

SUMMARY OF EXPERIMENTS CURRENTLY

BEING CONDUCTED AT THE

NW MICHIGAN HORTICULTURAL RESEARCH CENTER

6686 S. Center Highway
Traverse City, MI 49684
(231) 946-1510

1. **Red Tart Cherry Cultivar Trials.** These plantings are under the direction of Dr. Amy Iezzoni, Dept. of Horticulture, MSU. The tart cherry trials include both red and clear juice types. Plantings include both promising European cultivars and advanced selections from Dr. Iezzoni's tart cherry breeding program. Many possible characteristics may be incorporated into newly developed cultivars including improved fruit firmness, leaf spot and brown rot resistance, increased sugar content, and other desirable traits. An additional cultivar trial will be planted in spring 2011 to look at various tart cherry varieties grown in a high density system under the direction of Dr. Ron Perry, Dept of Horticulture, MSU.
2. **Sweet Cherry Variety Trials.** Over 150 varieties and advanced selections from North America and Europe are being evaluated for sustainability in Michigan by Drs. Nikki Rothwell, Greg Lang and Bill Shane. More sweet cherries continue to be planted each year. Recent introductions and advanced selections are under evaluation from sweet cherry breeding programs in New York (Cornell Univ.), Ontario, British Columbia and Washington (WSU). Eight selections from the NY breeding program have been named and introduced to the industry as a result of this trial.
3. **Rootstocks for Red Tart and Sweet Cherries.** The original NC-140 cherry rootstock trial was removed after ten years of evaluation from 1986-1996. A new planting was replanted on this site in 1998 and evaluated for 10 years. The third generation cherry rootstock trial was planted in 2011. The newest planting will evaluate tart cherry being grown on rootstocks developed in the MSU Tart Cherry Breeding program. These plantings are under the direction of Drs. Greg Lang, Ron Perry, Amy Iezzoni, Dept of Horticulture, MSU, and Nikki Rothwell, NWMHRC.
4. **Cherry Insect Studies (Entomology plots).** This work is under the direction of Drs. Mark Whalon, Larry Gut and John Wise, Dept of Entomology, MSU, and Nikki Rothwell, District Horticulturist. It involves control studies for major cherry insect pests, including possible biological control methods. A new study is determining the different emergence timings and how these emergences will affect management strategies. Cherry fruit fly trapping and management alternatives are also under evaluation. Trials for control of two-spotted spider mite and plum curculio have been added to this work.
5. **Cherry Pathology Studies** are under the direction of Drs. George Sundin, Dept. of Plant Pathology, Nikki Rothwell, MSU. Controls for such diseases as

bacterial canker, cherry leaf spot, brown rot, and powdery mildew are under investigation. During the past twenty-seven seasons, spray programs on both tart and sweet cherries consisting of both commercial and experimental fungicides have been evaluated. Studies being conducted in area orchards are finding significant levels of pathogen resistance to currently important fungicides. The result is that the work of finding new fungicides and control strategies is taking on greater urgency. New bacterial canker work has started in the sweet cherry planting by Drs. George Sundin, Dept of Plant Pathology, MSU and Nikki Rothwell, NWMHRC. American brown rot control trial as well as screening for fungicide resistance continues at the NWMHRC in collaboration with MSU.

6. **Apple Cultivars.** Some 115 apple cultivars have been established to study new introductions which might be profitably grown in Michigan. Additional cultivars are added each year. Several pear variety/rootstock combinations are also being evaluated, including some promising fireblight resistant pears. Many of the older trees in this block were removed to make room for planting additional varieties in the future. This work is conducted by Phil Schwallier, District Horticulturist, MSU-E, and Drs. Nikki Rothwell, NWMHRC and Bill Shane, SWMREC.
7. **Cider Apples.** There is also a trial planting of traditional cider variety apples. As these trees have come into bearing, we have investigated their potential for hard cider use. Growers and cider makers that are interested in these varieties can contact the Center for more information.
8. **Apple Rootstock Trial.** Under the direction of Dr. Greg Lang, these trials were planted in 2003 and 2004 to evaluate the performance of newly released Cornell-Geneva (CG) Elite rootstocks which exhibit resistance to the fireblight pathogen with Honeycrisp as the scion.
9. **International Tart Cherry Orchard.** This orchard has been established by Dr. Amy Iezzoni and contains tart cherry selections from several European countries. The most promising selections from the MSU tart cherry breeding program have also been planted in this orchard. This trial will continue to expand each year as new selections are developed and additional varieties are shipped in from other countries. The oldest trees were removed in 1998 to make way for new selections to be planted in the future.
10. **Obliquebanded Leafroller (OBLR)** have become more problematic in northwest apple and cherry orchards as well as other parts of Michigan. We suspect that OBLR have some level of organophosphate (OP) resistance. Drs. Nikki Rothwell and John Wise are investigating the cause of the rise of this pest. Efficacy trials were conducted in 2011 and 2012 to evaluate insecticides in controlling OBLR.
11. **Wine Grape Research.** A planting of wine grapes was established during 1995 and 96 to evaluate new selections under northwest Michigan conditions.

Various growing systems and low chemical input varieties are also being evaluated. These projects are under the direction of Dr. Tom Zabadal and Dr. Duke Elsner. In 1998 Dr. Tom Zabadal, Coordinator, SW Michigan Research and Extension Center, established an additional planting to study training growth, production and hardiness of the vines at various spacings, as well as vines placed in grow tubes. This study is assisted by Dr. Duke Elsner.

12. **Additional Grape Planting.** A new variety planting was established in 2008 as part of the NE 1020 Multi-state Cultivar and Clones project. This project is under the direction of Drs. Paolo Sabbatini and Tom Zabadal.
13. **Nut Planting.** Several selections of chestnuts and hazelnuts have been established under the direction of Dr. Dennis Fulbright, Dept of Plant Pathology, MSU, with the help of the Northern Nut Growers Association.
14. **Environmental Monitoring Project –** An electronic environmental monitoring instrument has been installed at the NWMHRC. Data are now linked into a new state-wide monitoring network to supply localized real-time information to Michigan growers. Growers access information via internet at <http://enviroweather.msu.edu/home.asp> This project is under the direction of Drs. Nikki Rothwell and Jeff Andresen, MSU Agricultural Meteorologist.
15. **Tart Cherry IPM Planting -** A cherry IPM project was initiated in 1996. The planting consists of both Montmorency and Balaton planted in 9 blocks of approximately 0.75 acres each. During the initial years, the study focused on orchard floor management and nematodes. This site is now the primary site for studying issues related to tart cherry IPM. Primary projects currently being conducted in this planting include organic cherry production, perma-culture production, and innovative cherry fruit fly and plum curculio management studies. This project was under the primary leadership of Dave Epstein, Office of IPM, MSU, Drs. Mark Whalon, George Bird, Dept of Entomology, MSU and Nikki Rothwell. Primary financial support has come from USDA's SARE program and the Michigan Cherry Committee. These blocks have been used for pathology and evaluation of sprayer type and alternate middle spray program work in years 2008 through 2012.
16. **Armillaria Root Rot** is a serious problem, which attacks the roots in stone fruits resulting in tree death. There is no known prevention or cure for cherries. A planting has been established to evaluate the susceptibility of a wide range of plant material to the species of Armillaria present in NW Michigan cherry orchards. The objective is to find Armillaria resistant rootstock candidates. The planting includes over 50 different Prunus species or Prunus crosses. The planting is located on leased property near the NWMHRS. It was established in 2001, with additional plant material added in 2002 and 2003. The project is under the leadership of Dr. Ray Hammerschmidt, Dept of Plant Pathology, with assistance from Dr. Nikki Rothwell NWMHRC. New Russian and plum rootstocks were planted in 2011 to investigate their potential to tolerate Armillaria. This project is located on grower sites with a companion planting located on the Station to evaluate horticultural characteristics.

17. **American Brown Rot Sensitivity to Sterol Inhibitor Fungicides.** American rot fungicide screening is currently underway in the NWMHRC equipped laboratory. Samples of American brown rot have been collected from multiple sites around the northwest. The fungi are cultured in the lab and will be used to determine the regional population's sensitivity to sterol inhibitor (SI) fungicides. SI fungicides are the main control for American brown rot, but are prone to developing resistance. This monitoring will aid in determining when and if resistance to SI's is occurring and will assist in evaluating current resistance management strategies. This project is managed by Dr. George Sundin, Dept. of Plant Pathology, MSU.
18. **Fungicide Rainfast Study.** Little is known about fungicide residues in the field. Determining the potency and quantity of fungicide on leaf tissue based on the amount rainfall during of a wetting period is an important part of determining when a fungicide re-application is needed. Perhaps more importantly, correlating residue levels after rain exposure to fungicide efficacy is key to understanding the management necessary after a wetting event – does a grower need to apply another fungicide spray or is the leaf tissue still protected?

The objective of this study is to determine the rainfast characteristics of commonly utilized cherry leaf spot fungicides, and evaluate the effects of those characteristics on leaf spot susceptibility of leaf tissue. Project is under the leadership of Erin Lizotte and Dr. John Wise.

19. **Locally Grown Hops.** With a world-wide hops shortage, brewers are increasingly interested in securing locally produced hops. In order to provide brewers and potential growers with information on hops production, last December, Michigan State University Extension hosted a "Sustainable Hops Production Workshop" in Traverse City, MI. Over 150 participants equally split between brewers, farmers, and backyard hobbyists attended the event. Because of the interest, MSU Extension applied for and received funding to establish a hops variety trial at the Northwest Michigan Horticultural Research Center. Currently there are seven different varieties planted. The goal will be to determine best management practices and test for yield and quality characteristics in order to assist growers in this emerging industry. We hope to have measurable yields again in 2011 and continue to support this growing industry into the future. Project is under the direction of Dr. Rob Sirrine, Extension Educator, Leelanau Co.
20. **Irrigation Trials.** Because so little is known about irrigated cherries in Michigan's sandy soils, we will evaluate five water emitting strategies at the NWMHRC. The results of this irrigation study will then be used as a guideline to install irrigation systems for other important research trials at the NWMHRC, such as sweet cherry cultivar evaluation, rootstock evaluation, and the high density tart cherry trial. The irrigation systems trial was installed in late 2008 in a block of established 11-year old Montmorency cherries planted

at a spacing of 6.1m x 6.1m. Five irrigation systems have been installed in four rows of 22 trees/row: 1) single RAM tubing system, 2) double RAM tubing system, 3) a standard drip irrigation system with one emitter per tree, 4) microsprinklers with cross row coverage (full coverage), 5) microsprinklers in row (rectangular spray) and 6) non-irrigated control. Treatments 1, 2, 3, 5, and 6 were installed in one row of trees in this block. Treatment 4, microsprinklers with cross row coverage, was installed in three adjacent rows due to the design of the sprinkler head which applies water in a circular pattern to achieve complete ground coverage. Data will be collected from the middle row in treatment 4. For the drip irrigation system, one 3.8-liter per hour emitter was placed at each tree. The RAM tubing treatments are composed of either one or two lines of RAM tubing with four 1.9 liter per hour-emitters/tree. The microsprinkler systems have one above ground sprinkler per tree. During the installation of the irrigation systems trial, the NWMHRC's manual irrigation controller was upgraded to an automated computerized control system. Baseline® irrigation software was installed on a computer which now gives the operator control over treatment run time, valve opening/closing, and sensor operation. The system is automated once the parameters have been established. Eighteen moisture sensors were installed into the irrigation systems trial, three sensors per treatment at three depths, 6", 18", and 30". These sensors measure soil water content and are connected to the Baseline® software to measure the output of each system. Data are collected hourly and automatically downloaded to the computer. The Baseline® system provides a technologically advanced approach to soil moisture sensing. Once we determine the saturation levels and the permanent wilting point, we can set the parameters on the system to provide water to meet but not exceed the needs of the soil and trees. This project is under the direction of Dr. Nikki Rothwell and Bill Klein. An additional set of new trees was established in 2011 to measure the effect of irrigation types and frequency on newly planted orchards.

21. **Insecticide Spray Coverage Trials.** Due to pesticide exposure and worker safety concerns, regulatory agencies have been removing organophosphates (OP's) from the arsenal of available pesticides to the Michigan cherry industry. As OP use is reduced, growers are faced with the challenge of controlling pests in an industry with a zero tolerance for larvae in fruit. Coupled with the loss of OP's is the introduction of new chemistries with novel modes of action. These insecticides possess modes of action that differ from OP's, including; anti-ovipositional, anti-feedant, and/or ingestion characteristics that are capable of acting on multiple insect life stages. Because these new insecticides control orchard pests differently than traditional broad-spectrum insecticides, we need to investigate their efficacy under standard spray regimes in tart cherry systems.
22. **Fungicide Spray Coverage Trials.** The majority of Michigan cherry growers use the alternate row middle approach to pest and disease management. With the introduction of new pesticides that vary in mode of action, a thorough

review of this strategy is needed to ensure adequate control of cherry insect pests and diseases. A 2009 study determined that insecticide coverage is paramount, particularly with reduced risk chemistries. Airblast sprayers applying traditional or reduced-risk pesticides deposit excess product on the first row, but provide inadequate coverage on interior rows. Curtec sprayers provided better overall coverage, but pesticide efficacy decreased when using reduced-risk pesticides compared with contact insecticides. Results also suggest that an alternate row middle approach will not ensure larvae-free fruit with reduced risk insecticides. As a result of the insecticide findings in 2009, we conducted a trial to investigate the impacts of the alternate row spray strategy on fungicide coverage and efficacy against cherry leaf spot (*Blumeriella jaapii* (Rehm) (CLS). With the limited number of fungicides available for CLS control, growers must control this disease with existing fungicide options while combating fungicide resistance issues.

In 2011, we directly test the impacts of alternate row middle and every row fungicide applications at two different time intervals (7 and 10 D) with the two sprayer technologies. We believe that this coverage trial will complement the insecticide coverage trial and the fungicide residue information to provide a reliable set of recommendations for both insecticide and fungicide spray strategies, which are critical due to the regular practice of tank mixing pesticides (fungicides and insecticides) in cherry. Our results will provide Michigan growers with a complete picture for overall pest management, particularly as these potential spray regimes and sprayer technology will impact the economic sustainability of cherry farms.

23. **High Density Tart Cherry Planting.** A new high density tart cherry orchard was planted in spring 2010. This planting has 65 trees on each of five rootstock genotypes: own-rooted Montmorency, Gisela 3, Gisela 5, Gisela 6, and Mahaleb. The different rootstocks are in five-tree replications of 11 rows. The spacing for the orchard is 4.9ft between the trees and 13ft between the rows. We have two training systems in the orchard: central leader and bush. In addition to evaluating the rootstocks and the training systems, we intend to collect data on the amount of time to fill hedgerow space, time to reach mature yields, the precocity of initial yields as well as the annual yield and fruit size, the yield decline once hedgerow is filled, hedging/pruning vs. development/pruning, and fruit quality. We are investigating the amount of water needed on these dwarfing rootstocks, and we are also fertigating the block. Lastly, the trees are set up to accommodate testing different mechanical harvesting systems. There is 22.75ft between each replication to ensure adequate maneuvering of diverse harvesters. This work is overseen by Drs. Nikki Rothwell, Greg Lang, and Ron Perry.

24. **Many Other Experiments Involving Fruit Trees** are being conducted both on and off the Station in nearby orchards. Fruit maturity, herbicide trials, spray deposition, fruit thinning and cherry cracking are examples of some of these projects. These special off-station projects are under the direction of various individuals from the Departments of Agricultural Engineering, Horticulture, Plant Pathology and Entomology, as well as Station personnel. Projects will continue in off-site orchards as needed thanks to collaborating area growers.
25. **Water Use and Irrigation of Tree Fruit and Grapes.** Supplemental application of water through irrigation is increasingly important in Michigan fruit production systems for improved production quality and consistency, crop yields, and economic efficiency. Water use of representative tart cherry and grape blocks will be estimated with a mass balance approach using automated soil moisture sensors placed in the crop root zones. Results from field observations taken during the 2009, 2010, 2011 and 2012 growing seasons will be used in the development of irrigation scheduling tools for growers and incorporation into the existing www-based Enviro-weather system. This work is under the direction of Dr. Bill Northcott, Jeff Andresen, Jim Flore, Ron Perry, Nikki Rothwell, and Paolo Sabbatini.
26. **Sustainable Vineyard Practices to Enhance Production of High Quality Grapes in Michigan.** Development of sustainable grape production practices are high research priorities for the grape industries of Michigan and across the Great Lakes region. Researchers at Michigan State University are collaborating with 2 Lads Winery on a new cover crop study in vineyards. The study is testing different cover crops for their ability to add nutrients to the soil and attract beneficial insects. By doing this, we hope to reduce the amount of fertilizer and pesticide applications in vineyards, while still producing high quality grapes and wine. The different treatments being studied are bare ground, grass, buckwheat, a native flowering mix, and a native mix plus alyssum. The results of this work will lead to increased sustainability in the vineyard and winery. The project team includes Paul Jenkins, Dept of Entomology; Drs. Paolo Sabbatini, Dept of Horticulture; Rufus Isaacs, Dept of Entomology; Nikki Rothwell, NWMHRS, and Rob Sirrine, MSU Extension with grower cooperators Cornel Olivier and Chris Baldyga, 2 Lads Winery.
27. **Post-harvest control strategy for control of cherry insect pests.** In 2010 and 2011, we evaluated the effectiveness of reduced-risk post-harvest on insecticide applications for control of plum curculio and cherry fruit fly in cherry on three northwest Michigan farms. This project is under the direction of Drs. Larry Gut, Mark Whalon, and Nikki Rothwell.
28. **Two-spotted spider mite trial.** We are conducting a two-spotted spider mite (TSSM) efficacy trial in cherry at the NWMHRC. The trial is investigating new miticides to be used in stone fruit and has been conducted collaboratively with Drs. John Wise and Nikki Rothwell.
29. **NWMHRC trap line.** Each season, the NWMHRC puts out an insect pest trap line for apples, cherries, and wine grapes. Traps are checked bi-weekly, and the

information is placed into our weekly or bi-weekly FruitNet reports. Trap catches for the many different insect pests are used in conjunction with Enviroweather (www.enviroweather.msu.edu) as many of our insect models are dependent on setting a biofix, or sustained catch. Additionally, growers can use the NWMHRC trap line catch data as a starting point for pest management control strategies on their own farms.

30. **Cover Crop Trial Continues at NWMHRC.** The third and final year of the cover crop trial is drawing to a close at the Center, with the site slated for planting in Spring 2013. The goals of the project were to use cover crops to reduce nematodes, manage weeds, and increase nutrients and organic matter. Oats, rye, Essex rape, pearl millet, clover, peas and mustards have all been used in an effort to achieve these complex goals. After the cover crop rotation is completed this year, the site will be planted to cherry and the trees will be evaluated as compared to a fumigated standard. The project is under the direction of Dr. Dale Mutch, Dept of Crops & Soil Science, MSU, and Erin Lizotte, NWMHRC.

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