

The background of the entire page is a close-up photograph of several fresh carrots. The carrots are bright orange and have long, green leafy tops. They are arranged in a slightly overlapping row, filling the frame from the bottom to the top.

FERTILIZER RESEARCH AND EDUCATION PROGRAM CONFERENCE

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PROCEEDINGS

DEVELOPMENT OF NITROGEN BEST MANAGEMENT PRACTICES FOR THE 'HASS' AVOCADO

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OBJECTIVES

1. Quantify the nitrate pollution potential of the various nitrogen fertilization strategies.
2. Identify the threshold rate of nitrogen fertilization above, which the pollution potential increases.
3. Evaluate the potential for replacing the April double dose or triple dose of soil nitrogen with foliar nitrogen.
4. Provide a ratio of enhanced-yield benefit to environmental cost for each nitrogen fertilization strategy.
5. Identify BMP's for nitrogen fertilization for the 'Hass' avocado in California.

SUMMARY

To reduce potential nitrate pollution of groundwater, avocado growers apply nitrogen (NH_4NO_3) fertilizer to the soil in several small doses annually. This strategy ignores tree phenology and the possibility that the tree requires more N at certain times of year. At the request of the California

Avocado Commission (CAC), a 4-year study was conducted to determine the impact of supplying extra soil N to 'Hass' avocado trees at key times in the phenology of the tree, relative to supplying an equal amount of N in six small doses/year. The results clearly identified specific times when N fertilization reduced yield (January and February), and times when extra soil-applied N increased yield, increased the number of larger commercially valuable fruit, and reduced alternate bearing (April or November). Double applications of N in November or April increased yield 201 lb and 133 lb more fruit/tree/4 years. Since orchards have more than 100 trees/acre, the yield increases are economically significant.

In 1997, the CAC funded a 6-year study to replicate the previous study and to quantify the effects of additional strategies with the overall goal to even out alternate bearing and to increase annual and cumulative yield without reducing fruit size and quality. The concern is that it is not known whether using double or triple doses of soil-applied N to increase yield will increase the potential for nitrate groundwater pollution. It is hypothesized that supplying an avocado tree with more N at times when demand is greater should not increase leached nitrate. Since yield increased, the interpretation is that the tree utilized the extra N. This project is coordinated with and complemented by the CAC project. The project is aimed at quantifying the amount of nitrate and ammonia leaching past the root zone of 'Hass' avocado trees under the various nitrogen fertilization strategies. The results of this research will identify Best Management Practices (BMPs) for nitrogen for the 'Hass' avocado in California. The avocado growers of California are seeking this information to work out a ratio of enhanced-yield benefit to environmental cost for each N fertilization strategy. The results of the first harvest (1997-98) in the current study clearly demonstrate the time of N fertilizer application is more important than the amount of N that is applied (See Table). The CDFR-FREP research was initiated in April 1999. Thus, it is premature to report soil leachate results. The second harvest (1998-99) is scheduled for September 20, 1999.

The results of the first harvest (1997-98)

<i>Treatment</i>	<i>Total lb N/acre</i>	<i>lb fruit/ tree</i>	<i>No. fruit/ tree</i>	<i>Net increase (or decrease) compared to control</i>	
				<i>lb fruit (%)</i>	<i>No. fruit (%)</i>
2x N in August (all years)	40.0	73.6 a ^z	158 a	22	26
Grower fertilization practice ^y	42.5	70.7 a	145 a	18	16
2x N in November (prior to "on" years) and April ("off" years)	40.0	68.1 a	143 a	15	14
2x N in November (all years)	40.0	62.3 ab	130 ab	4	4
Control ^x	80.0	58.8 ab	125 ab	-	-
2x N in April and November (no N in February and June) (all years)	80.0	58.8 ab	124 ab	0	0
2x N in April ("off" years) and 3x N ("on" years)	60.0	58.6 ab	123 ab	0	-2
2x N in April (all years)	40.0	56.8 ab	117 ab	-4	-6
2x N in April ("off years) and 3x N ("on" years) applied foliarly	100.0	42.3 b	85 b	-30	-32
<i>P</i> -value		0.06	0.06		

^zValues in a vertical column followed by different letters are significantly different at the specified P level by Duncan's Multiple Range Test.

^yGrower's fertilization practice is 40 lb N as ammonium nitrate/acre split as two applications in July and in August.

^xControl trees received 80 lb N as ammonium nitrate/acre, divided into four, 20 lb/acre applications made in mid-April, mid-July, mid-August, and mid-November.