Agenda of the 2021 NCCC 212 Meeting:

Tuesday, Nov 2, 2021

- 10:00AM – 1:30PM EST: State Reports Part 1
- 2:00PM – 4:00PM EST: NCCC 212: NCCC 212 Business meeting
- 4:00PM – 5:30PM EST: SCRI PIP CAP Kick-Off Meeting
- 7:00PM: Social Hour

Wednesday, Nov 3, 2021

- 10:00AM – 12:00PM EST: State Reports Part 2
- 1:00PM – 3:00PM EST: Germplasm Committee Meeting.
- 3:00PM – 4:00PM EST: Virtual tour and Q+A with Pairwise, a horticulture crop genome editing start-up in the triangle.
- 5:00PM – 6:00PM EST: Seminar: "Agricultural Research: Trends, Challenges & Opportunities from an Industry Perspective" with Adrian Percy, the new director of the NCSU Plant Science Initiative.

All state reports, minutes, zoom recordings and full agenda can be found here: https://smallfruits.cals.ncsu.edu/nccc-212-2021/

Brief **Summary of Minutes** of the annual meeting**:**

Day 1	**Day 2**
Auburn (Alabama) 2021 Report	Penn State 2021 Report
University of Arkansas 2021 Report	Ontario 2021 Report
British Columbia 2021 Report	Wisconsin-Madison 2021 Report
Michigan State University 2021 Report	USDA-ARS Beltsville 2021 Report
Mississippi State University 2021 Report	Utah 2021 Report
New Hampshire 2021 Report	USDA-ARS HCRU Corvallis 2021 Report
Rutgers (New Jersey) 2021 Report	USDA-ARS HCRU Appendix
Cornell CUAES and NYSAES 2021 Report	USDA-NCGR Corvallis Report
North Carolina State University 2021 Report	Washington State University 2021 Report
North Dakota 2021 Report	

Oregon State University 2021 Report	

British Columbia: works directly with the growers' organizations; BC Blueberry Council, Raspberry Industry Development Council, and BC Strawberry Growers Association. Pathology projects for blueberry and raspberry for fruit rot, integrating host resistance and alternatives, and monitoring arthropod pests. Other projects for blueberry and raspberry for non-traditional crop inputs, new blueberry cultivar challenges, Spotted Wing Drosophila pest management, non-chemical Vole Control, spray-induced gene silencing of blueberry scorch and chock viruses, Plant Growth Regulators for blueberry, PCR diagnostics for plant-parasitic nematodes, identify novel viruses in blueberry, european foulbrood in honey bees pollinating blueberry, fruit quality in blueberry, IPM guides, reduced nitrogen rates in commercial blueberry, and managing berry root health. Breeding programs for raspberry and blueberry had several challenges and accomplishments.
Michigan State is looking for collaborators for blueberry stem gall wasp (Pat Edgar). Genomic development for blueberry and cranberry. Genomic resources for strawberry are publicly available (see full notes for links), and five new publications.
Auburn (Alabama) introduced two new colleagues; a new breeder and plant physiologist. Cooperative projects are ongoing with UC Davis, assessment of muscadine and advanced selection cultivars, evaluating performance of table grapes, performance of UC Davis developed Pierce's Disease resistance, evaluations of rootstock for sustainable hybrid bunch grape production, assessment of UGA blueberry breeding program new releases.
Mississippi State collaboration request for germplasm that can withstand 100 inches of annual rain. Research in renovation pruning of blueberry, evaluating blackberry cultivars for tolerance to white drupelet disorder, additional nitrogen application reduced white drupelet disorder in blackberry, breeding of Pierce’s Disease tolerant and resistant grapes and muscadines. Two thornless blackberries. Bunch grapes have a graduate student working on wine production. Passionfruit, newly working with the USDA, collaboration efforts.
New Hampshire is evaluating seedless table grapes under VSP and Munson, and newer varieties were added. Ongoing work with production systems in strawberries; winter protection with row covers, testing low tunnels, and updating the Strawberry Production Guide. Fig production interest as a viable specialty crop.
Rutgers (New Jersey) is working on a patent and no longer has a breeder. Goldenberry had 18 strains identified, approximately 125 growers interested, being attempted in high tunnel, Sustainable Production Guide Free online PDF at the end of the year. Strawberry germplasm development, longday/day neutral, flower mapping with nitrogen affects and teaching growers how to flow map (see full notes for link to videos).
North Carolina State blackberry and raspberry has a breeding program looking at post harvest, Pairwise study with genetic focus in *Rubus*, long cane trials raspberry, blackberry trials of USDA cultivars on-farm, reflective groundcovers enhancing blackberry canopy light distribution, and evaluation of gibberellic acid and prohexadione calcium for cane management. Blueberry VacciniumCAP genetic study for fruit characteristics using QTL analysis, FFAR seeding solutions program, breeding and molecular genetic program, evaluation of selections for splitting, self-fertility, and fruit quality traits. Grapes had establishment of PD resistant cultivar trials, fresh market muscadine cultivar trials, Precise Indoor Vine Conditioning to improve grape flowering, evaluation of trunk disease, developed an under-vine crop guide, and fruit composition of muscadine. Strawberry development and integration of next generation propagation practices (PIP-CAP), genome wide association studies in octoploid biparental population discover QTLs for hemibiotrophic and necrotrophic infection resistance to *Colletotrichum acutatum* and *C. gloeosporioides*, breeding and germplasm screening, evaluation of cultivars and LCN advanced

selections, and evaluation of pathogen and weed control efficacy of heat releasing substances in combination with steam. Elderberry received a small grant for funding. Goumi berry suitability project.
Cornell (CUAES and NYSAES) reported climate concerns. Strawberry does not show a difference in plastic covering types and pre-planting in greenhouses showed an increased yield of 77%. Strawberry research on the effect of plastic low tunnels on natural enemies and pollinators, sugar content influenced by temperature during fruit development, and U-pick farms best practices during COVID-19 pandemic. Breeding program for raspberry was an outdoor production, and strawberry low tunnels experienced deer pressure. Patents for strawberry plants 'Dickens', raspberry plant 'Crimson Treasure', and one pending. Production of early plant growth had better yield, research on strawberry crown plugs, and performance in cold climate plasticulture production.
University of Georgia completed projects for objective 1 were to develop small fruit germplasm through cooperative breeding and evaluation programs, and productivity and postharvest quality trials of strawberry. Strawberry variety trial project for potential for southeastern production at harvest and postharvest. Ongoing projects for objective 3 were to evaluate pre- and postharvest fruit quality components, alternative atmosphere treatments in muscadine, objective 4 to identify opportunities and collaborate on extension resources, and online training bilingual series in postharvest handling and food safety of small fruits.
University of Arkansas had historic low/cold temperatures that impacted crops. Blackberry breeding program developed cultivars, Prime-Ark® Horizon new selection, novel dwarf program run by Margaret Worthington, molecular breeding activities, and the GWAS tetraploid project. Blackberry projects were Pairwise GWAS and collaboration trial, evaluation of gibberellic acid and prohexadione calcium, comparison of rotating cross arm trellis and standard T-trellis for pest management, nitrogen rate fertility trial, monitoring Broad Mite and Spotted Wing Drosophila, evaluation of pre-emergent herbicides and greenhouse screening, intelligent soft robotic gripper for fresh-market berry harvesting, cultivars assessment of quality traits for UA system, identify attributes and harvest practices that impact UA fresh-market, and evaluation of harvest date on flavor and volatile attributes of fresh-market. Blueberry have a new cultivar. Table grapes and Muscadines have release of wine grapes 'Indulgence' and 'Dazzle', muscadine cultivar development program, muscadines 'Carlos' and 'Noble' were cold hardy, continuing to seed cross with Jeff Bloodworth, evaluation of rooting protocol for hardwood cuttings of muscadines, evaluating postharvest quality attributes of fresh-market muscadines, Arkansas Quality Wine Program, and evaluate use of non-Saccharomyces yeast in wine fermentation. Strawberry research on row cover and planting dates for production, variety trial, evaluation of Promax and Zap, foliar fungicide termination timing, and Southeastern Strawberry School Webinar Series teaching resource. Open discussion of the heat effects on blackberry yield and fruit development from multiple participants (see full notes).
North Dakota had The Germplasm Enhancement Project focus on *V. riparia* for winter hardiness, two pre-release. Juneberry collected native biotypes for nursery evaluation, and continued to evaluate thirty-one biotypes and fourteen named cultivars, looking at ways of propagation. Chokeberry testing for resistance to X-disease. Grapes had devastating dieback of almost all cultivars. Blackberry and Raspberry had a grant to evaluate integrated Spotted Wing Drosophila management in red raspberries. Small Fruit has a PhD student continuing to evaluate SWD distribution and presence. Extreme weather conditions had abrupt changes of 80 degree swing in a single day; into the 60s and dips to below freezing.
Oregon State University objective 1 to develop improved small fruit germplasm through cooperative breeding and evaluation; USDA-ARS cooperative breeding program, and new blueberry and caneberry breeders hired. Objective 2 to develop practices for small fruit production tailored for climatic and market needs of growers; blueberry, raspberry and blackberry, strawberry, wine grapes, and integrated pest management. Objective 3 to evaluate pre- and postharvest fruit quality components including enhanced flavor, texture/firmness, shelf-life, and phytonutrients; blueberry. Objective 4 to identify opportunities and collaborate on the development of extension resources for multistate, regional, national, and/or international audiences; extension project in new leaf nutrient standards for blueberry in western OR, extension publications (berries, grapes, and SW), online education for industry (blueberry production

physiology course, five pruning modules for berries and table grapes, and vineyard management), mManagement techniques to optimize soil pH and nutrient availability in organic blueberry (see full notes).

Penn State Strawberry had outgrowth of SCRI project on plastic covers, two projects on anthracnose (characterizing fruit and crown rot fungi and identifying weeds host of fruit and crown), and pestalotia issue in a local nursery which produces 2 million plug plants. Raspberry research in containers (see full notes). Chemical Ecologist looking for Blackberry breeder connection.

Ontario Strawberry anthracnose resistance project, and crown size evaluation project. *Early alert of airborne fungal disease and the determination of fungicide resistance using air sampling monitoring.* Blueberry distribution of four major parasitic nematodes. The Strawberry, Raspberry, and Blueberry trial network is ongoing.

Wisconsin-Madison Cranberry fruit maturity relationship to fruit firmness, wild pollinators improve pollination with native wildflower planting, evaluation of new product to increase frost tolerance in buds, VacciniumCAP: genetics used to improve cultivars fruit quality, phenotyping and breeding, analysis of cold responsive genes in leaves and buds, Raspberry Pi powered digital system used for tracking growth and development, and effects of ericoid mycorrhizal fungi on performance of *V. macrocarpon* and *V. oxycoccos* under antibiotic stresses related to climate change. Blueberry VacciniumCAP: genetics used to improve cultivar fruit quality. Grapes had an assessment of mass trapping for the management of social wasps in vineyards, new attract-and-kill management strategy for Japanese beetles in vineyards, and supporting table grape production for the state. Raspberry had an impact of mulch treatments of SWD on fruit yield and quality. Strawberry had transitioned to organic day-neutral strawberry production and trap cropping to improve tarnished plant bug management.

USDA-ARS Beltsville had a mild-winter, affected resources due to pandemic, and the entire region had big yields. A novel cicada invasion. Strawberry review of specific cultivars; 'Cordial', 'Flavorfest', and 'Keepsake'. USDA postdoc position in genomic selection in blueberry (see full notes).

Utah Grapes had a cultivar trial. Elderberry had Aggieblue™ Rendezvous released, evaluation planting, and some collapse shortly after harvest. Raspberry had high tunnels used and cultivar comparison. Strawberry had cultivar comparison, organic systems (Jennifer Reeve), and WSARE organic adaptation. Peripheral things were BMSB collaboration on a multistate project (several parasitic organisms identified), SWD not a major problem, SCRI grant on tart cherries (looking for graduate students), and the Bringhrst biography is now published.

Washington State is looking for an Entomologist (see full notes). A heat wave promoted loss and prompted heat-stress analysis. Resiliency in Rubus and Ribes Cultivation 2023 Symposium in OR (see full notes). Raspberry breeding objectives (machine harvestability, high yield, fruit firmness and integrity, root rot tolerance, and RBDV resistance), review of cultivars sold, IQF performance of Cascade Premier and WSU 2188 cultivars. International news of tech transfer of material with the UK. Blueberry had a cold hardiness model available soon (see full notes), mummy berry ascospore released model (beta tested in 2022), soil science with nitrogen (N) mineralization, and Decision Aid System (DAS). Honey bee stocking density effects on crop visitation (see full notes). Raspberry and Strawberry soil-biodegradable and non-degradable plastic mulches; free training available, website resources, newsletter, and social media (see full notes).

USDA-ARS HCRU Corvallis Blueberry breeding program assessed quality and set up grower trials. Projects; Vaccinium CAP to identify DNA markers associated with fruit characteristics, breeding insights for genomic selections, evaluating vaccinium germplasm for tolerances. Blueberry breeding program (genomic selection with marker data, had effects of fertigation and granular application of phosphorus fertilizers on mineral nutrition and root colonization by mycorrhizal fungi, comparison of methods in applying boron fertilizers, Biostimulants comprehensive management strategies, mitigating heat damage via tools and practices, biochar used as an alternative soil amendment for production, maintaining optimal root temperature, drought strategies, ion-specific limitations of various salts, substrate production: irrigation and cost and benefits, and fertigation practices for increasing calcium content and improving fruit quality and shelf life. Raspberry pulsed drip irrigation increased growth and fruit production,

working with one releasing one selection, NCGR project goal is creating markers for fingerprinting raspberry germplasm, and nematode tolerance in germplasm. Blackberry is working on releasing three selections, developed new crop coefficients for irrigating trailing, and the hybrids showed some potential for heat resistance. Pairwise group: creating markers for different GWAS studies (sequencing data) and important research on chromosome behavior with hexaploid through dodecaploid.
Virus Database for NCPN crops (Bob Martin) the program is creating a virus database for the crop database to include berry crops, tree fruits, grapes, hops, sweet potatoes, roses, and citrus. Variables are geographic distribution, how it spreads, validated tests, and timing for sample testing. Collaboration request for the group to share images; blueberry disease in different cultivars (i.e., red ring spot; brown leaves curls, etc.). Blueberry used HTS to identify viruses, found ludia virus (~302/600 tested positive) and BBA (widespread in the Midwest), with PCR testing being used.
USDA-NCGR Corvallis Rubus had developed two fingerprinting sets for red raspberry, fine mapping black raspberry aphid resistance, analysis of multi-environment trial for black raspberry quality traits, and GWAS study by phenotyping diverse Rubus species and cultivars. Riber, Lonicera, and Sambucus: developing a Ribes fingerprinting set for germplasm management, expanding blue honeysuckle collection, and researching pollen incompatibility and developing seed germination protocols in divers Sambucus germplasm. Vaccinium confirming identification of blueberry cultivars by DNA fingerprinting, determining amount of unreduced pollen for divers species, evaluating germplasm (heat, drought, and cold) tolerance, phenotyping blueberry for fruit quality traits, developing a high throughput genotyping platform for blueberry and cranberry, assisting Breeding Insight (BI) in enabling genomic selection in blueberry, and testing Allegro Targeted Genotyping for blueberry genome wide association. Fragaria; assessing genetic diversity in the cultivated strawberry (*Fragaria x ananassa*) collection at the National Clonal Germplasm Repository (see full notes for search access). evaluating genotype x environment interaction for predicting SSC in strawberry, and phenotyping diverse strawberry cultivars in Corvallis, Oregon.

Business Meeting Minutes:

Agenda for NCCC 212 Business Meeting:
Nov 2, 2021. 2-4PM EST
Chair: Mark Hoffmann
Secretary: Lisa DeVetter (volunteered)
Minutes: Taken by Lisa DeVetter and NC State Communication Team

Old Business:

- Review/amendments/approval of 2020 minutes - approved by Gina Fernandez and seconded by Lisa DeVetter
- Review of 2020 business meeting agenda – no additions; was not available

New Business:

- New reporting format: Discussion of new report Template (Vance). We had several people complaining about the reporting format, due to two reasons: a) too short; b) not inclusive (projects over several crops e.g.)
    - Vance Baird reviewed NC Regional Multi-State Project/Committee Annual Report requirements – emphasized short, succinct reports that emphasize collaborations and accessible to the general public
    - Vance Baird suggested each state representative extract most salient, top-level topics under each objective to give chair more focus to condense into a final annual report
    - Margaret Worthington suggested skipping reports and just submitting publications and a short PPT that is shared during the meeting
    - Penny Perkins-Veazie suggested a short and long report format (short report will be to aid chair in the final annual report)

- Mark Hoffmann suggested going back to reporting by NCCC 212 objective followed by short impact statement, still list publications, possibly omit listing grants; Gina Fernandez added that each state/institutional lead can then highlight the most important projects or accomplishments per report
- Vance Baird suggested an executive summary for each state/institutional report to aid the chair in creating a final annual report – emphasis on accomplishments, not activities
- Nahla Victor Bassil suggested creating a Google Doc using the specific reporting format
- NC Regional Multi-State Project/Committee Annual Report Reporting format: https://68e8efec-fd4d-4588-ad94-5d9e5e07218a.filesusr.com/ugd/4081a5_18226943c6564ef594a002c44a32266e.pdf
- Margaret Worthington suggested not listing every presentation, just major workshops or events
- Vance Baird added to Margaret's statement – summarize impact of presentations (e.g., number of participants or presentations made at the international, national, rational, state, or local level)
- Vance Baird suggested not worrying about the equipment statement
- Brent Black stated he appreciated the long report because it helps him see what is going on elsewhere in the nation with regards to berry crop research; suggested a cover page executive summary that gives state/institutional highlights, then keeping the longer report after for those that benefit from the long report content; let the chair pull together highlights for final annual report; publications and other activities could be an appendix
- Vance Baird mentioned publications listed can be duplicative and there should be efforts to avoid this so the chair doesn't have to remove duplications
- Massimo Iorizzo suggested collaborations be reflected in peer-reviewed publications and possibly grants
- Vance Baird agreed 1-page executive summary by category or objective is a good idea and will help the chair collate information *focus should be accomplishments and collaborations*
- Bernadine Strik mentioned 1-page executive summary may be too limiting for states/institutions with large small fruit/grape research programs
- Kim Lewers suggested perhaps we just limit to *finished projects* with publications, meetings/workshops that are finished, and other tangible outcomes/impacts.; not in-progress items
- Courtney Weber – curious who should be included in the report – viticulture people, entomologists and plant pathologists working with fruits, etc.? Where do you draw the line? Should we be focused on reporting projects that NCCC 212 participants are involved with?
- Next steps – Mark will submit annual report using current state/institutional reports, but will form a committee to create a new reporting template based on the above discussion and pass that onto the next chair

- Hybrid format feasible for future conferences?
  - Preferable to have in person but depends on who is going to host in 2022
- Developing of an up-to-date email list that can be passed on
  - NC State will provide a list of participants from 2021 that can be added to/amended
- Developing a sort of guideline for new first-time hosts? (volunteers?)
- Host for the 2022 Meeting?
  - Margaret Worthington to speak with John Clark/Amanda McWhirt about hosting in 2022, Utah, Wisconsin?

List of previous hosts:

2011 — Univ. of Arkansas (Fayetteville)
2012 — Univ. of Florida (Clearwater Beach)
2013 — Beltsville, MD (USDA-ARS)
2014 — Oregon State Univ./USDA-ARS (Corvallis, OR)
2015 — Auburn University (Elina Coneva)
2016 — VPI/Virginia Beach (Jayesh Samtani)
2017 — PSU/State College (K. Demcheck, 2016 Secretary)
2018 — WSU, Mount Vernon/ (Lisa DeVetter, 2017 Secretary)
2019 — Minnesota (Mary Rogers, 2018 Secretary)
2020 – NCSU, Raleigh (Hamid Ashrafi, 2019 Secretary)

- Host for the 2023 Meeting?
    - Reach out to Driscolls for potential 2023 host, Cornell