

Avocado Varieties and Rootstocks

CAS/UCCE/CAC Webinar

June 10, 2020

Answers for Questions from Chat and Q&A provided by:
Mary Lu Arpaia, Herve Avenot, Ben Faber, Eric Focht, Rodrigo Iturrieta,
Petr Kosina, Patricia Manosalva, Themis Michailides

1. Where can we get the old illustrations of the fruit?

Mary Lu Arpaia: They are available on line to download free at <https://usdawatercolors.nal.usda.gov/pom/about.xhtml>. This takes you to the general page and then you can search for avocado. I spent hours looking at the avocado pictures, but they have a lot of other fantastic prints as well of many other fruit crops.

2. What is California's Hass volume production or acreage in 2019 compared to 2005?

Petr Kosina: here are some stats: <https://www.californiaavocadogrowers.com/industry/industry-statistical-data>. Hass is estimated to be 95% of the acreage in California.

3. What exactly is classified as a calcareous soil.

Ben Faber: It is a soil that is dominated by calcium carbonate, which is lime. Lime controls the pH at above 7, usually around 7.5 and higher up to 8.3. Avocado likes a pH below 7, in the range of 6 or so. A high pH causes problems with iron up take primarily and to a certain degree with zinc, manganese, and copper

4. When do you anticipate Orondis to be available?

Mary Lu Arpaia: I was told at a January 2020 meeting that it is most likely summer 2021.

5. What is the best way to treat root rot in a mature grove with unknown rootstocks?

Ben Faber: Same as with known rootstocks: phosphonates, gypsum and mulch AND make sure you irrigate correctly.

6. We have been told that we have "root rot on steroids" in San Marcos. We lost new trees planted on Dusa. Will the new chemical help us with new trees? Dan Grant came and look and said it was root rot death. Soil is good - not clay. We are spraying every month now with Phosgard. He told us that with the type of root rot we have that Dusa did not stand a chance without aggressive treatment. Wish we had heard that before we lost half our new trees.

Mary Lu Arpaia: There are other factors beyond root rot that can cause tree death. Even if your soil is "good" the trees can be waterlogged. Waterlogged trees can have similar symptoms to root rot (die back and water-stressed looking trees). Salinity can also influence the response of the tree to root rot and poor soil drainage. So, you can have several things going on in your orchard. Dusa tends not to be very tolerant of this type of conditions. If it really is just root rot, we probably need to get some isolates from you. As for the "new chemical", I think you are referring to the pending registration of Orondis. This material is very effective and so could possibly help you once it is registered. Contact Patty Manosalva through your local farm advisor, Sonia Rios (sirios@ucanr.edu) to collect a root sample to see what isolate(s) of Phytophthora you have and then we can understand its virulence.

7. In relation to dry matter - as a measurement of ripeness & quality, as opposed to oil content?

Mary Lu Arpaia: Oil and dry matter are highly correlated, so yes, high oil will give you a higher dry matter reading. If you want to know more check out a paper by SK Lee and CW Coggins from 1982 on www.avocadosource.com. The paper was published in the Journal of the American Society for Horticultural Sciences. This work formed the foundation for the current dry weight standards we have in California. It is a highly readable paper and the graphs are easy to understand.

Eric Focht: Dry matter is a measure of avocado fruit maturity: the percent of the fruit that is NOT water; high dry matter usually means high maturity.

8. Will the new varieties be released to the public or will they be limited to commercial growers?

Mary Lu Arpaia: Great question. I reached out to Joyce Patrona, the licensing officer for avocado in the UCR Office of Research. This is what she replied, "In California, they will be available for licensing to eligible (CAC member) avocado grower and will have licensing terms (TBD)." If you need more information, please contact Joyce Patrona at joyce.patrona@ucr.edu.

9. Do all the new varieties have black skins?

Mary Lu Arpaia: The four selections that Eric discussed all turn color when ripening. The two early selections, UCR02 and UCR03 turn more of a dark olive green/black when ripe.

10. What is the pounds per acres one can expect per acre of GEMs?

Mary Lu Arpaia: Great question, I think you could expect conservatively with good management 20,000 pounds on average. GEM does alternate bear but its alternation in our experience is not as severe as Hass.

11. I am replacing old rootstock with GEMs on 7 acres. What type of challenges can I anticipate?

Mary Lu Arpaia: The question is why you are replanting and where are you located. We do not have a good understanding on how GEM responds to salinity. I cannot tell you if it is more salt tolerant than Hass. So, if salinity is an issue for you now, it may be an issue after replanting. You do not mention which rootstock you will be using. In our experience with high soil pH and salinity, GEM on Dusa can become quite chlorotic. At the UC South Coast REC in Irvine, we have dealt with this by applying iron chelate in early summer and doing periodic leaching irrigations. For the most part this takes care of the problem for both GEM and the other varieties that we have. Another challenge could be the commitment that your packer has to a variety other than Hass. You need to discuss this with them. The GEM is still a new variety and we need to build market acceptance.

12. What rootstock do you recommend for GEMs? Dusa rootstock seems ill-matched because DUSA rootstock grows more vigorously than the GEM scion.

Mary Lu Arpaia: We have data from the Butler trial with 9 rootstocks. Most of our trials have been with Dusa and on high pH soils. We have had a lot of chlorosis on this rootstock requiring the use of iron chelates. We do not have data with Toro Canyon. If you contact me later, I can share the data from the Lloyd-Butler trial since we now have just collected the 2020 yield data.

13. What pH should I target for GEM?

Mary Lu Arpaia: I think avocado prefer a soil pH between 5.5 and 6.5 although they grow under many other situations. But the GEM I think is more dependent on this range to thrive.

14. How does the Dusa compare to the VC801 overall-especially interested how on it works on the GEM variety?

Mary Lu Arpaia: We have no data so I cannot give you any advice on this. It would be great to establish a large rootstock trial with GEM that includes the VC rootstocks.

15. Do you think Maluma could do well in Florida?

Mary Lu Arpaia: Good question for which we do not have an answer. The variety is being grown in Israel with good results as well as in Peru. The trees also perform well in the warm, humid conditions of South Africa, so I think it is worth exploring. I would contact Andre Ernst with this question. His email is andre@allesbeste.com.

16. Do we have a comparison between Maluma & GEM for heat tolerance?

Mary Lu Arpaia: No, since we do not have trials in California yet for Maluma. From what I have seen in South Africa it appears to have heat tolerance but compared to GEM, cannot really say except for the fact that both varieties are being grown in the same areas.

17. What is the salinity tolerance of the GEM variety--is it all about the rootstock selection?

Mary Lu Arpaia: I think GEM is slightly more salt tolerant than Hass. Salt tolerance is

dependent first on the rootstock but also, we need varietal material that is also tolerant since there are different mechanisms for salt tolerance. So, if a tolerant rootstock takes up salt and the salt then moves up into the variety, you will need tolerance in the variety. But it is primarily about the rootstock selection.

18. And with the reduced sun on flowering areas, what is the effect on ultimate fruit bearing potential per tree? How do they react to high-density reduction of lateral access to sunlight?

Rodrigo Iturrieta: Great points, Yes, we want the fruits to be "inside" to minimize sunburned fruits. Having said that, what is actually occurring is more related to what non-fruiting shoots do next or around the fruiting ones (so they are basically outgrown by non-fruiting shoots and they end up being "inside" the canopy).

Sunlight responses is something we need to consider. We are keeping our eyes open for avocados that react less to shade (instead of more to sunlight). If shoots laterally branch despite being more shaded (less branching bias) then you still keep the complexity and some parts of the shoot will have a chance to harvest light under high-density planting.

19. Ease of harvesting and less pruning would be other important qualities in a trellising situation.

Rodrigo Iturrieta: Thank you for pointing that out and it has been duly noted. I have been thinking about mechanization but defining what is needed to reach that goal should have the consequence of facilitating harvest as we do it today. Less pruning is a must, they need to have growth habits that requires fewer interventions and/or, if you go in, would need fewer pruning cuts.

20. Which varieties are being trellised besides Maluma?

Rodrigo Iturrieta: Personally, I have only observed and gathered data with Maluma on trellis. This focus happened because the Ernst family at Allesbeste (South Africa; owners of the variety) have jumped into a really close to commercial scale trellising system, so is beyond a small trial and the data I got is from that site.

21. Isn't the reason the trellised avocado having higher productivity because of decrease of apical dominance?

Rodrigo Iturrieta: I agree. Reducing the apical dominance by bending shoots to guide them along a wire should change the auxin:cytokinin ratio towards the CK's and that, in turn, should allow for more chances of lateral shoot release. Because more vegetative complexity increases the chances of reproductive growth the next season it is linked to increased productivity potential. Nonetheless, if it were solely based on the growth consequences of reducing apical dominance then I think we would be doing that commercially with the 'Hass' variety already. Different varieties have different natural branching tendencies. 'Hass' for example displays a reduced tendency to develop lateral shoots along the main shoot except when it stops at the end of a flush so it would require several well timed interventions to break apical dominance as the shoot is growing along the shoot to fill the lateral space and minimize sun burning. Other varieties naturally have lateral shoots developing somewhat concurrently with the main shoot, hence having more leaves along the wire that capture sunlight, photosynthesize, and cast shadow below where the fruit should be hanging. Also, it is likely that avocado trellising organizes and better expose the reproductive growth (the inflorescences) at the beginning of the season facilitating bee visitations, which is another aspect of the chances of increased productivity. Finally, the potential of easing the harvest of those fruits is an attractive reason to consider developing new varieties that are more naturally accommodating to trellising efforts.

22. Where is the trellis trial demonstration?

Rodrigo Iturrieta: The picture / data I had in the slide is from the home plantings of Andre Ernst, the owner of Allesbeste Nursery in Tzaneen, South Africa. It is a large scale, semi-commercial trial. It is a very good demonstration to my point of view.

23. What role does rootstock selection play in developing tree architecture?

Rodrigo Iturrieta: Good question. I guess the broad answer would be that just like applying plant growth regulators (like paclobutrazol), rootstocks modify shoot growth. Some

hormones are produced at root tips and travel to the canopy so that would be a way to influence the tendency of a variety grafted on it. Of course, tolerance to biotic and abiotic stress would play a role in their growth potential above.

Mary Lu Arpaia: In a rootstock trial that Gary Bender, Guy Witney and I had at UC South Coast REC from 1986 – 1996, we found that rootstock did influence the vigor and shape of the tree. In particular, the Borchard rootstock, which unfortunately has no root rot tolerance, consistently made the Hass a very upright more compact tree. On the other hand, the G755C made trees that were very large and open canopied. This is something that we need to pay attention to for the future.

24. How do we go to high-density plantings when we have to wait years just to get the trees?

Mary Lu Arpaia: Great question and you are correct that the industry in general needs to address this issue. Sorry I do not have a crystal ball in telling the industry on what to do.

25. What is a quick list of varieties for Trellising?

Mary Lu Arpaia: With the varieties that are currently available, I think Lamb Hass and GEM are potential candidates. Maluma as well when it is available more broadly to the California industry. As we release the new varieties, I believe several of them will be adaptable to trellising since they have flexible wood similar to Lamb Hass.

26. UCR-3 is most interesting because of early season and small fruit size. Look forward to its release. When might this be?

Eric Focht: This depends on what Mary Lu and Eurosemillas recommend, but if it is not in the first year, I think it would be in the second. One of the issues is that we will need to collect measurements of the tree in the early flowering period, so we will likely (with the exception of UCR04) need to wait until next winter to file a patent for this...this is a legal and logistic as well as biological question, though, so I cannot immediately provide a date, suffice to say that we are starting to get our data lined up for filing and hope to submit soon.

27. We didn't hear much about Reeds / how is Reed quality compared to Hass?

Eric Focht: Reed is not part of the UC program and has been available for some time. It is a small upright tree and seems to be amenable to high density growing for this reason. It is a large green fruit that is a summer fruit compared to Hass which is a dark-skinned late winter/spring fruit.

Mary Lu Arpaia: Reed is a very different fruit from Hass. From an eating perspective, when picked in late summer and early fall, it is a standout fruit. It is creamy and nutty in flavor and is one of my favorites. It is a bit more problematic postharvest since it stays green when ripe and has a thicker skin than Hass that is less pliable. However, once one learns to appreciate this variety for the excellent eating quality it has, these become minor points to the knowledgeable consumer. I know many people where this variety is the favored of all varieties.

28. Would not trees per acre influence production?

Mary Lu Arpaia: We normally collect individual tree data and do not normally have plots that are that large. Sample size is normally from 10 to 20 trees in a trial. We could convert the data to per acre but that will also be dependent on tree spacing. I prefer to collect tree size data so that yield data can be converted to pounds of fruit that is produced per unit area of tree. This is where GEM and some other varieties stand out, they are more productive than Hass. Trees per acre can influence production, an in the early years of a planting should give a higher amount per acre. The tricky part of this is to know when tree crowding is negatively impacting productivity and having mitigation strategies in place to address tree crowding.

29. Any suggestions on growing in an area of high winds?

Eric Focht: This is a very good question for a grower or farm advisor in a high wind area: our trials have not looked at windy areas so far. I have heard that on the Oxnard plain, there had been interest in Lamb Hass as growers felt its canopy protected against the wind and the stems "resisted" dropping the fruit. This is only anecdotal, but it would suggest, at least, that having a canopy that protected fruit more towards the interior of the tree would at least be a

good place to start

30. **2017 planting 7000 GEM on 15 acres. Leaf nutrients are adequate & balanced. Impressive uniformity and growth. Heavy bees yet set just drops in June. What's up?**
Mary Lu Arpaia: Do you have pollinizers in the planting with the GEM? We have not done work with the specific need of GEM for pollinizers since all our plantings have been mixed but perhaps this is a contributing factor. Another question: Even with the fruit drop, how many fruits are persisting on the trees? On 3-year-old trees; what kind of yield do you think you have?
31. **How much water does it take to produce avocados in the San Joaquin Valley?**
Mary Lu Arpaia: We hope to get a better idea with our specialty crop grant but I imagine it will be similar or somewhat higher to what is needed in the hotter growing areas of southern California like Valley Center and the Ojai Valley (probably 4-5 acre-ft/ac depending on the water quality, rainfall and the year).
32. **The geographic focus of all the research appears to be San Joaquin and south. When will there be focus on areas north (e.g. Bay area and beyond); in particular varieties that are more frost tolerant?**
Eric Focht: There are some cold nights and frost information that we have got out of the SJV site where our trees are planted, but it is a very different environment than Northern Coastal zones...Mary Lu and I met with some farmers up in Yolo County at Wolfskill and this may be a new region for avocado growing...a concern that I would have for a foggy, cold coastal region would be on flowering and fruit set: if the weather was too wet or cold during the flowering and fruit setting period, it may affect your fruit set...this is a different question than just overall freeze resistance, but I think needs to be considered for growers.
Mary Lu Arpaia: Historically, the emphasis on avocado has been southern California and a little bit of interest in the San Joaquin Valley, although I remember visiting some small commercial groves in Santa Cruz in the 80's with Bob Whitsell who was Dr. Bergh's research technician. One of our goals is to find material that will produce well in the Central Valley with production that will augment that of southern California. I must admit, in thinking about this I was thinking of the traditional Valley growing areas of Tulare and Kern Counties. With the correct microclimates I do believe with the proper rootstocks and varieties we can grow further north although the "risk" will be greater. For your general information, the original clonal rootstock, Duke 7, is a seedling of the Duke variety which was found in Butte county!
33. **Mary Lu mentioned that Fuertes are reasonably cold tolerant. My daughter can grow an avocado tree in Humboldt County south of Eureka and would also like to get some fruit. What variety would you suggest for that cool climate? Fuertes, Zutano, Bacon, or another Mexican variety?**
Mary Lu Arpaia: I would try Fuerte. Pinkerton does all right in the SJV and have been grown there for a long time. Zutano as well. There are some trees in Fresno of Stewart which is a Mexican race, early season with a nice nutty flavor.
34. **Are the rootstocks listed all currently available to the industry?**
Mary Lu Arpaia: Some of them are commercially available: Duke 7, Toro Canyon, Dusa, Uzi, Steddom and Zentmyer. The VC rootstocks (Tami, Miriam and Ben Ya'acov1) will be available but I don't know when or how they will be available. The newer rootstocks that Dr. Manosalva talked about are in the pipeline but we are planning on some of these to be available within the next few years.
35. **How does the Dusa compare to the VC 801 overall-especially interested how on it works on the GEM variety?**
Mary Lu Arpaia: We have no data so I cannot give you any advice on this. We do know that high soil pH, GEM and Dusa are not a happy mix.
36. **I would be interested in getting your feedback about GEMS on VC207 rootstock ... do you have any feedback on growth and production of this combination?**
Mary Lu Arpaia: We have no data so I cannot give you any advice on this.

37. **So, Rodrigo, was their standardization of management, and to what extent was there variation in elemental requirements for optimal production amongst the varieties? (This refers to the trellising work of Maluma in South Africa)**

Rodrigo Iturrieta: Good question. Honestly, the management standardization is basically being developed as it goes. They are trying different styles of trellising and even testing different wire distances (between each other). What I can say is that the growth responses are what I would see as prone to increase yield. There are presentations and videos online at Maluma Day where Andre and Zander Ernst really go into deeper details.

Right, Rodrigo, so no standardization, no knowledge of variation in leaf or soil analyses at baseline or attempts to identify optimal additive alterations to optimize. This really means all of this presentation is of little value to me, alas. Science must march on; I have 360 acres with 20,000 avocado trees in Valley Center. Want to play?

38. **Why are the VC 801 (Tami), VC 66 (Ben-Ya'acov1), and VC 218 (Miriam) not included in these trials?**

Mary Lu Arpaia: The VC801 and VC218 were included in many of Dr. John Menge's trials that were continued by Dr. Greg Douhan. There is a substantial amount of data about these and this data was included in a detailed report that Greg Douhan prepared prior to leaving UC Riverside and submitted to the California Avocado Commission. Although we had the VC66 in California since 2000 Menge and Douhan did not test it since they were primarily interested in material known for root rot tolerance and at the time VC66 was just considered "salt" tolerant. Back in 2000, salinity was not considered a big issue for the California grower. I agree, we should be including these in trials with other varieties.

39. **Who sells the Steddom rootstock?**

Mary Lu Arpaia: There are several nurseries in California licensed to propagate the Steddom rootstock. If you want to know more contact me and I will get the list for you (mlarpaia@ucanr.edu).

40. **Reuben Hofshi always said that he thought the VC801 (Tami) was going to be a good one for California. Do you think it might be a good choice for GEM?**

Mary Lu Arpaia: I think it will be good, but how it will compare to other rootstocks, we need a trial to determine this. Hass on this rootstock makes a larger tree so this would need to be considered if one was going into a high-density situation with GEM, this might alter the tree spacing. But bottom-line, we unfortunately do not know.

41. **Are there any trials going on with VC801 and GEM anywhere in the world?**

Mary Lu Arpaia: I think it will be a good idea to have such a trial, but to my knowledge there are no trials yet looking at this combination.

42. **Would you please share the result of Lloyd-Butler trial with all participants? That would be so interesting to see rootstock on high pH?**

Mary Lu Arpaia: We have shared this data at grower meetings previously. We are currently collecting the 2020 yield data and I will be happy to share the data. Contact me at the end of the summer and I can send you a copy or perhaps we can write a progress report for the CAS Quarterly.

43. **Have you tried the Shepard variety in SJV?**

Mary Lu Arpaia: Haven't tried the Shepard in the SJV but we need to try a lot of varieties in the Valley.

44. **What about the Bounty rootstock? I did not see it mentioned.**

Mary Lu Arpaia: The Bounty is not yet in the USA. Hopefully soon but you will need to wait a few years since USDA requires a 2-year quarantine before you can put it out in trial. Data from South Africa suggests that it is a good rootstock especially for the Maluma!

45. **Do you have information on varieties tolerant to wood canker? Lasiodiplodia fungi is a huge problem in Peru. This is a wood decay fungus and there is not anything resistant to it.**

Patricia Manosalva: Short answer, we do not know. We have not look onto this yet in California but we will.

We reached out to Themis Michailides and Herve Avenot (Dr. Michailides and Dr. Avenot have funding from the CAC to look at “canker and blight fungi” in California) for their opinion. Here is what Dr. Michailides wrote: Regarding your question, I do not have any information about tolerant varieties to Botryosphaeriaceae cankers. Lasiodiplodia is very aggressive fungus. We have a number of Lasiodiplodia spp. One-way people determine differences among varieties is to inoculate shoot and determine how well the fungus moves into the tissues and creates cankers. Then for other crops people measure the differences in the length of cankers. All these are in the lab. I prefer to do these inoculations in the field. But we have only a few varieties in Pine Tree Ranch where the CAC allows to use those trees for research. We can check something like this in the future there, but it will be, I believe, a few varieties. But so far, I do not have anything on tolerance differences among the avocado varieties, neither I have seen any literature.

Dr. Avenot replied: We did some preliminary pathogenicity tests of Botryosphaeriaceae species (*Lasiodiplodia theobromae* and *Neofusicoccum nonquaesitum*) on detached avocado budwood (scions = Hass and Gem) and rootstocks (Dusa, Toro Canyon, Duke 7). Our preliminary results using mycelial plugs showed that they were very aggressive on all cultivars and rootstocks. In comparison *Colletotrichum* species were less aggressive. In the coming weeks we will test the same pathogens on potted young avocado plants and liners. We also have done inoculations in the field with the same pathogens on Lamb Hass and Hass (on Toro Canyon).

46. If you were an avocado grower trying to maximize your profitability and about to plant new trees, what cultivar would you choose, what rootstock would you be growing it on and what spacing would you choose?

Mary Lu Arpaia: Excellent question with unfortunately not a straightforward answer. As you probably know, planning for a new grove or a replant situation is complicated. The development of new varieties and new rootstocks should be a process that is done in collaboration with the industry. I am going to talk about varieties here; rootstocks are simpler since we want them to have disease and salt tolerance, not limit productivity of the variety and ideally have wide adaptation to different soil types. Adoption of new varieties is very dependent on grower acceptance of the new material. Even after this, it may take years for a variety to take traction. For varieties, with lack of recent input by the industry, we have concluded that we need new varieties with very high eating quality so that consumers will want to purchase them, and we need new varieties that can reduce the cost of production to the grower. For us (Arpaia, Focht and Iturrieta) this translates into varieties that have a smaller footprint in the orchard, are amenable to high density if this is what you want to do, and are more yield efficient and with less alternate bearing. We believe that the Lamb Hass, GEM and Reed are 3 varieties that meet at least some of these requirements. Are they perfect? No, every variety has weaknesses, that is why varietal (and rootstock) development should be a continuous process, always improving on what we have and meeting the changing needs of both the grower and the consumer. We at the University need input from the grower as to what you think your needs are. We used to do this with the Variety and Rootstock subcommittee of the CAC-PRC which was chaired by John Lindstrom. This was a great interchange and the goals I set forth above largely came for this input. We also need to get feedback back from growers planting new material. When we develop new material, by necessity we can only do limited trials and the release of materials is based on these limited trials. We learn much more once growers begin to experiment with this new material. Another important aspect, at least for new varieties, is getting the packers and others promoting the material to be willing to invest time and energy into building a customer base for something new. Personally, I think the USA consumer, at least in mature markets, are ready for some varietal diversity. The feedback I receive back from friends and family, who are admittedly all avocado lovers, is that they want more choice. I know this is a long-winded answer to this question but it is just an attempt to let you know that we are committed to help you maximize your profits, we want to see you profitable and are open to hearing from you to help us find material that will sustain the California industry for future generations.

47. High density is not a good mix when Laurel Wilt gets to California

Mary Lu Arpaia: Yes, good point because of spread of the disease through root grafting.

48. At some point will someone be telling us based on what is currently known what is the best combination of rootstock/cultivar and planting density is likely to be to maximize profitability? I realize that there are many variables that play into an answer to this question but I think that's why most of us logged into this webinar.

Mary Lu Arpaia: Unfortunately, except for the Lloyd-Butler trial we have NO rootstock trials with varieties other than Hass.

OK thanks. Will anyone be putting all this information together with specific advice to us answering my questions? Ultimately almost all growers are primarily interested in being profitable so if this webinar does not address that issue directly most attendees are likely to consider this is not very helpful. I realize you guys don't have crystal balls but addressing our primary concern directly should be a key objective of any webinar or seminar you are asking us to devote our time to. Otherwise, we are wasting each other's time. I say this respectfully as I am strong supporter of research but give us useful information we can use and be as specific as possible.

Mary Lu Arpaia: With what is commercially available I would have a mix of varieties since they have different seasonality. Hass should be in the mix, I would try GEM, I would have some Lamb Hass, I would have Reed. As to rootstocks, we do not have a good idea of how different varieties perform on the different rootstocks ... we need trials for this but in the Butler trial I can tell you up to date there is no rootstock/variety interaction which suggests therefore that if Hass does well in one rootstock another variety should do good as well...

Tree spacing is going to be dependent on the variety and also to some extent on rootstock. In the Butler trial, you can clearly see that some rootstocks are making bigger trees. If you buy trees therefore on these rootstocks you will either need a wider spacing or will need to do more pruning. I think also it will depend on the region where you want to plant.

Respectfully back to you. Farming is not prescriptive or necessarily follows a cookbook.

Rather it is a mix of a sound foundation in plant biology and the general requirements of the crop we are growing, knowledge of your local conditions (benefits and limitations) and the ability to integrate this into an action plan that works for you and makes money. When one is cooking, we all adapt recipes to suit our situation and palettes, growing trees is the same thing, you need to adapt to your local conditions; there is no master recipe book. I am personally a firm believer that it is not my job to provide recipes but to provide guidance and to help a grower or packer or any interested party educate themselves so that they have the future tools to make sound decisions.

49. Congratulations! Amazing effort and expense to develop new and better avocados. A bit surprised, no mention (so far) of Laurel Wilt in the equation.

Mary Lu Arpaia: Great point, we don't have laurel wilt (yet!) in California so we can't test this but yes, it is an important thing to be considering and is always in the back of my mind. The 2020 Laurel Wilt Symposium held in Florida is online at: <https://ufl.zoom.us/rec/share/6tdrHq3spkxLRKuS2VOFGaEzRaS7X6a80SUfrqYJnkuVYiHCDKUa5wtKYTp5ucdn>