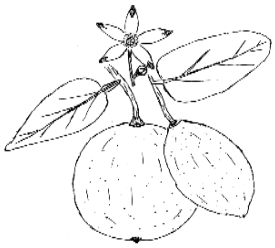

Limette

Newsletter Citrus Friends Europe **Issue 11**

Citrus and Lime

The fairy tale of Lime intolerant Citrus

As long as homeowners grow citrus in containers, as long these growers were followed by the old fairy tale of lime-intolerant citrus plants.

The home growers knew these words: Do only water with soft (low-lime containing) water. Do not use hard (lime containing) tap-water. Use only acid potting mixtures. Add no lime.

So most homeowners try hard to find the right water and potting mixture, to avoid lime from their tree. But why this statements? Why no lime to citrus?

The truth about Lime intolerant Citrus

Well, the basis of the fairy tale is because that many home owner trees were propagated onto the very lime sensitive Poncirus trifoliata rootstock. Many nurseries who propagate citrus for the home owner market depend on this rootstock. Because it is easy to grow this rootstock. Poncirus trifoliata can be grown outdoors nearly everywhere (where the winters permit) so the rootstock does not need a special care or special shelter during the winter. Nurseries for the home owner market plant the rootstock outdoors in fields, grow them to bud-able size. Then the rootstock is taken out from the field, it is root-cutted and repotted into containers for the market. After repotting the plant is propagated and after bud-take and bud-burst the scion is forced to vigorous growth. A cut before offering the plant at the market is common practice.

The rootstock

As mentioned before: Poncirus trifoliata is a lime intolerant rootstock. Poncirus trifoliata is a rootstock of high value. It is very cold tolerant, produces good yields of small but excellent quality fruit, and Poncirus trifoliata is very graft compatible to most scion cultivars. So this, and the easy outdoor culture makes Poncirus trifoliata a easy and desireable rootstock for the home owner market. Also: Poncirus trifoliata can be easily grown outdoors, so a seed source tree for further rootstocks can be planted or found nearly everywere.

If a home owner buys such a tree, he must carefully watch about the pH of the potting mixture. Poncirus trifoliata is very sensitive for high pH of the ground, as it is even sensitive to high salt contents in the ground. So the potting mix should be maintained at a pH of 5,5 up to 6,5. It should not exceed 7,0 and drop below 5,0. Otherwise this rootstock will suffer. Above pH 6,5 it will show either zinc or iron deficiency, and below pH 5,0 quickly salt damage can occur. Also the Poncirus trifoliata Hybrid rootstocks, like Citrange and Citrumelo are sensitive to high soil pH, as they are sensitive to salt accumulation in the grounds. Carrizzo Citrange can be gron at soil pH up to 7,5. On the other hand most Citrumelos are as sensitive as their parent Poncirus trifoliata, exhibiting very quickly Fe and Zn Chlorosis Symptomes if soil pH reaches levels of pH 7,5.

No lime to citrus?

Well, the answer is realy quickly given: No. Citrus requires lime as many other plants. Lime is a component made from Calcium Carbonates and Magnesium Carbonates, and both elements, Calcium and Magnesium are required by a citrus tree. Calcium is the most required element in the plant, because it is the structural component of the cell wall structure, so absolutely required for proper

health and growth. Also most fertilizers have more nitrogen and phosphorus levels, so both levels often exceed the levels of micronutients and potassium, which are alkaline, making the reaction of the fertilizer usually acid. So fertilizers bring acidity to the potting mixture.

As mentioned: Citrus needs calcium and magnesium, so the amounts of the soil will be taken up by the roots, because both elements are needed for growth and health. Quickly the lime levels in the potting mixture will decrease, and with fertilizer more and more acid compounds find place in the ground, making the soil pH slowly decrasing.

And as mentioned before: At soil pH of 5,0 quickly salt damage can occur, while soil pH of less than pH 4,5 are toxic for citrus.

So citrus requires further control of the soil pH, and sometimes, as in commercial groves, liming is required.

Annual pH control

The potting mixture should annualy inspected for the soil pH. If the soil pH is to high, and a lime intolerant rootstock was used or must be considered, a repotting is the best choice. Fresh potting mixture provides the tree with new micronutrients, new organic components, fresh not compressed soil and is more effective than adding micronutrients fertilizers, which can only provide limited help in to high soil pH induced micronutrient deficiency symptomes.

But if the compost ranges at a to low pH, lime is required to bring the soil recation back to levels of pH 6,0 or 6,5.

So a home gardener should inspect in spring the soil pH of the citrus trees, as in commercial groves today done. In commercial groves the soil cannot be exchanged, but a home grower can do this! If the soil is to alkaline, the plant should be repotted. But if the potting mix shows to low pH levels, the grower should add lime, as in commercial groves done.

Lime, how much and which material?

Well, lime is supplied to commercial groves in form of lime stone, dolomite or gypsum. Limestone is added, if only calcium is need and the soil reaction is to acid. Dolomite is used, if soil reaction is acid and calcium **and** magnesium are required. And at least gypsum is used, if soil pH needs no correction, but calcium should supplied to the trees.

In commercial groves calcium is added to the tree in the same amount as nitrogen is given to the trees based on annual fertilizing schedules. So in spring, when the nitrogen amount is considered after soil and/or leaf analysis the same annual amout of calcium is placed in the ochard. Lime is spread to the grove by large machines and is plowed into the soil. Also the irrigation water as calcium source is considerd, providing the most calcium to the trees.

Well home owners can do the same: if the soil is to acid in pH reaction, irrigation with calcium and magnesium containing tap water can be first aid. If soil reaction do not increase as desired, a hand of limestone or dolomite powder should be applied to the potting mix, worked a little bit into the ground and the potting mix should be irrigated throughly. This procedure should be repeated on monthly shemes, to increase the soil reaction slowly to the desired target of pH 6,5.

But now the grower should consider, to use more often a good irrigation with 'hard' water to supply calcium to his tree, as he must consider, not strongly to avoid lime to his citrus tree.

Lime Tolerance and Lime Intolerance

Limette Issue No. 5 has shown, that certain rootstocks do well in high pH planting conditions. So if a home owner does not want to watch realy the soil pH, he should use lime tolerant rootstocks. Citrus aurantium is as cold tolerant as Poncirus trifoliata if non-frost tolerant scions are used, but will at least of all rootstocks exhibit Fe chlorosis in high pH, calcerous soils. Also Citrus volkameriana, Citrus jambhiri and Citrus reshni do well in such conditions, but require more heat for proper growth. However the Trifoliata rootstocks should be avoid, if high soil pH is considerable. A customer on the other hand, cannot determine which rootstock is used, if the rootstock is not labeled. So he should first try to irrigate with 'hard' water if a source for low lime water is not available. If lime induced chlorosis symptomes develop, he should inspect the pH of the potting mixture, and repot the tree.

But now he knews the tolerance of his rootstock and knows about which water quality the tree requires. But if the tree does not suffer, he can further irrigate his tree with the 'hard' water without getting in hard and critical situations. Repotting an anual sheme or every two or three years might be tolerated, and as less repotting actions are need, as more tolerant the rootstocks. Further a fertilizer with nitrogen and phosphorus levels which together exhibit more than the potassium and micronutrient levels in the mixture will supply acidity levels to the compost, so avoiding quick soil pH changes beyond pH 7,0.

So Citrus isn't lime intolerant, it requires lime, but the dosage is the key and a grower should know.

Update

After scientic citrus sources in Florida and Israel read this publication, we got a kind reply from the Israelian Volcani Center. As reported from Israel, in many citrus orchard soil pH is managed not only by dolomite or other calcium/magnesium sources. Soil pH is usually managed by application of different nitrogen fertilizer sources. Nitrate fertilizer sources will raise the pH, and application of ammonium fertilizer will lower the soil pH. Not quickly, but continously.

And as reported from Israel and Italy, too, most recommend Volkamer as good rootstock for container growers, because it is tolerant to pH problems, very vigorous and a can produce a good crop, even in containers.

Also the citrus horticulturist recommend not to make to much mind about soil pH. As Citrus trees requieres large amounts of calcium, soil pH would not raise to quickly in containers, because fertilizers will add acid components to the container potting mixture, so soil pH will not easily raise only by using lime containing tap water. So for the horticulturists many factors must come togehter, to induce iron deficiency symptomes. Usually iron chlorosis occurs in soil lacking organic material much quicker than in fertile soils of high organic matter. So sandy soils are more prone to iron deficiency than loamy or clay soils. Those heavy soils are often planted with rootstocks like *Poncirus trifoliata* , and so iron chlorosis is seldom found in those soils. Only in the sandy soils sometimes iron chlorosis can develop, if fertilisation will not match the low levels of iron in soil, preventing a deficiency to the plant. And those soils are often very infertile, having low levels of organic matters, thus being naturaly low in macro and micro elements. So if here sensitive rootstocks like Swingle Citrumelo are used, and improper fertilisation will benefit a deficiency, trees quickly exhibit the typical micro element chlorosis symptomes. But commonly in those soils tolerant rootstocks, like Volkamer Lemon are used, or not that sensitive rootstocks, like Carrizo Citrange. Least one is still sensitve to high soil pH, but will exhibit a deficienty in certain micronutrients much later than Swingle Citrumelo.

And thus the Horticulturists in Florida recommend not to make to much mind about pH in growing citrus in containers. If feed properly, the symptomes of high pH in form of a micronutrient deficiency will exhibit in containers not quickly as many growers might expect. Also the recommend the usage of tolerant rootstocks, because sensitive rootstocks are often not that vigorous and their slow growing habit will often not match the demands of the customers in the ornamental citrus market.

So the Scientific Citrus Horticulturists recommend a repotting action, if micronutrient deficiences were shown, a sensitive rootstock is used and annual soil pH control shows a high pH, too.

Citrus News

Still good books about citrus in german language are missing. In french some books from the french INRA Institute are available, in Italian language form the Citrus Research Center and the national agricultural ministry. As for Italy, also in Spain books in spanish language are present, from the spanish ministry of agriculture / Department of Citrus Industry.The Spanish books are also used in Mexico and other spanish talking citrus growing nations. But the most available science sources about citrus are available in english, from Florida, like the University of Florida, Cooperative Extension Service and from Californias University, Cooperative Extension Service.

But in German language, good books are still missing. Citrus Nursery Owner Bernhard Voß made a good varieties book, focusing mainly onto freeze hardy hybrids, and nursery owner Peter Klock, a citrus pioneer of germany and his children also wrote books about citrus culture in containers.

Now a citrus book from the french citrus passionist couple Bachés was translated to german. The book, mainly written for people who wants to grow a citrus tree in their home yard, reports also on citrus trees growing in containers. Even if many informations in the book are on free planted trees, the book is a good source for container citrus growers, but the book is not such a recommendable source like the scientific books in english language from the cooperative extension services.

And as last news, unfortunately a bad one: A Citrus collector , Harald Coenen, known as a good friends and recomendable source in citrus informations, with a focus on historical described citrus varieties has died after suffering from illness in hospital. We are in deep sorrow about loosing a good friend in citrus hobby.

Now just a finishing information: This issue took little longer to develop and the next one will also take longer. Because I am preparing to change the Publishing Software and PDF creation software, to ensure further issues. Becuse with change in Software I also change the system and hardware for development and edtion these issues. I am also working onissues containing pictures, and maybe this will start with the next issue.
Thanks for your patience