Posted: Mon Apr 16, 2007 3:31 am Post subject: Citrus Bark Grafting Tutorial - the Real deal!http://citrus.forumup.org/about1762-citrus.html

The citrus forum.org no longer exists. Joe Real graciously permitted me to repost this tutorial here.

I gave a quick seminar yesterday, April 14, 2007 at the Santa Clara Valley Chapter of the California Rare Fruit Grower. I promised the group a tutorial specific for citrus bark grafting, and so here it is.

The very first step is to sterilize your equipments and your hands with 70% rubbing alcohol or ethanol.

This is the branch that I am going to do a bark graft operation on.

You will have to remove the leaves. Push the petioles sideways until it snaps. Do not pull off the leaves as it might pull away some of the bark. That is why pushing sideways is a good way to prevent pulling away some of the bark.

This is what it looks like after removing the leaves around the area where I intend to do the bark graft. If you look to your right, I have just finished a bark graft operation over there. That's how our bark graft should look like at the end.

Now spray with alcohol around the branch that you just cleaned. We want to make sure that there are no fungal spores and bacteria alive that will otherwise damage our graft. Wait about a minute for the alcohol to dry a little bit.

Then cut off where you want to do your bark graft. Make sure you have at least 4 inches of branch that you can insert a scionwood later. You would only need 2 inches in most cases, the other 2 inches if for allowances in case you make mistake.

This is what it looks like after cutting the branch.

Then do the vertical cut. 2-3 inches would be nice, but it depends upon how big your scionwood budstick is. For a 1/4" diameter budstick, a 2" longitudinal cut along the branch is very good. Simply press the knife hard so that you cut through the bark and scratch off the wood underneath the bark. Just slide the knife up along the branch while pressing it down to slice the bark.

Then open the flaps of the bark after doing the vertical cut. Use the dull end of the grafting knife or you can use a bread knife or flat head screw driver to lift up the flap.

Do also the other side:

Snip off 1/2" to remove the dirty end of your scionwood. Then begin to make a very long 2" splice. Shave off several times. Make sure the splice is flat and straight as possible.

The cut should be flat, do the best you can to make it flat by shaving off straight using your knife. You can do it even better than I did. Flat will have better contact. Sometimes, you may need to make it a little bit curve depending on the curvature of the destination branch. In most instances, a flat one is better to insert on a straight branch.

Now, don't forget this detail. Shave off a tiny portion of the edges of the lower half of your splice to expose the cambium layer. The lower portion of your splice will really be under the flaps and exposing the cambium layer for that purpose will help enhance take. Notice the tiny green shavings? Those are how small the trimmings on the edges you should do

Do also the other side, trim the edges very lightly

Take a look at the tip of the knife, I am pointing to the exposed cambium layer which will have direct contact on the cambiums of the destination bark flap.

I am just refining the trimmings to make it more uniform. the upper half of the splice cut, I did not trim those, although you can do it, they will usually not help that much in the contact.

and this is the properly prepared scionwood, ready for insertion. The tip of the bark flap lifter is pointing to the exposed cambiums of the scionwood.

This is a series of pics showing that it is easy to insert the scionwood. Remember that we have lifted the bark earlier, so the tip scionwood can be used to lift the bark with almost no force required.

Wiggle the scionwood a little bit so that it is centered between the two bark flaps and inspect to make sure all the edges of the scionwood are under the bark flap of the branch.

You may have to push up or down to make sure the tip of the splice cut is aligned with end of the branch that you cut. No area of the splice should be exposed. Don't push the scionwood deeper either. The scionwood insertion is good if you can leave it alone and it stays in place.

Then take about a foot of parafilm tape and wrap starting from end of the branch. Hold the flap until you have wrap around at least once.

Make sure to completely wrap the cut end of the branch. Wrap several times as juices will flow out of this cut end, so better seal it off. The parafilm is highly stretchable and is good for this job.

Continue wrapping up to 1" below the vertical incision to make sure you seal off the graft union. The purpose of this first parafilm layer is for sealing off the graft union. It is very weak union and would easily snap off if a bird were to perch at the end of the scionwood.

So we have to reinforce this with a rubber band. Choose a flat rubber band. Start wrapping with rubber band from the end of the branch going downwards. Remember the rubber band here is the graft strength reinforcement and also it keeps a nice pressure between the scionwood and the branch which dramatically help increase your success rate.

Then loop over the end of the rubber band to prevent it from unwrapping itself. This picture is a dramatization of how it is done, but the quicker way is to simply place the second to the last wrap over your thumb and then slide it off to trap the end of the rubber band.

And here is super strong graft union.

Now take another foot of parafilm tape. Wrap starting from the bottom going to the top to seal off everything. It is extremely important that you start from the bottom going up for this final sealing step because it helps prevent trapping water in case it rains. The tape will be layered over each other like tiles on a roof that will not let water in, in case some of those wraps are a little bit loose.

It is also important to seal off the very tip of the scionwood. The parafilm helps preserve moisture to prevent the scionwood from drying out as the healing takes place which is about 2 to 3 weeks depending on temperature.

And here's the finished product. You can just leave it alone and don't touch it, only look or take pictures. Just be patient, it will grow.

Lookie here, I did 4 of them very quickly. It is really faster to work when someone else is taking pictures. Many Thanks to Bo Torres, my host friend that I visited after giving a lecture at CRFG, and especially for assisting me by providing ladder, taking nice quality pictures, along with some barbecued oysters, coffee, etc (I'm really demanding you know). In return, he gets the grafted cultivars for free. The base tree is a Lisbon lemon.

Look at this T-bud. It is still alive, green, and never sprouted. That's why I am switching over to bark grafting when doing multi-grafts on an established tree. Unlike grafting to rootstocks, we experience much more unsprouted T-buds on established trees than doing them on rootstocks. I'm sure Benny can vouch for this observation.

Yes we did all tricks to force this T-bud out, it is not a blind bud, I am sure of that. We tried bending it, halfway cutting it, fully cutting it, to no avail. Ultimately, this T-bud will be swallowed alive by the callous and forgotten. I intentionally retained this one for this purpose of picture taking. But there is always that hope that it might really sprout one day. I have a 3 year old T-bud that sprouted this spring, and this one is just 18 months old.

These are my new blood oranges, bark grafted 3 weeks ago, and look how vigorous their sprouts already are. We had 70's and 50's for the last month, and these guys are very anxious. The T-bud would have been still asleep and it would just be time to force them. The bark grafts on the other hand are pushing out.

This is Ruby blood orange that I bark grafted over the Cara-Cara branch. I just did the bark graft 4 weeks ago. That is in March, and already have very nice growth.

Remember that this is my very first citrus bark graft. EZ's Kaffire lime bark grafted unto Rio Star grapefruit.

Look at the Kaffir lime now, less than a year later, and it survived the arctic blast of 2007, with lowest temp of 20 deg F and almost a month of frosty and freezing nights.

My 50-in-1 citrus tree is currently a 57-in-1 citrus tree. Thanks to these volunteers that were bark grafted on the top canopy. These are cold hardy types, they are on the top and would serve as my natural frost blanket for the 57-n-1 citrus tree.

And yes, before you move on to the next tree, don't forget to sterilize your pruning shears and grafting knives, also your hands. Rubbing alcohol is a good massager too.

Because if you did not sterilize, your grafts could end up like these guys. They were eaten by sooty mold. Yes they took only to die a quick death, with the black traces left behind by the mold.

So it is good to sterilize. Helps prevent spread diseases too.

Posted: Mon Apr 16, 2007 11:04 am
valenciaguy wrote:

Joe did you leave a little bare spot around the buds on the scion so they can grow when ready, or did you completely cover the whole scion. If you did is it the same for other fruit trees like apples, pears etc.

With parafilm tape, there is no need to leave any space, cover them completely, the same style for all other fruit types. The parafilm is so soft that the buds can grow through them, easily.

The only time I would leave a little bit space is if the citrus scionwood is so fresh that the leftover petioles are still attached. I wouldn't want to cover the petioles, so will have to wrap the scionwood as good as possible without including the leftover petioles. The leftover petioles will wither away and fall off and sometimes could rot away. You wouldn't want those rotting parts sealed inside.The petioles that remain on the scionwood are intentionally left during citrus budwood collection for various good reasons. Among them is that it serves as a nice handle when holding the bud without touching the cut side when doing T or Chip budding. It also enhances take. But these fall off after some time when you are storing the budwood for a long time, and when still very fresh budwood, they are firmly attached.

Posted: Mon Apr 16, 2007 11:43 pm
Good job Joe, thanks! You put a lot of time and thought into this developing your technique, and it is very professional looking. Your demonstrations add a lot to this forum.

In grafts using long scions, where I wrap it with parafilm, I have started wrapping it before inserting it into the rootstock. Of course, yours are so secure that there is not much chance of disturbing the union anyway.

Ned

That's one of the common techniques Ned, especially if you don't use rubber band reinforcement. But with rubber band reinforcement as illustrated, I could save on grafting tape, not that it is really a lot of savings. I just don't like shaving off previously wrapped scionwood, but that technique is used by one of my very expert grafting friend in the east coast.

patrick
Citruholic

Joined: 12 Aug 2006
Posts: 32
Location: PHOENIX
PostPosted: Mon Apr 16, 2007 4:39 pm Post subject:
Joe,
Thanks for the great article.
Right now the sap is flowing and the bark is slipping well on my trees in Arizona. Would this method work in fall when the bark isn't slipping as much? Can this graft be performed with success all year around?

JoeReal
Site Admin

Joined: 16 Nov 2005
Posts: 3840
Location: Davis, California
PostPosted: Mon Apr 16, 2007 5:06 pm
patrick wrote:
Joe,
Thanks for the great article.
Right now the sap is flowing and the bark is slipping well on my trees in Arizona. Would this method work in fall when the bark isnt slipping as much? Can this graft be performed with success all year around?

Yes, provided you can lift the bark flap without damaging it. You may have a problem during freeze or frost, so you should protect it. Unlike T-budding, the bud will stay dormant the entire fall and winter if you don't force them. The bark graft on the other hand, a week of freaky warm spells, it could sprout them out in the middle of winter only to be damaged by frosts. I am sure we will have more of these freaky warm spells during winter and then sudden freezing events due to global climate change. So I won't use this method late in the fall, and would only use this method if the added cultivar is really cold hardy such as Yuzu, Sudachi, Kinkoji, etc. I would also use the bark graft approach if I can adequately protect the grafted cultivar. Otherwise, I'll either use chip-budding or T-budding.

baumgrenze

Joined: 19 Apr 2007
Posts: 1
Location: Palo Alto, CA
PostPosted: Thu Apr 19, 2007 9:41 pm Post subject:
Thanks (And an Idea for Modifying the Branch)
Thank you Joe for all the work you and your friend put into this tutorial. The time spent resizing the photos, writing the text, and then uploading everything must have been significant.

I just finished doing 15 grafts using 7 varieties. As I worked I made an observation. I did not take time to make the tool to implement the solution it suggested; perhaps in another season, or perhaps I'll just try it on "prunings" once I find time later this summer.

My observation is that the branch surface is round and the scion surface is flat. The flatness is most significant at the 'upper' end of the cut on the scion, where the scion has the least 'give.'

Wouldn't it be desirable to flatten this portion of the branch to match the scion? Wouldn't the bark flaps close better over the scion if it fit better?

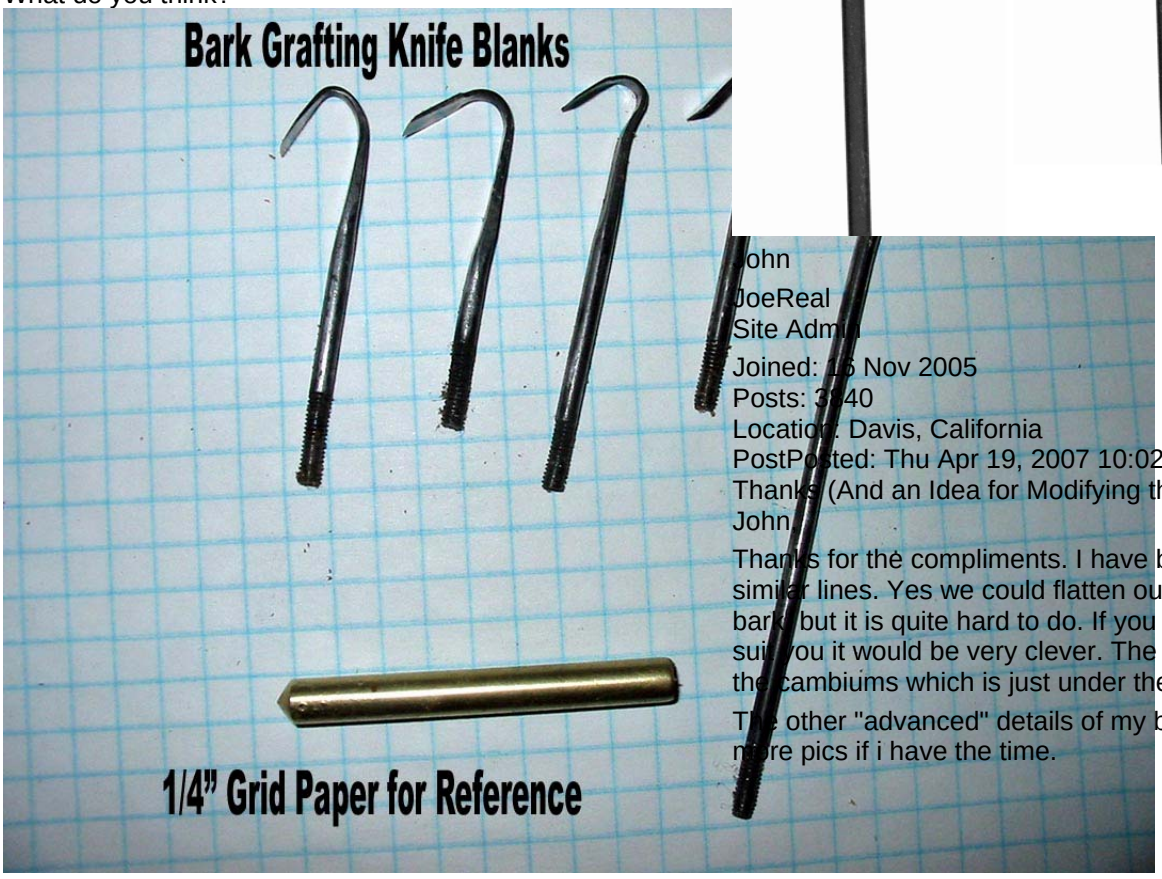
Here's what I propose to do. I will start with a broken 1/8" high speed steel drill bit and heat it red hot and allow it to cool to anneal the steel. Then I'll heat one end and flatten it with a hammer on my anvil (or the anvil portion of a vise) creating a tapered flat that will be a chisel-knife. Next I will grind it flat and roughly sharpen it. Then I'll make a "U" bend in the round portion of the bit. Then I will reheat it, quench it to harden it, and then gently temper it, heating the round portion and watching the color migrate towards the cutting edge. Finally I will mount it on a dowel handle. Once sharpened, I should be able to insert this between the bark flaps and flatten the exposed part of the branch to match the scion better.

Where does the graft union form? Is it just along the slightly relieved edges of the bark on the scion? Might we be able to induce the formation of even more callus if we lightly scored the bark remaining on the scion with a very fine gouge, made for the purpose, from a syringe needle?

As I envision union formation, callus forms on the underside of the bark flaps and also on the edges of the scion, and this forms the union. For the union to be strong, the tree must fill in the space between the round branch piece and the flat scion piece with new tissue.

I have an alternative approach to the chisel-knife that starts with a length of 1/4" spring steel (a scrap from a broken recoil starter spring, for example,) which I'd anneal. I'd then fold back the edges in the center 1/3 of the piece to form a rounded channel. This I would bend with the round face on the inside of the bend (to be gentle to the bark flaps) until I had a hook with a chisel-knife on one end and a mounting tang at the other. Then I'd proceed as above with tempering and sharpening.

What do you think?



John

JoeReal
Site Admin

Joined: 15 Nov 2005
Posts: 3940
Location: Davis, California
PostPosted: Thu Apr 19, 2007 10:02 pm Post subject: Re: Thanks (And an Idea for Modifying the Branch)

John,

Thanks for the compliments. I have been thinking along similar lines. Yes we could flatten out the wood under the bark but it is quite hard to do. If you can make such tools to suit you it would be very clever. The trick is not to damage the cambiums which is just under the bark.

The other "advanced" details of my bark grafting, I will add more pics if i have the time.

The idea is to have the scionwood fit much better. Manipulating the scionwood and proper branch location at the same time is key to better fit during bark grafting.

In real life application of this method which I forgot to detail out, is to find a portion in the branch that has a flatter surface than the others and would bark graft to those. Not all branches are perfectly round, you may find that there are many locations along the branches that the cross section is oblate, giving you a section that is relatively flat, and I would select those as the best places to bark graft to. When I cut off the stem, you can find the flattest side and so make the vertical incision that runs through the middle of the flat side of the branch. Sometimes it may not be the ideal height nor the ideal location, and for that I will redirect the growth of the buds, and hence when I prepare the scionwood, and try to imagine where I will stick it, I would make sure the direction of the budwood are ideal.

The next is how you would prepare the splice. If you notice, the scionwood is also not perfectly round. So you can create a splice that is really long but narrow by properly selecting the position on how you cut it. You should splice cut the scionwood so that it produces the narrowest splice, not just simply making a splice.

With a narrow splice cut and a flatter branch, equals very good fit most of the time.

Regards,

Joe

JoeReal
Site Admin

Joined: 16 Nov 2005
Posts: 3840
Location: Davis, California
PostPosted: Fri May 04, 2007 2:49 am Post subject:
Tips for the scionwood part:

With Bark Graft, you have tremendously more flexibility in what scionwood to use. Angular ones, itty bitty tiny ones, even the big ones, they will most likely take.

I am jumping up and down from the results of my different bark grafting experiment with citruses. It is very forgiving. As long as the scionwood is not diseased or doesn't have molds yet, it will surely take, even if it is very lousy to use for T-budding. Finally, I would be able to use all those lousy extra freebie budwood that sometimes UCR will send along with your budwood orders, they are perfect for bark grafting but impossible with T-budding.

I have used the current season's growth, as long as the wood has hardened a bit, and not the succulent vegetable-like branch, but as long as it has some hard wood in the middle, it is good to use. I can also use the stems below the current season's growth, they would also take, and even those below the ones recommended for T-budding.

Of course the best to use, simply because of diameter size are the budwoods below the current season's growth. The size is just my preference for speed of handling and grafting process.

You usually won't worry about the blind buds with Bark Grafting, those are the ones that gets removed when you form the splice on the budstick, good riddance to those fake buds that sometimes can fool you when you are doing T-bud and you didn't know they were included by accident by the donor, or simply forgot to remove them or didn't remove them because they know you are an expert to identify and not use them.

And now for the collection part:
Although you can collect scionwood any time of the day, but if you have the option to chose the time to collect, the best time would be early in the morning, from 1 hour before sunrise to 1 hour after sunrise. TAKE NOTE: That's two hours, one hour before to one after sunrise. There would enough visible light at that time too.

It is "cool" to do, very comfortable temperature to work, at least for me. The temperature would have been the lowest for that day if it is calm. If you study closely micrometeorological data that keeps track of temperature continuously, the time of the coldest temperature is normally about half an hour after sunrise due to thermal inertia of the land mass but depends if you have interacting breezes at that particular time.

Plus, collecting at the lowest temperature at that time in spring means that the scionwood will not go into a lot of shock adjusting to their destination storage bins until you can graft them. Contrast this with collecting at the hottest time of the day and suddenly place the scionwood into coolers at 38-40 deg F ideal storage, it will have some shock.

Plus, the citruses or avocado budwoods have been saturated with appropriate amount of moisture by that time. If you have not been watering your plants, water them the afternoon before you collect the scionwood in the morning. It will make the scionwood turgid and have enough water stored that is needed when your grafting schedule slips further and would have extended your storage requirement. Even if you did not water your plants, the overnight duration would have allowed the plants to recover from lack of watering, and have helped with increase turgidity come early morning time when evapotranspiration is about to significantly start.

Of course there are downsides to collecting scionwood in the morning, and it could be really chilly to some of us.

Here's my modus operandi:
1. Select the scionwood, the day before and mark them, this is to make your morning collection much faster. I usually have an orange glow ribbon tapes that I buy from Ace Hardare, so easy to tear and tie to the branches that I want to cut from. To select the branches, just read my tips earlier about the below the current season's growth.

2. the night before, prepare your equipments:
a) small carry on cooler with about an inch of ice in the bottom, then layer a plastic sheet over the ice, then paper towels over the plastic sheet. This would make the temperature chamber of the cooler within ideal temperature for longer transport if needed. for backyard that is a few steps behind the kitchen, there is no need for this step.
b) have some ziploc bags ready, quart size is the best.

c) make sure you have lysol or rubbing alcohol (70% isopropyl) or ethanol (70%) hand held sprayers.
d) clean your pruning shears to remove gunk, best to sterilize them with alcohol or lysol.

3. Come early morning, you go to the first pre-selected branch. I do the opposite procedure as most of you will instinctively do: I first label the ziploc bag with the cultivar name. I first cut off off the current season's growth and throw away, leaving the last season's brnch intact, then nip off all the leaves from that branch from their petioles, leaving the petioles attached to the buds, while that last season's branch is still attached to the main branch. I would then spray with lysol, or alcohol, after the leaves are cut, wait one minute, do other stuff like label your ziploc bag with proper cultivar name, to wait for the alcohol to take effect and partially dry off, and then finally cut off the budstick when it is just ready to go into the ziploc bag. This sequence of steps minimizes moisture losses from the budsticks and at the same time sterilize it.

Normally what most of you will do is to first cut off the branch, then start to clean it up of current growth and nipping off the leaves. This is very convenient and instinctive and most of you will surely do it like this. But take note that the moment you cut that budstick branch off, it will start to lose water right away before you finish preparing it. It is like you cut the supply side and it is drying out while you prepare it for he collection bag. So it is better to prepare the budstick while it is still attached to the plant and the last step of taking it off is to cut it off and put right away into the bag.

4. Then seal the ziploc bag, there is no need to put moist paper towel in there if you have prepared your tree the day before so that budsticks have enough moisture for longer storage. Simply throw into the cooler.

5. Finally, squirt alcohol or lysol from where you cut the branch from the mother tree and then sterilize your pruning shears, your hands by spraying alcohol or lysol and move on to the next collection point.

6. At end of collection, move your collected budwoods in the ziploc bags into the fridge bin which is set at between 38 to 40 deg F and it can stay there until you are ready to use them or ship them off at later dates. Or package them right away into the priority mail envelopes and store overnight in the fridge before mailing them the next morning.

When prepared the way I do it, your budwoods will be plump, and hopefully sterilized at their surfaces, and the insect eggs that happened to be there may have also been dehydrated by alcohol treatment.

That's how I am preparing my scionwood for sharing. Of course, you can collect them any way you choose to do so. This is only my recommendation.