
**Zusammenfassung**


**Ausblick**

Dissolve the chalk in your soil

We need to examine the calcium stream through the trees more in detail. For the later quality the calcium uptake by the young fruits in the first 6 weeks after blossom is of most importance. This is the period in which the cells in the fruit are still dividing.

Uptake from a calcareous soil is favoured by acid root exudates and carbon dioxide from soil life by humidity. By a high contact of soil colloids and a moderate supply of nitrogen, potassium and magnesium. For growers this means:

- Annual manure, grass mulch (leaves where is to much potassium).
- Undercover or weeds to stimulate root life and production of carbon dioxide that makes calc.
- Water if dry in the period
- To supply chalk if the soil has a shortage in soil analyses.

In our soil management experiences calcium uptake and fruit quality always is part of the justification. Some examples.

**Orchard 1:** Light clay, Eliston, 1997, Böhm, J. Kalkweg, Quelle T. Elistor, 1999

<table>
<thead>
<tr>
<th>Tree strip management</th>
<th>Baumstreifen</th>
<th>Calcium in leaves</th>
<th>Calcium in fruits at harvest</th>
<th>Fruhstücksblätter bei Ernte</th>
</tr>
</thead>
<tbody>
<tr>
<td>grass, fertilizer</td>
<td>Gras, Sulfatdung</td>
<td>1.4</td>
<td>3.7</td>
<td>mg/100g fresh</td>
</tr>
<tr>
<td>grass, 60 kgN March</td>
<td>Gras, 60 kgN März</td>
<td>1.4</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>grass, 60 kgN August</td>
<td>Gras, 60 kgN August</td>
<td>1.4</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>2 year white clover</td>
<td>2. Jahr Weißklee</td>
<td>1.5</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>decorative</td>
<td>Dekorativaue</td>
<td>1.1</td>
<td>2.4</td>
<td></td>
</tr>
</tbody>
</table>

**Orchard 2:** Light clay, Conference, 1999, Böhm, J. Kalkweg, Quelle T. Conference, 1999

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</thead>
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<tr>
<td>grass cultivated</td>
<td>Schorf</td>
<td>2.4</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>3 year white clover</td>
<td>3. Jahr Weißklee</td>
<td>2.7</td>
<td>5.9</td>
<td></td>
</tr>
<tr>
<td>1 year white clover</td>
<td>1. Jahr Weißklee</td>
<td>2.3</td>
<td>5.0</td>
<td></td>
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Calcium arrives by the water flow.

Evaporating leaves suck the water flow from the roots and take the minerals with it up into the leaves and into the young fruits. Fruit belonging to a high evaporating cluster or shoot are easier fed than fruits at the top of a shoot or poorly arranged?- cluster. In the first 6 weeks after blossom the quality of leaves is very important and we must be careful with hydropathy by pest and disease treatments or natural causes like frost (Jevse, 1999).

**Growth control:**

If calcium is taken up by the roots, it is not sure it also goes into the young fruits.
Young growing shoots are big competitors for calcium, so adequate measurements for growth control are favourable for calcium content in the fruit.

**Good winter pruning, summer pruning, root pruning (also see results from Altenheuer 1999)**

**Place in the tree:**

Calcium moves through the trees by the water stream (xylem) and not by the assimilate stream (soem) as most nutrients do. This place in the tree is of great importance for the calcium uptake by the fruit. A fruit beside a grown out shoot profits by sucking of water and nutrients by the evaporating shoot, without the disadvantage of the competition of the growing point. Fruits at these places in the tree have the highest calcium content. Fruit besides a strong growing shoot have less. This is a point for training your tree.

**Seeds are calcium sinks:**

Some researchers (e.g. Jones and Samulson 1983) have proved the relation between the amount of seeds and calcium content. And we do again for Boskop in 1998 and also found a positive relation with sugar and acid (still unpublished).

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**Diagram:**

Kalkumgehalt Boskop = calcium content

A minimum of 3-5 seeds is necessary to grow out the fruit in a regular and big form.

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Calcium arrives by the water flow
Exudating leaves suck the water flow from the roots and take the minerals with it up into the leaves and into the young fruits. Fruit belonging to a high evaporating cluster or shoot are easier fed than fruits at the top of a shoot or poorly arranged cluster. In the first 8 weeks after bloom the quality of foliage leaves is very important and we must be carefully with hortic oldy by pest and disease treatments or natural causes as fruit (Pfeffers, 1999).

Growth control
Calcium is taken up by the roots, it is not sure it also goes into the young fruits. Young growing shoots are big competitors for calcium (so no adequate measurements for growth control are favorable for calcium content in the fruit). Good winter pruning, summer pruning, root pruning (also see results from Ahlweiler 1999).

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A minimum of 3-5 seeds is necessary to grow out the fruit in a regular and big form. Beside that it is thought that the auxine production by the seeds acts as a sink for calcium and other nutrients in the fruit. This idea is a possibility to explain the better
quality of high seed fruits. At the other hand, auxines decrease flowerbud initiation for the next year. Already 1 or 2 pips a cluster do reduce as severe as 10 pips (Tromp a.o.). When the fruit grower tries to find the optimum in amount of seeds to balance fruit quality this year and fruit production next year, he has to reduce the amount of clusters with fruits and not the amount of seeds in the fruit.

For seeds in the fruit there is not too much to manage. The amount of pips changes from year to year and depends much on weather during flowering time and is not manageable. But the grower can manage in the way of:

- sufficient pollinators and pollination trees in the orchard,
- no aggressive sprays in bloom period and
- a good nutrition for good fruit set and a severe juli-dropping (=selection on fruits with many seeds).

- early thinning in case of heavy load.

Does organic fruit growing differ in amount of seeds from regular?

We sometimes noticed that the amount of pips were higher by organic growers than by regular fruit growers. We start to look at it more in detail because we wonder if it was a part of the explanation for the better fruit quality and for the less fruit set. We often see in organic orchards. In 1998 we looked only at a few orchards and saw a higher amount of seeds by organic. In 1999 we again counted seeds by many orchards and there was a extreme high amount by both organic and by regular orchards because of excellent flowering weather. Notice the influence of limesulphur as a thinning method in some experimental fields and its reduction of seeds.

Number of seeds a fruit in relation to scab treatments, also see our poster.

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<th>Treatment</th>
<th>Seeded/fruit</th>
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<tr>
<td>Untreated</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>Sulphur + Mycosin</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>Captan + calb</td>
<td>Konventioneel</td>
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<td>Schweefel</td>
<td>3.6</td>
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Summary

The positive relation between high calcium content in the fruit and its inner quality is summarised from literature. The conventional treatments with soluble calcium are on bad terms with the principles of organic growing and have some unfavourable side effects (sincipital origin, damage to fruit skin, sunburning). We investigate which possibilities fruit growers have to be less dependent on calciumchloride to obtain good quality.

In our evaluation of organic fruit growers' management calcium content is one of the points. Positive in this way were a living soil, European, especially white clover, moderate control of growth, good quality cluster leaves, fruits located at the basis of a shoot, and fruits with a high number of seeds.

Literature


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**Literature**


Tramp, a.o. 1973: Grundlagen der Fruchtbaul's Gravenhage Nederland.