

NGWB GRANT FINAL REPORT

2012-2013

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Issue of Interest

The efficacy of spraying dormant vines with Amigo Oil in order to delay bud break and thus avoid considerable damage due to frost/freezing events has been proven repeatedly (McFarland, 2008, 2009, 2010, 2011). However, minimal research with inconclusive and equivocal results has attempted to evaluate the number of applications necessary to maximize these efficacious results. Year 1 Pilot study (McFarland & McFarland, 2012) results indicate that a 14 day delay can be attained with two applications while no significant delay resulted from a single application. While these results are valid, with the unusual weather conditions of the winter/spring 2012, it is impossible to yet determine whether these results can be replicated and expected in more "normal" years. This project investigated the effects of single application vs multiple applications. Results of this study potentially could have significant impact upon the profitability of the entire grape growing industry in the state of Nebraska. Based upon 350+ acres of grapes planted in Nebraska, the difference between single vs three applications of Amigo Oil could result in an increase in profitability of nearly \$100,000 per year for the grape growers. Thus, these results could make it possible for grape growers to significantly increase

In previous research conducted by this researcher at Mac's Creek Winery & Vineyards (2008 – 2011) data have documented that depending upon the year, and the specific cultivar, bud break has been delayed anywhere from five days to three weeks. Delays of this magnitude can mean the difference between harvesting a full crop on primary buds or reduced or even no crop at all. It is hypothesized that perhaps one factor that may account for the variability of amount of delay from year to year in addition to the weather, may be the number of applications of Amigo Oil that are applied to the vines. For example, in one given year, five applications were made while during another year (due to weather constraints) only three applications were possible. A review of the literature has found no studies that have systematically investigated this question.

Mac's Creek has just completed a Year 1 Pilot study which investigated this issue. Preliminary results suggest that one application resulted in no significant bud delay. Due to the weather constraints, only two applications were possible. However, two applications resulted in significant bud delay when compared to Controls (no treatment), and significant bud delay when compared to the one application group. This delay was found to be an approximate 14 day delay. Moreover, anecdotal findings (non-research based) reported from a single application of Amigo Oil in Minnesota in the spring of 2012 suggested significant delay in bud break on that site. Given the profound significance of these findings combined with the extremely unusual winter/spring weather (resulting in one of the cultivars budding out a full month earlier than ever recorded at this site), it is recommended that this study be replicated for at least a second year in order to determine whether such results can be replicated across differing winters/springs in central Nebraska.

Therefore, the purpose of this study is to more thoroughly investigate the efficacy of single application vs multiple applications of Amigo Oil.

Approach to Problem

Sample

Each of four cultivars (Marechal Foch, Brianna, deChaunac and Edelweiss) were divided into four or five groups by row and consisted of at least 30 vines in each group: Control group (no Amigo Oil was applied), Treatment #1 (single application early – first week of March); Treatment #2 (two applications); Treatment #3 (four applications), Treatment #4 (single application late-last week of March).

Note: Due to vineyard management/production decisions, there were no Control group vines left unsprayed and no one application (late) group for both the Edelweiss and deChaunac cultivars.

Instrumentation

A Bud Rating Form (developed by the researcher and used in the four years of previous study) was used to rate the extent of bud development. Buds were rated by a research assistant on a scale of 1 – 5 (1 = no bud swell; 5 = bud break, one leaf unfurled).

Procedure

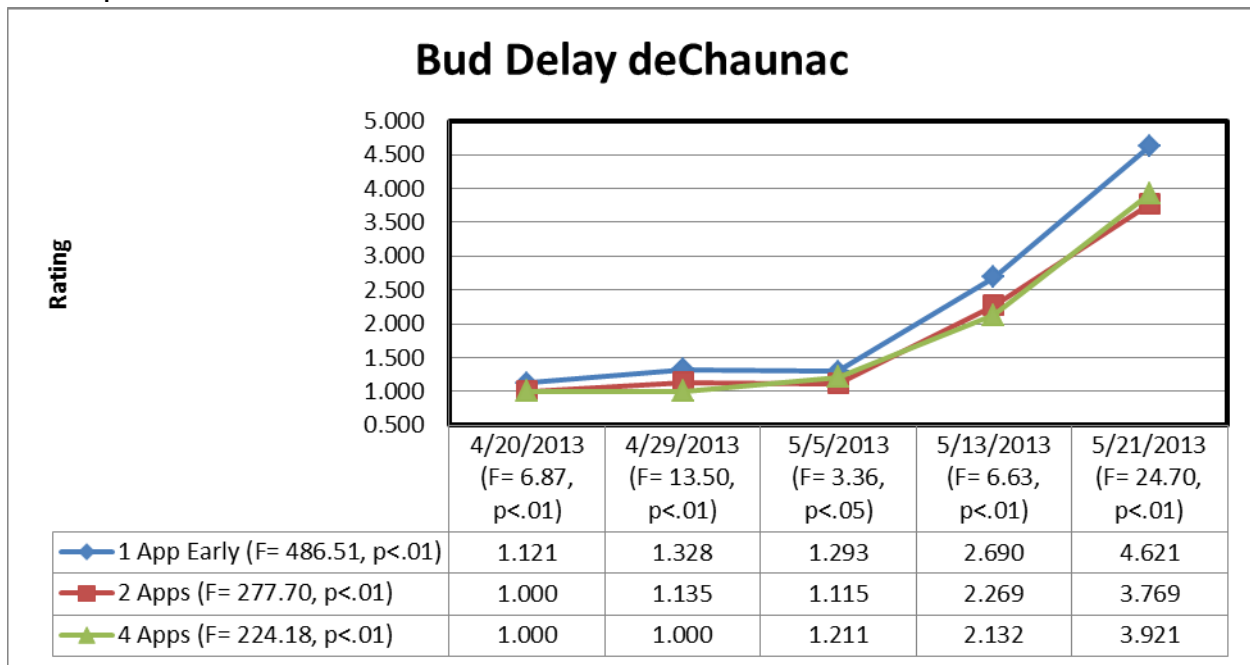
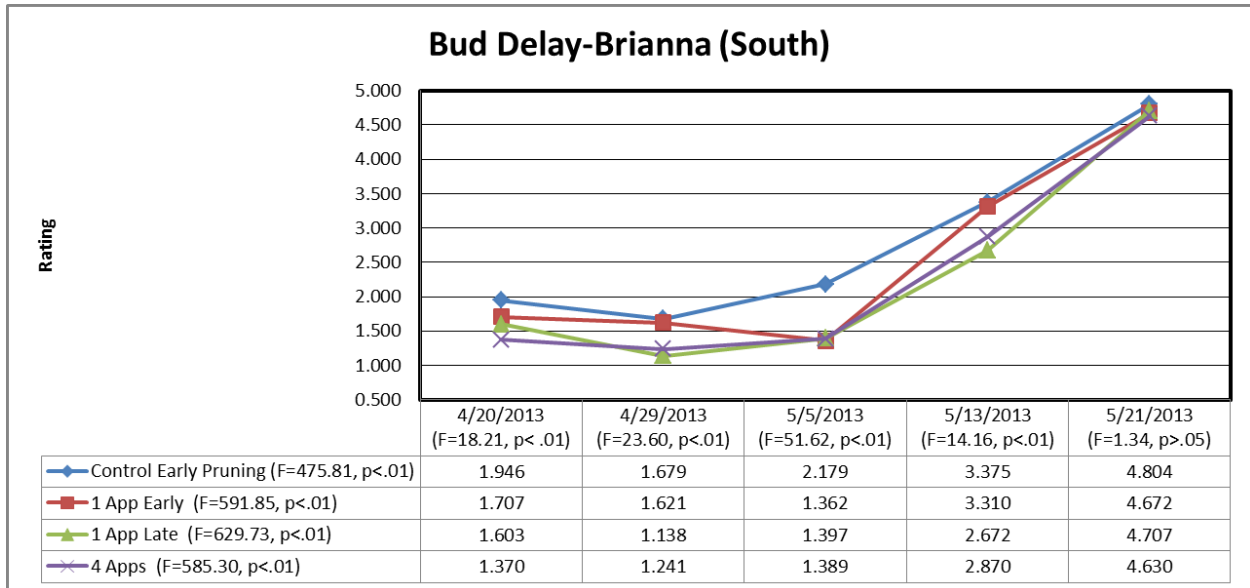
The research assistant identified each of the sample groups. The first Amigo Oil application was applied late February and subsequent applications were made approximately every two weeks until bud swell began. When bud swell began (approximately late April), the research assistant rated buds every week until most all buds were rated at "5" (approximately four to five weeks). Adequate inter-rater agreement was maintained $r > .95$.

Goals/Achievement of Goals

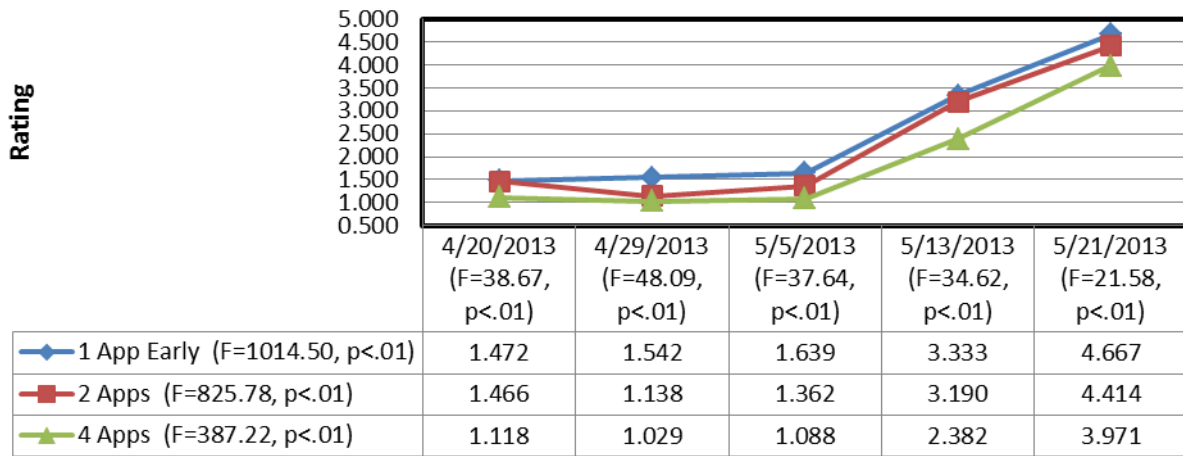
Goal #1. Is there a difference in the extent of bud delay when comparing single application vs multiple applications within each of the four cultivars investigated (i.e. Marechal Foch, Brianna, Edelweiss, deChaunac).

Results, Conclusions, Lessons Learned

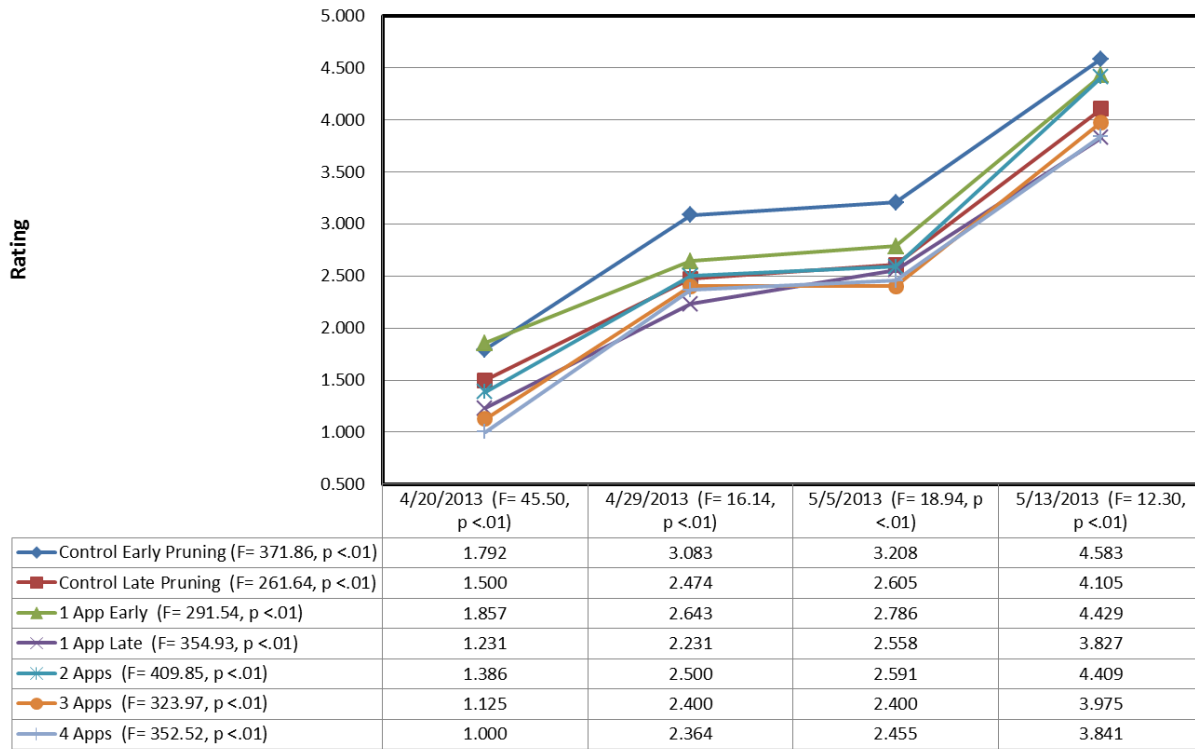
Average ratings on all vines within each of the four groups (Control, Tx1, Tx2, Tx3, Tx4) for each of the four cultivars (Edelweiss, Brianna Marechal Foch, deChaunac) were analyzed (ANOVA) and compared weekly (see graph below).



Bud Delay Edelweiss



Bud Delay Marechal-Foch



Note: Due to vineyard management/production decisions, there were no Control group vines left unprayed and no one application (late) group for both the Edelweiss and deChaunac

cultivars. In each case, the estimated number of days delay that were observed were made by comparing the four application group to the one application (early) group.

- 1) Single App. Early (first of March): no significant delay observed
- 2) Two Applications: significant delay in bud break for deChaunac and Marechal Foch
- 3) Four Applications: significant delay in bud break for deChaunac, Brianna, Edelweiss and Marechal Foch.
- 4) Single Application Late (end of March): significant delay in bud break for Brianna and Marechal Foch. Delay is comparable to the Four Application groups, indicating a delay estimated to be 7 – 8 days.

Conclusions

No significant bud delay was observed with a single application (early) of Amigo Oil during these trials. However, significant delay ranging from 6-8 days was observed with two or four applications. Moreover, significant delay was found for a single application (late), comparable to the delay observed in the four applicatin trials. These findings are significant in that prior to this study, it was assumed that “the more applications the better” when it come to bud delay. These preliminary results, however, suggest that perhaps equal positive benefit may result from many fewer applications. These data should be considered as preliminary at best.

Progress Achieved According to Outcome Measures

The efficacy of spraying Amigo Oil (a vegetable oil surfactant) onto dormant grape vines in order to delay bud break has been proven repeatedly. In previous research conducted by this researcher at Mac’s Creek Winery & Vineyards (2008 – 2011) data have documented that depending upon the year, and the specific cultivar, bud break has been delayed anywhere from five days to three weeks. Delays of this magnitude can mean the difference between harvesting a full crop on primary buds or reduced or even no crop at all. It is hypothesized that perhaps one factor that may account for the variability of amount of delay from year to year in addition to the weather, may be the number of applications of Amigo Oil that are applied to the vines. For example, in one given year, five applications were made while during another year (due to weather constraints) only three applications were possible. A review of the literature has found no studies that have systematically investigated this question.

These results suggest positive effect with fewer applications. This could result in significant cost savings (see Year 4 report) when considering the cost of the Amigo Oil, time, labor , application costs, etc. Thus, significant increase in productivity/quality (i.e., harvesting on primary buds instead of secondary or tertiary), increase sustainability of the industry state-wide, without having to increase acreage.

As previous research has shown (McFarland, 2008, 2009, 2010, 2011) treatment of dormant vines with Amigo Oil has resulted in bud delays ranging from five days to three weeks. The impact of these delays to Nebraska grape growers is huge, i.e., the difference between a partial crop/no crop and full crop on primary buds. At 3 tons/acre, a 25% decrease in crop due to a frost event (such as occurred in 2010) results in a loss of approximately 1500 lbs/acre or a \$900

loss/acre. Avoiding that late frost damage equates to a \$900/acre savings less the cost (4 gal/acre X 4 applications=16 gal/acre @ \$17/gal = \$272/acre plus 8 hours labor and machine costs @ \$20 = \$160 equals a grand total of \$432/acre cost. Thus, this nets \$468/acre savings X 7 acres at Mac's Creek, which results in a savings of \$3276 in one year. These figures estimate a 25% loss scenario, with a 50% loss scenario the net savings doubles, or, \$6552/year.

Moreover, German researchers are also investigating the question of single vs multiple applications of vegetable oil. Their findings (reported at the VitiNord, 2012 conference) suggested that a single application did result in significant effect of bud delay. The ensuing discussion resulted in the discovery that perhaps the timing of this single application is predictive. In this Nebraska trial, the single application was applied both in early March and another trial applied in late March. These results are quite consistent with those reported by the German researchers, i.e., showing significant delay in bud break with a single late application; equally as effective as multiple applications.

Expected Benefit to the State of Nebraska

When the above estimation is expanded to the grape growing industry across the entire state of Nebraska, the following increase in profitability is possible:

Using the figure of 350+ acres of grapes planted in Nebraska (Nebraska Grape Board Survey, 2009), a single application (\$817/acre net savings) = an increase in profitability of \$285,950 per year.

Using the same 350+ acres @ four applications (\$570/acre net savings) = an increase in profitability of \$199,500 per year.

This difference, determined solely by the number of applications of Amigo Oil necessary to be effective yields a difference of \$86,450 in profitability to the growers of Nebraska in just one year.

Grape acres in production may be approaching the level of exceeding demand based on 26 wineries. In production agriculture, a common method of increasing profit is to increase acres put into production. Within the grape industry, that approach may be counterproductive and when supply exceeds demand, profitability decreases. This study could enable growers to increase profitability without expanding acres planted.

Financial Report

This project was funded in the amount of \$5970. These funds were spent as follows: Supplies = 2000; Equipment Leasing = 1000; Labor = 375; Research Assistant = 800; Research Consultant = 1000.