



Limette

Newsletter Citrus Friends Europe

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Storing the trees during the winter

Well, there are many terms about how to store and cover citrus during the winter times. Mostly those terms are reduced to following guideline: Keep the trees in a sheltered bright cover, at temperatures from 0°C and 10°C, water only lightly just to let the rootball not dry out. Give the trees as much light as possible.

Well if you store the trees in such conditions and you have no problems, be lucky. Most people who do, have problems.

Winter leaf drop (WLD)

The winter leaf drop is a phenomenon which occurs mostly during the low light period of the year when Citrus trees are stored in a conservatory, greenhouse or an other place with favourable conditions as mentioned above. The trees shed leaves one by one, often with no visible cause or care failure. Some leaves have a vein chlorosis and some show different chlorotic patterns. Mostly leaf drop occurs after bright sunny days, like usually found in the mid winter. First mind was causes WLD was the low light conditions, but those effects often did not appear on trees stored in less bright environments. Next about to look was a root damage by cold, wet substratum, but many trees seem more to suffer water than to have abundant irrigation. How about less water was the last thought, but most trees did not suffer from inadequate irrigation. In a test four 'Pinofiore' seedlings were used as causes winter leaf drop. The plants were stored in five different conditions: 1. south facing window, unheated room, temperatures around 6°C-10°C. 2. north facing window, same room and temperature. 3. east facing window,

temperatures around 15°C. 4. south facing window same temperatures 5. south facing window, extra illumination and temperatures around 21°C. All trees were irrigated if the rootball needed to be protected from keeping drying out, only in point 5 the trees were regularly watered and even feed. In the case of point 1 heavy leaf drop occurred, place 2 only less leaf were shed, point 3 less leaf loss point 4 no leaf loss, point 5 even no leaf loss. Trees in point 1 to point 4 did not grow, the tree in point 5 did only grow slowly.

So the evidence that the temperature causes the WLD was never really realized, but it seems to be the major factor. To explain this more clearly, we must look more on Citrus botany: Counting on temperature tables at the reference book (Biology of Citrus, Cambridge Press) Citrus seems to stop root growth and root function if the soil temperature drops below 12,5°C. Leaf activity will be reduced if the temperature drops below 18°C, but leaf activity is the complete process to force growth, evaporation, energy transformation (Photosynthesis) and starch reduction for building amino acids and other products for plant growth. Citrus controls its leaf temperature in summer by water evaporation, so heat will be reduced and kept at the optimum levels of 25°C and 35°C. But light even on cold days can heat up the leaves quite quickly to levels beyond biological zero of 12,5 °C. Photosynthesis itself works better in cooler conditions, than in heat periods, so optimum temperatures for photosynthesis in citrus ranges from 10°C up to 32°C, depending on leaf temperature. Photosynthesis itself needs Carbon dioxide, light and water to transform the Carbon dioxide with the water into Starch and Oxygen. During the night starch will be reduced by transforming the starch with oxygen back

into energy needed for plant growth and cell development. This process is called breathing. Water and nutrients for the leaf activity must be uptaken by the roots, Oxygen and Carbon dioxide will be delivered from the air. So root and leaf activity must run in a balance to provide best plant performance for growth, flowering and fruit development.

chlorosis (yellow veins) can develop, but will disappear if the temperatures raise above 18°C in soil and air temperature. Sometimes even fruit are shed during the winter, so for fruit ripening and fruit grow higher temperatures and a good leaf activity should be maintained by irrigation and feeding the plant even in the winter.

The cause of Winter Leaf Drop

If the trees are stored in temperature conditions below 12°C but gather enough light for photosynthesis, the balance is broken. The leaf activity needs water, which the roots cannot deliver. So first the plant tries to stop evaporation, but even loses water by the need of cooling the leaf surface. So the plant reduces active leaf area by reduction: The plant sheds leaves. This seems to be the one of the best theories about what causes WLD. An internet inquiry seems to support this theory more than to refute it. WLD was never critical if the root-ball was kept at the dry side, but if get to wet, very quick root decline developed, even on *Poncirus trifoliata*. Most trees recovered quite well in spring and a heavy bloom was set.

So what to do against WLD?

High air humidity, like practised in GB before seemed to reduce evaporation and reduces leaf drop. Irrigation with warm (25°C-32°C) water support the root function and supports water uptake, leaf drop can be slow down. Irrigation with warm water seems to be a recommended practise for winter times, because it reduces general stress of the tree. Even a light fertilisation even during the winter should be done, to provide best nutrient support for the plant. Next storing the trees in less bright conditions slows down WLD, even a place shaded by other trees in the conservatory. Keeping the root temperature around 15°C but below 18°C seem so work best for stopping winter leaf drop. The plant functions are minimized, but water and nutrient uptake for leaf activity is high enough to support the leaf activity, only a mild winter