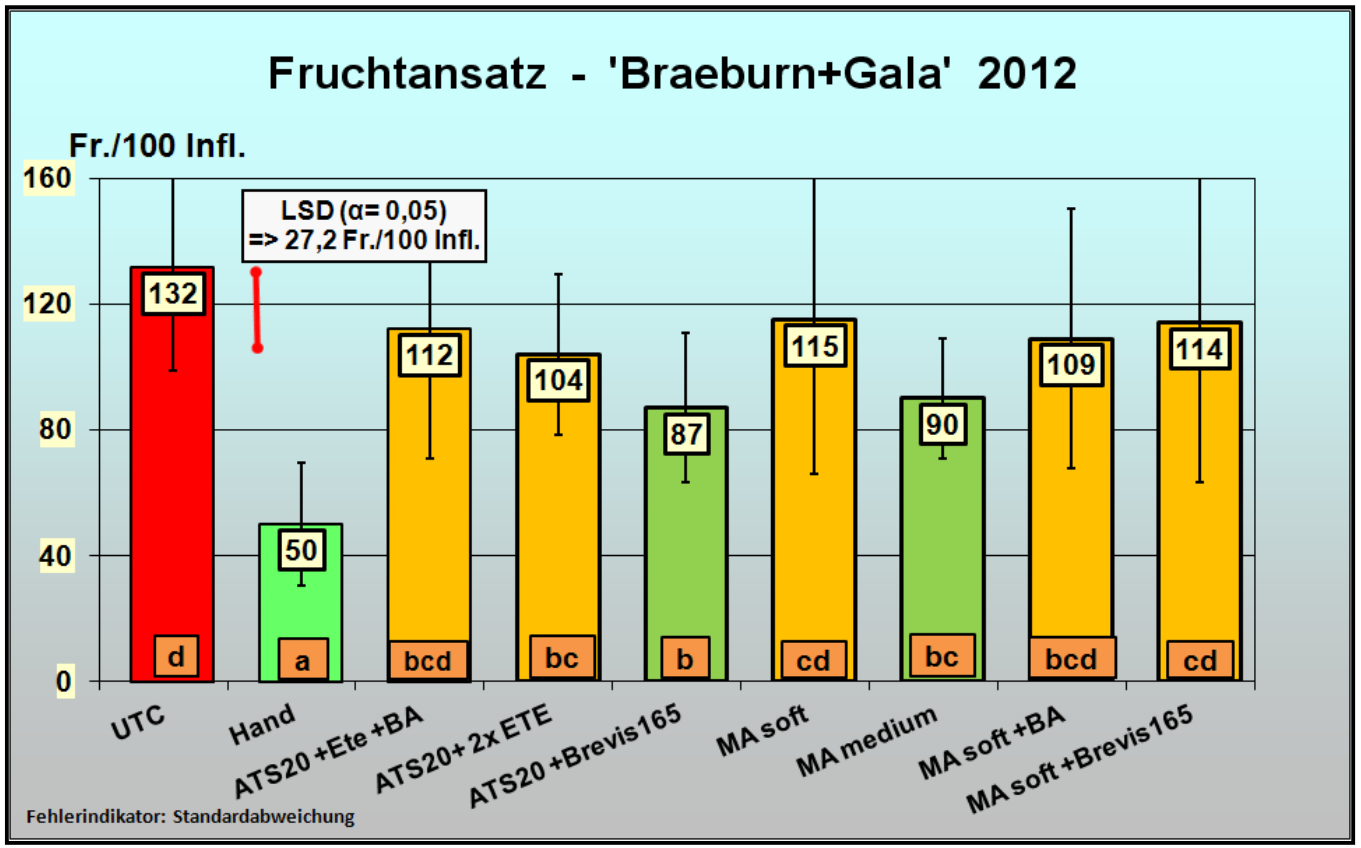


Chemical thinning at full bloom

Chemical thinning at 8mm diameter

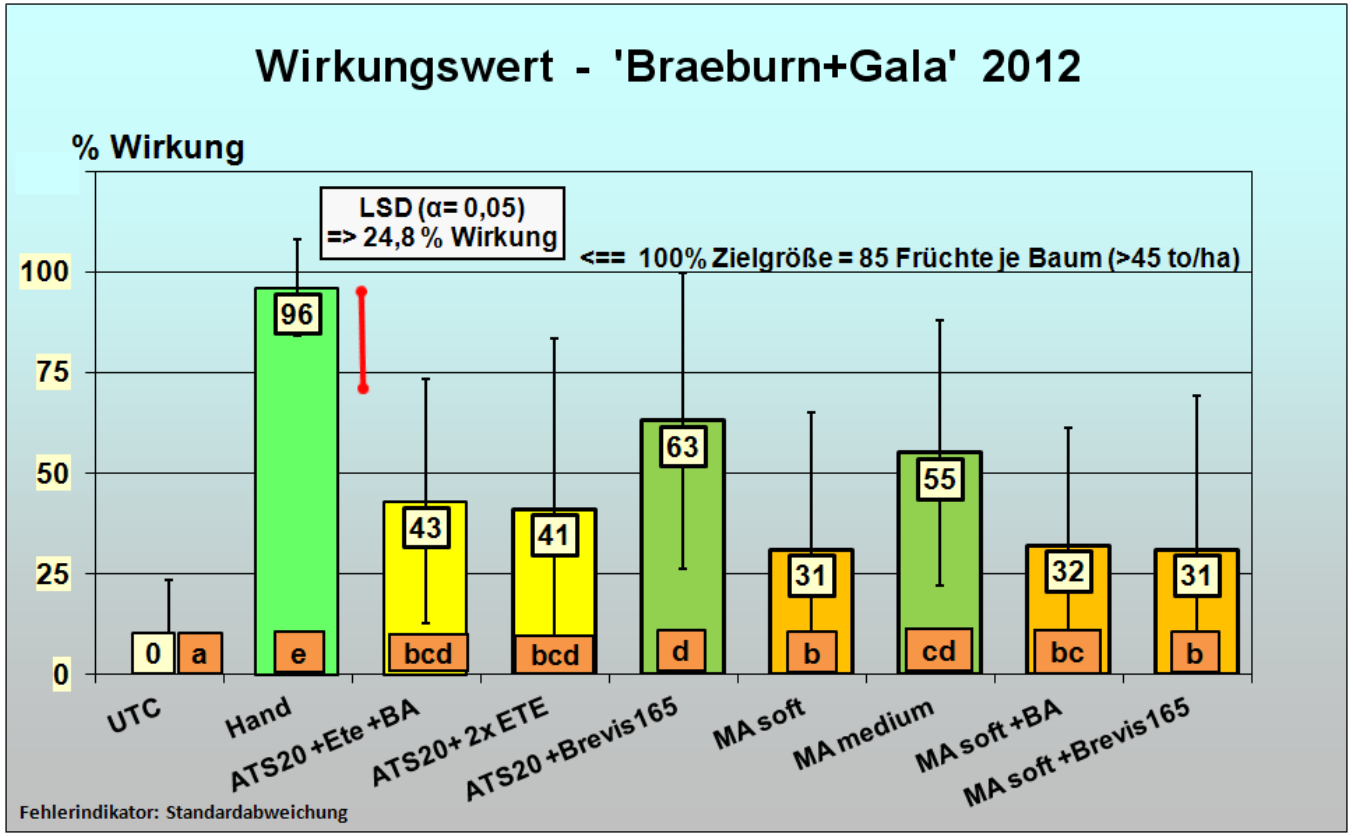
Combined thinning – 2012

Combined thinning – fruitset



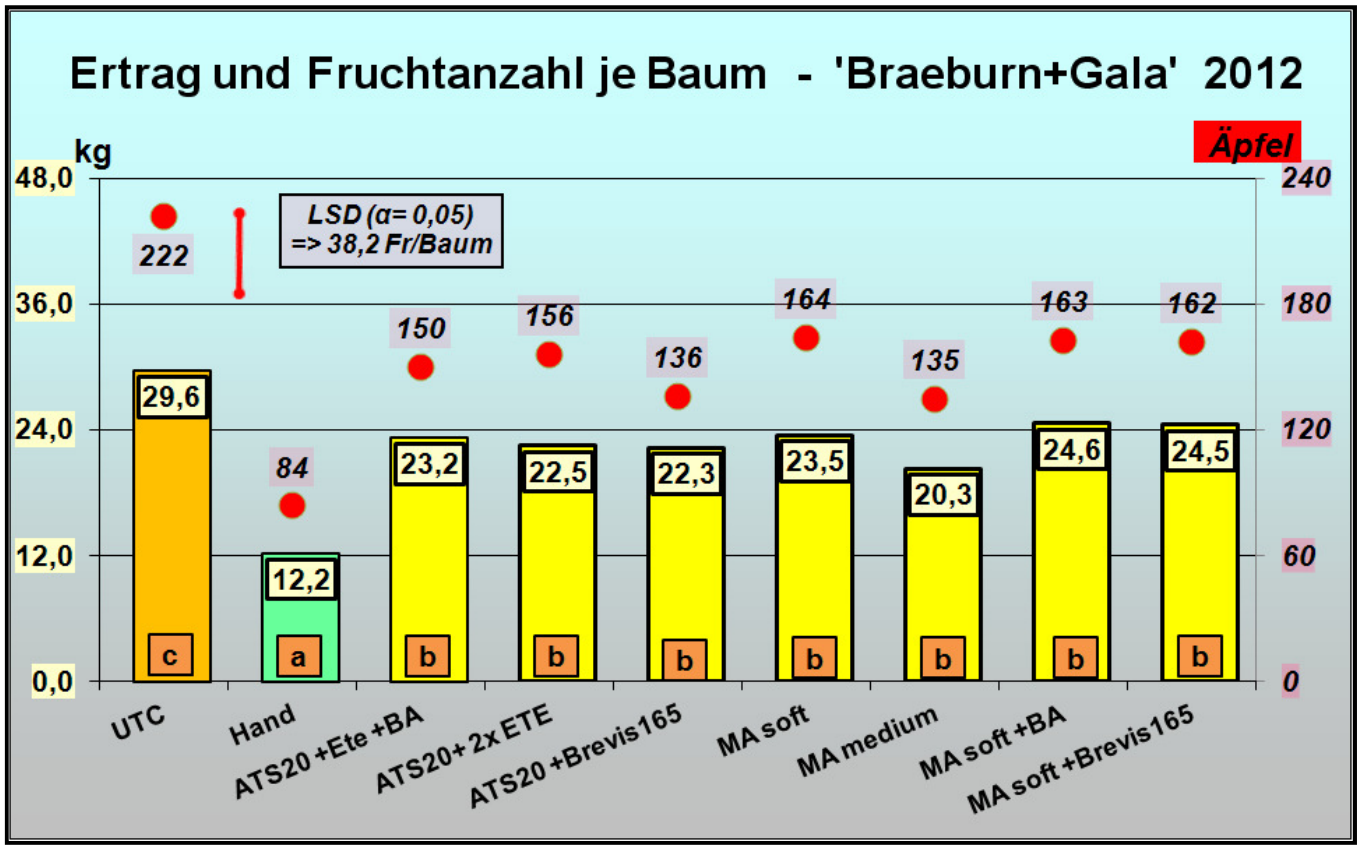
- **ATS (20kg)+Brevis and E_{kin} 100% = medium were good.**

Combined thinning – efficacy value



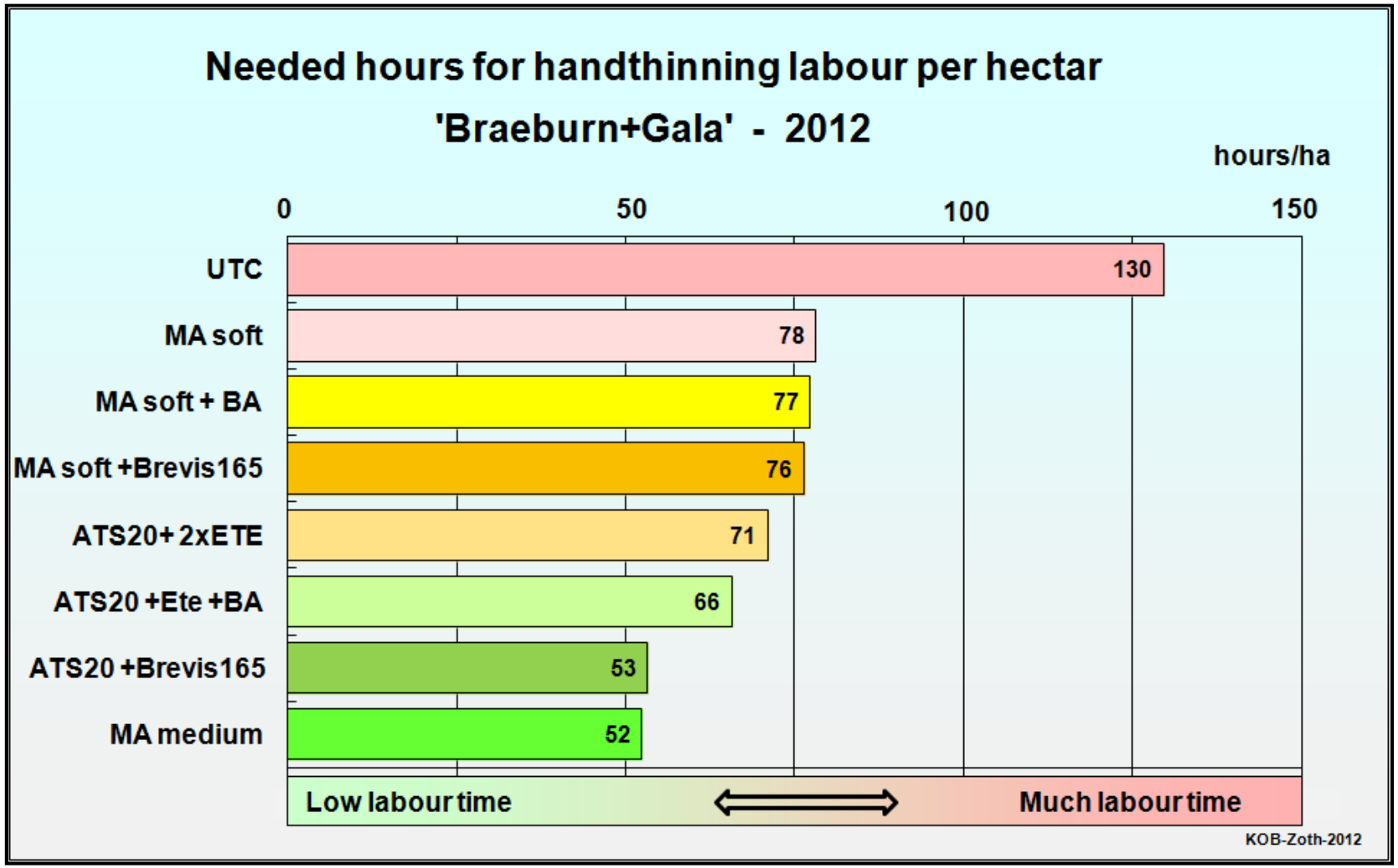
- **ATS (20kg), Brevis (248ppm) and E_{kin} 100% = medium acted well.**

Combined thinning – yield and fruits per tree

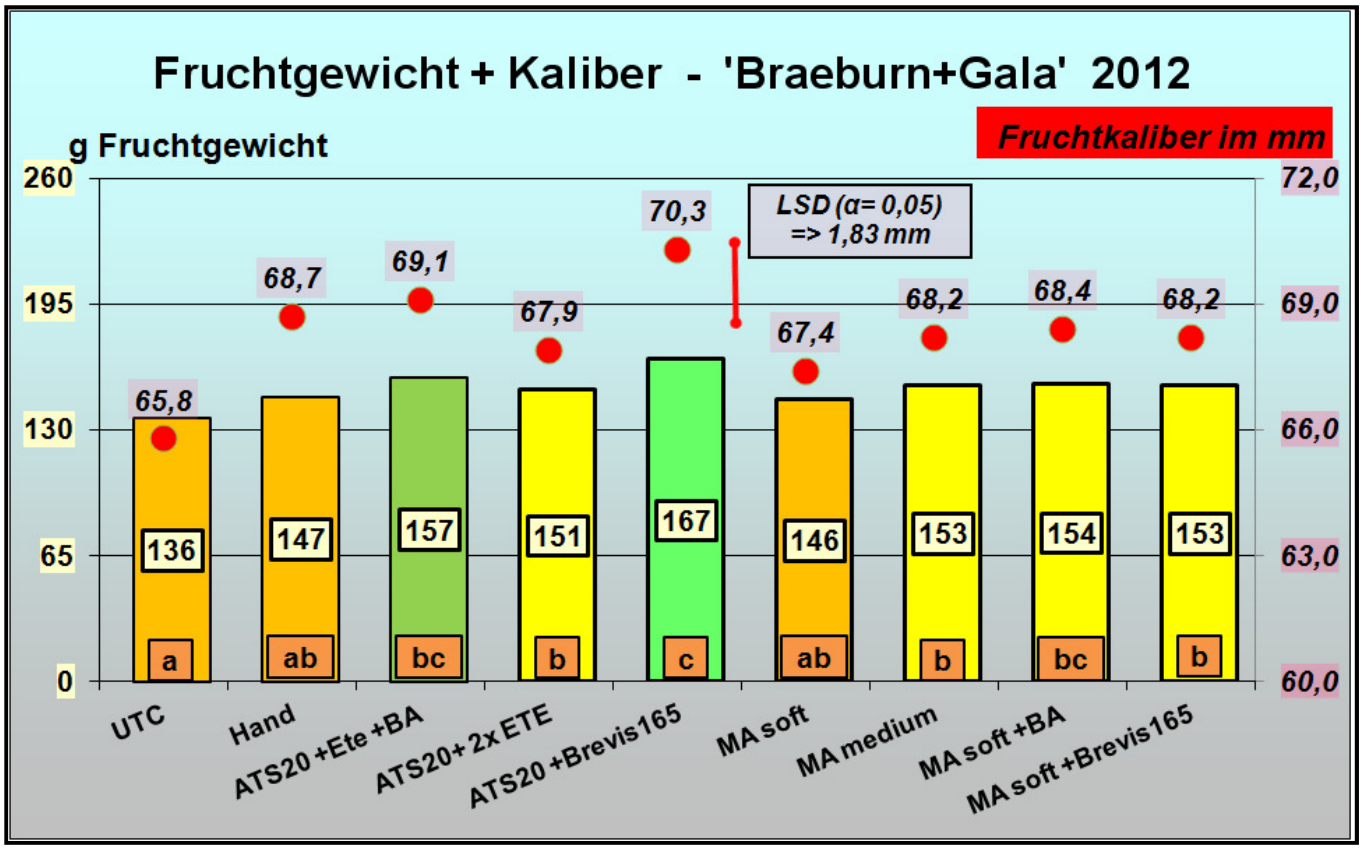


➢ **Fruits an yield per tree often times exessive.**

Combined thinning – time exposure handthinning

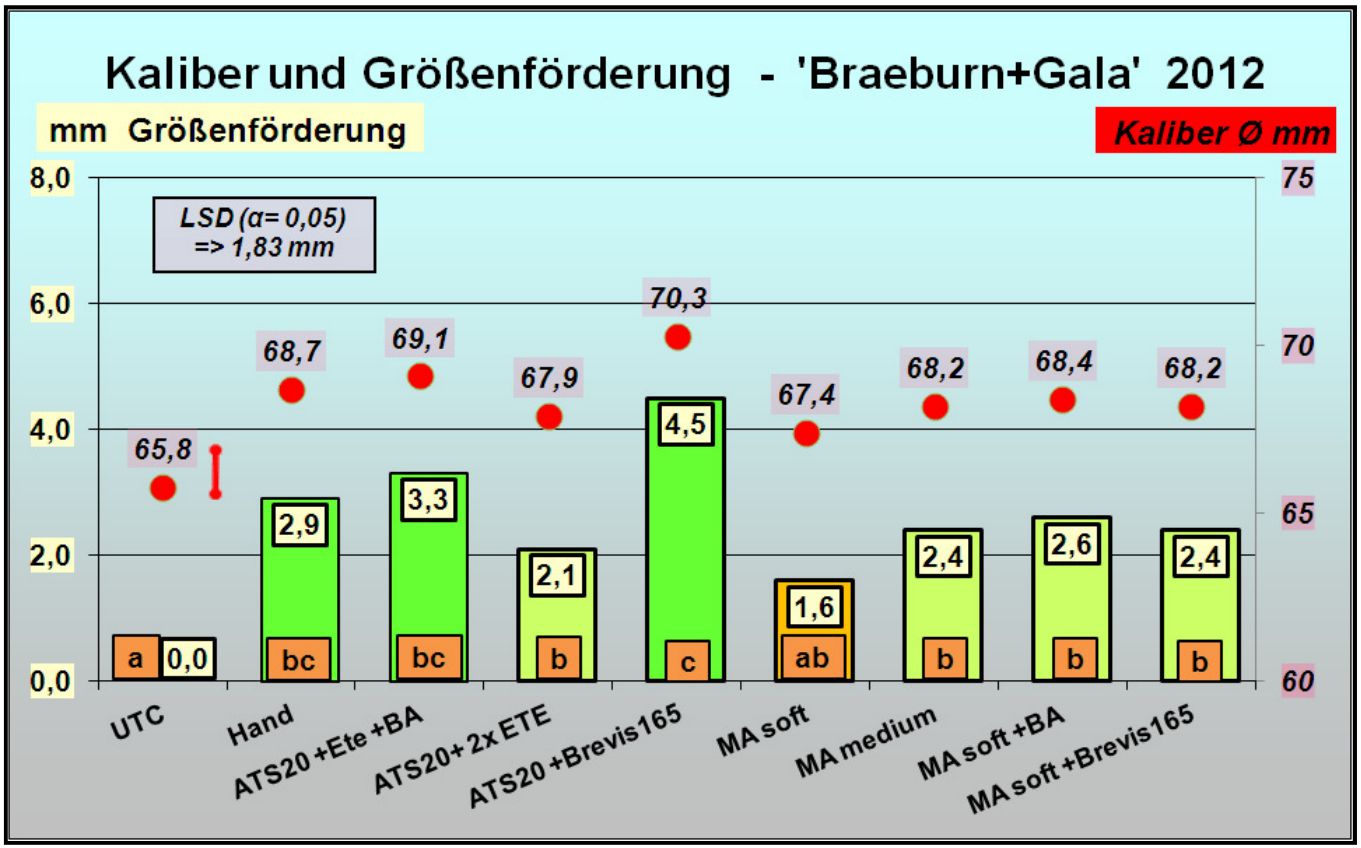


Combined thinning – fruitweight and diameter



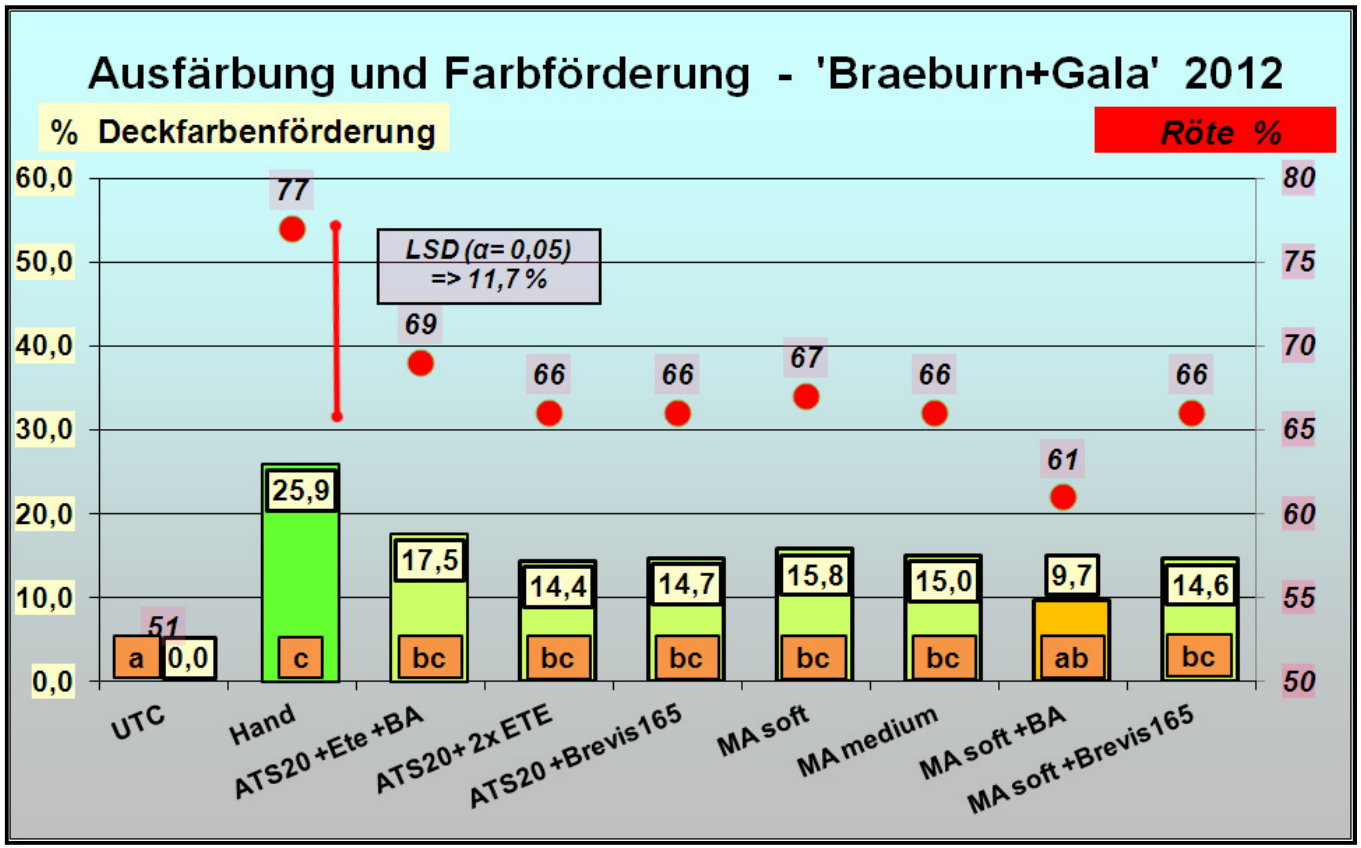
➢ **ATS (20kg) combined with Brevis => biggest fruits**

Combined thinning – increase of fruitdiameter



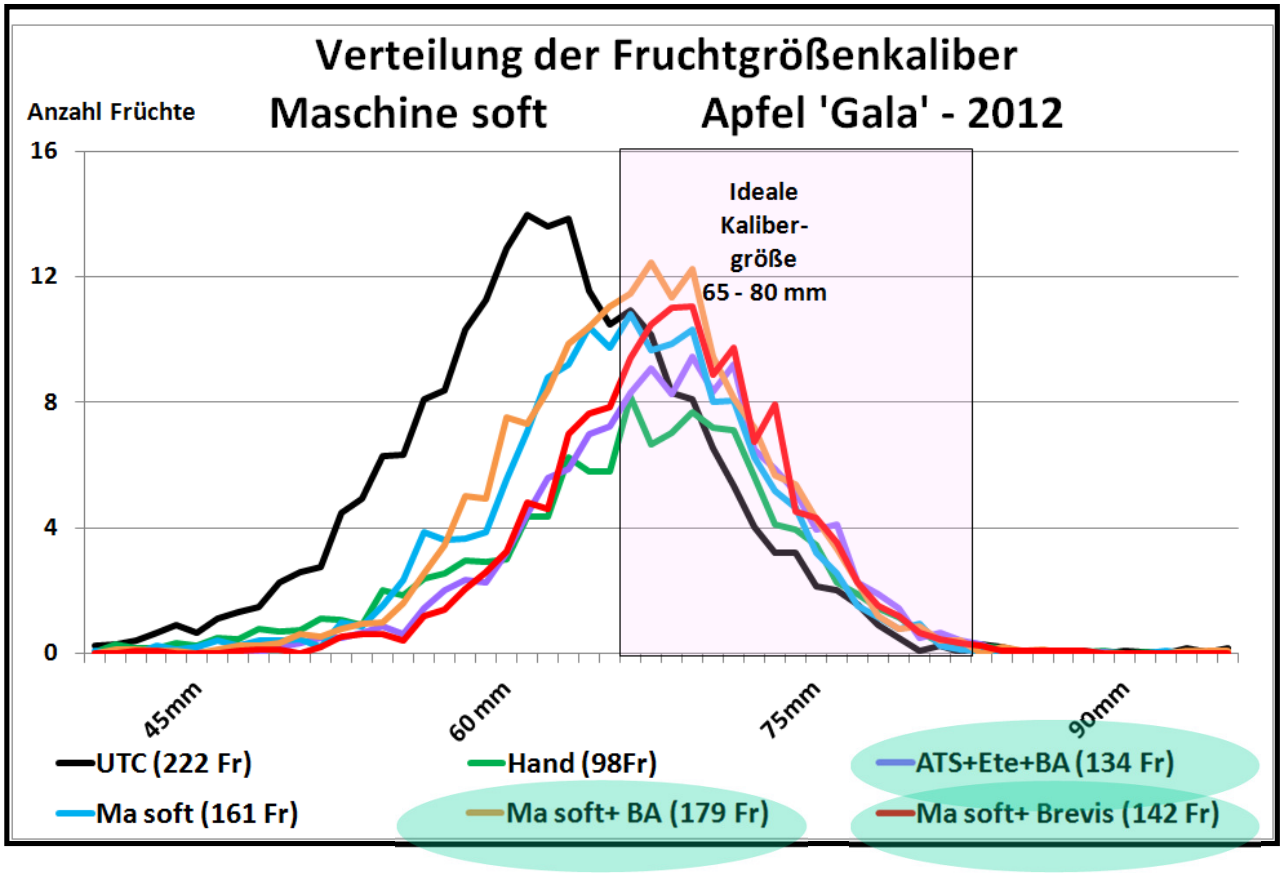
➢ **ATS (20kg) combined with Brevis => biggest fruits**

Combined thinning – improvement of colour



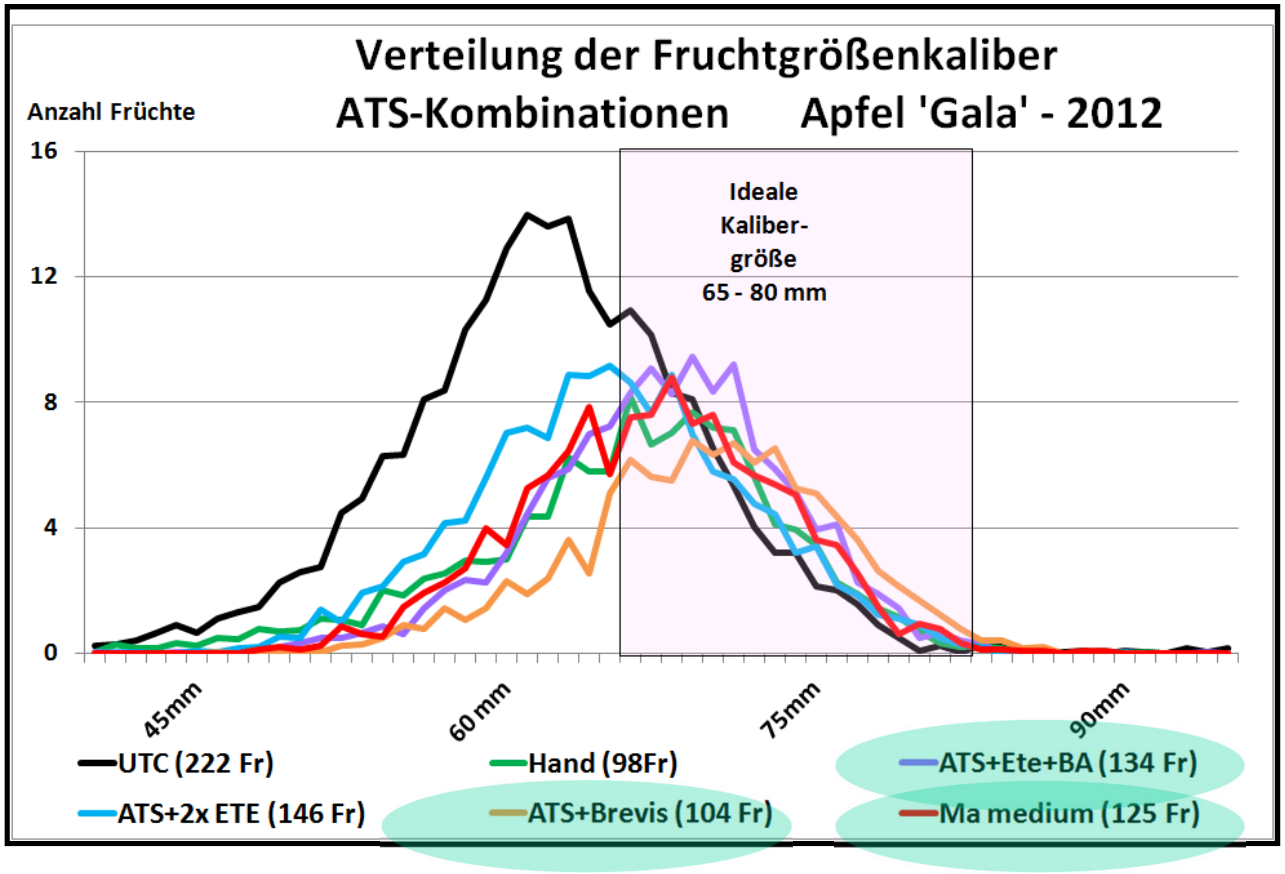
➢ **Decreasing fruitset improves red colouration.**

Shifting of fruitsize ‚Gala' - soft machine settings



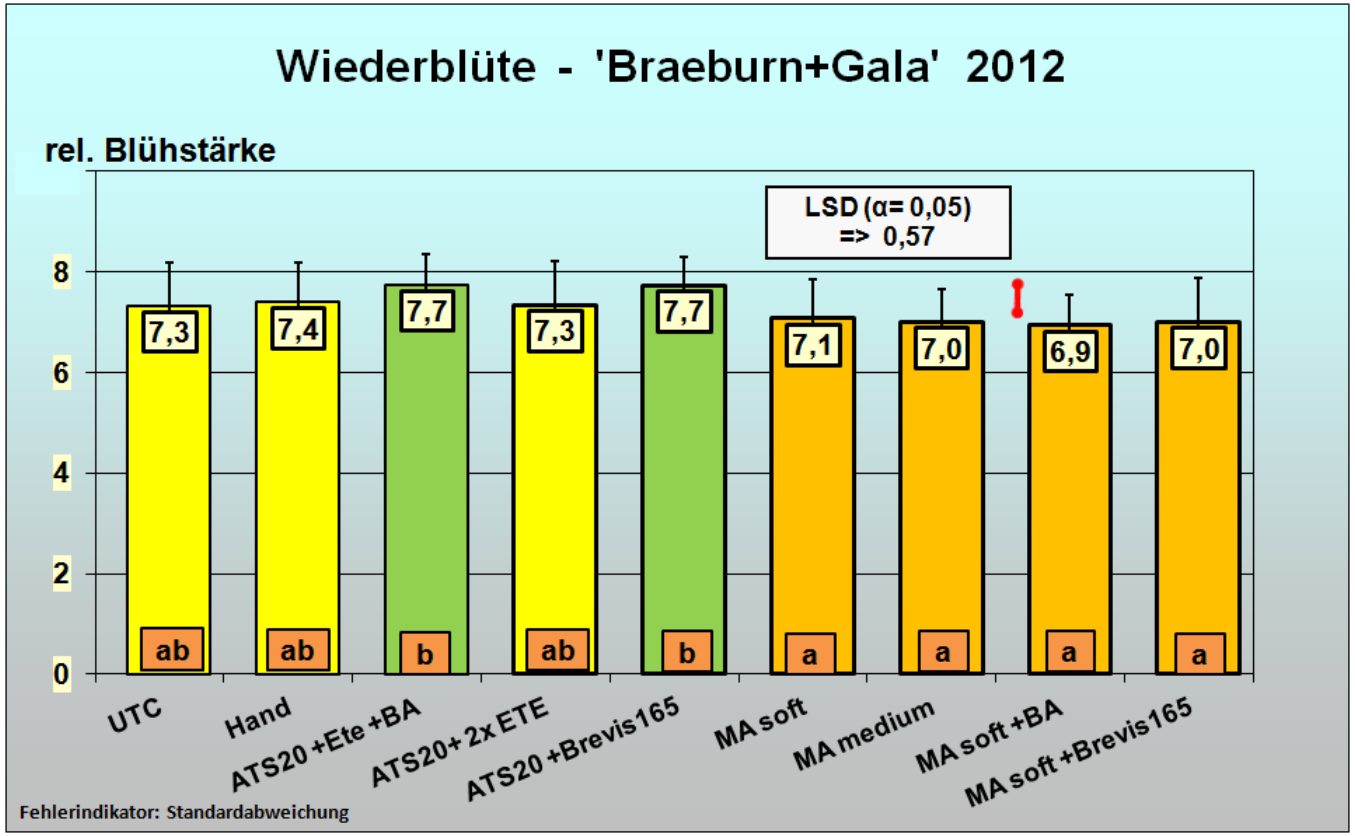
ATS+Ete+BA resulted similar to Machine soft + Brevis.

Shifting of fruitsize ‚Gala' - ATS using



Additional 6-BA resulted in better fruitsize.

Combined thinning – return of bloom



- **ATS slightly improved the return bloom vs. Darwin.**

Conclusion

- **Available chemical agents today are not enough (Ger). Registration of Brevis (= Metamitron) is needed!**
  Expected time now 2017?
- **Adjusted mechanical thinning is possible and equal to chemical thinning.**
- **Combination of an early flower thinning methods**
  a.) ATS b.) Tree-Darwin (machine)

  with fruit thinning agents (6-BA, Brevis) resulted good

  => medium/higher concentrations of Brevis

Conclusion

Optimal cropload control is always important!

- **The earlier fruitset is reduced, the more an increase of fruitsize will be forced.**
- **The aim is a good range of cropload and yield.**
- **Both, yield per tree x range of fruitdiameter lead to good financial results.**

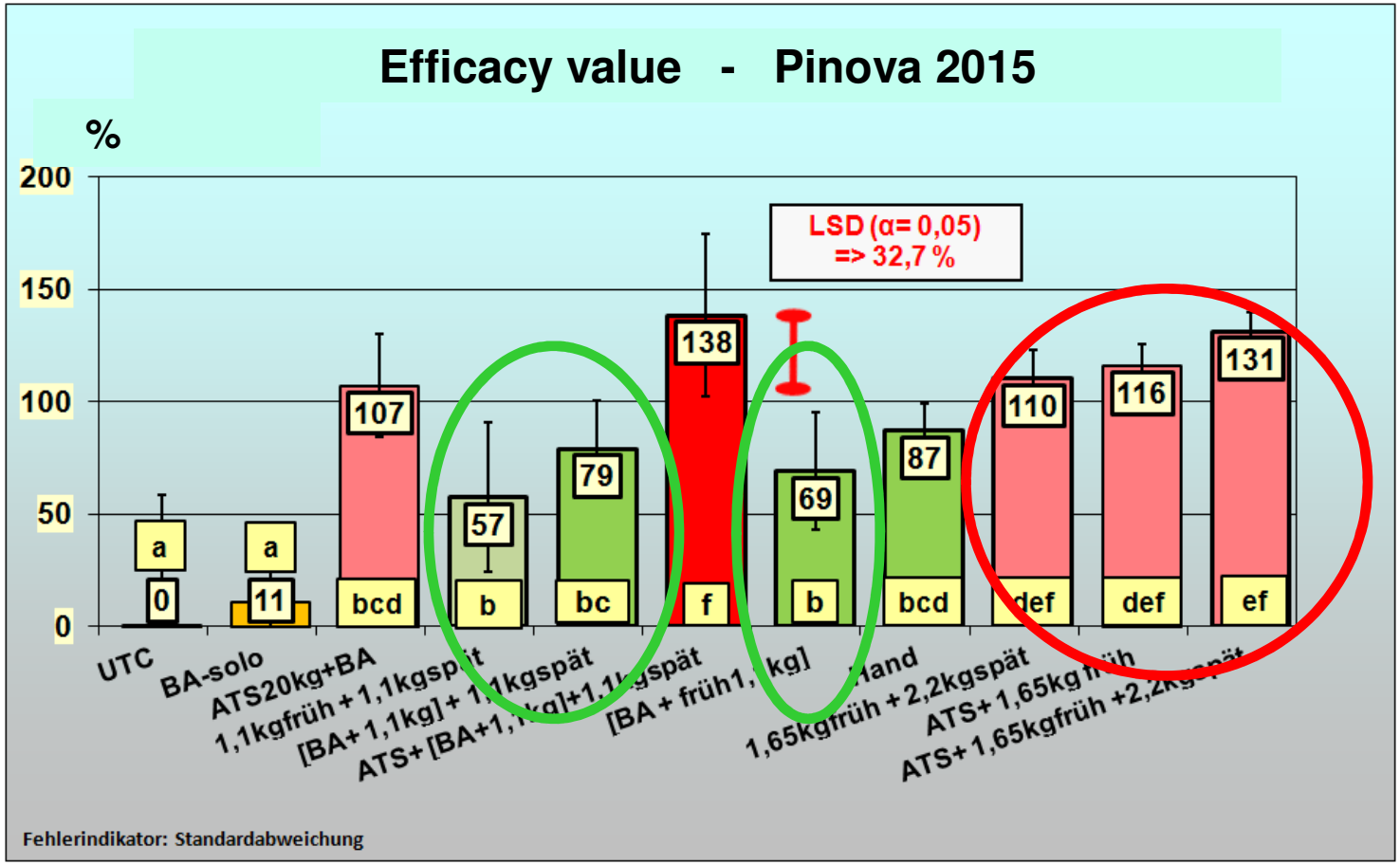
tons/ha x diameter (-range)

- **Today the improvement of colour is less payed.**

Thank you

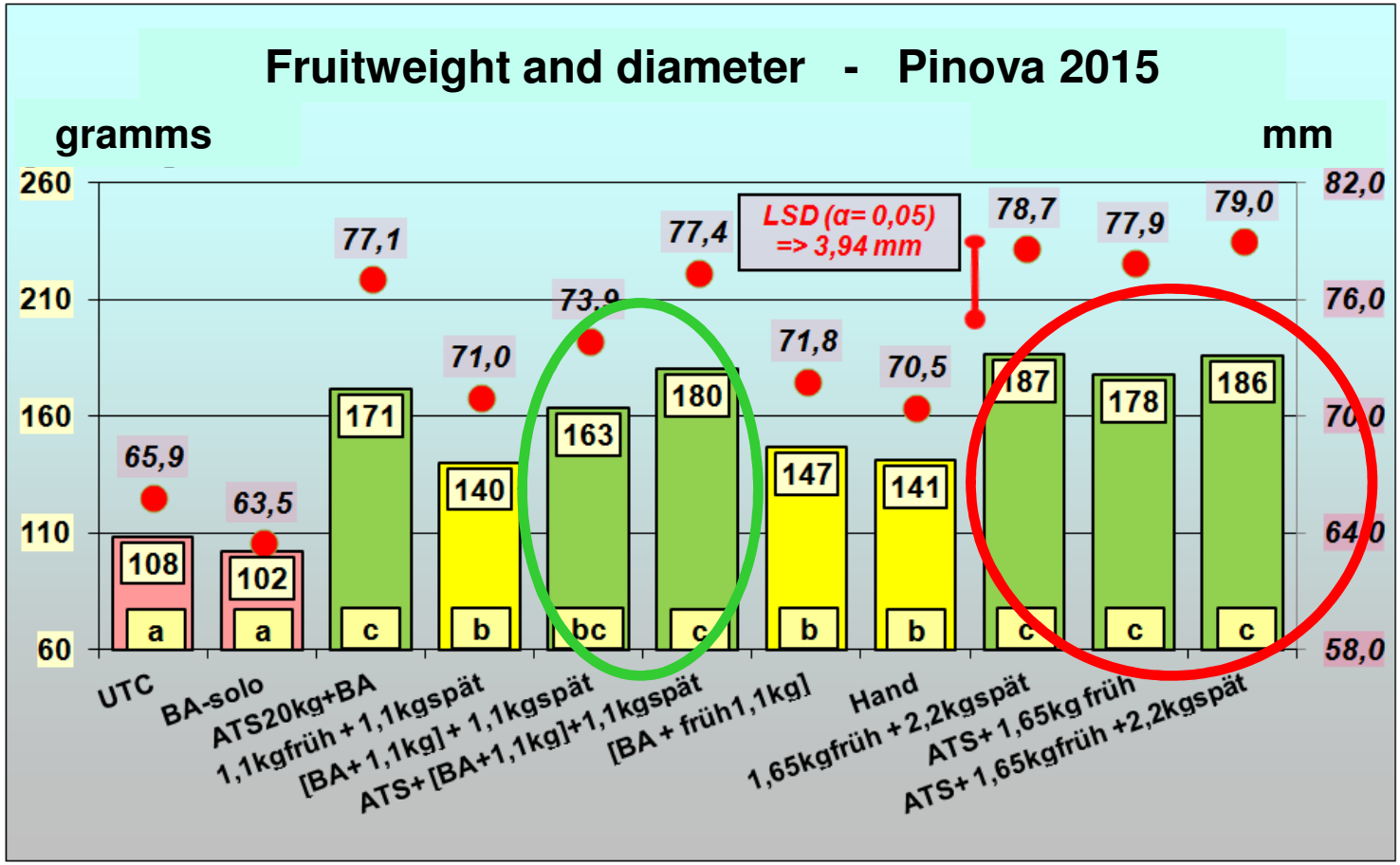
for your attention

Brevis® + ATS/6-BA - Pinova 2015



➢ **Results for metamitron + 6-BA looked good**

Brevis® + ATS/6-BA - Pinova 2015



➢ **Metamitron + 6-BA: slightly better fruitsize (?)**

Conclusion

- **The timing of metamitron is important.**
- **Metamitron is dependend to: - temperature**
  - radiation
- **If metamitron works poor (less efficacy) it is an disadvantage => less fruit growth**
- **The additional use of 6-BA might help to increase the fruit size**
- **The investigations will be continued.**

Physiologie

AGENDA:

- Thinning in plums
- SMAART Project 2013 – 2016 – sensorcontrolled thinning

- Thinning underneath hailnets
- Chemical and mechanical thinning
- Compound Metamitron and others

SMAART Project 2013 – 2016

SmaArt – Camerasensor controlled thinning

SMAART Project 2013 – 2016