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Viticulture Notes

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vitis@vt.edu https://www.arec.vaes.vt.edu/arec/alson-h-smith.html

I. Current situation:

Sharp temperature changes in the middle of winter are always a cause for concern with any of our commonly grown cultivars, but particularly with the more tender, cold injury-prone varieties such as Merlot and Tannat. This is the first winter in over a decade that I've had reason to measure grapevine dormant bud cold hardiness, which I'm doing with one of our research projects. My sampling is limited to two varieties, Petit Manseng, and Cabernet Sauvignon, both of which are grown at our experiment station near Winchester, and both of which are moderately cold-tender. Monthly bud hardiness assessments conducted since early November have illustrated excellent cold acclimation with both varieties and, despite the relatively warm December, both are at good to excellent stages of mid-winter cold hardiness. With respect to the latter point, the temperature required to kill approximately 50% of the Cab Sauvignon buds as of 6 January 2020 was -7.0°F. The temperature required to kill approximately 50% of the Petit Manseng buds at the same time was about -3.0°F. Both varieties entered the fall/winter in excellent condition and with upcoming, forecast lows in the low teens, I would only anticipate slight decreases (greater cold hardiness) in these figures. So far, so good, but there's a lot of winter ahead of us yet.

II. Research recap: What happens when Cabernet Sauvignon grapevines are converted from spur pruning to cane pruning at five-foot vine spacing?

Tremain Hatch, viticulture research/extension associate

This report has been adapted from**:** *Hatch TA, Nita M and Wolf TK. 2019. Vegetative and reproductive responses of mature Cabernet Sauvignon grapevines converted from spur pruning to cane pruning at five-foot in-row vine spacing. Catalyst 3:8-16.* (Copies are available by request)

Although cordon training and spur pruning has been the preferred training used in the Mid-Atlantic, more growers are now designing vineyards to utilize head training and cane pruning.

What about established vines? Can mature, cordon-trained vines be “retro-fitted” to head-training and cane pruning where such vines were planted at relatively wide in-row spacing? This trial with mature, cordon-trained, spur-pruned vines was conducted to determine if conversion to cane pruning was justifiable from the standpoint of three desired outcomes: vegetative growth suppression, maintenance of crop yield, and achievement of uniform crop ripeness. This work was presented orally at several meetings including winter technical meetings, and was recently published the American Journal of Enology and Viticulture’s *Catalyst* journal as indicated above. Seven-year-old, spur-pruned Cabernet Sauvignon (clone 337) grapevines were either maintained with cordon training and spur-pruning or were converted to head training and cane pruning in the experiment. The vines were originally spaced five feet apart in the row, which we felt was marginally excessive for uniform shoot and fruit development if retro-fitting back to cane pruning. Let’s see if our concerns were justified.

Here were the basic features of the field experiment: The experiment comprised a sub-set of plots that were part of a larger experiment established in 2006 at the AHS Jr. Agricultural Research and Extension Center near Winchester Virginia. The larger experiment sought means of reducing vine size in overly vigorous grapevines and used Cabernet Sauvignon (clone ENTAV-INRA 337) grapevines spaced five feet apart in nine-foot wide rows oriented on a NE/SW bearing. Within the broader experiment, three factors were evaluated in a blocked field plot design. Within each of 6 blocks, main plots (strips) compared under-trellis cover crop (UTCC) with conventional floor management that included an herbicide strip; subplots (n=3) were a rootstock comparison; and sub-subplots (n=3) evaluated the effects of root restriction or training manipulation (this report). More specifically, the UTCC was a 2.8-foot wide strip of creeping red fescue established in fall 2007, and combined with a permanent, mixed sward of tall fescue and orchard grass in the vineyard interrows. The UTCC treatment was compared with a conventional Mid-Atlantic floor management scheme comprising the same interrow groundcover combined with a 2.8-foot weed-free strip maintained under the trellis with a combination of pre- and post-emergence herbicides. Subplots compared rootstocks Riparia Gloire (Riparia) (*Vitis riparia*), 420A (*V. berlandieri* x *V. riparia*), and 101-14 (*V. riparia* x *V. rupestris*). The sub-subplots compared root system manipulation and the training comparison described in this report. Root system manipulation compared vines grown in root-restrictive synthetic bags (RR) or conventionally planted with no root restriction.

The pruning comparison for this report included 30 cordon-trained and spur-pruned vines, compared with 30 vines of corresponding sub-subplots of similar vines converted to head training and cane pruning using a single-trunk system. Conversion occurred following the 2011 season, six years after planting. Until the year of conversion, all vines were trained to two trunks and bi-lateral cordons were spur-pruned annually. Training conversion took place prior to budburst in 2012 and involved making large cuts to remove existing cordons and one trunk of the double-trunked vines of the cane-pruned vines. Cane-pruned vines were head-trained each year at dormant pruning to two canes, each about 2.5 feet long and tied to the fruiting wire in a (flat) double-Guyot-like fashion. Spur-pruned vines retained the double trunk and bi-lateral cordon architecture to which they had originally been trained.

Major Results: The consequences of conversion from cordon training to head training include these general areas of interest: suppression of vine size to aid canopy management, maintenance of crop yield, and uniformity of crop ripeness at harvest.

Vine size suppression: The overarching goal of the research in which this trial took place was to evaluate practices that could reduce vine size in a humid environment. In this context, cane pruning resulted in a modest reduction (25%) of vine size compared to spur-pruned vines, as measured by dormant cane pruning weights. The reduction in vegetative growth was less than that achieved with root restriction, but slightly more than that caused by the use of competitive, intra-row cover crops. Nevertheless, cane pruning has utility in a humid environment to reduce vine size, especially if combined with other practices such as under-trellis cover crops and lower vigor conferring rootstocks (Figure 1). Reduced vine size with cane pruning was conceivably due to the reduced volume of perennial, above-ground wood and possibly root volume, and corresponding reductions in carbohydrate and nitrogen reservoirs, relative to the greater volume of perennial wood used with spur-pruned vines.

Maintenance of crop yield: Crop levels were lower on the cane-pruned vines the season following conversion, then higher the remaining three seasons of the trial. Increasing crop levels are desirable to increase vineyard revenue; however, both crop quantity and quality are important for revenue generation. Grape quality did not diminish on cane-pruned vines with one caveat: in years with sustained rainfall directly preceding harvest, we anecdotally observed more bunch rots with the cane-pruned vines in which there were regions within the fruit zone with overlapping or entangled clusters. Selective cluster thinning with the goal of removing entangled clusters is prudent on cane-pruned vines in regions prone to fungal bunch rots.

Crop load or the ratio of crop weight to cane pruning weight for a given year is used as a measure of vine balance. The combination of decreased vegetative growth coupled with an increase in crop levels resulted in a net increase of crop load with cane pruning. Wine grapes grown in a humid and warm environment often have low crop load values due to the supra-optimal vegetative growth relative to crop level.

Uniformity of shoot development, including corresponding fruit ripening, was a primary response of interest with this experiment. Anecdotal experience with cane pruning in Virginia suggests that shoot growth on cane-pruned vines is more variable in growth than spur-pruned vines. We therefore hypothesized that shoots of cane-pruned vines would be more variable [less uniform] in size than those of spur-pruned vines. In fact, while the mean cane weight is lower for cane-pruned than for spur-pruned vines, our individual cane attribute data showed statistically similar variance [uniformity] between canes of the two systems. Thus, although somewhat long canes (~2.5 feet) were required for bi-lateral cane-pruning with vines spaced five feet apart in the row, the commonly observed suppression of mid-cane shoot development on these canes did not translate into amplified variance of individual cane weights at dormant pruning with cane-pruned vines (Figure 2).

Uniformity of crop at harvest: The mean juice brix from individual shoots were not significantly different between the two pruning systems in either year; however, in 2014 the variance was greater for cane-pruned than for spur-pruned shoots. Examination of Figure 2 suggests that the greater variance of brix with cane-pruned vines in 2014 owes to a greater proportion of lower brix (18 – 20°) fruit that season. Cluster number, crop load, pH and TA were all significantly different and had different distributions (Figure 2). Other reproductive attributes such as crop weight and cluster weight had inconsistent differences.

Altered phenology: Delaying budburst is desirable in a continental climate where spring frosts can reduce crops, and in this respect the cane pruning had a clear advantage to the spur-pruned vines. The duration of this delay varied from 5 days to 13 days depending on the year. This delay is important, but not enough to clear a mid-May frost. Interestingly, the delayed shoot development in cane-pruned vines was still present at bloom; however, the cane-pruned vines had a higher proportion of fruit showing color change at the onset of veraison. Comparable Brix between the two training systems at harvest suggests that the cane-pruned vines “caught-up”.

Canopy characteristics: Fewer buds developed into shoots on cane-pruned vines and our goal of ~ 12 shoots per 3.3 feet of canopy required less shoot thinning than was required with the spur-pruned vines (Table 1). We doubt, however, that there is a net decrease in labor needed per year because the tying of dormant canes necessary with cane-pruning adds labor. While there may not be a net change in labor needs between the two training systems, tasks in the dormant period such as pruning and cane tying are less time-sensitive than shoot thinning which takes place when skilled labor is in higher demand.

Trunk diseases: Head training and cane pruning inherently reduces the number of pruning wounds on retained wood compared to spur-pruning, although rather large pruning wounds were created here in the year of conversion to remove existing cordons and one of the two trunks from the spur-pruned vines. The annual wounds of cane-pruned vines are restricted to the head region of the vine, simplifying preventative measures such as double-pruning and prophylactic wound protection. We did not observe vine loss or visually apparent evidence of fungal trunk diseases during dormant pruning and canopy management over the course of this study. Nevertheless, double-pruning, prophylactic wound protection, and a program of trunk renewal are appropriate practices in the year of conversion as well as in subsequent years under commercial situations.

Conclusion: Our goals did not include an evaluation of the merits of one pruning system over the other, only whether conversion at a relatively wide in-row vine spacing was feasible. Our results, while limited to Cabernet Sauvignon, suggest that vines that are spaced five feet apart in the row and trained to cordons and spur-pruned are not permanently relegated to this pruning system should the vineyardist decide that head-training and cane-pruning might be superior. Compared to spur-pruned vines, cane-pruned vines exhibited delayed budburst and bloom, produced fewer, but more fruitful shoots, and had lower dormant cane pruning weights. Juice Brix at harvest was similar between the two systems in the four seasons after conversion.

Table 1. Fruitfulness and total shoot count per vine in 2013, 2014, and 2015.

	Count shoot fruitfulness (inflorescences/shoot)[a, b]			Total shoot count (shoots/vine)[a]		
Training/pruning treatment	2013	2014	2015	2013	2014	2015
Cane-pruned	2.0	1.9	1.9	24	19	23
Spur-pruned	1.6	1.5	1.7	46	44	45
Significance[c]	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Percent change with cane-pruning compared to spur-pruning	25%	27%	14%	-48%	-57%	-49%

[a] Fruitfulness and shoots counted before shoot thinning. Shoots were subsequently thinned to about 20 per vine.
[b] Count shoots defined as shoots that arose from clearly defined nodes and distinguished from basal shoots, which arose from latent buds and buds at the base of spurs.
[c] Probability of a greater F statistic.

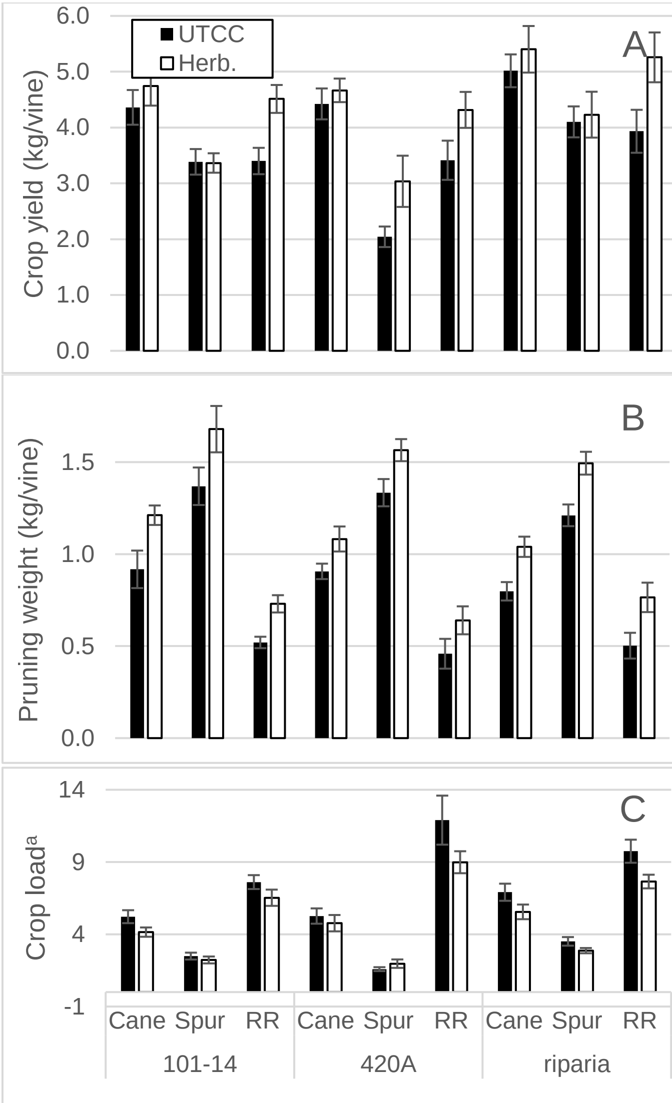

Figure 1: 2014 Crop yield (A), dormant pruning weights (B) and crop load (C) of Cabernet Sauvignon vines as a function of vineyard floor management (under trellis cover crop, UTCC, or herbicide strip, herb.), rootstock (101-14, 420-A, or riparia) and manipulated with either spur-pruned (Spur), cane-pruned (Cane) or root restriction (RR). Crop load is calculated as yield divided by pruning weight. Weights in kilos can be converted to pounds by multiplying by 2.2. For a given rootstock, vine size (pruning weight) was decreased by cane pruning, by root restriction, and by under-trellis cover cropping (black bars), while riparia rootstock had the greatest reduction among the three rootstocks evaluated.

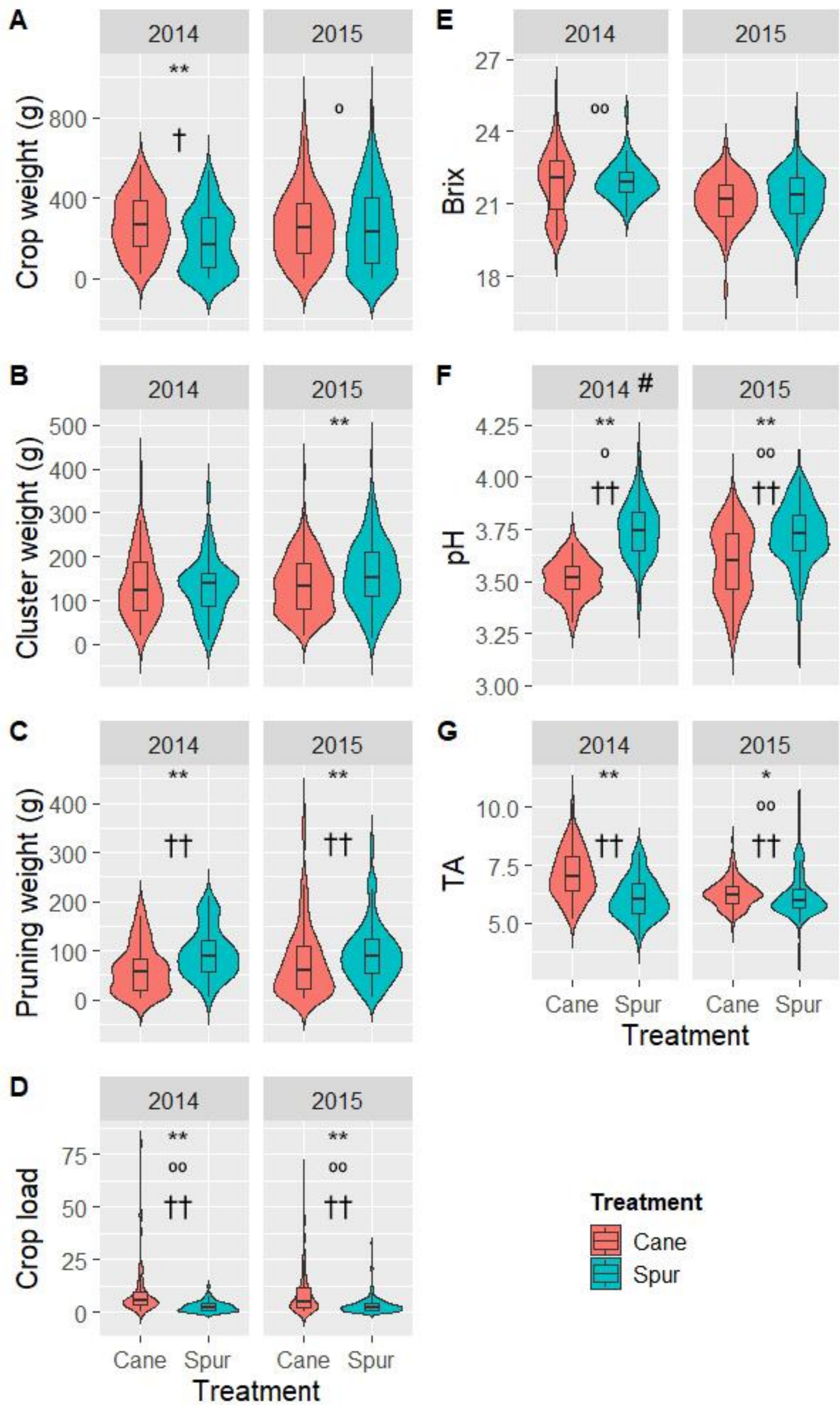

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Figure 2 (PREVIOUS PAGE): Distribution of individual shoot/cane attributes sampled from individual shoots from 2014 (n=148 canes) and 2015 (n=364 canes) from vines trained to cane-pruned (Cane) or spur-pruned (Spur). The horizontal line within the box represents the median sample value. The violin plot width shows the density of response observations at the y-axis value – in essence, the wider the "violin" body, the greater the data variability at that point of the y-axis value.

Acknowledgments: The authors gratefully acknowledge funding for this work from the Virginia Wine Board, Virginia Agricultural Council, and the National Institute of Food and Agriculture, U.S. Department of Agriculture. Appreciation is also extended to Danielle Bunce, Dana Melby, Cain Hickey, Brycen Hill, Hannah Kasabian and Russell Moss for their collective vineyard assistance.

III. Periodical cicadas: (adapted from https://www.pubs.ext.vt.edu/444/444-276/444-276.html *and discussed periodically in previous Viticulture Notes*)

The emergence of periodical or 17-year cicadas will occur over parts of northern Virginia in May/June 2021. The emergence of periodical cicadas varies throughout the state, depending upon the specific brood. "Brood X", as the northern Virginia brood is referred to, last appeared as adults in 2004. Readers in parts of southwest Virginia witnessed the emergence of the brood IX 17-year cicada in 2003, while growers in central Albemarle County saw brood II emergence there in 2013. These insects disregard geo-political boundaries: depending on where your vineyard is in Shenandoah County, for example, you might have witnessed the last emergence of 17-year cicadas in 2004, 2016, or 2017.

Eric Day and other entomologists at Virginia Tech provided the following information (https://www.pubs.ext.vt.edu/444/444-276/444-276.html):

Biology: Periodical cicada spends most of its life as a nymph, feeding on xylem sap from tree roots. In the final year of development, nymphs crawl from the soil, climbing tree trunks or any other structure. During the night, the nymphal skin splits along the midline, and the adult emerges. Adults appear in mid- to late-May (a few individuals may be heard as early as late-April). They appear around sunset, males slightly preceding females. Males congregate *en masse* in "chorusing centers". Singing peaks around 10:00 AM. Adults feed on a wide range of woody plants during the day; such feeding is apparently restricted to the females because the male digestive tract is rudimentary. Oviposition (egg laying) begins about 2 weeks after emergence. Eggs are inserted into twigs in groups of 10-25; the slit into which the eggs are inserted is 1-4 inches (2.5-10 cm) long. Females may lay over 500 eggs. Oviposition peaks in the early afternoon. Adults are active for about 6 weeks. Eggs hatch 6-10 weeks after oviposition, whereupon nymphs leave the twigs and drop to the soil. Nymphs tunnel to the roots where they establish themselves for feeding.

What threat do cicadas pose to grapevines? Injury by egg-laying is a much greater problem than is the feeding, and injury to young (one- and two-year-old) vines is more significant than is injury to older, mature vines. The cicadas will deposit eggs in grape shoots and smaller cordons of the vine. Unsupported shoots often break beyond the point of egg-laying, but because this occurs relatively early in the growing season (June), lateral regrowth will normally compensate for the loss of a primary shoot tip. In older wood, the oviposition site typically heals without apparent long-term consequence. The damage to shoots on newly planted vines, however, may render the shoots and developing canes unfit for retention as permanent trunks (or cordons), and one southwest Virginia grower reported actual vine loss due to cicada injury during 2003.

Insecticidal control of cicadas is not very practical because of the extended period of emergence and activity (up to 6 weeks) and because insecticides would have to be applied very frequently to come in contact with newly emerging insects. Netting is an option, but the economics of this approach with grapevines is questionable. Young (first-year) vines are a special consideration in that one is attempting to produce shoots to serve as trunks in the following year. One means of protecting the shoots of young vines would be to use grow tubes, which would discourage cicadas from at least the first 24 to 36 inches of the shoot, depending upon the height of the tube. Another consideration is to delay planting for a year or two before the anticipated adult emergence to reduce the potential for egg-laying in shoots intended to serve as vine trunks.

IV. WineGrape Spray Guides

The **2019-2020 WineGrape Spray Guides** from VineSmith are available**.** This set of unique at-a-glance posters contains all the information you need to quickly and easily select the best fungicides, insecticides and herbicides for your vineyard. These posters will save you countless hours of time planning and tracking your spray program.

Here's what's new in the **2019-2020** edition:

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- regional restrictions for each product
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- Insecticide Guide poster

- Herbicide Guide poster
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- efficacy for each disease, insect and weed pest
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- cost per acre per application
- mode of action
- resistance risk
- maximum allowable rates and applications per season
- restricted entry interval
- pre-harvest interval
- personal protective equipment
- toxicity to humans, bees, beneficial insects and fish
- spray adjuvant recommendations
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…….for all the major pesticides registered for use on wine grapes east of the Rocky Mountains.

That's 52 fungicides, 47 insecticides and 23 herbicides!

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www.vinesmith.com/spray-guides

V. Grape Production and grape acreage

Each year, the Virginia Wine Board assesses Virginia commercial grape production and acreage to produce the Commercial Grape Report (CGR). This report helps associations, wineries and growers understand the market over time. Compiled data are used to inform and execute on key marketing strategies that affect our industry. We use the data to help advise new and potential growers about market conditions, industry well-being, and varietal mix of the industry. Demonstrated positive growth of the industry is also very helpful when trying to garner research and extension support from our administrative superiors. The reports are only as good as the data collected. The Wine Board is working with a new company this year, SMS Research Advisors. SMS mailed survey forms to known commercial producers before the holidays to gather data from the 2019 harvest. At last count, the return rate was well below 50%. Although the research group wished to receive results before the first of the year, they are continuing to solicit returns from others – there is still time to participate.

This is my space to urge you to please complete the survey if you've been contacted by SMS. This only applies to vineyards and wineries in Virginia. The survey should take less than 10 minutes. If you prefer to complete via online/telephone or would like to opt-out of further reminders regarding this assessment, please reach out to Leanne Stacey, research manager at SMS Research. Her contact information is:
lstacey@smsresearch.com
952.939.4307
If you have already replied -- thank you! The composite (no individual data) reports will be publicly available on the Virginia Wine Board's website in early 2020. Those who participate will also receive a first-look summary of results, which will include exclusive third-party insights and trends not included in the public report.

Please do your part with this important industry function.

VI. Meetings, workshops and shortcourses:

Virginia Vineyards Association's winter technical meeting:

Reminder: Make plans to attend the 2020 Virginia Vineyards Association winter technical meeting, 19 – 21 February, 2020. The meeting will be held at the Omni Hotel in downtown Charlottesville. A notable change from past meetings is the day earlier start of the meeting, with a conclusion on Friday afternoon rather than Saturday. Registration, lodging and other information is provided on the VVA website, here: https://virginiavineyardsassociation.org/

The meeting will provide something for nearly everyone. Attendees on Wednesday, 19 February can choose between a "beginner's grape production workshop" led by Virginia Tech's viticulture team, and an "Interactive grape disease management workshop" led by Virginia Tech's Mizuho Nita. These workshops are scheduled separately from the main meeting on 20-21 February.

The program on Thursday the 20th is based on the premise that variety development and testing is an on-going imperative for the Virginia wine industry. Dr. Bruce Reisch of Cornell University will discuss some of the tools being developed to accelerate the breeding of new grape cultivars as part of a federally funded (USDA/NIFA) project (VitisGen2, https://www.vitisgen2.org/). Joe Fiola (University of Maryland) and Alice Wise (Cornell University, Long Island) will review some of the recent wine grape evaluation results from their respective programs. Yuri Zambon of Vivai Cooperativi Rauscedo (VCR, http://www.vivairauscedo.com/en) in Italy will discuss the development and recent release of a number of wine grape cultivars with increased tolerance to certain diseases (with wine tastings). Some of our own producers (Jenni McCloud and Sharon Horton) will also discuss the hoops and hurdles they faced in gaining TTB and consumer acceptance of "novel varieties" (who knew what a Virginia Petit Manseng was in 1990?). The presentations on Thursday follow similar discussions at the VVA/ASEV/Eastern Section meeting organized in July 2017.

The Friday portion of the program provides an opportunity to learn about some of the on-going research in Virginia (Virginia Tech and via the Winemaker's Research Exchange), and to obtain full recertification credits towards Virginia's private pesticide applicators certification. Bring your applicator's certificate number with you. We will also hear from economists (Trent Davis, Cornell University) on vineyard financials: what the anticipated costs and returns are from a commercial vineyard operation (okay – Finger Lakes of NYS, not Virginia, but some ideas on applying the methodology to our situation).

The meeting is hosted by the Virginia Vineyards Association with heavy, but not exclusive, program input from specialists with Virginia Cooperative Extension. Rooms at the Omni Hotel fill quickly and the discounted room rate is valid only through 24 January. See the VVA website for details. Hope to see you there!

Commercial pruning workshop:

Pruning School - Featuring UvaSapiens Vineyard Consulting Team
https://www.eventbrite.com/e/pruning-school-featuring-uvasapiens-vineyard-consulting-team-tickets-89250577881

The Monticello Wine Trail Association has organized a two-day winter pruning school followed by 1.5 days of follow-up in the spring according to the following schedule. The course will be taught by the internationally acclaimed consulting team, UvaSapiens (http://www.uvasapiens.com/en/) and will focus on pruning techniques which respect vine physiology and sap flow resulting in improved vine longevity, yield, and uniform ripening. Avoiding poor decisions and bad cuts is essential to the health and lifespan of a vineyard. This course will instruct students on the best management practices for achieving long term pruning success in a challenging climate.

Course Details:

Monday, Feb. 17, 2020 - 8:00 AM-4:00 PM (Winter Pruning)

Tuesday, Feb. 18, 2020 - 8:00 AM-4:00 PM (Winter Pruning)

Tuesday, May 12, 2020 - 8:00 AM-4:00 PM (Spring Follow-Up)

Wednesday, May 13, 2020 - 8:00 AM-12:00 PM (Spring Follow-Up)

Registration is required via the following website:

https://www.eventbrite.com/e/pruning-school-featuring-uvasapiens-vineyard-consulting-team-tickets-89250577881

For further information,
Joseph Geller
Viticulturist
Trump Winery
jgeller@trumpwinery.com

Shortcourses from Bordeaux Sciences Agro:

Bordeaux Sciences Agro has created short courses in English for wine professionals that might be of interest to Virginia producers. Bordeaux Sciences Agro is the agricultural university of Bordeaux with expertise in viticulture, enology, terroir and sensory analyses. Three short courses are offered in 2020. It's worth checking out the details of the multi-day courses by clicking the hyperlinks to each.:

Bordeaux wine making specificities:
https://www.agro-bordeaux.fr/fiche-pedagogique/bordeaux-winemaking-specificities/

Terroir and vineyard management:
https://www.agro-bordeaux.fr/fiche-pedagogique/terroir-and-vineyard-management/

Sensory analysis, a tool for monitoring wine making
https://www.agro-bordeaux.fr/fiche-pedagogique/sensory-analysis/

These courses are tailored for winemakers, viticulturists, technical managers and consultants. Further information can be obtained from the instructional team.

- Kees van Leeuwen (vanleeuwen@agro-bordeaux.fr)

- Coralie Dewasme Laveau (coralie.dewasme@agro-bordeaux.fr)

- Anne-Laure Piaser (anne-laure.piaser@agro-bordeaux.fr