

Report trial with Biodevas foliar program
with
Acti Bosca, MC Boron, Secura
on
apple (Elstar, Kanzi) and pear
(Conference, Doyenné du Comice)
in The Netherlands, 2022

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This field trial is sponsored by: Biodevas Laboratoires

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1 Introduction

Commissioned by Biodevas Laboratoires in 2022 Fruitconsult carried out four trials on apple and pear on the Research Station for Fruitgrowing in The Netherlands 'Proeftuin Randwijk'.

The aim of the trials was to test the effects of the Biodevas foliar program with the biostimulants Acti Bosca, MC Boron and Secura on the apple cultivars Elstar and Kanzi and on the pear cultivars Conference and Doyenné du Comice under Dutch growing conditions.

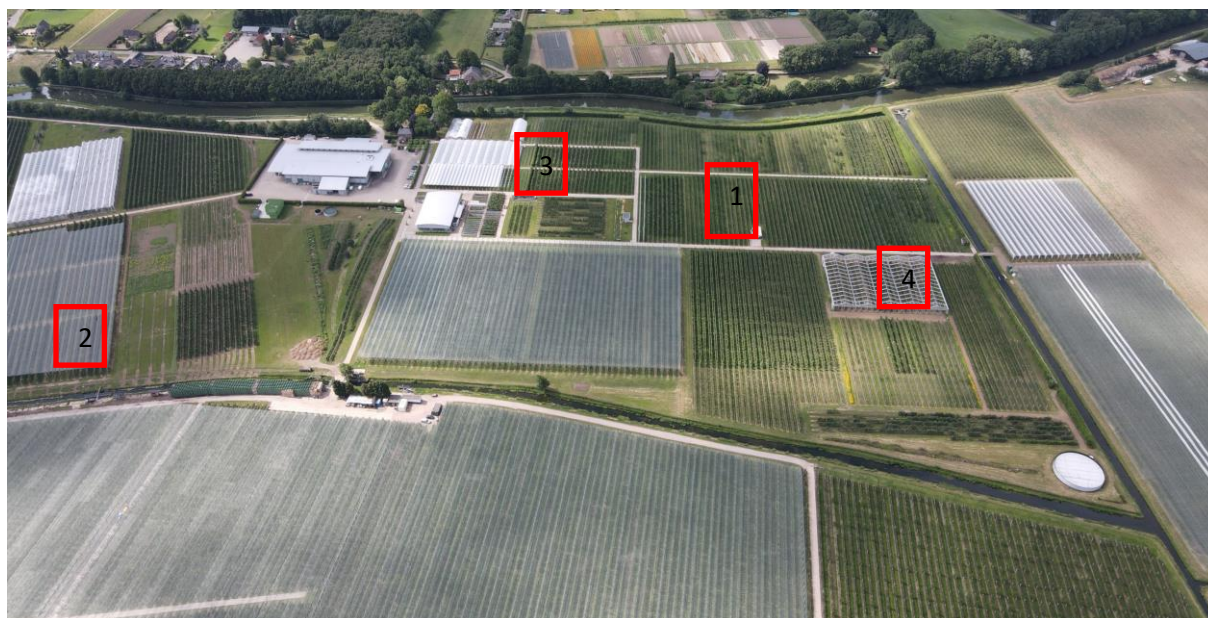
This report contains the results of this trial in 2022.

2 Experimental field and trial setup

2.1 Experimental field

The trials took place on the Research Station for Fruitgrowing 'Proeftuin Randwijk', Lingewal 1b, 6668 LA, Randwijk, The Netherlands. Two trials on the apple cultivars Elstar and Kanzi and two trials on the pear cultivars Conference and Doyenné du Comice.

<p>1. Parcel : West 3D, row 1 Cultivar : Conference Tree age (years) : 6 Rootstock : Quince MC Planting distance : 3.00 x 1.00 m Tree shape : two leaders This parcel is covered with hail nets</p>	<p>2. Parcel : East 1B, row 5 and 6 Cultivar : Doyenné du Comice Tree age (years) : 5 Rootstock : Quince Eline Planting distance : 3.25 x 1.1 m Tree shape : V hedge (replicate a and b) / slender spindle (repl. c, d) This parcel is covered with hail nets</p>
<p>3. Parcel : West 3B, row 2 and 3 Cultivar : Elstar Tree age (years) : 2 Rootstock : M.9 Planting distance : 3.00 x 0.70 m Tree shape : slender spindle</p>	<p>4. Parcel : West 2D, row 15 and 16 Cultivar : Kanzi Tree age (years) : 4 Rootstock : M.9 Planting distance : 3.25 x 0.80 m Tree shape : slender spindle This parcel is covered with a Cravo cover system</p>



The trees were pruned, fertilized, irrigated, fertigated and protected from pests and diseases according to the normal advising of Fruitconsult. All trees got the normal pestmanagement schedule and foliar program.

The Kanzi trial is covered with a Cravo cover, a sophisticated covering system that easily opens and closes itself. The area closes itself when rain is expected, but also under dew wet conditions. One can

say, that the trees stay completely dry from the period of bud break, until 4 weeks after leaf drop.

The trees under the Cravo system are maintained with a minimum input of chemicals.

The soil of Proeftuin Randwijk is river clay.

Spring frost protection was done with overhead sprinklers on April 3rd and 27th 2022.

Sunburn protection was also done with overhead sprinklers on July 18th and 19th and on August 11th, 12th, 13th, 14th and 25th 2022.

2.2 Treatments

The trials contains 2 treatments:

1. Standard Proeftuin Randwijk foliar program
2. Biodevas foliar program with Acti Bosca, MC Boron and Secura

Acti Bosca:

- Ball stage (BBCH 59): 1 spray 2L/ha
- From fruit set (BBCH 72): 5 sprays of 2L/ha (repeat every 7 days)
- From harvest (BBCH 89): 2 sprays of 2L/ha (repeat every 7 days)

Secura:

- From fruit set (BBCH 72): 5 sprays 2L/ha (every 7-14 days)

MC Boron:

- Beginning of flowering: 1 spray 1L/ha
- End of flowering : 1 spray 1L/ha

2.3 Implementation

The sprayings were done with the special KWH crossflow orchard sprayer for trials, with pink 80-0075 Albuz TVI hollow cone anti-drift venturi nozzles, pressure 7 bar, driving speed 4.4 km/hour and a spraying volume of 335 litres of water per ha.

	Ball stage BBCH 59	Beginning flowering BBCH 61	End of flowering BBCH 69	Fruit set BBCH 72	+7 days	+7 days	+7 days	+7 days	From Harvest BBCH 89	+ 7 days
Actibosca	2 L/ha			2 L/ha	2 L/ha	2 L/ha	2 L/ha	2 L/ha	2 L/ha	2 L/ha
Secura				2 L/ha	2 L/ha	2 L/ha	2 L/ha	2 L/ha		
MC Boron		1 L/ha	1 L/ha							
	Spraying dates									
Conference and Comice	12/4 AM	12/4 PM	19/4	28/4	4/5	11/5	18/5	25/5	14/9	21/9
Elstar	15/4	19/4	2/5	17/5	23/5	30/5	7/6	15/6	14/9	21/9
Kanzi	15/4	19/4	2/5	17/5	23/5	30/5	7/6	15/6	11/10	18/10



Spraying trial Comice 2/5/2022

2.4 Experimental design

Statistical design : randomized block design
 Replicates : 3 (Conference and Kanzi) or 4 (Doyenné du Comice and Elstar)
 Observation trees/plot : 5

2.5 Observations

- Number of flower clusters per tree; 7 April (Conference), 8 April (Comice), 14 April (Elstar), 15 April (Kanzi).
- Leaf samples on 22 June and 30 August, for leaf analysis on macro elements and trace elements by Eurofins. 1 mixing sample per variety over the repeats.
- Number of hand thinned fruit per tree (only Elstar; other varieties were not hand thinned).
- Number of fruits and kg per tree at harvest; 26 August (Conference), 13 September (Comice), 24 Aug. and 2 Sept. (1st and 2nd pick Elstar), 29 Sept. and 10 October (1st and 2nd pick Kanzi).
- At harvest fruit samples were taken (random 20 fruits per replication) for measuring fruit quality directly after harvest, after 2 months mechanical storage and after 1 week 14°C (pear) or 2 weeks (Kanzi) or 3 weeks (Elstar) 18°C shelf life. Measured parameters:
 - Starch degradation (only at harvest);
 - Firmness (kg / 0.5 cm²) (using Guss Fruit Texture Analyzer);
 - Sugar content (°Brix).

3 Results 2022

3.1 Production

In appendix 1 all results are listed per replicate. Below the average results per treatment per variety.

Production Conference 2022

Treatment	# flower clusters 2022	# fruits/tree	kg/tree	average fruit weight (g)	fruit set (fruits/100 fl.cl.)
1. Control	50	51	12,1	239	101
2. Biodevas	50	49	12,0	246	98

Production Doyenné du Comice 2022

Treatment	# flower clusters 2022	# fruits/tree	kg/tree	average fruit weight (g)	fruit set (fruits/100 fl.cl.)
1. Control	47	40	13,0	331	91
2. Biodevas	63	47	14,8	322	81

Production Elstar 2022

Treatment	# flower clusters 2022	# hand thinned fruits/tree	# fruits/tree (1 st +2 nd pick)	kg/tree (1 st +2 nd pick)	% 1 st pick	average fruit weight (g)	fruit set
1. Control	91	8	56	8,2	42	146	71
2. Biodevas	96	10	62	8,9	38	143	76

Production Kanzi 2022

Treatment	# flower clusters 2022	# fruits/tree (1 st +2 nd pick)	kg/tree (1 st +2 nd pick)	% 1 st pick	average fruit weight (g)	fruit set
1. Control	101	50	10,9	45	217	50
2. Biodevas	94	48	10,0	58	207	51

Production of Conference and Comice were not very high, but normal for young pear trees in The Netherlands. Conference about 40 tons/ha in the 5th production year and Comice around 36-41 ton/ha in the 4th production year.

Production of Elstar in the first production year was very high. Due to the high numbers of fruits per tree, the average fruit weight didn't reach the target level of about 165 gram. So, fruit size was rather small. The Biodevas program didn't improve this.

Production of Kanzi in the 3rd production year was with about 38 ton/ha not very high, but acceptable. The average fruit weight and fruit size was very good. Biodevas gave a bit lower average fruit weight compared to the control, but an average fruit weight of 207 gram is also good.

There were no substantial, consistent differences in production between the standard spraying schedule and the schedule with the Biodevas foliar program with Acti Bosca, Secura and MC Boron. In Comice and Elstar production of the Biodevas program was a bit higher, but the also the trees in the starting situation had a bit more flowerclusters.

In Elstar fruit set was a bit higher, but in Comice it was't. On the other hand, in Kanzi the production of the Biodevas schedule was a bit lower, but the starting situation did also have a bit less flower clusters.



Biodevas trial Elstar, just before harvest, 23/8/2022.



1st pick Kanzi trial, 29-9-2022.

3.2 Fruit quality at harvest

Firmness (kg/0,5cm²) at harvest

	Conference	Comice	Elstar		Kanzi	
			1 st pick	2 nd pick	1 st pick	2 nd pick
1. Control	6,5	5,0	5,6	5,5	6,6	6,3
2. Biodevas	6,6	4,9	5,7	5,5	6,5	6,5

Starch degradation at harvest

	Conference	Comice	Elstar		Kanzi	
			1 st pick	2 nd pick	1 st pick	2 nd pick
1. Control	4,3	4,9	6,2	6,8	6,5	6,3
2. Biodevas	4,3	5,7	5,7	7,6	6,7	6,8

Sugar content (°Brix) at harvest

	Conference	Comice	Elstar		Kanzi	
			1 st pick	2 nd pick	1 st pick	2 nd pick
1. Control	13,1	14,0	13,6	14,2	12,3	12,2
2. Biodevas	13,3	14,0	13,7	14,0	12,2	12,2

At harvest, there were no substantial, consistent differences in fruit quality between the standard spraying schedule and the Biodevas program. Sometimes, firmness (important quality parameter) of the Biodevas treatment was a little bit higher, sometimes a little bit lower, but the differences were very small. Firmness of Elstar was lower than desired at harvest, (firmness of 5,8 – 6,2 is the target), but this was the case at both treatments. Biodevas program didn't give a clear better firmness. Also in sugar content and starch degradation at harvest were no substantial, consistent differences. Sugar content and taste especially of Conference, Comice and Elstar were very good, due to a lot of sun in summer of 2022.

3.3 Fruit quality after storage

Firmness (kg/0,5cm²) after about 2 months mechanical storage (2,5°C)

	Conference	Comice	Elstar		Kanzi	
			1 st pick	2 nd pick	1 st pick	2 nd pick
1. Control	5,9	4,0	4,0	4,2	7,1	7,0
2. Biodevas	6,0	3,9	4,0	4,1	7,1	6,9

Sugar content (°Brix) after storage

	Conference	Comice	Elstar		Kanzi	
			1 st pick	2 nd pick	1 st pick	2 nd pick
1. Control	14,0	14,6	13,2	13,2	12,5	12,6
2. Biodevas	13,8	14,5	13,0	13,4	12,6	12,1

Just as it was at harvest, there were no substantial, consistent differences in firmness and sugar content after storage.

3.4 Fruit quality after shelf life

Firmness (kg/0,5cm²) after about 2 months mechanical storage + 1 week (pear), 2 weeks (Kanzi) or 3 weeks (Elstar) shelf life

	Conference	Comice	Elstar		Kanzi	
			1 st pick	2 nd pick	1 st pick	2 nd pick
1. Control	1,2	0,7	4,1	4,2	6,9	6,7
2. Biodevas	1,3	0,6	4,1	4,6	7,1	6,9

After 1 week shelf life Conference and Comice were ready-to-eat, there was no difference between the treatments.

After 2 or 3 weeks shelf life, firmness of 2nd pick Elstar and Kanzi (1st and 2nd pick) of Biodevas program was a little bit higher compared to the standard schedule.

3.5 Leaf Analysis

Results early leaf analysis, 22-6-2022

cultivar	object	% dry matter	N	P	K	Ca	Mg	Fe	Zn	Mn	Cu	B
Confe- rence	1	43,0	23,1	1,6	16,6	14,5	3	140	19	68	3,7	18,6
	2	39,9	22,8	1,6	17,2	14,3	2,9	140	18	59	3,7	17,9
Doy.du Comice	1	45,1	23,2	1,7	16,6	11,3	2,6	100	26	78	5,8	15,3
	2	43,6	23,0	1,6	16,1	11,1	2,5	100	22	65	5,1	14,4
Elstar	1	38,6	26,6	2,5	23,9	13,8	2,2	160	25	115	4,7	25,5
	2	39,3	28,5	2,1	20,7	12,5	1,9	140	20	88	3,9	22,2
Kanzi	1	36,2	28,2	2,1	21,3	13,4	2,3	350	31	218	5,4	22,8
	2	38,2	30,0	2,5	28,0	17,6	3,0	300	34	228	6,8	31,8

Results late leaf analysis, 30-8-2022

cultivar	object	% dry matter	N	P	K	Ca	Mg	Fe	Zn	Mn	Cu	B
Conference	1	48,4	23,1	1,5	13,1	23,9	3,7	130	17	87	3,2	25,5
	2	41,1	21,8	1,5	12,3	24,3	3,6	130	16	86	3,3	24,2
Doy. du Comice	1	48,3	19,5	1,3	14,4	16,2	3,0	140	28	93	5,7	23,9
	2	46,4	18,9	1,4	15,1	17,3	2,8	160	26	85	5,4	23,5
Elstar	1	43,0	26,0	1,7	14,2	22,5	2,3	110	24	79	4,7	29,4
	2	41,7	24,9	1,6	14,6	21,7	2,1	130	24	74	4,8	29,5
Kanzi	1	38,5	24,9	1,6	20,6	16,9	2,00	270	65	135	5,0	34,1
	2	37,7	25,6	1,6	21,3	15,5	1,7	320	50	147	5,3	36,5
target range			22,4-26,5	1,5-1,9	14,4-19,0	11,0-14,5	3,1-3,5	60-100	50-200	25-80	8-20	30-60

In the results of both early and late leaf analysis, it was difficult to see consistent differences between the spraying schedules.

4 Conclusions

Biodevas foliar program with Acti Bosca (6x 2L/ha), Secura (5x 2 L/ha) and MC Boron (2x 1 L/ha) didn't give consistent effects on production, fruit weight, fruit quality and leaf analyses on Conference and Doyenné du Comice pears and on Elstar and Kanzi apple in the trials in The Netherlands in 2022.

On Proeftuin Randwijk fruit growing is at a high level; with a very good, fertile river clay soil, and a cultivation, fertilisation, irrigation, pruning and crop protection according the advising of Fruitconsult and best practice. In this situation, it appears difficult to see a lot of effects of biostimulants.

Appendix 1. Production per replicate

Conference

average of flowerclusters/tree		replicate			
treatment		a	b	c	average
	1	50	53	47	50
	2	51	51	47	50
Harvest, 26-8-2022					
average of fruits/tree		replicate			
treatment		a	b	c	average
	1	48	59	46	51
	2	56	44	46	49
average of kg/tree		replicate			
treatment		a	b	c	average
	1	10,5	14,4	11,4	12,1
	2	13,9	11,1	11,0	12,0
Average fruit weight (g)		replicate			
treatment		a	b	c	average
	1	222	247	248	239
	2	251	250	237	246
Fruit set (fruits/100 flowerclusters)		replicate			
treatment		a	b	c	average
	1	96	110	98	101
	2	110	87	99	98

Comice

average of flowerclusters/tree		replicate				
treatment		a	b	c	d	average
	1	73	57	32	25	47
	2	70	92	28	62	63
average of fruits/tree		replicate				
treatment		a	b	c	d	average
	1	54	43	36	26	40
	2	51	59	31	47	47
average of kg/tree		replicate				
treatment		a	b	c	d	average
	1	16,8	13,8	12,5	8,7	13,0
	2	15,6	17,6	11,3	14,7	14,8
Average fruit weight (g)		replicate				
treatment		a	b	c	d	average
	1	312	321	352	338	331
	2	306	298	368	316	322
Fruit set (fruits/100 flowerclusters)		replicate				
treatment		a	b	c	d	average
	1	74	75	111	102	91
	2	73	64	111	75	81

Elstar

average of flowerclusters/tree		replic				
treatment		a	b	c	d	average
	1	83	100	90	91	91
	2	97	95	88	103	96
average of handthinned fruits/tree		replic				
treatment		a	b	c	d	average
	1	9	8	7	9	8
	2	13	11	8	9	10
average of fruits/tree		replic				
treatment		a	b	c	d	average
	1	53	55	57	58	56
	2	65	60	59	65	62
average of kg/tree		replic				
treatment		a	b	c	d	average
	1	8,0	8,3	7,7	8,6	8,2
	2	9,7	8,5	8,5	9,0	8,9
Average fruit weight (g)		replicate				
treatment		a	b	c	d	average
	1	150	150	136	148	146
	2	148	143	143	139	143
average of fruits/tree yield + thinning		replic				
treatment		a	b	c	d	average
	1	62	63	63	67	64
	2	79	71	68	74	73
fruit set (fruits/100 flowerclusters)		replicate				
treatment		a	b	c	d	average
	1	75	63	70	74	71
	2	81	75	76	71	76
average of % first pick		replic				
treatment		a	b	c	d	average
	1	29	52	44	43	42
	2	26	40	45	43	38

Kanzi

average of flowerclusters/tree		'replica			
treatment		a	b	c	average
1. Control		96	94	115	101
2. Biodevas		106	88	88	94

average of fruits/tree		'replica			
treatment		a	b	c	average
1. Control		52	51	48	50
2. Biodevas		52	46	47	48

average of kg/tree		'replica			
treatment		a	b	c	average
1. Control		10,4	11,1	11,3	10,9
2. Biodevas		10,4	8,9	10,6	10,0

Average fruit weight (g)		replicate			
treatment		a	b	c	average
	1	199	219	235	217
	2	201	196	224	207

average of % first pick		'replica			
treatment		a	b	c	average
1. Control		27	47	60	45
2. Biodevas		45	53	76	58

Fruit set (fruits/100 flowerclusters)		replicate			
treatment		a	b	c	average
	1	55	54	42	50
	2	49	52	54	51

Appendix 2. Fruit quality after harvest per replicate

average of firmnes					replicate				
variety	date	treatment	A	B	C	D	average		
Conference	26-aug		1	6,8	6,0	6,5			6,5
			2	6,6	6,6	6,7			6,6
Elstar	24-aug		1	5,5	5,7	5,7	5,7		5,6
			2	5,6	5,7	5,7	5,9		5,7
	2-sep		1	5,0	5,8	5,3	5,9		5,5
			2	5,2	5,5	5,7	5,7		5,5
Comice	14-sep		1	4,9	4,9	4,9	5,2		5,0
			2	4,9	4,7	5,3	4,8		4,9
Kanzi	29-sep		1	6,6	6,5	6,5			6,56
			2	6,4	6,5	6,7			6,52
	10-okt		1	6,2	6,3	6,5			6,3
			2	6,6	6,3	6,6			6,5
average				5,9	5,9	6,0	5,5	5,9	

average of starch					replicate				
variety	date	treatment	A	B	C	D	average		
Conference	26-aug		1	4,8	3,9	4,3			4,3
			2	4,6	4,4	3,9			4,3
Elstar	24-aug		1	6,5	6,1	6,4	6,0		6,2
			2	6,2	6,0	5,4	5,5		5,7
	2-sep		1	7,5	6,4	7,5	5,7		6,8
			2	7,3	6,7	6,8	9,5		7,6
Comice	14-sep		1	4,4	6,5	4,7	4,1		4,9
			2	6,3	5,5	4,6	6,4		5,7
Kanzi	29-sep		1	6,7	6,7	6,1			6,5
			2	7,2	6,3	6,6			6,7
	10-okt		1	6,4	6,4	6,1			6,3
			2	7,0	6,8	6,5			6,8
average				6,2	5,9	5,7	6,2	6,0	

average of sugar					replicate				
variety	date	treatment	A	B	C	D	average		
Conference	26-aug		1	13,0	13,6	12,8			13,1
			2	13,4	13,4	13,2			13,3
Elstar	24-aug		1	14,1	13,6	13,5	13,3		13,6
			2	14,2	14,0	13,7	13,1		13,7
	2-sep		1	14,3	14,2	14,3	13,9		14,2
			2	14,3	14,2	14,1	13,5		14,0
Comice	14-sep		1	13,9	14,1	14,0	14,0		14,0
			2	14,1	14,0	14,2	13,6		14,0
Kanzi	29-sep		1	12,0	12,2	12,6			12,3
			2	12,0	12,2	12,6			12,2
	10-okt		1	12,3	12,1	12,2			12,2
			2	12,3	11,9	12,5			12,2
average				13,3	13,3	13,3	13,6	13,3	

Appendix 3. Fruit quality after storage per replicate

Average of firmness direct after storage				replicate				
variety	pick	treatment	A	B	C	D	average	
Comice		1	1	3,9	4,1	4,2	3,6	4,0
			2	3,8	3,7	4,0	4,1	3,9
Conference		1	1	6,1	5,7	6,0		5,9
			2	6,1	5,8	6,1		6,0
Elstar	1		1	4,1	4,2	4,1	3,7	4,0
			2	4,0	4,0	4,1	4,0	4,0
	2		1	4,1	4,3	3,9	4,5	4,2
			2	3,6	4,0	4,3	4,5	4,1
Kanzi	1		1	7,0	7,1	7,2		7,1
			2	7,2	7,2	6,8		7,1
	2		1	7,0	7,1	7,0		7,0
			2	7,1	6,8	6,9		6,9
average				5,3	5,3	5,4	4,1	5,2

Average of firmness after shelf life				replicate				
variety	pick	treatment	A	B	C	D	average	
Comice		1	1	0,7	0,7	0,7	0,7	0,7
			2	0,6	0,5	0,7	0,8	0,6
Conference		1	1	1,1	1,3	1,1		1,2
			2	1,2	1,2	1,4		1,3
Elstar	1		1	4,2	4,1	4,3	3,9	4,1
			2	4,3	3,8	4,2	4,0	4,1
	2		1	4,1	4,2	4,2	4,4	4,2
			2	4,0	4,6	4,7	5,0	4,6
Kanzi	1		1	6,9	6,8	6,8		6,9
			2	7,1	7,0	7,1		7,1
	2		1	7,0	6,8	6,4		6,7
			2	6,9	7,1	6,8		6,9
average				4,0	4,0	4,0	3,1	3,9

Average of sugar				replicate				
variety	pick	treatment	A	B	C	D	average	
Comice		1	1	14,4	14,4	14,6	14,7	14,6
			2	14,6	14,3	14,6	14,4	14,5
Conference		1	1	13,9	14,3	13,9		14,0
			2	14,0	13,7	13,8		13,8
Elstar	1		1	13,2	13,6	13,1	12,7	13,2
			2	13,1	13,1	13,2	12,5	13,0
	2		1	13,4	13,4	13,0	13,2	13,2
			2	13,3	13,6	13,6	13,2	13,4
Kanzi	1		1	11,7	12,7	12,9		12,5
			2	12,8	12,4	12,6		12,6
	2		1	12,5	12,0	13,1		12,6
			2	11,9	12,4	11,9		12,1
average				13,2	13,3	13,3	13,3	13,3