Thinning the cultivar Natyra®

M. Hechinger[1], S. Buchleither[1], A. Bohr[1], U. Mayr[1]

Abstract

Having started to plant Natyra® trees in larger numbers in Germany, farmers and research centres have to gain experience with the cultivar and its requirements. Problems of reduced yield and a lack of growth occurred partially. Therefore, Natyra®'s reaction to thinning is of great interest. At the Kompetenzzentrum Obstbau Bodensee (KOB), different trials were conducted during the years 2016 and 2017 – both years with frost during bloom. In addition to a control group without thinning, the effect of mechanical and manual thinning was compared. The current research implies that a consequent thinning is indispensable to establish a constantly good yield and desirable fruit quality.

Keywords: Natyra®, mechanical thinning, manual thinning

Introduction

Natyra® was breed in the Netherlands by the Plant Research Institute of the University of Wageningen. The cultivar is a crossbred of ‘Elise’ and a variety of the Wageningen breeding programme. The cultivar gains more and more importance due to its positive properties like apple scap resistance, good storability (Neuwald *et al.* 2016) and taste, but there are also characteristics that need further investigation. For example, Natyra® tends to be very sensitive to high crop load. Concerning this topic several trials have been conducted at KOB in 2016 and 2017. Both years were characteristic frost years with a large amount of the harvest being lost especially in 2017.

Material and Methods

The aim of thinning is a yield that is suitable for the age of the trees, so that they are not overstrained. This should result in a constant, adjusted crop load and a good flower bud setting for the next year. According to BAAB (2016), the crop load of Natyra® should develop as shown in table 1.

Table 1: Recommended yield of Natyra® trees depending on their age

Years after Planting	Number of apples	Kilogram per tree [kg]
1st	0	0
2ed	1 – 20	2 – 3
3trd	30 – 40	5 – 7
4th	50 – 60	8 – 10
5th	70 – 80	12 – 14

In table 2 an overview of the different orchards used in the trials is given. Depending on their planting year the desired crop load can be calculated.

[1]Kompetenzzentrum Obstbau Bodensee (KOB), Schuhmacherhof 6, D-88213 Ravensburg, Germany, Meike.Hechinger@kob-bavendorf.de

Table 2: List of Natyra® sites at KOB used in the trials

Cultivar	Trial	Planting Year	Planting distance row distance x planting distance	Rootstock
Natyra®	1	March 2013	3,5m x 1,0m	M9
	2	March 2014	3,5m x 1,0m	M9

Trial 1: Crop load and flower cluster development using mechanical thinning

The trial was carried out in an organically managed Natyra® orchard at KOB. Three replications at 20 trees each were thinned mechanically with additional manual thinning if necessary. The same number of trees remained untreated without any thinning. For mechanical thinning, a 'Darwin' mechanical rope thinner of the company 'FruitTec', was used. The treatment was executed at full bloom with a rotation of 220 per minute and driving speed of 6 km/h. The influence of the treatment was rated by counting the number of flower clusters in spring and the number of fruit in the beginning of June.

Trial 2: Crop load and flower cluster development supplemented by analysis of growth factors and the additional treatment 'only manual thinning'

The second trial was set in another organically managed Natyra® orchard at KOB. In this trial three treatments were compared using a randomized complete block design with four replications each. Each replication consisted of ten trees, while five trees were analysed. The treatments compared were mechanical thinning versus mechanical plus manual thinning versus untreated control. As in trial 1, a 'Darwin' mechanical rope thinner of the company 'FruitTec', was used. The treatment was executed at full bloom with a rotation of 220 per minute and driving speed of 6 km/h.

The number of flower clusters and fruit was counted similar to trial 1. The quantity and total weight of fruit per tree was recorded at harvest. Differences in size and colouring between the treatments were determined using a mechanical sorter. The growth parameter shoot length was recorded additionally. The shoot length of the annual shoots was recorded in January using six categories as listed in table 3.

Table 3: Classification of shoot length

Description	Length in [cm]
very short	< 5
short	5 – 15
middle	15 – 25
long	25 – 35
very long	35 – 50
longer than 50 cm	> 50

Results

Trial 1: Crop load and flower cluster development using mechanical thinning

Figure 1 represents crop load and the resulting number of flower clusters in the following year from 2014 to 2017. The trial started in 2014 with an equal number of flower cluster in both treatments. Through the years, the thinned group reacted with constantly high sets of flower clusters every year. Likewise, the yield reached the desired value in every year. For

the untreated control, a high crop load in the first year resulted in few flower buds in the following year 2015. As it was to be expected, the trees developed a circle of alternate bearing with a high quantity of flower buds and fruit in 2016 and low number of flower clusters in the subsequent year of 2017. Moreover, a higher standard deviation of the control group compared to the thinned treatment was observed. Without the frost during bloom in 2016, the untreated control might even have had more fruit in 2016.

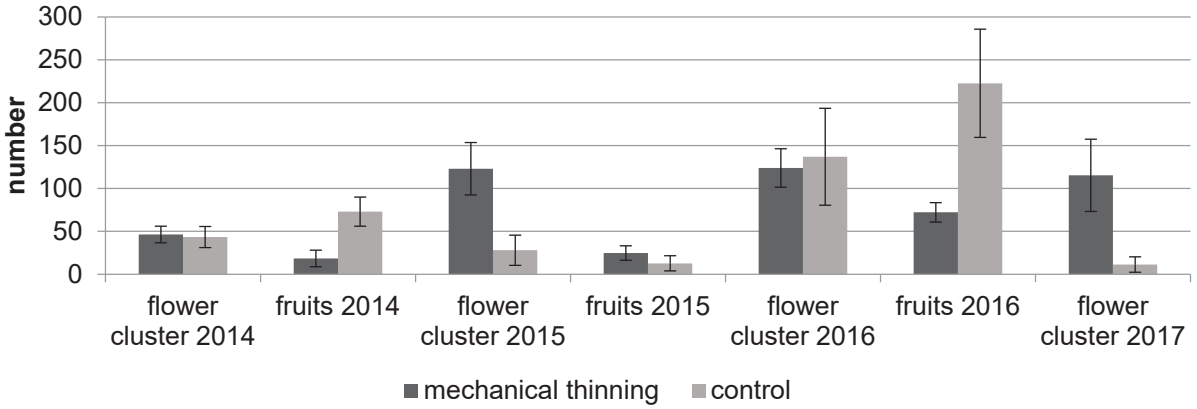

Figure 1: Quantity of fruit and flower clusters 2014-2017 for mechanical thinning and untreated control.

Trial 2: Crop load and flower cluster development supplemented by analysis of growth factors and the additional treatment ‘only manual thinning’

The measured yield and number of flower clusters in each treatment are shown in figure 2. The dashed line describes the recommended number of apples per tree, as explained in table 1. In the first year of the trial, a similar number of flower clusters was recorded in every treatment. Concerning the number of fruit per tree, the manually thinned treatment had more fruit than desired. The additional mechanical thinning resulted in the desired amount of fruit, while the untreated control carried more than twice the recommended number of apples. As there was frost during bloom, the control possibly profited from this ‘natural thinning’ effect. As well due to the frost, the manual thinning was carried out too carefully and resulted in too many fruit in that year 2016.

In the following year 2017, the amount of flower clusters was lowest in the control group with seven on average. The group ‘only manual thinning’ reacted with about 50 flower clusters per tree. The group ‘manual and mechanical thinning’ reached nearly the same high number of clusters as in the precedent year. The number of apples developed respectively, very few in the control, more in the manually thinned group but with a wide standard deviation. The mechanically plus manually treated group achieved with nearly 40 apples the highest yield per tree. In this year 2017, the frost during bloom was even more severe than in 2016. Nevertheless, the groups ‘only manual’ and ‘mechanical + manual’ thinning were thinned to document the possible negative or positive reactions disregarding the frost. Thus, they presumably would have returned more fruit, if they would have been left unthinned as a grower in practice would have decided that year.

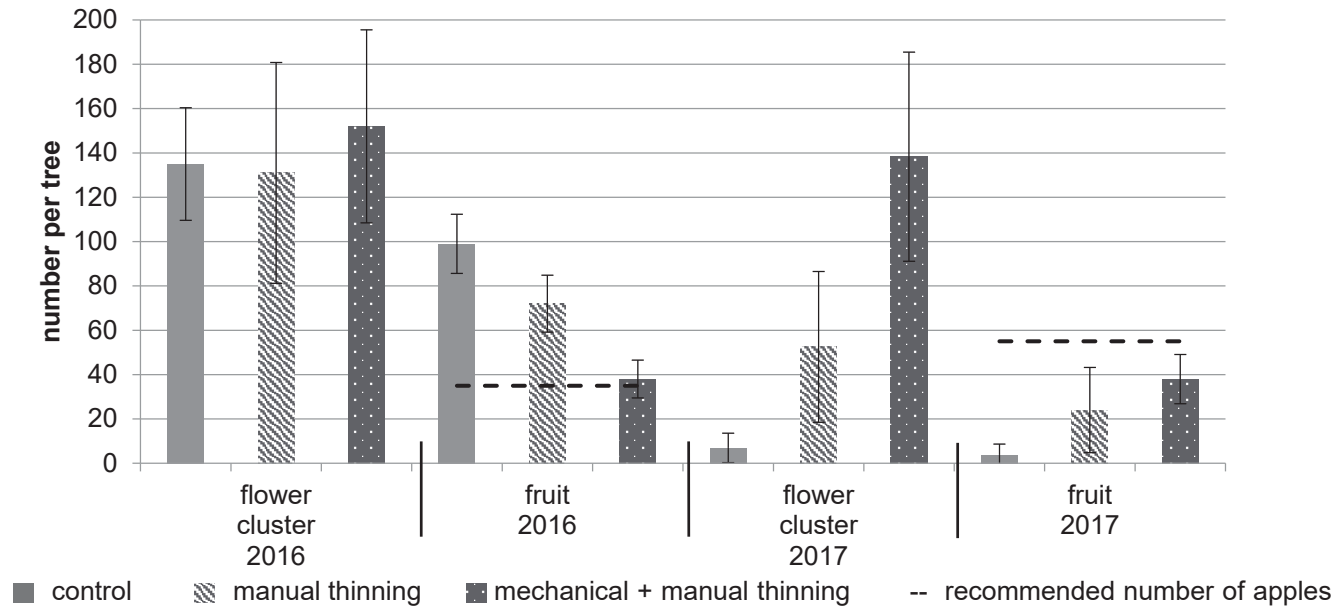

Figure 2: Quantity of fruit and flower clusters 2016-2017 for manual thinning, mechanical plus manual thinning and untreated control.

The harvest data contains the kilograms per tree per group as presented in figure 3 and the results from the mechanical sorter.

In 2016, both the control and the group ‘manual thinning’ were above the recommended six kilograms per tree. Only the group with additional mechanical thinning reached the desired yield. In 2017, the crop load of the control was very low (many trees did not have apples at all). The manual group did not reach the eight to nine recommended kilograms either and a high standard deviation was observed. The yield of the mechanically plus manually thinned group was lower than recommended but the highest of all treatments.

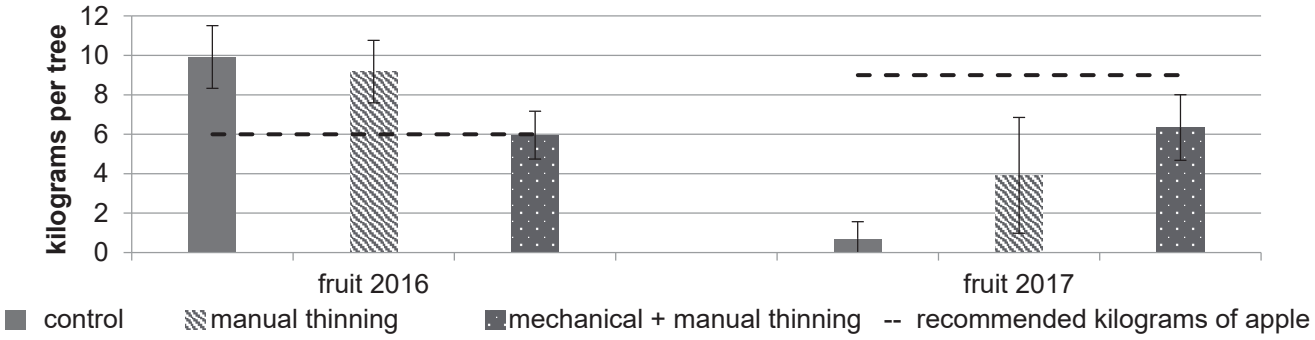

Figure 3: Kilograms of fruit per tree in 2016 and 2017

Analysing the distribution of size, a range from 65 – 80 mm diameter is considered as ”good”. In both years of examination, the group ‘mechanical plus manual thinning’ showed a high percentage (82% resp. 79%) of apples within the “good”-range. With 44%, almost half of the fruit of the manually thinned group were outside of the desired range in 2016. In the control group, even 79% were outside the desired range. Because of the low crop load in 2017 in the control and the manually thinned treatment, the fruit size was good with 76% and 80% within the “good”-range.

Redness from 60-100% is considered as well coloured. The distribution of the colouring results was similar to the fruit size results. Most well coloured apples (65% resp. 61% in both years) appeared in ‘mechanical plus manual thinning’. In 2016, the control had 14% good coloured apples and the ‘manual thinning’ 31%. In 2017, the percentages in the control (50%) as well as in the manually thinned group (57%) were higher than in 2016. The main reason for the analysis of growth factor was a suspected growth depression of Natyra® caused by mechanical thinning. The shoot lenght were examined in 2017 only and thus are presented as one-year-results only. Figure 4 shows the shoot length distribution in percent. The group ‘mechanical plus manual thinning’ reacted with the lowest percentage of shoots in “very short” and the highest percentages in “middle”, “long” and “very long” (see black boxes) ranges compared to the other groups. Thus, for this first year of trial, no growth depression was observed.

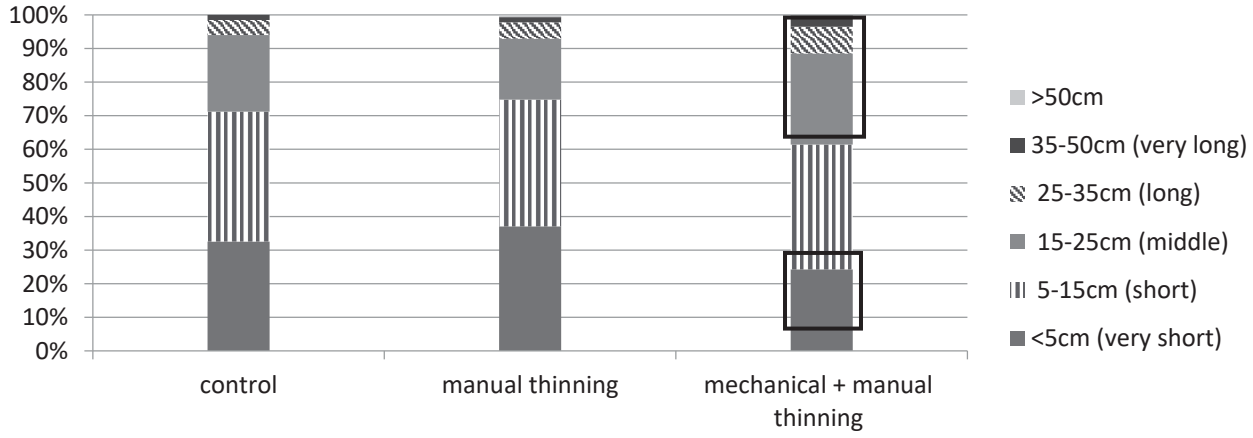

Figure 4: Distribution of shoot length in 2017

Discussion

Both trials imply the sensitivity of Natyra® to alternate bearing. A yearly thinning is indispensable to reach a balanced yield over the years. In our trials, a combination of mechanical plus manual thinning achieved best results. It has to be taken into consideration, however, that there has been frost during bloom in 2016 and 2017. In 2017, a great part of that year’s harvest was lost. Therefore, the group ‘mechanical plus manual’ thinning with its higher number of flower clusters had a better buffer in 2017. It was thinned to document the possible negative or positive reactions disregarding the frost. Concerning the growth factors, more documented years are needed to draw reliable conclusion. They show only a tendency now; furthermore, they depend on the yield of the particular year.

Acknowledgements

The trials were conducted at the research and educational orchard for organic fruit production at the KOB, which was funded by the State Ministry of Rural Affairs and Consumer Protection of Baden-Württemberg (MLR).

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