SCRI: PIP-CAP NEWSLETTER

Quarterly Report • Summer 2024
Volume 1: Issue 3

Student Highlights!

Fertilizer Formations for Runnering

Are We Headed Toward Molecular Breeding?

Explore our interactive newsletter — click around to get where you want to go. Especially on this page and page 3!

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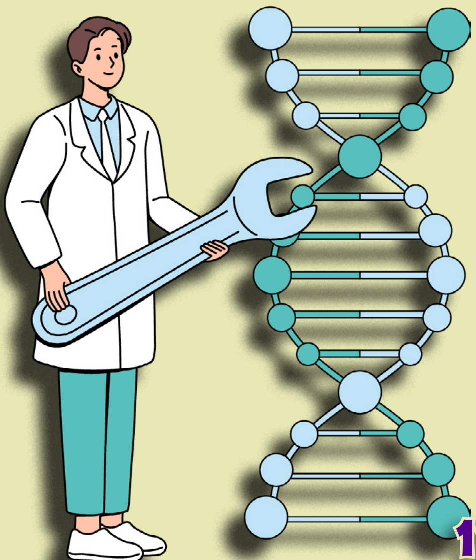
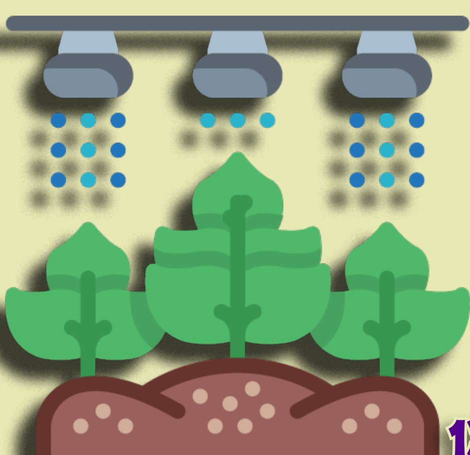
9

Dr. Edward Durner is researching the relationship between light input and physiological responses in long-day and short-day cultivars.



11

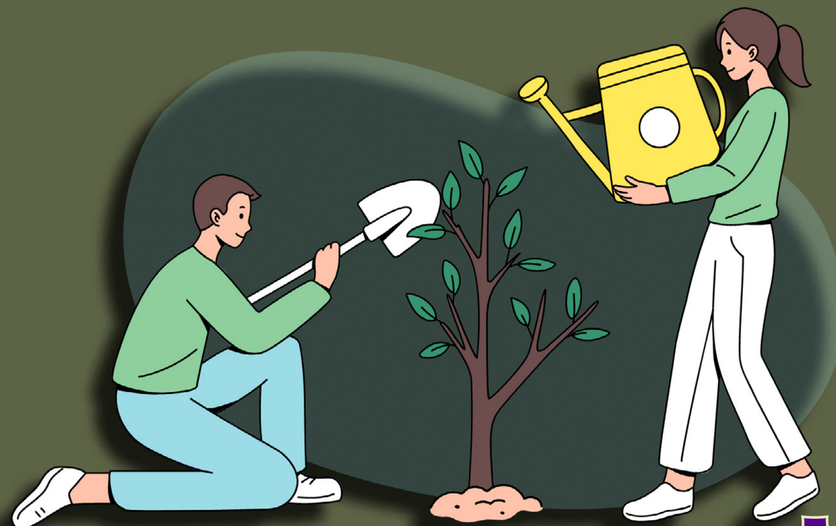
Read about the genome sequencing of 3 short-day and 3 long-day cultivars, and how it will be useful in the application of growing strawberries commercially and at home.



13

Dr. Shinksuke Agehara and his team in Florida planted and evaluated plugs grown at NC State.

IN THIS ISSUE



7

Dr. Erin Yafuso and Dr. Jennifer Boldt's current work focuses on determing which fertilizer recipies lead to high daughter plant production in soiless substrates.

DIRECTOR'S LETTER

Progress and Hope.

"You cannot hope to build a better world without improving the individuals." (Marie Curie, Autobiographical Notes, pp. 167-168). Marie Curie, born in 1867, was on a life-long struggle to overcome prejudices and patriarchy. Academia was for most of its existence reserved for the upper class of white men: "A woman, whatever her intellectual qualifications, can no more become a member of an academy than the educated monkeys Consul [...] for the same reason. Neither is Human" (French Academy of Sciences, 1911). Just a little bit more than a century ago, Marie Curie was denied an education because of her gender. She had to educate herself in secret underground societies, and fought her way into academia. As we all know, she became the first woman to win a Nobel prize, and is until today the only person who won a Nobel prize in two different disciplines.

Her story needs to be a strict reminder to our own historical responsibility. Especially today, with women's rights and DEI under scrutiny all across the country, her life needs to serve as guidance to all of us. But her story also can and should be a source for inspiration. As the quote above shows, Marie Curie always had hope. She believed in change. And she knew that progress is "neither swift nor easy".

This project is driven by a remarkably diverse group of people, who are all excellent at what they do. It is a testament for what has changed in academia in the past century, but also a reminder that the only path from here is forward. I am extremely proud of what we have accomplished so far, and I can say with confidence that we are all working to improve indoor strawberry propagation every day.

This newsletter scratches only the surface of the progress we made in the past 2 ½ years. In this issue, we report on the efforts to condition strawberry plants at Rutgers University, the field evaluations of conditioned plants at University of Florida, or the development of nutrient recipes for indoor propagation at the USDA-ARS. These are highlights of our work. So is the effort between University of Maryland and NCSU to develop a searchable strawberry genome database (pg. 11-12). I can say with confidence today we truly made big steps towards improving strawberry propagation.

But most importantly, this newsletter is proof of the power of diversity, and the dedication of each single person to excellent research. I feel blessed to be able to serve as your director and thank every single one of you from the bottom of my heart for your work. Let's keep making progress, and let hope be our guide.

Mark Hoffmann
Project Director

STUDENT HIGHLIGHTS

Dr. Ibraheem Olasupo | **Lian Durón Alvarado** | **Calyssa Stevenson**

Most used emoji?

Ibraheem, if you had to switch teams, what team would you want to work on and why? Options: physiology, genetics, economics, field evaluation, or extension.

"Economics. The team evaluates the profitability and economic sustainability of the propagation technique that we are developing. This has huge implications on the adoption of our technology by growers which is very crucial."

Lian, what's the best strawberry cultivar you've ever tasted?

"For me, the best strawberry cultivar must be Albion. Its sweet flavor and juicy texture are incredible, but what truly stands out is its amazing aroma. I loved walking into the greenhouse and being greeted by that sweet, fresh scent. The greenhouse manager and my lab mates often commented on how wonderful it smelled."

Calyssa, what has been your favorite memory of the project so far and why?

"I really enjoyed the annual PIP-CAP conference in 2023, especially the bonfire afterwards at Dr. Gina Fernandez's house. I really enjoy connecting with people and it was super fascinating getting to talk to people involved with the project on a more personal level and learn about their backgrounds. Everyone was super passionate about their role and as a newer student on the project, it was inspiring and motivating to feel that energy and know that I would also get to be a piece of this larger puzzle. It also put into perspective how large and important developing controlled environment propagules is for the strawberry industry."

Ibraheem, can you think of any interesting non-work related skills you'd like to learn?

"Videography."

Lian, can you think of any interesting non-work related skills you'd like to learn?

"A future project is learning to play an instrument, with saxophone and piano."
at the top of my list. Also, I have become excited about the idea of learning tennis or pickleball, they look like such fun sports. I also want to improve my cooking skills by trying new recipes, especially during my weekend cooking sessions with my roommates. It is a great way to bond and enjoy delicious meals together!"

Calyssa, what do you do when you're not working?

"I enjoy decompressing and spending time with friends and family. I also really enjoy being in water, so if it's nice out and I have enough free time, I love spending time in a nice body of water, such as a pool or the Eno Quarry."

HIGHLIGHTS CONTINUED

Ibraheem, if you could have coffee with a celebrity or famous person, who would you choose and why?

"President Bola Ahmed Tinubu Reason: He is the current President of Nigeria and I know he aims at positively impacting the life of the people. I would like to advise him and also learn from his wealth of wisdom."

Lian, if you had to switch teams, what team would you want to work on and why?

"If I had to switch teams, I would choose extension. I am passionate about ensuring that the knowledge and technology developed in our projects reaches everyone who can benefit from it. The idea of connecting researchers, industry professionals, and the public to share the innovative research being developed within our teams is fascinating. I love the challenge of translating complex scientific findings into practical, impactful knowledge that can drive real-world change. Working with the extension team would allow me to help bring practical solutions, making a tangible impact on the industry and public awareness."

Calyssa, can you think of any interesting non-work related skills you'd like to learn?

"I'd like to get better at crocheting and learn needle punch art/ making artsy rugs."

Ibraheem, what drew you to work on the SCRI: PIP-CAP?

"I was moved by the fact that the project aims at disrupting the strawberry industry positively and impacting every strawberry grower in the US."

Lian, is there anything you've recently learned that you found interesting?

"I have been fascinated by experimenting with different environmental conditions to understand how strawberry plants function and develop. For instance, during our last runner tip cold storage experiment, we explored new approaches to improve the protocol, as our initial method did not deliver the expected results. This journey of trial and error, combined with insights into plant physiology, has been enriching and has highlighted the complexity and potential of controlled environment techniques."

Calyssa, what is the best strawberry cultivar you've ever tasted?

"Some of the best strawberries I've ever tasted are actually unreleased genotypes from Dr. Fernandez's breeding program. There are quite a few of her breeding lines that I've really enjoyed, such as NC 21-033. Since I've started working for her as an undergraduate, I've been spoiled by such amazing variety/flavor that I no longer enjoy store-bought strawberries."

Ibraheem, what's been your favorite memory or milestone of the project so far?

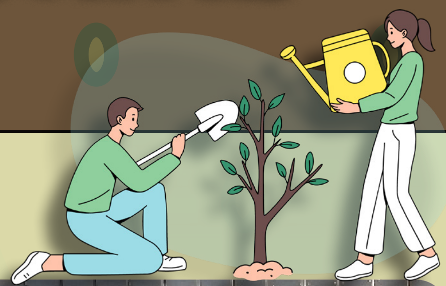
"I took over the management of eight cultivars of strawberry mother plants grown at Grafted Growers (one of the foremost strawberry plant factories in Raleigh), and led the transition of these plants to the precision greenhouse where we conduct further research on them and another nine new cultivars till date."

Lian, if you could have coffee with a celebrity or famous person, who would you choose and why?

"I would love to have coffee with Oprah Winfrey. Not only is she a global media leader, but she is also a dedicated philanthropist who has made significant contributions to humanitarian causes. I admire her ability to overcome challenges as a woman, and I would love to hear her insights on balancing a successful career with impactful philanthropy. Her work supporting education and empowering women and children is incredibly inspiring. I would love to learn how she has used her platform to help others and the challenges she has faced."

Read more!

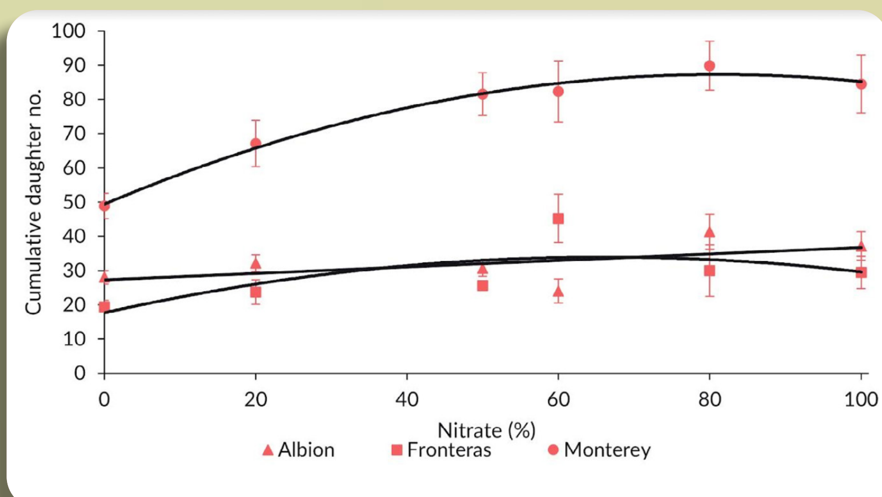
NO_3^--NH_4 RATIO FOR DAUGHTER PLANT PRODUCTION



Article and images by Erin Yafuso
USDA-ARS Application Technology Research Unit, Toledo, OH.

PIP-CAP team members Dr. Erin Yafuso and Dr. Jennifer Boldt are working to identify fertilizer recipes that optimize strawberry mother plant growth in soilless substrates. This work focuses on producing a high number of daughter plants in controlled environments that can be used to propagate well-rooted plug or tray plants.

Fig. 1 (above). Strawberry plants growing in a greenhouse after eight weeks of treatments. Fig. 2 (below). Daughter plant number in three greenhouse-grown strawberry cultivars in response to the fraction of total N provided as NO_3^-.



Our first trial examined the role of nitrogen (N) form in influencing stolon and daughter plant number. In water-soluble fertilizers, N is generally supplied through a combination of nitrate (NO_3^-) or ammonium (NH_4^+). Three cultivars ('Albion', 'Fronteras', and 'Monterey') were grown in the greenhouse in a soilless substrate for 16 weeks (Fig. 1). They were fertilized with a strawberry-specific (Yamazaki) nutrient solution formulated to provide 100 ppm total N. The percent of total N that was supplied as NO_3^- ranged from 0% to 100%.

'Monterey' was the most prolific cultivar and produced more daughter plants than 'Albion' or 'Fronteras', regardless of the fertilizer formulation. 'Albion' had a linear response to the increase in %NO_3^-, and daughter plant number increased from 27 at 0% NO_3^- to 37 at 100% NO_3^- (Fig. 2). 'Fronteras' and 'Monterey' both had quadratic responses, which means that daughter plant number increased as $\%NO_3^-$ increased, reached a plateau, and then began to decline at very high $\%NO_3^-$. The maximum number of daughter plants occurred at 66% NO_3^- for 'Fronteras' and at 87% NO_3^- for 'Monterey'. One key finding is that while the optimal $\%NO_3^-$ that resulted in maximum daughter plant number was cultivar specific, including at least 65% NO_3^- in a fertilizer formulation produced a high number of daughter plants in all three cultivars.

Next, we looked at refining the ideal $\%NO_3^-$ for daughter plant production by looking at more treatments in the 60% to 100% NO_3^- range. In a follow-up trial, 'Monterey' was grown hydroponically in 2 gal. buckets for 16 weeks in an indoor growth room (Fig. 3). Consistent with the greenhouse study, 'Monterey' daughter plant number increased as $\%NO_3^-$ increased, reached a maximum of 92 daughter plants at 76% NO_3^-, and gradually decreased to 68 daughter plants as $\%NO_3^-$ increased to 100% (Fig. 4). Based on this model, we can calculate how responsive daughter plant number will be to a change in $\%NO_3^-$. For example, if a 10% fluctuation in yield is deemed acceptable by a grower, a $\%NO_3^-$ range of 63% to 92% NO_3^- could be supplied. Modeling these responses will help growers decide if they want to have specific fertilizer formulations for each cultivar grown, or if one formulation, while maybe not optimized for every cultivar, would be suitable across their range of cultivars grown.

Part two of our three-part goal to optimize a strawberry fertilizer recipe for runner productionlooks at fertilizer concentration. We are currently examining the impact of fertilizer electrical conductivity (EC) on stolon and daughter plant productivity. A sneak peak of our preliminary results suggests that strawberry runner and daughter plant production in soilless substrates increases when they are provided a higher fertilizer concentration than that recommended for fruit production. Stay tuned for a more in-depth report of these results.

Erin Yafuso is a postdoctoral research associate and Jennifer Boldt is a Research Horticulturist with the USDA-ARS Application Technology Research Unit in Toledo, OH.

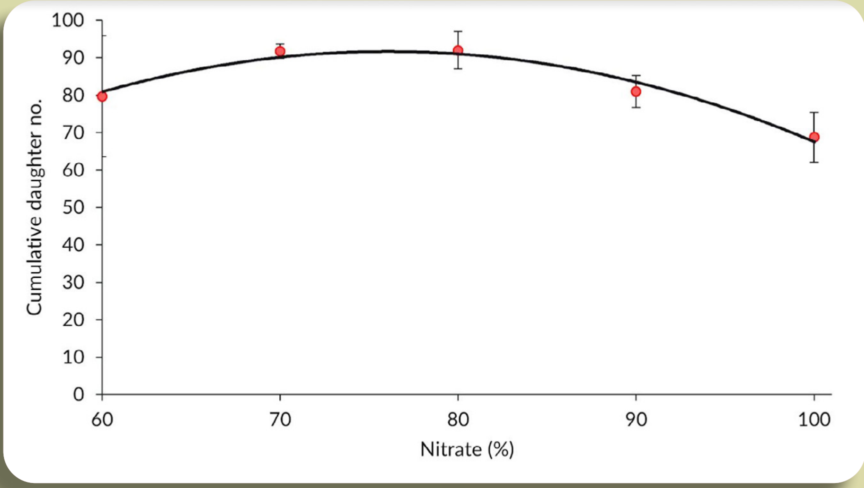


Fig. 3 (left). 'Monterey' strawberry plants growing hydroponically in an indoor growth room after 16 weeks of treatment. Fig. 4 (above). Daughter plant number in 'Monterey' grown indoors hydroponically in response to the fraction of total N provided as NO_3^-.

IMPACT OF LIGHTING ON STRAWBERRY BIOLOGY

Article and images by Edward Durner
Department of Plant Biology
Rutgers University, New Brunswick, NJ.

Most seasonal flowering strawberries (June-bearers) produce a single crop in the spring (except in Florida and California, USA) and are considered quantitative short-day (SD) plants at temperatures (<20^{C}/<68^{F}), qualitative short-day plants at temperatures (>20^{C}/>68^{F}) and most fail to form flowers at any daylength at temperatures approaching 30^{C}/86^{F}. Recurrent or perpetual flowering cultivars (everbearers, day-neutrals and remontants) are qualitative long-day (LD) plants at high temperatures (27^{C}/80.6^{F}), quantitative LD plants at intermediate temperatures (between 10 and 27^{C}/50 and 80.6^{F}) and day-neutral at temperatures below 10^{C}/ 50^{F} regardless of whether they derive their LD character from California or European cultivars. The major difference among them is the temperature at which they become qualitative LD plants. The critical photoperiod for flowering of SD cultivars is between 12 and 15 hours (shorter at higher temperatures) and 15 hours (longer at higher temperatures) for LD cultivars. Strawberry flowering is regulated via the pigment phytochrome and it is often manipulated using a night interruption (NI) of 3-hrs with low-level (<10 µmoles$^{m-2\ sec-1}$) incandescent lighting or a 4–8-hr daylength extension. Both treatments simulate long days under con-trolled or field conditions, and enhance flowering in LD cultivars and inhibit flowering in SD cultivars. LD simulation with incandescent light is effective because it contains both red and far-red wavelengths. Fluorescent light is deficient in far-red and is not effective. The physiological responses observed with either treatment are attributed to differences in the far-red fraction [(Amount of far-red light)/(Amount of far-red light + amount of red light)] of the light source with low far-red fractions (closer to 0) promoting SD responses and high far-red fractions (closer to 1) promoting LD responses. In many plants, blue light at higher levels (20 µmoles$^{m-2\ sec-1}$) can promote flowering in LD species and inhibit flowering in SD species, but at low levels (1-2 µmoles$^{m-2\ sec-1}$) blue light is generally ineffective.

Field evaluation of light-treated plants.

In addition to the quality (wavelength) and quantity (µmoles$^{m-2\ sec-1}$) of light, photoperiodic flowering responses are sensitive to the timing of exposures during a 24-hr cycle. LED lighting makes it feasible to precisely time specific wavelengths during the 24-hr cycle to enhance flowering in both controlled and field systems or to enhance stolon production for controlled environment propagation. My research focuses on documenting the effects of supplemental LED lighting on flowering and vegetative growth in both long and short-day cultivars. In a recent study, I evaluated the growth responses of the LD, F1, seed-propagated cultivar 'Soraya' to a variety of light treatments. 'Soraya' is a seed-propagated cultivar from Europe. North American LD cultivars would respond similarly based on published research from Norway. I used 'Soraya' to ensure sufficient plant material to complete the experiment. Growth was evaluated during and following 6 or 12 weeks of exposure to supplemental red (660 nm), far red (730 nm), blue (454 nm) or incandescent lighting at the beginning, middle (night interruption) or end of the dark period of a 10-hr, normally non-inductive photoperiod at non-inductive temperatures (>27/18^{C} or >80.6/64.4^{F}, day/night) in light controlled tents. Treatment effects were monitored via flower mapping and phenology during treatment, and field and greenhouse flower production after treatment, and floral scores derived by combining all evaluation criteria. The most promising treatment for enhancing the floral nature of plug plants was exposure to far-red + red light as a 5-hr night interruption. This treatment resulted in a multi-branched, floral plant with potential for use in either greenhouse or field production. Greenhouse runner production was substantially increased following exposure to incandescent lighting at the beginning of the dark period, thus this treatment may be suitable for enhancing vegetative propagation in controlled environments. As of last year, incandescent bulbs are no longer produced or sold in the United States. Any LED bulb or combination of red and far-red bulbs which emit a sufficient amount of radiation in the red and far-red portions of the spectrum should induce similar responses to those achieved with incandescents. This year, I am conducting a similar study with 'Albion', and 'Royal Royce' (both long day) (to verify responses observed in 'Soraya'), and 'Chandler' and 'Sweet Charlie' (both short-day). Stay tuned...

Tents used for light treatment of strawberry plugs.

Greenhouse evaluation of light-treated plugs.

GENOMIC DATABASE AND PHENOTYPING

Article by Xi Luo[1], Yuan Gao[1], Ibraheem Olasupo[2], Mark Hoffmann[2], Zhongchi Liu[1], Caren Chang[1]
1. Department of Cell Biology and Molecular Genetics, University of Maryland, College Park, MD
2. Department of Horticultural Science, North Carolina State University, Raleigh, NC

Crop performance is largely determined by a combination of "Genotype × Environment × Management". Genetics plays a fundamental role in this equation as it instructs the plant on how to respond to both the environment and management, while dictating the basic features of the plant.

One of the objectives of our SCRI PIP-CAP project is to identify the genetic variations (or "DNA variants") underlying the diverse runner production abilities of various strawberry cultivars for the purpose of developing DNA markers associated with runner traits. The association between a DNA variant and a phenotype, specifically the runner-producing capacity, can be used to assist with breeding. Specifically, the presence or absence of a DNA variant in a genome would be determined by a simple polymerase chain reaction (PCR)-based assay, which can help predict the phenotype.

As we proposed in our project, Genetics Team member (Dr. Xi Luo) sequenced the genomes of six short-day and six day-neutral cultivars. The short-day cultivars were Brilliance, Camarosa, Chandler, Fronteras, Radiance, and Ruby June; the day-neutral cultivars were Albion, Cabrillo, Monterey, Moxie, Portola, and Finn. We have now sequenced the genome of another short-day cultivar, Sensation, for a total of thirteen sequenced U.S. cultivars. In our preliminary analysis to demonstrate the feasibility of associating DNA sequence variants with phenotypes, we looked for DNA variants in the GA20ox4 gene, which encodes a biosynthesis enzyme for the plant hormone gibberellic acid (GA). We focused on this gene, because GA is known to be critical for runnering (Tenreira et

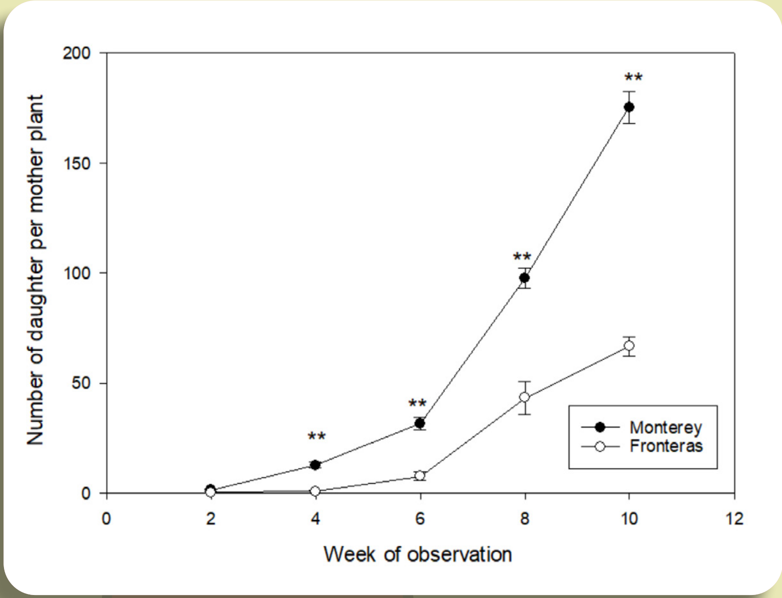


Figure 1. Reduced runner development in cv. 'Fronteras' compared to cv. 'Monterey' in plants grown in a controlled environment. (A) Monterey (M; left) and Fronteras (F; right) plants at 10 weeks of observation. (B) The number of daughter plants per mother plant for Fronteras and Monterey at 10 weeks of observation. n = 3. P-value < 0.05 by t-test.

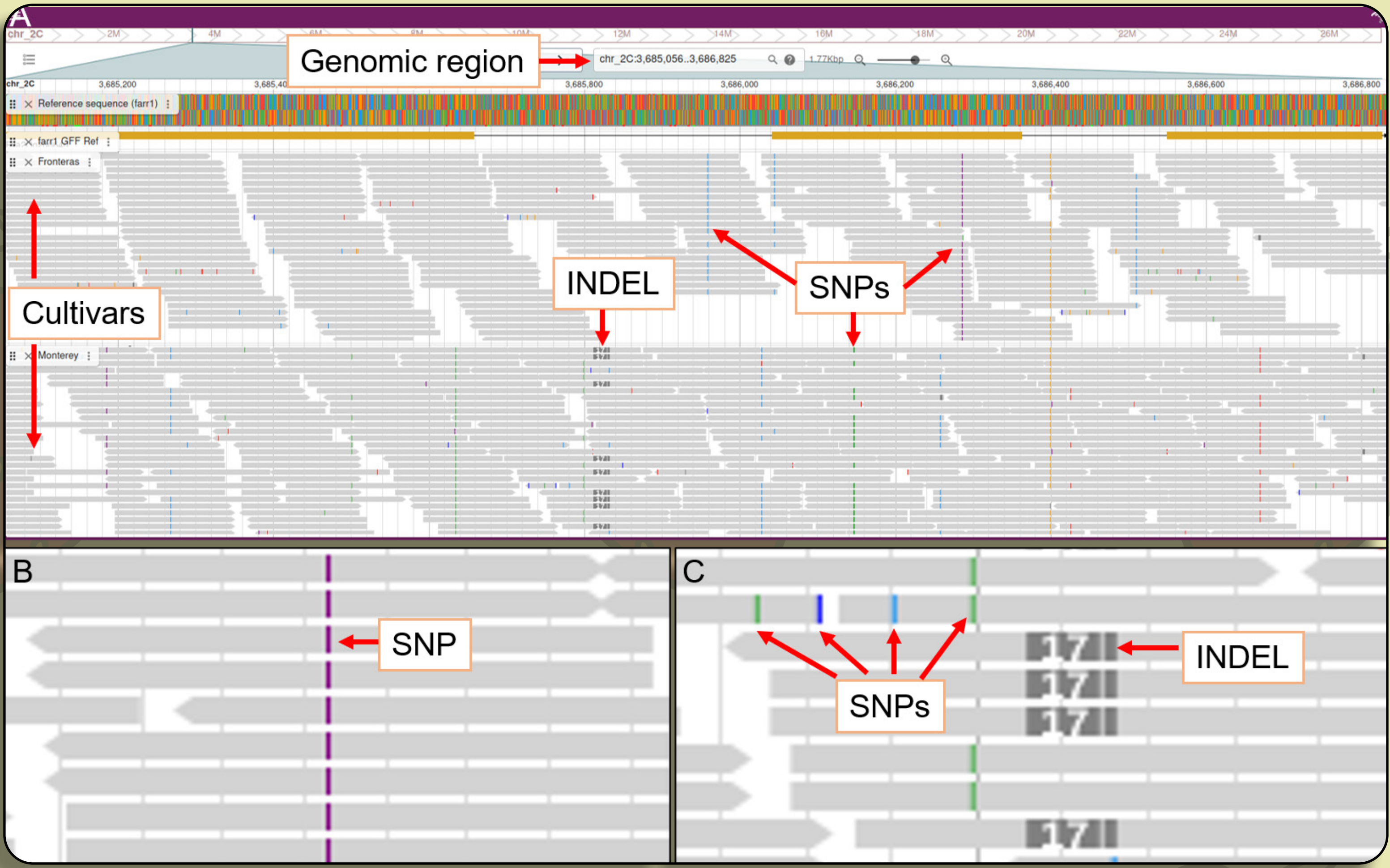


Figure 2. Screenshot from our Strawberry Genome Browser online tool. (A) Genomic sequences in the same genomic region of Fronteras and Monterey. DNA reads (gray lines) are aligned to the cv. Royal Royce v1.0 reference genome. Gray lines indicate sequences that are identical to this reference genome. Colored short vertical lines indicate SNPs, gray rectangles with numbers indicate INDELs. (B) A zoomed-in view of a region harboring one SNP. (C) A zoomed-in view of a region harboring multiple SNPs and one INDEL (in this case, a 17-nucleotide insertion).

al., 2017). This led us to identify a DNA variant in the GA20ox4 sequence that is present in the cultivar Fronteras and absent in Monterey. We then asked whether this sequence variant would negatively impact runner production in Fronteras, given our hypothesis that there would be less GA production in Fronteras due to one nucleotide deletion in GA20ox4. An analysis of runner phenotypes was conducted by Dr. Ibraheem Olasupo, in the laboratory of Dr. Mark Hoffmann at NCSU, Reduced runnering was, in fact, observed in Fronteras compared to Monterey (Figure 1), thus supporting a possible correlation with the GA20ox4 variant sequence.

The sequencing data of 13 cultivars is valuable for molecular breeding, because knowing the exact DNA sequence is a prerequisite for designing molecular markers or single guide RNAs (sgRNAs) for genome editing by CRISPR/Cas9. We (graduate student Yuan Gao) developed an interactive web-based visualization tool to display the genomic sequence data. With this tool, a user can input a genomic region or a gene name, and the nucleic acid sequences of the gene of interest are automatically displayed for the selected cultivar(s). DNA variants located in the specified region are colored by categories. Users are able to access, compare, and analyze the single nucleotide polymorphisms (SNPs) and small insertions and deletions (INDELs) across the 13 cultivars (Figure 2). Currently, we are in the process of developing HRMs for the variant identified in GA20ox4 in Fronteras in strawberry. CRISPR/Cas9 has been used successfully to edit genes for trait improvement, and this tool will advance the application of CRISPR technology in cultivated strawberry. You can expect to hear more information about this online tool soon!

IN-FIELD PERFORMANCE OF PLUG TRANSPLANTS

Article and images by Shinsuke Agehara
Gulf Coast Research and Education Center, University of Florida, Balm, FL

Plant Physiologist Dr. Shinsuke Agehara and his research team at University of Florida completed the first-year field evaluation of strawberry plug transplants in Florida. This experiment was conducted at Gulf Coast Research and Education Center in Balm, FL.

In the field experiment, we used two short-day cultivars that are commonly grown in Florida, 'Florida127' (Sweet Sensation®) and 'Florida Brilliance'. For each cultivar, we had three transplant treatments, including unchilled and chilled plug transplants, as well as bare-root transplants as control. Plug transplants were sourced from Dr. Mark Hoffmann's team at NCSU and shipped overnight to Florida, whereas bare-root transplants were sourced from a commercial nursery in California and shipped by a refrigerated truck.

For strawberry growers in Florida, the main desirable effect of using plug transplants compared to bare-root transplants is to increase early season yield by accelerating establishment growth, which is economically important because of high premium prices associated with fruit earliness. In this study, plug transplants established quicker and maintained greater canopy growth than bare-root transplants throughout the growing season. These differences, however, did not result in increased early season (November–December) yield. On the contrary, there was a tendency that plug transplants produced higher yield than bare-root transplants in the late season (January–February). In 'Florida127', relatively lower yield of bare-root transplants may be due partly to greater damage by Phytophthora crown rot. Overall, chilling had no significant effect on the performance of plug transplants.

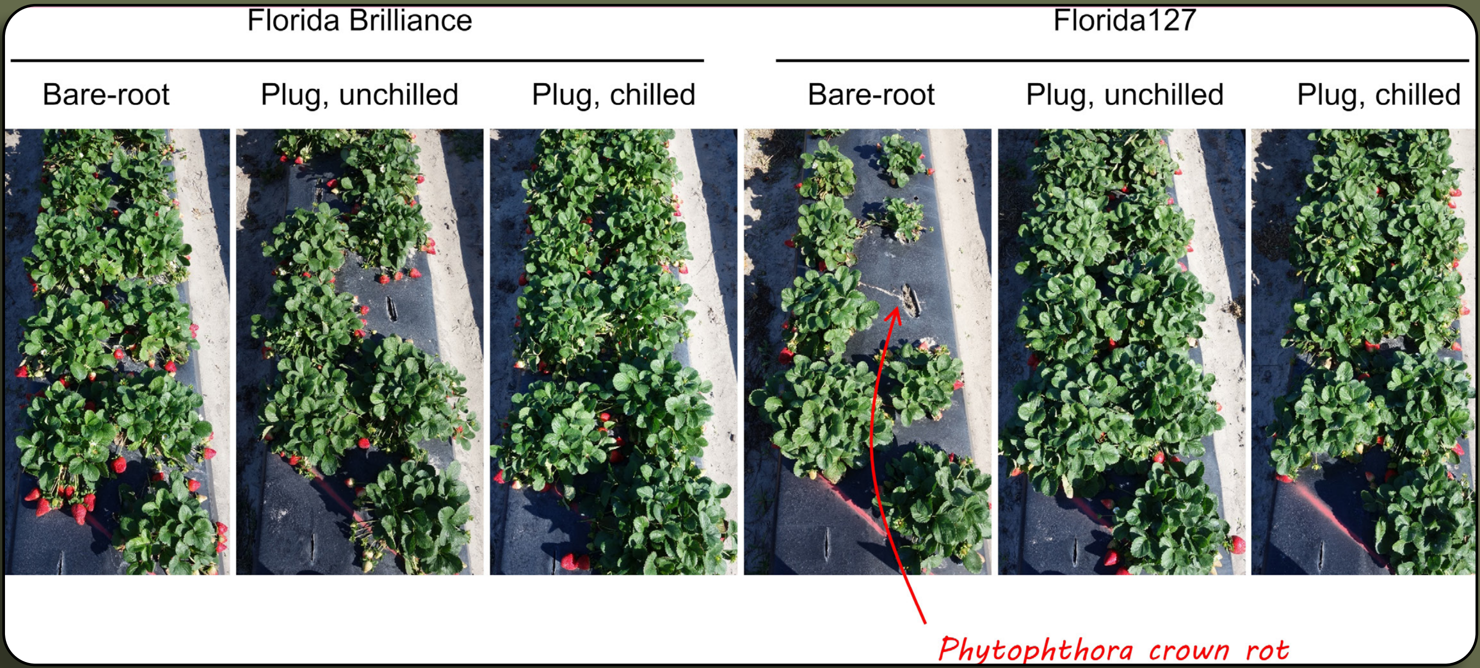


Figure 1. Canopy growth and Phytophtora crown rot damage of 'Florida Brilliance' and 'Florida127' strawberries as affected by the transplant type.

Traditionally, the performance of plug transplants is affected largely by weather conditions. We will repeat this study in the 2024–25 season to obtain conclusive data and fully evaluate the potential benefits of plug transplants for winter strawberry production in Florida.

Cultivar	Transplant	Canopy projected area (cm^2/plant) 18 DAT	40 DAT	70 DAT	96 DAT	124 DAT
Florida Brilliance	Bare-root	73	353 b	799 c	866 c	1137 c
	Plug, unchilled	93	326 bc	819 c	1048 bc	1232 bc
	Plug, chilled	117	424 ab	916 bc	1109 b	1281 ab
Florida127	Bare-root	57	233 c	580 d	700 d	832 d
	Plug, unchilled	106	392 ab	1052 ab	1198 ab	1363 ab
	Plug, chilled	140	481 a	1233 a	1298 a	1417 a
		Pooled data				
Florida Brilliance		94	367	845	1008	1216
Florida127		101	369	955	1065	1204
	Bare-root	65 b	293	689	783	984
	Plug, unchilled	99 a	359	936	1123	1297
	Plug, chilled	128 a	452	1075	1204	1349
		p value				
Cultivar		0.0003	<0.0001	<0.0001	0.0003	<0.0001
Transplant		0.4976	0.9439	0.0052	0.0451	0.6151
Cultivar × Transplant		0.2507	0.0033	<0.0001	0.0004	<0.0001

DAT = days after transplanting

Means followed by the same letter are not significantly different (Tukey–Kramer test, $p < 0.05$).

Above: Table 1. Canopy growth of 'Florida Brilliance' and 'Florida127' strawberries as affected by the transplant type. Below: Table 2. Monthly marketable yield of 'Florida Brilliance' and 'Florida127' strawberries as affected by the transplant type.

Cultivar	Transplant	Marketable yield (t/ha) Nov	Dec	Jan	Feb	Total
Florida Brilliance	Bare-root	0.13 a	3.77	6.23	18.61	28.74 ab
	Plug, unchilled	0.01 b	1.54	5.12	19.59	26.26 abc
	Plug, chilled	0.02 b	1.90	8.37	19.89	30.18 a
Florida127	Bare-root	0.04 b	1.89	3.01	11.57	16.51 d
	Plug, unchilled	0.07 ab	0.17	5.00	16.76	22.00 cd
	Plug, chilled	0.15 a	0.41	6.03	15.80	22.40 bcd
		Pooled data				
Florida Brilliance		0.05	2.40 a	6.57 a	19.36 a	28.39
Florida127		0.09	0.82 b	4.68 b	14.71 b	20.30
	Bare-root	0.08	2.83 a	4.62 b	15.09	22.62
	Plug, unchilled	0.04	0.86 b	5.06 b	18.17	24.13
	Plug, chilled	0.09	1.16 b	7.20 a	17.85	26.29
		p value				
Cultivar		0.0134	0.0001	0.0050	0.0003	<0.0001
Transplant		0.1698	0.0015	0.0051	0.0543	0.0627
Cultivar × Transplant		<0.0001	0.6744	0.1115	0.2734	0.0422

Means followed by the same letter are not significantly different (Tukey–Kramer test, $p < 0.05$).

Did you know?

'Monterey' was the most prolific cultivar and produced more daughter plants than 'Albion' or ' Fronteras', regardless of the fertilizer formation (pg. 7).

Specifically, the 'Fronteras' genome contains two DNA variants of the GA20ox4 gene, which encodes a biosynthesis enzyme for the plant horomone gibberellic acid (GA). GA is directly related to the plant's ability to produce daughter plants (pg. 12).

- NO_3^- NH_4 Ratio for Daughter Plant Production (pg. 7)

MEDIA

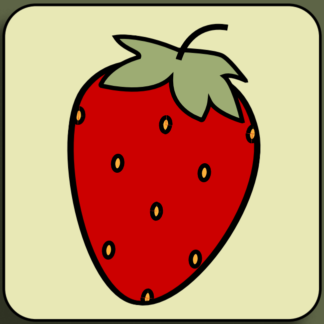
Row Cover and Strawberry Yield Potential Research

We are evaluating the flowering and yielding potential of 2 strawberry varieties- Chandler and Ruby June, by accruing different growing degree days in the fall (photo) utilizing floating row covers. We are currently collecting fruit yield data and can't wait to see the correlation.

Patricia Richardson
Small Fruit Program Research Specialist

Baker Aljawasim
Ph.D. Candidate

Mia Perry and Amy Burnett
Field and lab. aides



Audre'ana Ellis
Field and lab. aide

Shout out!

Thank you to the team that made this study possible at the Hampton Roads Ag. Research and Extension Center in Virginia Beach, VA. Your hard work is appreciated!

NEXT ISSUE'S OUTLOOK

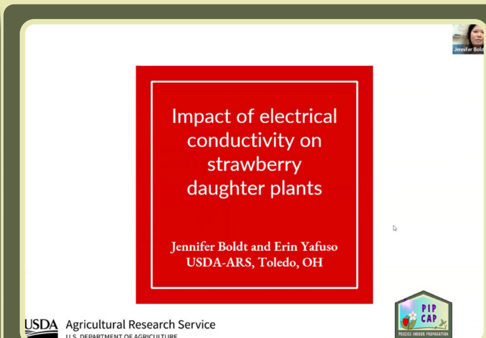
You can look forward to hearing about these topics next:

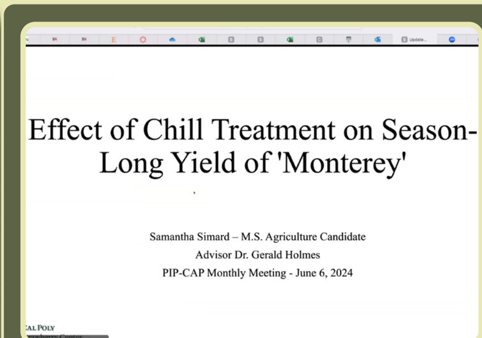
3rd Annual PIP-CAP Meeting
Effect of Artificial Chilling Treatment
Field Evaluations of Chilled Treated Strawberry Plants Propagated in Controlled Environment
California Field Trials
2024 ASHS Conference Presentations

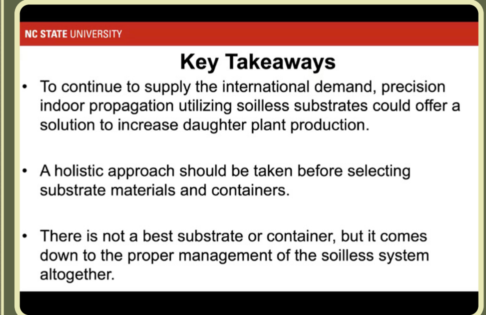
Click here to receive the next newsletter directly in your inbox!

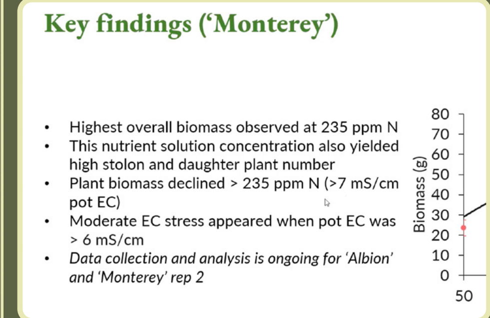
2024 Team Meetings

Our group is spread out across the United States, so it's difficult getting together for quick updates. Thanks to Zoom and other online technologies, we can collaborate and share our findings virtually. This year we had updates from our plant physiology team members as well as updates from our field trial groups at Cal Poly and NC State.









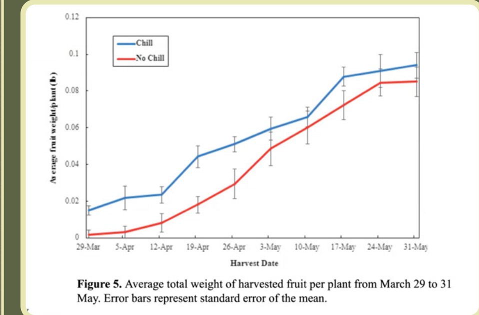


PHOTO CREDITS

Cover: *Table of strawberries which were harvested at the 2024 Strawberry Field Day, at the Central Crops Research Station, photo by Kaitlyn Aguiles.* **Media:** *"Row Cover and Strawberry Yield potential Research" and images by Alana Matin.* **2024 Team Meetings:** *(left to right) "The Characterization and Development of Soiless Substrate Systems for Mother Plant Production of Strawberries" by Brandan A Shur; "Impact of Electrical Conductivity on Strawberry Daughter Plants" by Jennifer Boldt and Erin Yafuso; "Effect of Chill Treatment on Season-Long Yield of 'Monterey' " by Samantha Simard.*