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Cherry Training Systems: Yield and fruit quality

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Cherry training system effects on light interception, yield and fruit quality

Greater availability of semi-dwarfing rootstocks has enabled the adoption of high-density cherry orchard systems.

Research over two years investigated light interception and fruit quality of five-year-old 'Kordia' on 'Krymsk 5' rootstock trained to the 2D planar training systems of Bibaum (BB), free- standing steep leader (SL) super spindle axe (SSA), tall spindle axe (TSA), upright fruiting offshoot (UFO) and the (see Figure 1 for indicative tree structures).

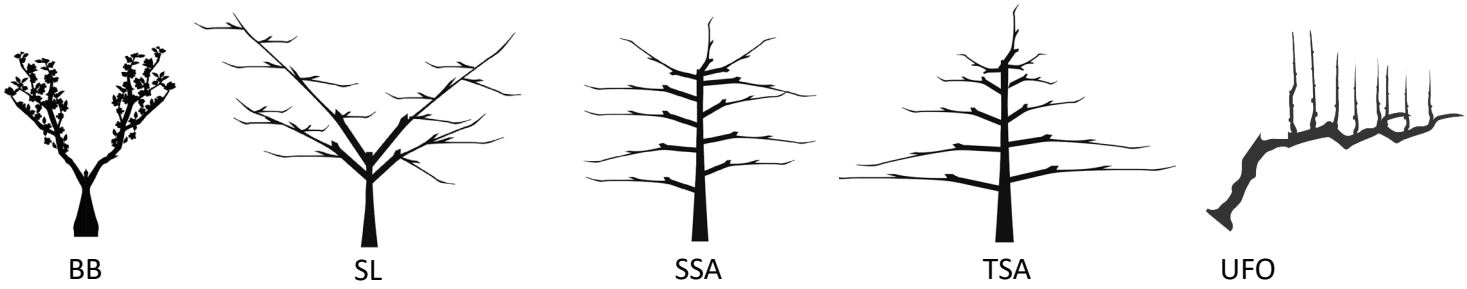

Figure 1: *Illustrations of the five different training systems Bibaum (BB), steep leader (SL), super spindle axe (SSA), tall spindle axe (TSA) and upright fruiting offshoot (UFO).*

Planting distances

High density plantings are critical to take full advantage of the light and space beneath protected cropping systems. Table 1 below illustrates the different planting distances and row spacings for each training system.

Training System	Tree spacing (m)	Row width (m)	Trees per hectare	Fruiting branches per hectare
BB	1.8	3.2	1,700	3,400
SL	1.8	4.8	1,100	4,400
SSA	0.9	3.2	3440	3440
TSA	1.8	3.2	1,700	1,700
UFO	1.8	3.2	1,700	13,600

Table 1: *Average tree spacing and planting distances for each training system for the sweet cherry cultivar 'Kordia' on 'Krymsk 5' rootstock.*

Light Interception

Canopy light interception increased for all training systems in the second season as trees came into fifth leaf (Table 2.). Average light interception was highest for the UFO and SL training systems (69%) followed by BB (66%), SSA (62%) and TSA (60). The increase in light interception for all training systems was due to increased lateral wood within the canopies.

Training System	Light Interception	
	Season 1	Season 2
BB	61%	79%
SL	66%	71%
SSA	54%	70%
TSA	52%	68%
UFO	66%	71%

Table 2: *Mean light interception values of the various training systems in the 2019–2020 and 2020–2021 seasons.*

Yield and fruit quality

Training system and yield

The highest average yields over the two seasons from the different training systems were

- SSA 15.1 t/ha
- SL 14.5 t/ha
- UFO 12.7 t/ha
- TSA 11.2 t/ha
- BB 11.2 t/ha

The three highest average yielding training systems corresponded with the three training systems that had the highest number of fruiting branches per hectare as seen in Table 1.

High yield & crop load reduces fruit quality

In each season, higher yields per hectare were associated with reduced fruit total soluble solids (°Brix) (Fig. 2). This was also true for high crop loads (number of fruit per limb cross sectional area). Superior fruit total soluble solid levels for the Kordia cultivar are between 18-20 °Brix.

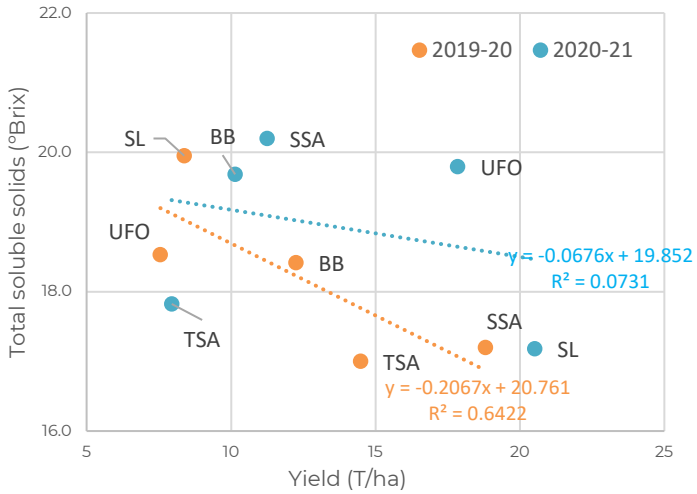

Figure 2: *Correlation between yield per hectare and fruit total soluble solids of sweet cherry cultivar 'Kordia' across different training systems and seasons*

2D training system: *'Kordia' grafted to Krymsk 5 trained to the* upright fruiting offshoot (UFO) *structure under a Cravo protected cropping system*

Fruit size

The largest average fruit size in each season came from the TSA training systems (Table 3.). Fruit diameter was larger for all training systems in the first season in contrast to the second season (Table 3.). Warmer average temperatures (+0.5°C) and higher average solar radiation levels (+0.5 W m²) present in the first season are key factors contributing to the increased fruit size.

Table 3: *Descriptive percentage fruit diameters for first-class sweet cherry cv. 'Kordia' fruit on multiple training systems for season 1 (S1) (2019-2020) and season 2 (S2) (2020-2021).*

	UFO		SSA		TSA		BB		SL	
Diameter	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
<26mm	1	36	1	24	0	2	1	3	0	10
26-30mm	97	62	71	75	59	82	66	94	72	84
>30mm	2	2	28	1	41	16	33	3	28	6
Average	28	26.5	29.3	27	29.5	28.5	29.4	27.9	29.3	27.1

2D training systems for lateral bearing cultivars

In this study, training systems such as the **TSA, BB and SL** provided sufficient space for the strong growth of fruiting laterals. This provides the ideal environment for high quality fruit production when crop loads are not too large. However, no individual training system outperformed all others consistently in terms of yield or quality.

As trees become fully mature (+6 years) the training system primarily dictates light interception. However, ongoing pruning practices imposed on the system have the ability to alter light interception, fruit yield and quality.

Ideal crop loads for lateral bearing cultivars for each of these training systems is still unknown Results from this study indicate that excessive fruit loads will result in poorer fruit quality (Figure 2).

High density planting: *'Kordia' grafted to Krymsk 5 trained to the* super spindle axe *structure under a Cravo protected cropping system*

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