

## Results from an experiment about pruning of the apple variety ‘GoldRush’

### Ergebnisse eines Schnittversuchs bei der Apfelsorte ‘GoldRush’

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#### Abstract

The scab resistant apple variety ‘GoldRush’ can be grown in regions, where vineyards are common. At the LVWO Weinsberg ‘GoldRush’ is ripening about October 20<sup>th</sup>. In organic fruit growing this variety must be thinned strongly, because it tends to alternate bearing. The intention of the small experiment in the organically grown orchard Katzental was to reduce by special pruning measurements the time for thinning by hand and to improve the fruit quality. During the years 2001 to 2005 clear effects could be seen on the size of the apples. The time for hand thinning varied from year to year depending from the setting of blossom clusters, but there was no success in reducing thinning time by pruning alone. There was a positive influence on the quantity of picked apples per hour. The trees grew more balanced, the number and the length of the one-year-old twigs/branch were higher in 2005. There was a middling effect of the severe pruning on the alternate bearing. Well-considered pruning is an important component within organic cultivation to produce apple of high quality.

**Keywords:** Apple, GoldRush, pruning, hand thinning , fruit quality

#### Introduction

GoldRush is a scab resistant apple variety, typical properties are: late picking time (at the LVWO Weinsberg about October 20<sup>th</sup>), alternate bearing and not too strong growing of the trees. In organic fruit growing many hours per ha are necessary for thinning by hand to produce apples of a good size and inner quality. The question of this trial was, if with a more severe pruning type the time for thinning by hand could be reduced in the years with high fruit setting and if the alternate bearing could be equalized.

#### Material and Methods

The trees of this experiment had been grown in an organic nursery and were planted in 1998, the distance within the row was 1,20 m and between the rows 3,50 m. The two different pruning types started in February 2001. The aim of the “severe-pruning”-variant was to reduce the number of branches with lots of blossom-buds strongly, additionally parts with bad exposure to the sun were removed. Each variant was replicated three times, in each replication 7 trees were evaluated. The additional removing of blossom-clusters per diameter of the trunk was about 10-12 % in comparison to the “normal” winter pruning. Two or three times thinning by hand followed between end of May and harvest.

From 2001 to 2005 the following characteristics were evaluated each year: Diameter of trunk (at the beginning of the vegetation), number of blossom-clusters per tree, effort and intensity of thinning by hand, number of apples and kg/tree at harvest, distribution of the apples within 8 classes of size. Trees outside the experiment, which were not thinned so intensively, could be used as a comparison for more extensively cultivation. In 2005 also the time necessary for picking each tree was registered. At the end of the experiment in December 2005 the number and the length of twigs/branch grown in 2005 was measured (all twigs longer than 2 cm, four branches/tree), and divided in

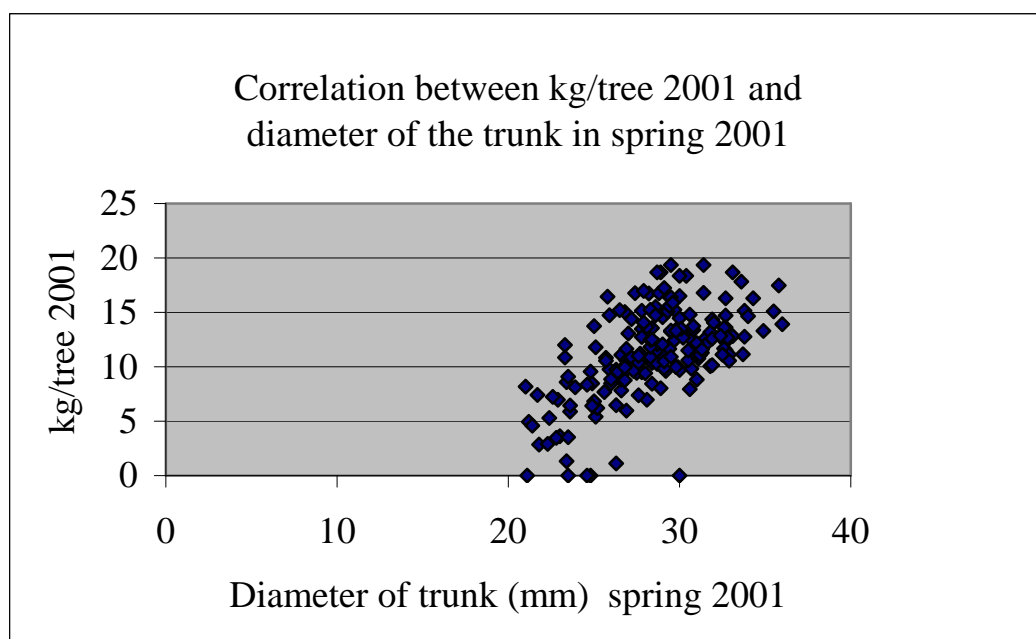
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classes: < 5 cm, 5-10 cm, 10-15 cm and > 15 cm. This evaluation should characterize the growing balance of the trees.

## Results

The data about the yield in 2001 were compared with data from 2000 (number of apples/tree in May, number and kg at harvest) to find correlations, but without success. Rather a clear correlation between diameter of the trunk at the beginning of vegetation and the yield at harvest could be found (see figure 1).



**Figure 1:** Correlation between yield 2001 and diameter of trunk in early spring 2001 (180 trees)

For each tree the average fruit-weight had been calculated, comparing these data and the yield per diameter a kind of clue for an optimal fruit size came out (for the variety GoldRush under the climatic conditions at Weinsberg):

Diameter (in mm) \* 2,4 = number of apples/tree at harvest

In this calculation an average fruit setting of 0,75 apples/blossom-cluster at harvest (with additional thinning by hand) has been respected. For example a younger tree with a diameter of 30 mm should have only 72 apples at harvest to reach a good size. Under normal pollination-conditions about 100 blossom-clusters per tree are necessary for that yield. From 2002 to 2005 this clue had been respected at the intensity of thinning by hand, especially in the years with high fruit-setting.

**Table 1:** Blossom-clusters(BB) and effort for thinning by hand (per tree) in the years with high yield

Variant	2001		2003		2005	
Control	111 BB	4,0 min	329 BB	6,9 min	270 BB	15,5 min
Severe pruning	123 BB	4,9 min	313 BB	8,1 min	253 BB	14,7 min

The number of blossom-clusters has to be seen in relation to the diameter of the trees. The influence of 'severe-pruning' wasn't as high as originally expected at the beginning of the experiment. Most parts of the tree could be reached from soil during thinning work. With increasing age of the

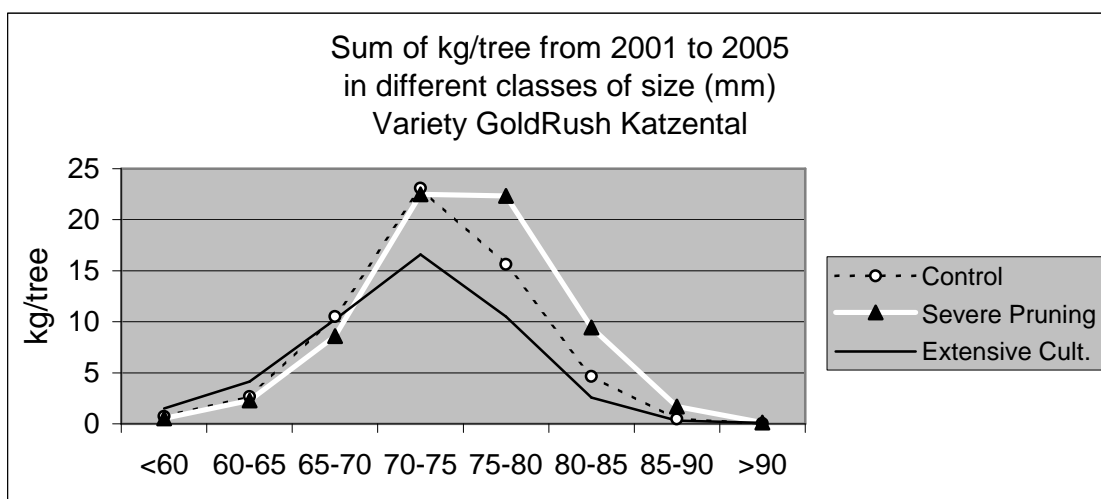
trees up to 600 hours per ha were necessary (in a year with an extremely high setting of blossom-clusters), when only thinning by hand and no sprayings during blossom were done. The high fruit setting in 2005 was still caused by the years before: Extremely dry and hot weather in summer 2003 was unfavourable for the blossom-quality in 2004, so the yield in 2004 was low, good conditions had been in 2004 for the development of blossom-buds for 2005. In combination with a good pollination the fruit setting in 2005 was extremely high. The results of the yield from 2001 to 2005 can be compared in table 2.

**Table 2:** Yield (kg/tree) and average weight of the fruits from 2001 to 2005

Characteristic	Yield (kg/tree)			Weight of the fruits (g)		
	Control	Severe Pruning	Extensive cultivation	Control	Severe Pruning	Extensive cultivation
2001	9,72	12,70	11,25	153	156	148
2002	6,41	6,03	4,58	170	161	165
2003	16,34	16,80	14,80	147	149	118
2004	8,46	9,75	5,86	165	176	157
2005	17,93	17,59	10,03	158	174	167

Using the clue in the variants of the experiment had a big influence in the years 2003 and 2004 in comparison to the extensive cultivation. Caused by the hot and dry summer the fruit-weight in 2003 was lower than 150 g, in the extensive cultivation it was lower than 120 g. In 2004 rain fell more balanced (enough in September and October), so fruit-weights between 157 and 176 g could be realized.

Effects of the 'severe-pruning'-variant are mainly visible in the years with high fruit-setting, especially at the distribution of the fruits in different classes of size. The yield (kg/tree) in each size was summarized for the whole duration of the experiment (2001 to 2005, see figure 2). Severe pruning caused a clear moving to the classes 70-80 mm, that was often combined with a better balance between fruits and growing of the twigs.



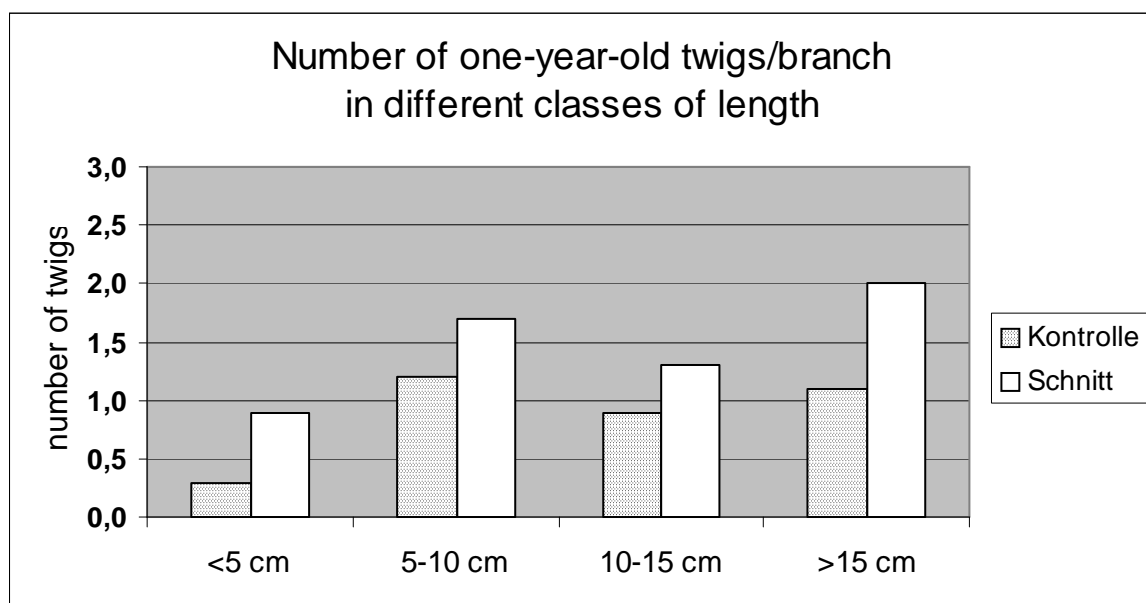
**Figure 2:** kg/tree in classes from < 60 mm up to > 90 mm, summarized yield from 2001 to 2005. Supplementary evaluations in 2005

After the blossom-bud-evaluation in January 2005 it was clear, that the trees had very high setting of blossom-buds. So the time for pruning each tree had been stopped. The growing character of the

8 year old 'GoldRush'-trees were calm, the most branches could be reached from soil. In the control pruning lasted 48 seconds/tree, in the 'severe-pruning'-variant 71 seconds/tree. Forecasting per ha (about 2400 trees) 15 hours more had been necessary to reduce the number of blossom-clusters/diameter to 86 % of the control.

In October 2005 the time for picking each tree was stopped (only picking, without emptying the picking bags), occasionally it was necessary to use a picking-sledge to reach the higher branches. Because of the better distribution of size of the fruits by severe pruning picking lasted only 3:26 minutes in comparison to the control with 4:18 minutes/tree. Respecting the differences in yield and picked apples/hour about 30 hours per ha could be saved at harvest by severe pruning.

In December 2005 also the number and the length of twigs on four branches/tree grown in 2005 were measured to clarify the difference in growing character. The results are shown in picture 3. The 'severe-pruning'-variant grew more balanced, more twigs were longer than 10 cm. This had also an influence on the number of blossom-buds, which was analysed in December 2005: In the control only 37 % blossom-buds were found, in the 'severe-pruning'-variant 53 % blossom-buds.



**Figure 3:** Distribution of length of one-year-old twigs/branch grown in 2005

## Discussion

Although there was no success in the intention to reduce the time for thinning by hand at the variety 'GoldRush' clearly, some important data were found. A kind of limit of yield depending from the diameter of the trunk exists (diameter in mm \*2,4 = apples/tree at harvest as a clue), a higher yield causes to small apples of a bad quality, because there is too less energy of the tree left for enough leaves for feeding the apples and the blossom-buds for the next season. This should be considered in the first years of an orchard, when the thinning by hand isn't as costly as in later years. The instrument of pruning shouldn't be neglected for regulation of the yield, it is independent from registration conditions.

To optimize the time for thinning by hand at GoldRush in years with a high blossom-setting sprayings during blossom seem to be necessary: 400 to 600 hours/ha thinning by hand are very expen-

sive and not easy to organize. The results can be considered also for other varieties with a similar growing and bearing type as the scab resistant variety 'GoldRush', but not for varieties, which react with strong growing, when the trees are pruned too severely.

### **Literature**

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