

NGWB GRANT FINAL REPORT

2013-14

Contract Number

#18-13-230

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ISSUE OF INTEREST

The Grape/Wine industry is burgeoning in the state of Nebraska. As such, viticulture practices must be scrutinized closely to assure the industry is sustainable while minimizing environmental impact. This study investigated the feasibility of eliminating/reducing chemical usage in disease control via the usage of ozone technology, thereby enhancing sustainability, reducing environmental carbon footprint, enhancing the positive image of the Nebraska industry and protecting the consumer.

Potential Impact

Current viticulture practice within the state of Nebraska typically includes the usage of a variety of fungicides for the control of disease. The industry has done a good job of training/informing growers such that hopefully all products used have been labeled for usage with grapes and the application of the products are within safety and legal parameters. However, even with these safeguards in place, there is an ever increasing concern with potential harmful environmental impact, and, potential public/consumer impact resulting from the continued and increasing usage of these practices. With the number of grape acres in Nebraska (Grape Board Survey, 2009) this concern will only continue to increase.

Should it be determined that disease control could be realized with chemical free or chemically reduced processes (via the use of ozone technology) the impact could be huge and far reaching. The use of fungicides varies, from nearly non-existent (due to minimal disease pressure) in the western areas of Nebraska, to nearly weekly usage (due to heavy/constant disease pressure) in the eastern areas of our state. Thus, this study, likely will impact every grape grower in Nebraska.

Moreover, the potential cumulative environmental impact could be perhaps even more significant. As stewards of our environment, it is the responsibility of each grape grower to minimize /eliminate adverse effects on our environment and to aspire to move our industry toward sustainability with reduced carbon footprints.

Lastly, the impact upon the consumer could be two-fold. First, when used as prescribed by the label, the products currently being used should be considered safe to the consumer. Reduction or elimination of the usage of these chemicals could only move in the direction of increased safety to the consumer. Second, while actual safety should be of paramount importance to our industry, so too should the increased "image of safety" of our industry in the eyes of our consumers. This impact of positive "image" can be seen with the increase in interest in organic grape growing in other parts of the U.S.

Project Purpose

This study investigated the feasibility of eliminating/reducing chemical usage in disease control via the usage of ozone technology, thereby enhancing sustainability and enhancing the positive image of the Nebraska industry as well as protecting the consumer. Ozone technology and engineering have reached levels which enable commercial application in vineyards to be researched. This is a continuation study from the previous year. Preliminary data show inconsistent results depending upon cultivar and microclimate. Therefore, the purpose of this project is to continue this investigation and evaluate the efficacy of using ozone to reduce usage of pesticides to control disease on grape vines.

APPROACH TO THE PROBLEM

Sample: Three cultivars were initially selected for study, those being Edelweiss, Lacrosse and Vignole. Three groups of vines were identified within each of the three cultivars; Control Group (no treatment); Treatment Group #1 (Tx1) (received chemical/pesticide spray); and Treatment Group #2 (Tx2) (received ozone spray). Sample groups were systematically selected by row blocks, i.e., three rows for each group with the Control Group in between the two Treatment Groups. This was done to minimize drift/overlap between Tx1 and Tx2. Sample vines which were evaluated were selected from the two outside most rows, again to minimize any drift overlap. These data were collected in the 2013 growing season.

Procedures: Tx1 groups were sprayed with chemical pesticide sprays in accordance with the vineyard's normal and customary practices (i.e., sprayed approximately every 10 days beginning in May; 25 gallons/acre rate of application using an air blast mist sprayer. Pesticides were alternated with no pesticide being used twice in a row. Normal spray schedules were adhered to.

Ozone spraying was done in a highly similar manner i.e., within two days of when the pesticide spraying was done and approximate same rate of application.

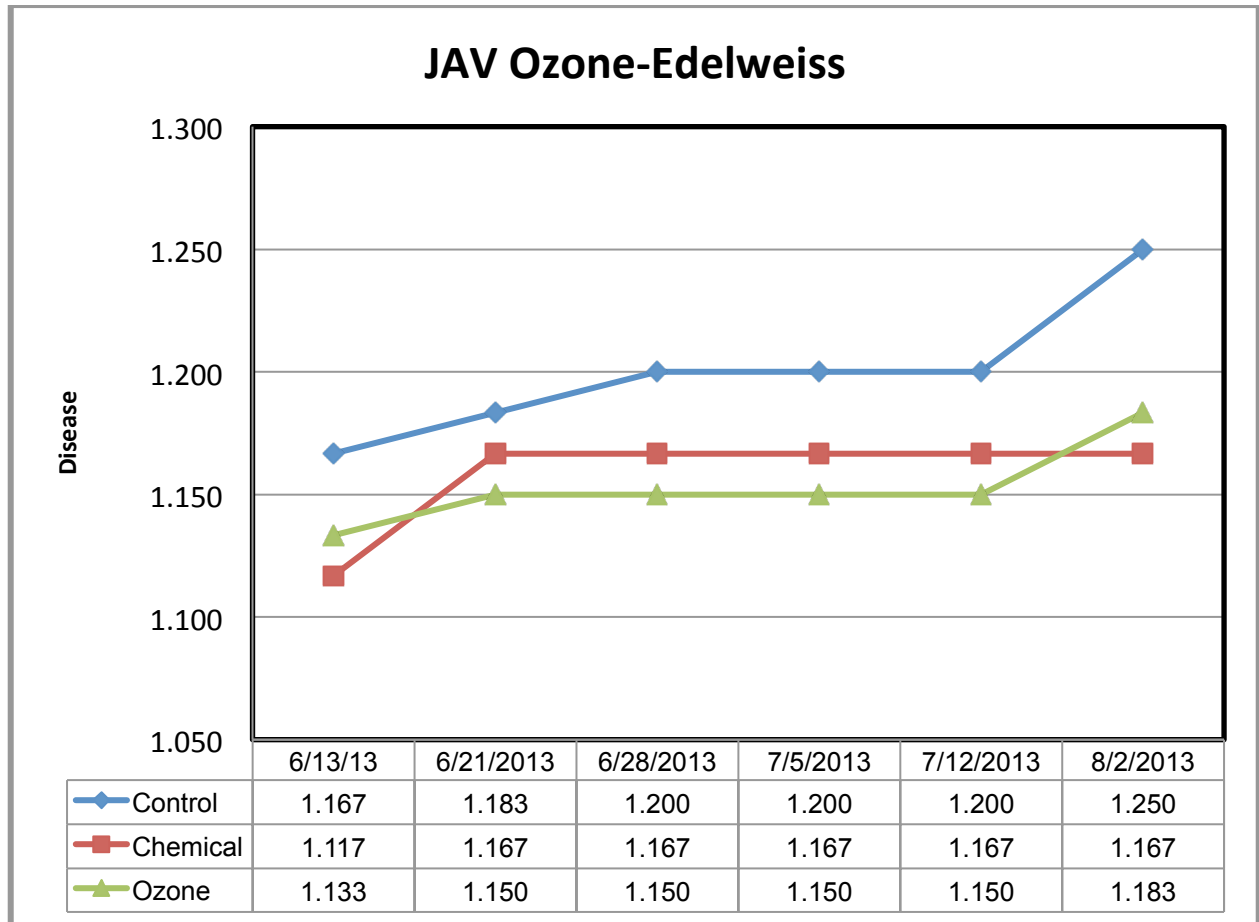
Vines were evaluated using a 5-point scale (1=no observable disease, 3= moderate disease pressure; 5= near lethal disease pressure). Approximately 10% of the vines were randomly selected for independent evaluation by the research consultant for reliability checks. Adequate inter-rater agreement was maintained $r > .90$. Vines were evaluated weekly and a total of six weeks of data are reported.

GOALS/ACHIEVEMENT OF GOALS

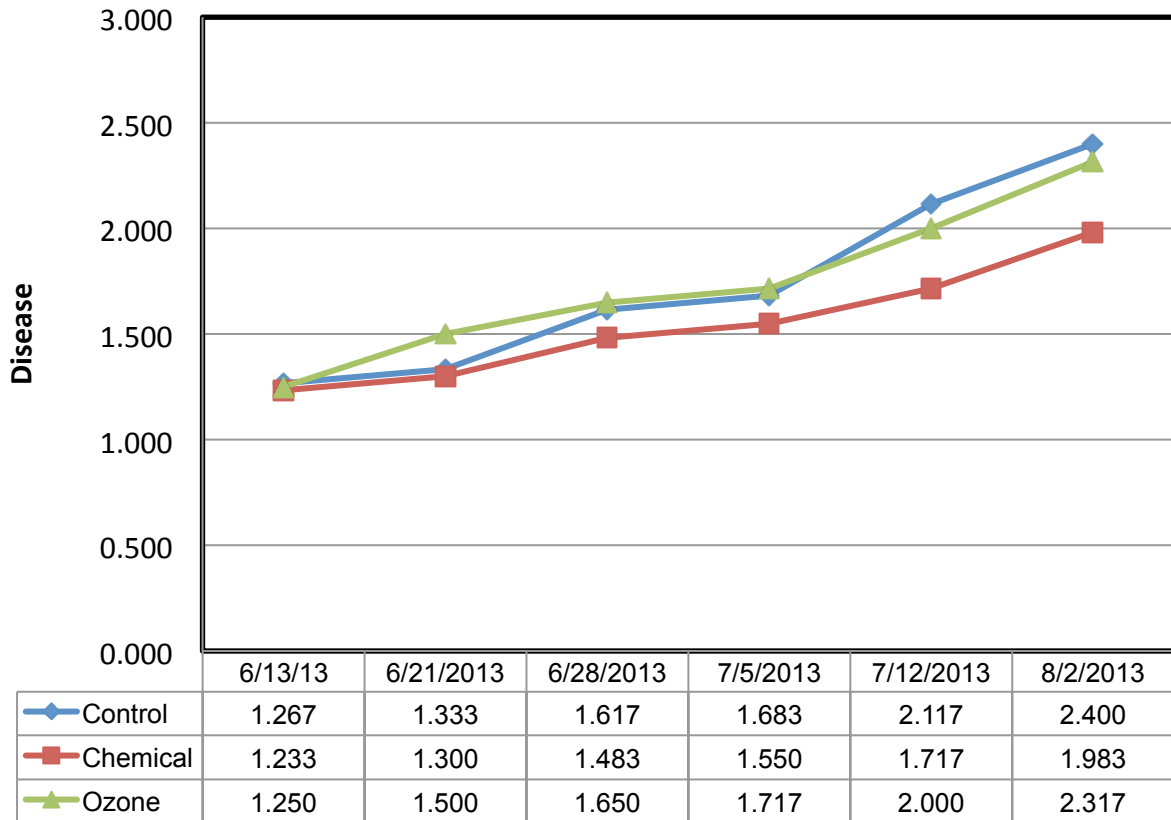
Goal #1: To investigate the efficacy of ozone application to control disease in a commercial vineyard application.

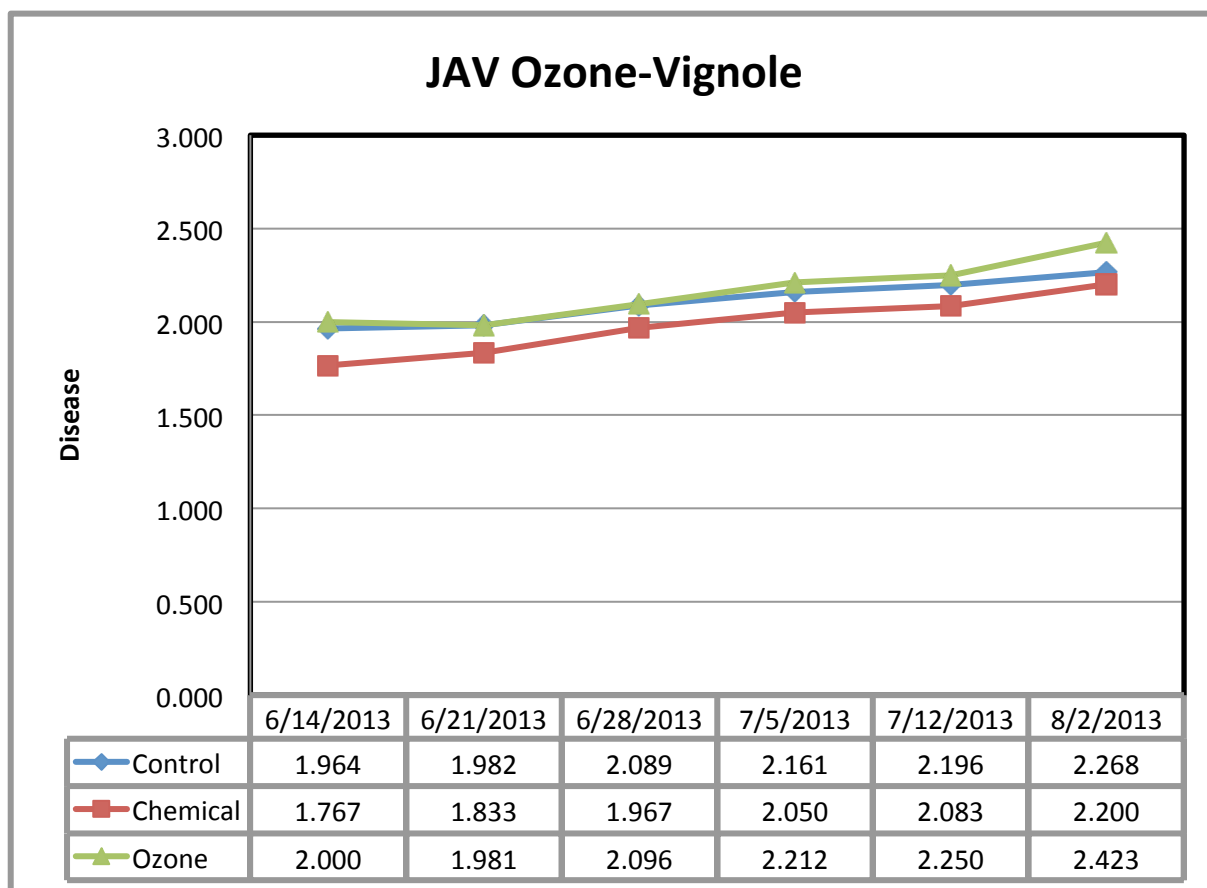
RESULTS, CONCLUSIONS, LESSONS LEARNED

Average ratings on all vines within each of the three groups (Control, Tx1, Tx2) for each of the three cultivars (Edelweiss, Lacrosse, Vignole) were analyzed (ANOVA3-1R) and compared weekly (see graphs below).



JAV Ozone-Lacrosse





These data should continue to be considered as preliminary. That said, these results are inconsistent at best.

- 1) Edelweiss: Effect of Ozone treatment is significant and rated as showing less disease pressure than when using pesticides.
- 2) Lacrosse: Pesticide usage rated as resulting in somewhat less disease pressure but inconsistently. Ozone rated as no effect on disease pressure.
- 3) Vignole: Neither pesticide usage nor ozone usage rated as having any effect on disease pressure.

PROGRESS ACHIEVED ACCORDING TO OUTCOME MEASURE

These results are perplexing and raise many questions. First, ozone effectiveness in this study seems to be cultivar specific, i.e., only effective on Edelweiss. Other ozone studies have also reported effectiveness with Edelweiss but have not found the effects to be cultivar specific. A second, and somewhat alarming finding of this study is the ineffectiveness of typically used pesticides in the control of diseases for which these pesticides are labeled for usage. Third, the inconsistency between these results and other past and concurrent ozone studies (McFarland & McFarland) prompted further investigation. It was determined that the ozone generator being used in this study was malfunctioning and that ozone being generated was not of sufficient concentration to potentially have any impact upon disease. A minimum of 750 millivolts concentration is recommended (Agri-Ozein) and according to the vineyard manager, the level being used did not exceed 600 millivolts. As such, at those levels, disease control would not be expected.

Thus, further research is recommended. This malfunction was not detected until after the growing season had ended. It is hoped that this research can be replicated in the coming year to better understand the potential impact of using ozone to control disease.

FINANCIAL REPORT

Grant expenditures aligned with projected budget and were expended as follows:

Research Consultant = \$1500

Research Assistant = \$1395

Data Analyst = \$500

Site Coordinator = \$500