

THE EFFECTS OF TRUNK SCORING AND PRUNING METHODS ON FRUIT QUALITY OF APPLES

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(Received June 16, 2005/Accepted November 16, 2005)

A B S T R A C T

From 2001 to 2004 a study was carried out on the effect of trunk scoring and pruning methods on the yield and quality of 'Jonagold' and 'Elstar' apple fruit. After the eighth year after planting, the trees were subjected to four different methods of training: 1) control – pruning during blossoming; 2) pruning and trunk scoring during blossoming; 3) branch breaking at the end of May and the beginning of June; 4) both trunk scoring and branch breaking. The trees were grafted on M.9 and M.26 rootstocks, trained as spindles, and planted 3.5 x 1.2 m apart (2381 trees/ha).

Yearly trunk scoring improved yield in 'Elstar' on both rootstocks, but did not improve fruit colour. In 'Jonagold' trees on M.26 rootstock, trunk scoring alone or combined with branch breaking intensified fruit colour. Branch breaking increased yield in 'Jonagold' trees on M.26 rootstock.

Key words: apple, trunk scoring, breaking of branches, yield, fruit quality, rootstock

INTRODUCTION

Trunk scoring causes the outflow of assimilates, induces flowering, and reduces vegetative growth. The trunk should be scored at two places and at the right age to prevent the water accumulation (Mika, 2002). According to Poniedziałek et al. (2003), trunk scoring improves colour in 'Melrose' grafted on M 26 rootstock. However, Elfving and Loughheed (1991) reported that trunk scoring did not affect fruit size.

Branch breaking reduced vegetative growth because the part of the branch with dormant buds was removed (Kołodziejczak, 2000). Tearing off shoots in the upper part of canopy improved size and colour in trees grafted on M.26 (Gruca et al., 2002). Fruit quality improves after branch breaking because of the better distribution of light in the crown of tree (Wertheim et al., 2001).

Tearing off shoots is a faster method of training of trees than pruning (Mika, 2002). However, tearing off weak shoots could reduce induction of flower buds (Poniedziałek et al., 2000).

MATERIAL AND METHODS

The experiment was carried out in 2001-2004 at the Experimental Station in Samotwór near Wrocław. Trees of the cultivars 'Elstar' and 'Jonagold' were planted in the spring of 1995 on M.26 and M.9 rootstock 3.5 x 1.2 m apart (2381 trees per ha) and trained as spindles. Eight years after planting, the trunks were scored and the branches in the centre of the canopies were broken. The control trees were pruned with shears during blossoming. Trunks were scored during blossoming with a hand saw at two places: 15 cm and 65 cm above the budding place. Score were made on opposite sides of the trunk to a depth of one third of the circumference. Two-year-old branches were broken at the end of May and the beginning of June. Stronger branches were pruned with shears, and shoots in the upper part of a canopy were torn off. The last treatment included both trunk scoring and branch breaking.

The experiment was carried out in a randomized block design with four replications of four trees each. The yield per tree, mean weight of apples, the size of fruit in every class of diameter and the fruit skin covered with blush were assessed.

Data were statistically elaborated by analysis of variance, followed by Duncan's multiple-range t-test at $P \leq 0.05$.

RESULTS AND DISCUSSION

The methods of training of trees used in the experiment can have an influence on the yield and its quality. However, this influence depends on the cultivar and rootstock.

Table 1. Yield of 'Elstar', depending on of trunk scoring and breaking of branches

Treatment	Yield [kg tree ⁻¹]				Total yield 2001-2004
	2001	2002	2003	2004	
M.26					
Control	8.7 a*	11.1 abc	12.5 bc	7.0 a	39.3 abc
Trunk scoring	5.5 a	21.5 bc	7.6 abc	17.9 bc	52.5 c
Trunk scoring + branch breaking	6.0 a	3.9 ab	14.6 bc	1.7 a	26.2 a
Branch breaking	3.5 a	8.3 ab	14.8 c	1.9 a	28.5 ab
M.9					
Control	7.7 a	20.0 bc	5.1 ab	13.7 abc	46.5 c
Trunk scoring	5.1 a	25.3 c	2.5 a	20.0 c	52.9 c
Trunk scoring + branch breaking	4.9 a	15.7 abc	10.7 abc	12.4 a	43.7 bc
Branch breaking	3.0 a	12.9 abc	10.7 abc	9.2 ab c	35.8 abc

*Means followed by the same letter do not differ significantly at $P=0.05$ according to Duncan's t-test

In 'Elstar', yield was generally higher with trunk scoring, and generally lower with branch breaking (Tab. 1). Neither method influenced size or colour (Tab. 3, 5).

Table 2. Yield of 'Jonagold', depending on of trunk scoring and breaking of branches

Treatment	Yield [kg tree ⁻¹]				Total yield 2001-2004
	2001	2002	2003	2004	
M.26					
Control	2.7 a*	29.6 b	6.1 a	24,3 c	62.7 a
Trunk scoring	9.0 ab	27.8 ab	11.2 abcd	23.9 bc	71.9 ab
Trunk scoring + branch breaking	7.0 ab	26.8 ab	18.3 cd	19.1 bc	71.2 ab
Branch breaking	5.5 ab	31.0 b	16.9 bcd	21.5 bc	74.9 b
M.9					
Control	7.6 ab	28.3 ab	10.9 abc	18.7 bc	65.5 ab
Trunk scoring	4.8 ab	25.9 ab	10.0 ab	17.7 abc	58.4 a
Trunk scoring + branch breaking	4.9 ab	25.9 ab	18.9 d	15.4 ab	65.1 ab
Branch breaking	10.9 b	20.9 a	17.6 bcd	9.8 a	59.2 a

*For explanation, see Table 1

Table 3. Percentage of apple in different size classes of 'Elstar' in (mean 2001-2004)

Treatment	% of apple with diameter [cm]				Mean fruit weight 2001-2004
	> 7.5	7.5 -6.5	6.5-5.5	<5.5	
M.26					
Control	8.5*	37.1	43.0	11.4	131 a**
Trunk scoring	33.0	37.7	26.8	2.5	123 a
Trunk scoring + branch breaking	32.3	33.9	31.5	2.3	142 ab
Branch breaking	12.3	51.3	34.8	1.6	133 ab
M.9					
Control	22.1	43.4	25.6	8.9	133 ab
Trunk scoring	21.8	37.3	32.1	8.8	129 a
Trunk scoring + branch breaking	28.6	23.3	42.5	5.6	130 a
Branch breaking	36.8	49.7	12.2	1.3	153 a

*Any significant differences **For explanation, see Table 1

Table 4. Percentage of apple in different size classes of 'Jonagold' in (mean 2001-2004)

Treatment	% of apple with diameter [cm]				Mean fruit weight 2001-2004
	> 7.5	7.5 -6.5	6.5-5.5	<5.5	
M.26					
Control	85.1 ab*	14.9 a	0.0 a	0.0 a	214 c
Trunk scoring	87.7 b	11.9 a	0.4 a	0.0 a	204 abc
Trunk scoring + branch breaking	54.0 a	44.0 b	2.0 a	0.0 a	186 a
Branch breaking	60.7 ab	28.1 ab	11.2 a	0.0 a	193 ab
M.9					
Control	76.4 ab	17.4 a	6.2 a	0.0 a	202 abc
Trunk scoring	72.8 ab	20.4 a	5.8 a	1.0 a	209 bc
Trunk scoring + branch breaking	71.1 ab	26.6 ab	2.3 a	0.0 a	205 abc
Branch breaking	74.0 ab	24.3 ab	1.7 a	0.0 a	202 abc

*For explanation, see Table 1

In 'Elstar' on M.9 rootstock, mean fruit weight was higher, but yield was lower (Tab. 1, 3).

Table 5. Percentage of apple in different coloration classes of 'Elstar' (mean 2001-2004)

Treatment	% of apple with blush on surface			
	> 75%	50-75%	25-50%	< 25%
M.26				
Control	12.9*	20.9	30.4	35.8
Trunk scoring	24.0	20.0	28.3	27.7
Trunk scoring + branch breaking	23.3	27.2	25.0	24.5
Branch breaking	18.2	27.8	30.4	23.6
M.9				
Control	17.5	23.9	31.1	27.5
Trunk scoring	21.5	24.5	26.1	27.9
Trunk scoring + branch breaking	21.1	19.6	34.2	25.1
Branch breaking	24.4	32.0	22.9	20.7

*Any significant differences

Table 6. Percentage of apple in different coloration classes of 'Jonagold' (mean 2001-2004)

Treatment	% of apple with blush on surface			
	> 75%	50-75%	25-50%	< 25%
M.26				
Control	8.6 a*	30.6 ab	35.8 b	25.0 a
Trunk scoring	23.4 b	24.9 a	28.4 ab	23.3 a
Trunk scoring + branch breaking	21.7 ab	35.2 b	22.4 a	20.7 a
Branch breaking	14.5 ab	31.2 ab	27.6 a	26.7 a
M.9				
Control	13.1 ab	37.9 b	23.6 a	25.4 a
Trunk scoring	20.6 b	29.1 ab	28.9 ab	21.4 a
Trunk scoring + branch breaking	17.0 b	29.6 ab	26.8 a	26.6 a
Branch breaking	19.9 b	25.2 a	26.2 a	28.7 a

*For explanation, see Table 1

In 'Jonagold' on M.26 rootstock, branch breaking increased yield but reduced mean fruit weight (Tab. 2 and 4). Trunk scoring improved fruit colour (Tab. 6). This agrees well with earlier reports (Poniedziałek et al., 2003; Elfving and Lougheed, 1991. According to Gruca et al. (2002), tearing off shoots in the upper part of a canopy improved size and colour in apples. In this experiment, branch breaking in the centre of the canopy did not affect fruit colour.

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JAKOŚĆ JABŁEK W ZALEŻNOŚCI OD NACINANIA PNIA I METOD CIĘCIA

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S T R E S Z C Z E N I E

Badano zabieg nacinania pnia i wyłamywania gałęzi drzew w sadzie jabłoniowym. Od ósmego roku po posadzeniu w okresie kwitnienia piłką ręczną nacinano pień z dwóch stron. Na przełomie maja i czerwca wyłamywano gałęzie w środkowej części korony. Trzecią kombinację stanowiły drzewa, na których zastosowano zabieg nacinania pnia i wyłamywania gałęzi jednocześnie. Kontrolę stanowiły drzewa cięte sekatorem w okresie kwitnienia. Skuteczność zabiegów oceniano na drzewach odmian 'Elstar' i 'Jonagold' na podkładkach: M.26 i M.9 posadzonych w rozstawie 3,5 x 1,2 m (2381 drzew/ha). Na obu badanych podkładkach coroczne nacinanie pnia okazało się zabiegiem poprawiającym plonowanie drzew odmiany 'Elstar'. Zastosowane zabiegi nie wpłynęły na wybarwienie owoców odmiany 'Elstar'. Dla drzew odmiany 'Jonagold' na podkładce M.26 wyłamywanie gałęzi wpłynęło na wzrost plonu, a zabieg nacinania pnia zwiększył procent owoców wybarwionych w porównaniu do drzew kontrolnych.

Słowa kluczowe: jabłoń, nacinanie pnia, łamanie gałęzi, plon, jakość owoców, podkładka