

**AGRICULTURAL RESEARCH FOUNDATION
INTERIM REPORT
FUNDING CYCLE 2020 – 2022**

TITLE: Fruit Cracking in Cranberry

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EXECUTIVE SUMMARY:

Year 2 of the fruit cracking project produced mediocre results. The treatments were applied on cranberry beds on two farms: the Puhl farm and the Davis farm. The amount of cracked fruit from this season was incredibly low, which was very good news for the farmers, but wasn't very helpful when analyzing treatment effects on the amount of fruit cracking. There was no difference between treatments on the Davis farm (percent cracked fruit ranged from 1.1% to 1.6% between treatments). On the Puhl farm, only the 0.25 gal/ac treatment was significantly different from the control, and with that the percentage of cracked fruit was only 2.4% lower than the control. This is a much different story from that of year 1, in which the amount of cracking was reduced by 50% in one treatment.

In year 1, differences in the amount of rot at harvest between treatments was an exciting finding. Unfortunately, those differences did not manifest in year 2. A third year of data will help determine if more work needs to be done in this area.

None of the CranShield treatments resulted in a difference in yield.

The 0.5 gal/ac treatment increased Brix values 0.6% and 0.4% on the Puhl and Davis farms, respectively. While these values are statistically significant, they are not of practical importance.

After 6 weeks in storage, the fruit treated with 0.5 gal/a of CranShield had 7% less rot than the untreated control.

While it is good to know that there can be significant year-to-year differences in the amount of cracked fruit in a cranberry bed, this makes it difficult for a grower to anticipate potential crop loss. This, in turn, makes the decision to go to the expense of applying CranShield a difficult one. CranShield is an expensive product: two treatments of 0.5 gal/ac, would cost \$120/ac total.

OBJECTIVES: In year two, my objectives were as follows:

1. To evaluate rates and efficacy of CranShield against splitting and peeling of the cuticle in 'Demoranville' cranberry fruit.

2. To evaluate the effect of CranShield on yield, fruit size, total soluble solids, and field and storage rot at these different rates.

PROCEDURES:

Four treatments (7x10 ft plots) were administered in a randomized block design with four replicates (16 plots). Treatments were as follows:

1. Untreated control
2. 0.1 gal/ac CranShield
3. 0.25 gal/ac CranShield
4. 0.5 gal/ac Cranshield

Treatments were applied at 100% petal drop (July 13, 2021 at the Puhl farm, and July 14, 2021 at the Davis Farm) with a CO₂ backpack sprayer and then again on August 6, 2021).

Fruit was hand-harvested from the Puhl Farm on September 22 and 24, 2021. Davis Farm fruit samples were collected September 29, 2021. Four 1-ft² samples were collected per plot, removing all fruit within that sampling square, and the fruit was deposited into separate paper bags.

The four samples from each plot were used to collect the rest of the data:

1. In-field cracked fruit. Fruit cracked in the field was separated from each sample, counted, and weighed.
2. In-field fruit rot. This fruit was soft or had other signs of rot that was not related to cracking. It was separated from each sample, counted, and weighed.
3. Yield. Once the rotten and cracked fruit were separated out, the remaining marketable fruit was counted and weighed.
4. Berry weight. 50 whole fruit were collected from each sample, counted, and weighed.
5. Percent total soluble solids (Brix). Brix values were collected from each of the 50 fruit set aside.
6. Storage rot. Once the split and rotten fruit was removed from each sample, the remaining whole fruit was placed into storage at 41°F. The samples were then sorted at 6 weeks. Rotten fruit was separated from whole fruit, and both groups were counted and weighed.

Results were analyzed with JMP Pro 15.1.0.

SIGNIFICANT ACCOMPLISHMENTS TO DATE:

The second season of the trial was completed successfully. Interestingly, there wasn't a lot of cracking in the fruit collected this year, which led me to request an extension of the project

timeline to collect another year's worth of data.

1. In-field cracked fruit. The plots at the Puhl farm yielded quite an impressively large amount of fruit in 2021. In fact, that particular cranberry bed hit a farm record for yield (700 barrels/ac, or 70,000 lbs/ac). Despite this huge harvest, the amount of cracked fruit this year was minimal and the differences seen were small. Statistically, the 0.25 gal/ac treatment had significantly less fruit cracking (4.0%) than the untreated control (6.4%) ($p = 0.025$). The remaining treatments of 0.1 gal/ac and 0.5 gal/ac had 5.6% and 4.9% cracking, respectively. While both had less cracking than the untreated control, neither was significantly different from each other or the control.

The plots at the Davis farm yielded much less fruit (the bed was young) and mirrored the Puhl farm in that there was not much cracking this year. There was not a statistically significant difference between treatments at this farm this year, with treatment means ranging between 1.1% to 1.6%.

2. In-field fruit rot. When looking at the amount of fruit in the field that was rotten due to factors other than cracking, there was no difference between treatments at either farm.
3. Yield. There was no difference in yield between treatments at either farm.
4. Average berry weight. As in 2020, there was not a difference in berry weight by treatment on the Puhl farm. Interestingly, there was a significant difference on the Davis farm between the size of berries from the 0.1 gal/ac treatment (1.3g) and the untreated control (1.4g) ($p = 0.01$). The remaining treatments of 0.25 and 0.5 gal/ac were not significantly different from the control.
5. Percent total soluble solids (Brix). On both farms, the 0.5 gal/ac treatment had a significantly higher Brix value than the 0.25 gal/ac treatment. In addition, on the Puhl farm, the 0.5 gal/ac treatment was also significantly different from the 0.1 gal/ac treatments (Table 1).

Table 1. Brix values for treatments with significant differences.

Farm	0.1 gal/ac	0.25 gal/ac	0.5 gal/ac	Probability
Puhl		8.67%	9.26%	$p = 0.0001$
	8.81%		9.26%	$p = 0.0071$
Davis		8.95%	9.36%	$p = 0.0026$

6. 6-week storage rot. On the Puhl farm, only the 0.5 gal/ac resulted in significantly fewer rotten fruit after 6 weeks in storage than did the untreated control (19% vs. 26%, respectively) ($p = 0.05$).

On the Davis farm, there was no difference in the amount of rotten fruit between treatments after 6 weeks in storage, with the mean values of the four treatments

ranging from 37% and 47%.

There were some interesting results during year 2. However, the amount of cracking this year was extremely low, and I believe that impacted the results. I have been granted an extension to do this work an additional year. It IS good to know that there is dramatic year-to-year variability in the amount of fruit cracking that occurs, although this amount of variability makes it challenging for a grower to anticipate (and potentially correct for) crop loss.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:

No additional funding was received.

FUTURE FUNDING POSSIBILITIES:

Preliminary results from 2020 suggest that CranShield significantly lessens in-field fruit rot (non-cracked fruit rot) in 'Demoranville' cranberries. I do not understand how a post-bloom application of a protectant like CranShield would impact fruit rot, as it is well-known that fruit rot pathogens infect fruit during bloom. However, that is an extremely interesting result; the cranberry industry is very limited in the number of effective fungicides available for fruit rot control. While there was not a difference in the amount of field rot in 2021, given the differences seen in 2020, I am looking forward to 2022 data to determine if 2020 was an aberration.

Additionally, I suspect that the 60 gal/ac application rate might not provide the coverage needed to reach all the fruit through the canopy. I would like to add an application volume variable into the 2022 season trial if possible. Further, I was directed to make two CranShield applications in years 1 and 2, as that is the standard application for the product. However, I would like to trial a single application to definitively rule it out. If it is possible to get control with a single application, that would be of significant benefit to the grower, as two applications can cost up to \$120/ac.