Comparing 6 training system and cultar for peaches in Israel

Erez A., Antman S., Redel G and Wallach A.

Northern R&D Israel

Light and fruit production

- Fruit production efficiency depends on light interception and distribution. The first factor affects total yield while the second affects fruit quality.

- The training system and the tree spacings are the dominant factors influencing both light effects

- With peach and nectarine, that need heavy annual pruning to produce strong annual growth on which the fruit is borne, shade is building with age and may change the light exposure and distribution markedly.

- Peaches and nectarines are grown on relatively vigorous rootstocks. No size controlling rootstock exists in commercial orchards. As a result the trees tend to grow strongly leading frequently to excessive vegetation that might compete with fruit growing

- For quite a few years we have Giberellin biosynthesis inhibitors (GBI) like Cultar (paclobutrazol) that controls excessive vegetative growth.
We examined the combined effects of the training system with cultar on yield, fruit quality and manual labor needed for peach and nectarine production.

Aim of the trial

To test different training systems with GBI in comparison to the open vase in order to:

- Improve yield and fruit quality and
- Improve labor input efficiency in the orchard

Materials and methods

- We examined the nectarine 5-15 and the peach Summersnow

- The Rootstock : GF677

- Five training systems compared to open vase in every cultivar

- Every training system was planted in 4 rows in an area of 0.1 Hectare

- In addition, we checked the effect of Cultar, a Gibberellin biosynthesis inhibitor in combination with the different training systems

Training systems examined (1)

- Open vase: heading back the central trunk at planting, developing 4-5 main scaffolds. For 3 years to open the center by pruning the growing scaffolds on a lateral branch pointing out of the center. Cleaning the inner growth. Planting spacing: 4.5 *3 m

- Delayed vase: Leaving most of the lateral branches intact for first 3 years. Taking the central part out in the 4th year leaving lowest 4-5 main branches. (After Caruso in Italy). Planting spacing: 4.5 *3 m

- Axe: Central leader with wider lower part like the Italian Fusetto. Planting spacing: 4.5*2 m.

Training systems examined (2)

- <u>Y form</u>: Two scaffolds per tree aiming perpendicular to the row 60 degrees open center. Similar to the Australian Tatura. Planting spacing: 4.5*2m.

- <u>V form</u>: Trees planted inclined 30 degrees to the vertical pointing one right and one left of the center of the row. (After Caruso in Italy). Planting spacing: 4.5*1 m.

- <u>T form</u>: Tree is divided at 1.3 m to 4 scaffolds trained horizontally two back and two forward with a gap of 80 cm between scaffolds. (After the Lincoln canopy proposed for apples in New Zealand). Aimed at mechanical pruning of all upright branches in winter. Planting spacing: 3.5*4m.

Materials and methods (cont.)

- Systems V, Y and T needed a cordon system to support the trees. Some support was needed to the Axe system too.

- Trials continued for 6 years of which we collected yields during the last 3 years.

- We examined the yields, the fruit quality, the development of the trees, the input in cost and labor in every system
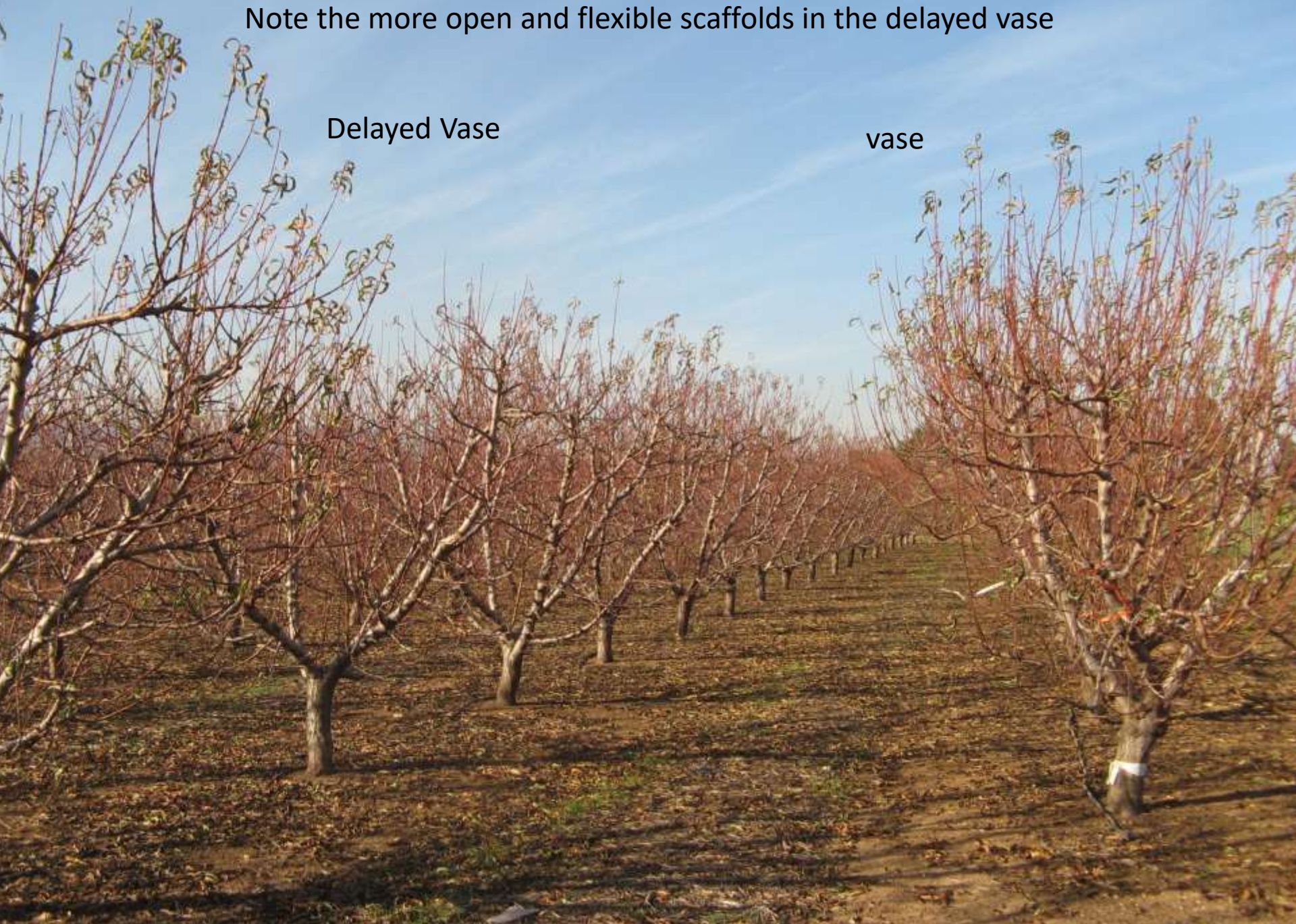
vase

Note the more open and flexible scaffolds in the delayed vase

Delayed Vase

vase

Axe

Y system

V system

T system

Flexibility of branches depends on avoiding heading back

Delayed Vase
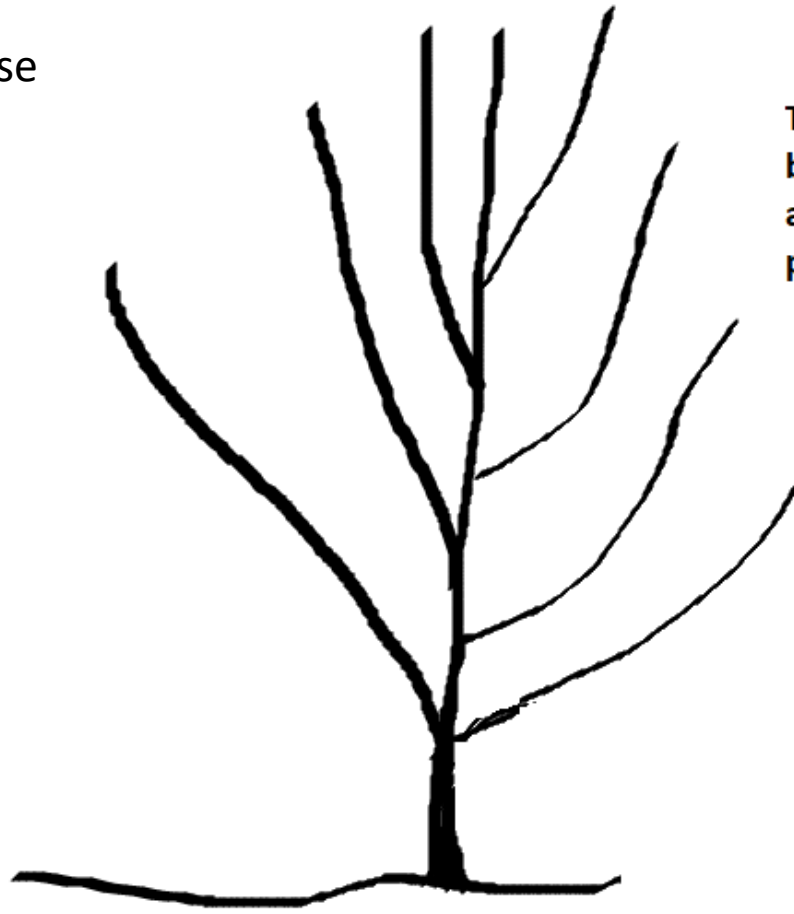
The pattern of branching angles in the peach

Cost till first production

Training	Establishment Cost(US$/Ha)	Difference from Vase	Labor in first 2 yrs /days. Ha
Vase	19697	-	16
Delayed vase	16765	- 2932	20
Axe	18142	-1555	34
T	28163	8466	21
Y	30968	11271	30
V	39380	19683	32

Yields in the 5-15 nectarine during 4 years in the different training systems (Tons/ha of fruit > 60 mm)

Year	Training systems					
	Vase	**Del. vase**	**Y**	**V**	**Axe**	**T**
2007	22.3	27.8	29.3	31.0	29.3	27.2
2009	33.2	23.7	36.7	28.1	27.4	20.9
2010	36.7	37.8	41.9	37.2	37.4	27.5
2011	27.5	33.8	32.1	31.8	23.6	22.6
Total	119.7	123.1	140.0	128.1	117.7	98.2
Mean	29.9	30.8	**35.0**	32.0	29.4	24.5
SE	3.2	3.1	2.8	1.9	2.9	1.6

Yields in the <u>Summersnow peach</u> during 3 years in the different training systems (Tons/ha of fruit > 65 mm)

Year	Training systems					
	Vase	**Del. vase**	**Y**	**V**	**Axe**	**T**
2009	28.3	30.6	27.2	17.4	26.3	14.8
2010	20.0	23.0	22.0	18.0	13.0	17.0
2011	20.7	25.1	23.3	21.9	15.6	4.9
Total	69.0	78.7	72.5	57.3	54.9	36.7
Mean	23.0	**26.2**	24.1	19.1	18.3	12.2
SE	2.7	2.3	1.6	1.4	4.1	3.7

Effect of training system and Cultar on yield, fruit quality and labor in 5-15 nectarine

Training	Cultar treatments	Yield Tons/ha	Yield Tons>60	Working days/Ton	Relative to Vase (%)	Working days/ton>60	Relative to vase >60 (%)
T	2008-2010	27.7	19.2	6.52	92.8	7.99	72.9
	2010-2011	27.0	23.4	6.68	95.0	7.73	70.4
	-	27.7	22.6	6.52	92.8	9.39	85.6
V	2008-2010	41.7	35.8	6.31	89.7	7.35	67.0
	2010-2011	47.4	39.3	5.60	79.7	6.73	61.4
	-	37.6	31.8	7.00	99.6	8.27	75.4
Y	2008-2010	48.0	**40.6**	5.51	78.4	6.53	**59.5**
	2010-2011	44.5	**39.9**	5.95	84.6	6.65	**60.6**
	-	39.0	32.1	6.79	96.7	8.26	75.3
Del Vase	2008-2010	43.4	35.3	7.07	100.6	8.71	79.4
	2010-2011	42.2	33.0	7.29	103.7	9.31	84.9
	-	41.7	33.8	7.36	104.7	9.09	82.9
Vase	2008-2010	44.6	37.2	6.76	96.1	9.20	83.8
	2010-2011	45.1	36.7	6.70	95.3	8.26	75.3
	-	42.9	27.5	7.03	100	10.97	100
Axe	2008-2010	47.0	37.2	6.56	93.3	8.30	75.6
	2010-2011	42.8	35.4	7.21	102.6	8.72	79.5
	-	35.6	23.6	8.66	123.2	13.09	119.4

Training	Cultar treatments	Yield Tons>60	Working days/ton>60	Relative to vase >60 (%)
T	2008-2010	19.2	7.99	72.9
	2010-2011	23.4	7.73	70.4
	-	22.6	9.39	85.6
V	2008-2010	35.8	7.35	67.0
	2010-2011	39.3	6.73	61.4
	-	31.8	8.27	75.4
Y	2008-2010	**40.6**	6.53	**59.5**
	2010-2011	**39.9**	6.65	**60.6**
	-	32.1	8.26	75.3
Del Vase	2008-2010	35.3	8.71	79.4
	2010-2011	33.0	9.31	84.9
	-	33.8	9.09	82.9
Vase	2008-2010	37.2	9.20	83.8
	2010-2011	36.7	8.26	75.3
	-	27.5	10.97	100
Axe	2008-2010	37.2	8.30	75.6
	2010-2011	35.4	8.72	79.5
	-	23.6	13.09	119.4

Effect of training system and Cultar on yield, fruit quality and labor in Summersnow peach

Training	Cultar treatments	Yield Tons/ha	Yield Tons>65	Working days/Ton	Relative to Vase (%)	Working days/ton>65	Relative to vase >65(%)
T	2008-2010	11.5	10.1	7.29	121.6	8.37	120.9
	2010-2011	13.4	12.1	6.27	104. 6	7.50	108.4
	-	5.6	4.9	15.01	250.4	17.27	249.5
V	2008-2010	28.0	26.0	5.10	85.0	5.50	79.5
	2010-2011	24.1	22.6	5.93	99.0	6.38	92.1
	-	25.0	21.9	5.71	95.2	6.52	94.2
Y	2008-2010	31.1	**28.5**	4.73	78.8	5.17	**74.7**
	2010-2011	24.7	23.4	5.96	99.3	6.30	91.1
	-	25.9	23.3	5.69	94.9	6.30	91.0
Del Vase	2008-2010	31.9	**29.0**	4.14	69.0	4.55	**65.7**
	2010-2011	30.7	**28.6**	4.31	71.8	4.67	**67.5**
	-	28.9	25.1	4.56	76.1	5.26	76.0
Vase	2008-2010	32.0	**27.6**	4.48	74.7	5.19	**75.0**
	2010-2011	32.6	**28.2**	4.39	73.3	5.09	**73.5**
	-	23.9	20.7	6.00	100	6.92	100
Axe	2008-2010	21.5	20.2	7.44	124.05	7.93	114.6
	2010-2011	22.0	20.9	7.28	121.5	7.71	111.4
	-	17.0	15.6	9.43	157.3	10.25	148.2

Training	Cultar treatments	Yield Tons/ha	Yield Tons>65			Working days/ton> 65	Relative to vase >65(%)
T	2008-2010	11.5	10.1			8.37	120.9
	2010-2011	13.4	12.1			7.50	108.4
	-	5.6	4.9			17.27	249.5
V	2008-2010	28.0	26.0			5.50	79.5
	2010-2011	24.1	22.6			6.38	92.1
	-	25.0	21.9			6.52	94.2
Y	2008-2010	31.1	**28.5**			5.17	**74.7**
	2010-2011	24.7	23.4			6.30	91.1
	-	25.9	23.3			6.30	91.0
Del Vase	2008-2010	31.9	**29.0**			4.55	**65.7**
	2010-2011	30.7	**28.6**			4.67	**67.5**
	-	28.9	25.1			5.26	76.0
Vase	2008-2010	32.0	**27.6**			5.19	**75.0**
	2010-2011	32.6	**28.2**			5.09	**73.5**
	-	23.9	20.7			6.92	100
Axe	2008-2010	21.5	20.2			7.93	114.6
	2010-2011	22.0	20.9			7.71	111.4
	-	17.0	15.6			10.25	148.2

Summersnow

Effect of Cultar on vegetative growth in the Summersnow peach.

(new growth in cm measured on April 28).
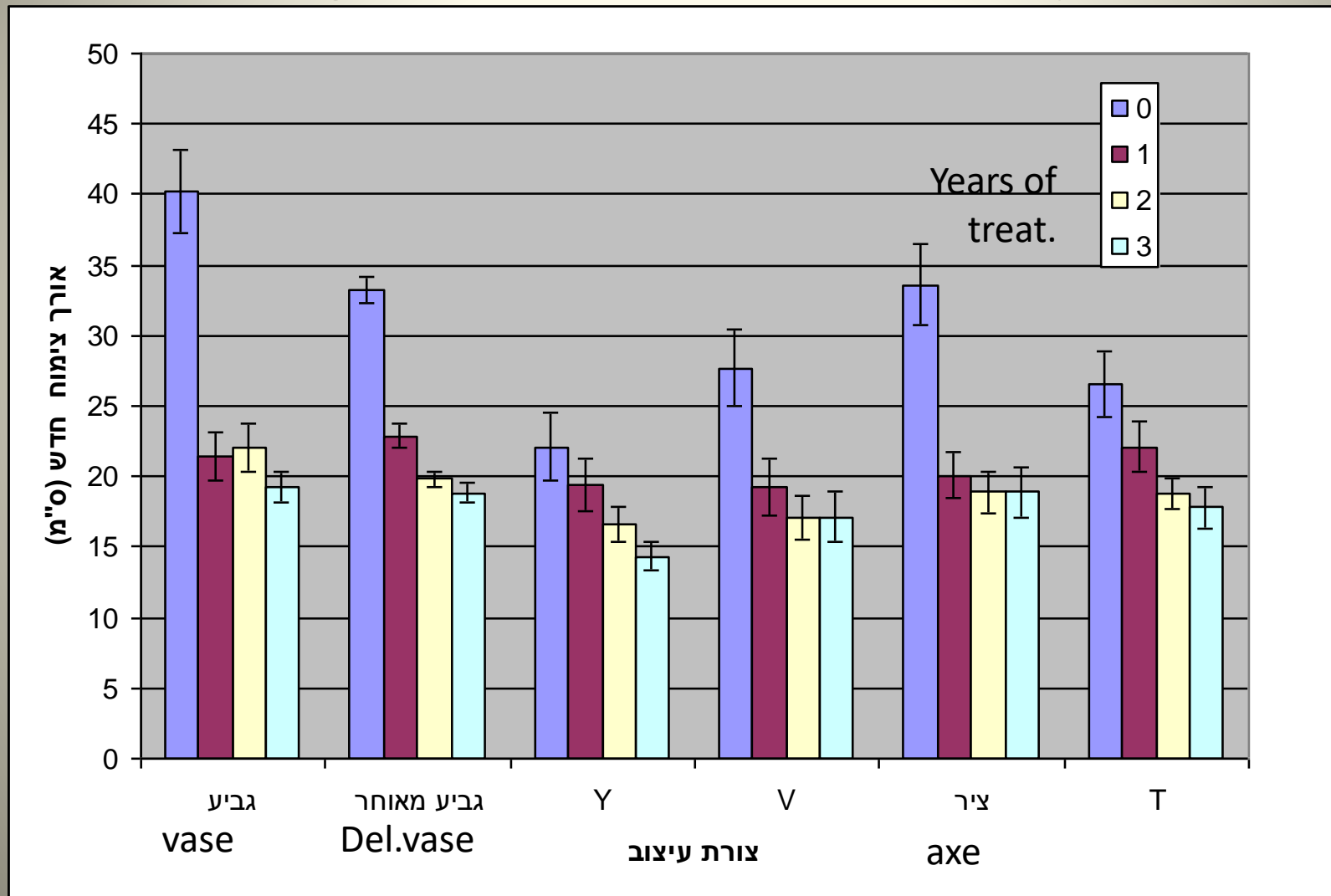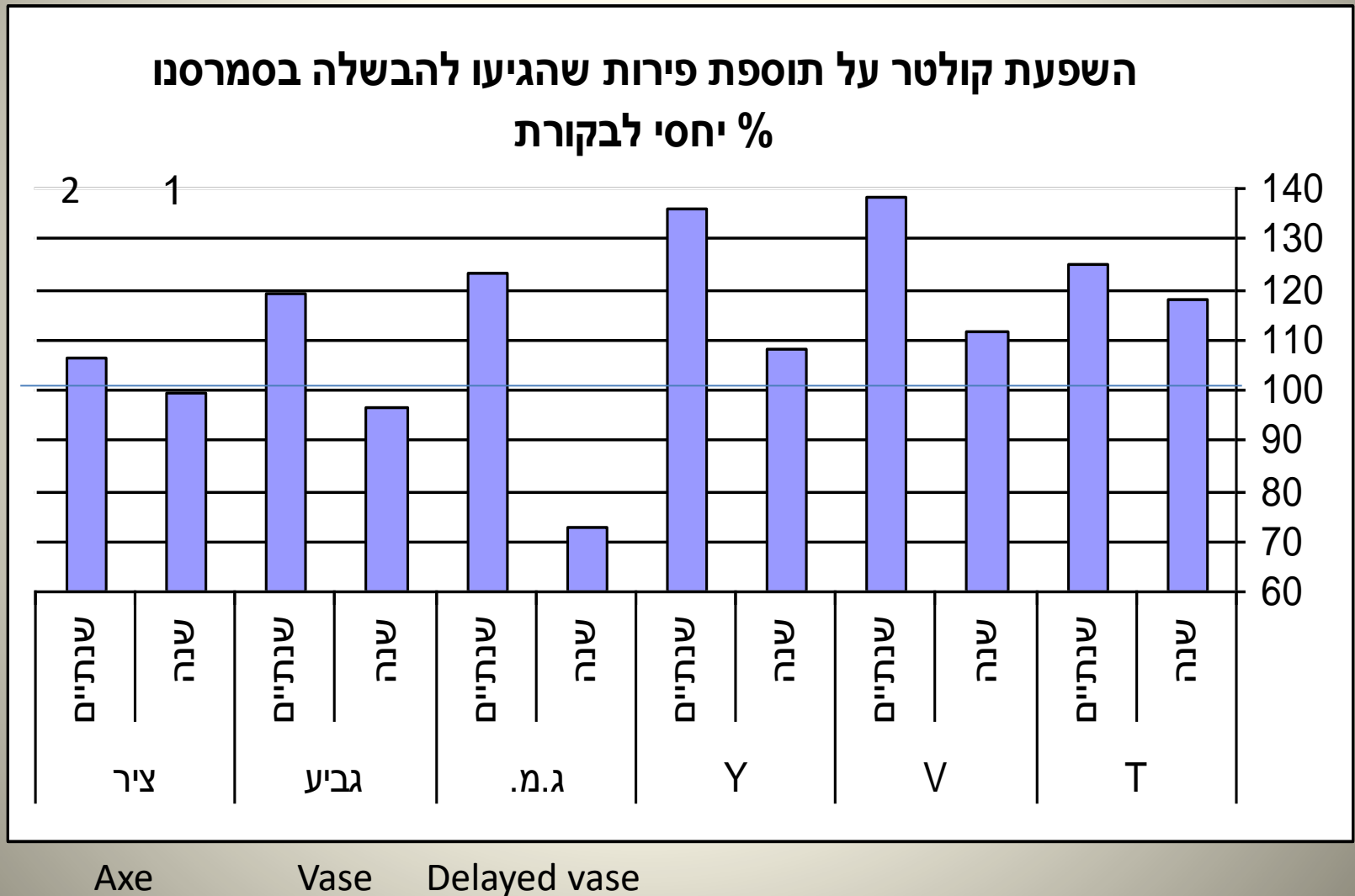
Cultar

Control

Effect of Cultar during one and two years on fruits that reached maturity after thinning (control =100)

השפעת קולטר על תוספת פירות שהגיעו להבשלה בסמרסנו
% יחסי לבקורת

Axe   Vase   Delayed vase

Sugar (TSS) and color of 5-15 fruit in the various systems and cultar treatments

Cultar	VASE color (0-4)	TSS (%)	DEL. VASE color (0-4)	TSS (%)	AXE color (0-4)	TSS (%)	Y color (0-4)	TSS (%)	V color (0-4)	TSS (%)	T Color (0-4)	TSS (%)
0	2.8	9.6	2.9	8.5	**3.4**	9.0	**3.4**	9.0	**3.6**	8.8	3.1	8.5
1	2.7	8.7	3.2	9.4	2.9	8.5	3.2	**9.5**	3.4	9.2	3.3	8.8
2	3.2	8.5	3.0	9.6	3.0	10.4	3.2	9.4	3.3	**9.3**	3.2	9.0
3	3.2	**10.2**	3.0	**9.9**	3.2	**11.2**	3.3	**9.5**	3.0	8.6	3.3	9.0

Conclusions regarding training systems

Two systems appeared to have economical advantage
The delayed vase in the Summersnow peach and the Y system in both cultivars

The delayed vase had the following advantage :
 Lower establishment costs
Good open center
Extra fruit in first 2 years of production
Flexible scaffolds allowing opening of the center of the tree with fruit weight

The Y system had the following advantages:
Higher yield and better fruit quality especially in the 5-15 nectarine
Better exposure of the tree to light
The extra costs of establishing the trellis will be covered in the first 4 fruiting years.

The T system was disappointing as many fruits were borne on horizontal branches so mowing was not efficient for fruit thinning

The V system was more expensive and not superior to the Y system

Conclusions regarding Cultar application

Cultar reduced vegetative growth in all training systems

Reduced fruit drop

increased markedly the yield of large fruits in both cultivars

Major effects on the **Axe, and Y sytems.**

It improves also TSS levels in the fruits

Improved labor efficiency in the orchard

Clearly Cultar favors better fruiting in peaches and nectarines grown on vigorous rootstocks