

Research - Strawberry Nutrition
Project 2006-04

The Effect of Increased Nitrogen and Potassium Levels within the Sap of Strawberry Leaf Petioles on Overall Yield and Quality of Strawberry Fruit as Affected by Cultivar (Summary of 3 years).

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Justification:

Among the recent techniques for N and K management in vegetable and small fruit has been the use of petiole sap analysis to determine supplemental fertilizer needs. Sap tests to determine nutrient status of crops have been used to a limited degree since the 1920s. Until recently, however, these tests have been considered semi-quantitative at best. Within the last 20 years, advances have been made in determining sap NO₃ and K in various crops using Merck EM Quant test strips. More recently, the introduction of the electrode by Horiba Instruments called a “Cardy meter” has a flat membrane capable of providing a reading for NO₃ or K concentration in a non diluted sap. Researchers using the Cardy NO₃ electrode with non diluted sap have also shown that sap NO₃ is correlated to petiole NO₃ expressed on a dry weight basis. The Cardy K meter has been used to establish sufficient levels of K in petiole sap for eggplant. Plant sap analysis can help achieve optimum fertilization of strawberries. Petiole sap testing is not intended to replace standardized laboratory analytical procedures for whole leaves or dried petioles. However, analyzing fresh plant sap for N and K concentrations is a quick procedure to determine the N and K levels in plants, the results of which can be used in guiding N and K applications to strawberry plants. However, proper use of the equipment and sample techniques is vital to a reliable reading.

Work by investigators in California provides evidence of the benefits derived from strategically spaced nitrogen applications in the spring. Higher fruit yields in their studies were associated with nitrogen applied during vegetative growth and fruiting. During this period, petiole nitrate nitrogen values were 3000 – 4000 ppm nitrogen, which appears to be adequate. In general nitrate nitrogen should never drop below 500 ppm. Exceptions to this general rule would be during early winter and after fruiting. During plant establishment (fall) petiole nitrate nitrogen should approach 1500 – 2000 ppm. This work concurs with work in North Carolina as well. However, these numbers reflect the response of only one cultivar, Chandler.

Objectives:

1. Examine the effectiveness of the use of the Cardy Meter as a reliable source to be used by growers to monitor the Nitrogen and Potassium levels within the petiole sap throughout the production season.
2. Examine the levels of both nitrogen and potassium to maximize yield, yet maintain fruit quality as it is affected by cultivar selection.

Summary

The use of the Cardy Meter as a reliable source for testing tissue samples has proven to be useful only for nitrogen levels. Potassium level readings proved to not be of use. When using the Cardy meter, take samples the same time each day (early morning), and take only petioles from newly developed leaves. Make sure that the meter is well maintained and the instructions are followed. The use of the meter can save you time and money if used in the proper way. I would recommend that growers have one on hand and know how to use it.

The majority of variation in the plant growth and yield of strawberry plants were attributed to cultivar by weekly harvest effects. However, there was also an interaction effect of from the fertigation treatment by the weekly harvest. The fertigation effect on cultivar selection was only seen in the marketable number and weight of the fruit harvested as well as the sugar level and the firmness of the fruit. Cultivars performed differently as expected. 'Gaviota' was the first harvested at any significant number. 'Chandler' produced quality berries early. Then as the season progressed, the number of defects as well as rots increased. 'Camerosa' produced early and yielded consistent. There were fewer rots than 'Chandler' and much easier to pick.

Fertility effects saw little affect during each week of harvest until the third week. At the highest fertility rates marketable number as well as weight went down significantly during the third week. However so did the defect number and weight. Visually the plants seemed to show a market visual reduction in growth and fruit set at the highest level (10 lb/week). Also this effect was not persistent in the data. The marketable number and weight continued to fluctuate each week as well as season.

Cultivar selection played a major role in there response to fertigation treatments. 'Chandler' was the most effected by increased fertility levels greater that the 5 lb of N and K per acre per week. The marketable fruit number as well as marketable weight was reduced significantly. The fruit decrease in size with a lot of misshapen berries. Fruit firmness was also reduced above this level. The fruit became very soft and was easily damaged in the harvest bins. The plants had a lot more vegetative material which made finding the berries more difficult. Sugars levels were reduced significantly only at the highest fertigation rate (10 lb/week). 'Gameraosa' was the least effect by the fertigation rates. Increasing the levels of nitrogen and potassium did little to affect any of the parameters measured. However, there was a slight increase found with marketable fruit size at the higher rates. Size was reduced and the fruit seeded to be slightly softer but still firm enough for shipping. The only complaint was in harvesting the fruit. The fruit was not as visible and made it harder to find. Therefore, I would not recommend fertigation rates over 7.5 lb/acre/week. 'Gaviota' yields were reduced at any of the fertigation rates over 2.5 lb/acre/week. The highest fruit number and fruit weight was with the lowest fertility rate. Firmness as well as sugar levels were unaffected by the fertigation rates. 'Gaviota' is a high yielding cultivar early and then comes in again at the end of the season. If this cultivar is given high nitrogen rates early the fruit set will be poor. When you exam the plants you will see a lack of

crown development which is essential for high yield. It was found that as few as two crowns were present at the fertigation rates above 2.5 lb/acre/week. Try to maintain the level of nitrogen within the petiole sap at 3200 ppm to 4000 ppm for 'Chandler' and 'Gameraosa' and 2500 ppm to 3200 ppm for 'Gaviota'. Follow the recommended program that has been developed for tissue sampling.

