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EFFECT OF NITROGEN FERTILIZATION ON YIELD AND FRUIT OIL CONTENT OF AVOCADO TREES

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ABSTRACT

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This work was carried out to study the effect of two nitrogen levels, 250 and 500 g of actual nitrogen per avocado tree per year. The nitrogen sources were calcium nitrate (as soil application) and urea (as foliage application).

Nitrogen fertilization gave a highly significant increase in tree yield (kg/tree) in most treatments. Moreover, urea sprays seemed to be more effective on the yield than calcium nitrate added to the soil at the same nitrogen level. The 500 g nitrogen level of both sources gave a higher yield increase than 250 g nitrogen. Nitrogen fertilization gave a slight increase in mean avocado fruit weight and size, while urea sprays seemed to be more effective in increasing the mean fruit weight and size. A slight decrease in flesh oil content occurred as a result of nitrogen fertilization.

INTRODUCTION

Avocado (*Persea americana*, Mill) is considered to be a good source of minerals and vitamins (Kay, 1964). The fruits are generally used in some countries as an appetizer or salad (Roberts, 1955). Blasberg (1953) mentioned that urea spraying increased the yield of apple trees. Lynch et al. (1954) found that variations in nitrogen level appeared to have a direct effect on the yield of four avocado cultivars. El-Tomi et al. (1968) reported that high levels of nitrogen fertilization caused a significant increase in the yield of 'Chemiali' olive during the off-season, about 265% over the control, while nitrogen fertilization did not affect flesh oil percentage. De la Rocha and Flores (1955) found that foliage sprays with Nu-green slightly improved fruit size in young avocado strawberries and in oranges. Maximos et al. (1969), working on mature 'Baladi' guava, reported that the addition of nitrogen increases fruit weight and size. The aim of the present work was to study the influence of nitrogen fertilization as urea spray or soil application on the yield and oil content of fruits of avocado trees.

TABLE I

Differential treatments used

Treatment	Actual nitrogen per tree (g)	Found in:		No. of applications	Time of fertilization
		Calcium nitrate (kg)	Urea spray (kg)		
Control	0.0	—	—	—	—
N_1	250	1.60	0.54	2	March and April
N_2	500	3.20	1.08	4	March, April, May and June

MATERIALS AND METHODS

The materials used in this investigation were 15 'Fuerte' avocado trees, budded on 'Fuerte' rootstock at Seds orchard which belongs to the Ministry of Agriculture. The trees were about 24 years old, planted in clay loam soil, and were vigorous and as uniform as possible. A completely randomized design was followed. The selected trees were treated according to the usual farm management except for the nitrogen fertilization. The treatments are mentioned in Table I.

Each tree also received about 100 kg of balady manure during the winter months. Trees treated with urea were given drenching water spray containing the 270 g of urea dissolved in 27 l of water. Fruits of each individual tree per treatment were recorded at the commercial harvesting time. A sample of 20 fruits for each tree was used for the determination of the fruit weight, fruit size and oil content.

RESULTS AND DISCUSSION

Yield. — Data concerning the yield in kg/tree are shown in Table II (left part). For the first season, all levels of fertilization of the nitrogen sources caused an increase over the control trees. The maximum increase in yield was about 40% which resulted from 500 g nitrogen in the form of urea sprays. Also, there was about 34% increase in yield due to 500 g nitrogen as soil application of calcium nitrate. Trees sprayed with 250 g nitrogen as urea gave about 31% increase over the control. The only non-significant treatment was 250 g nitrogen as soil application, the increase over the control being about 13%.

In the second season all levels of nitrogen sources caused highly significant increases over the control. The maximum increase was about 122% which resulted from 500 g nitrogen in the form of urea sprays. The soil application at the same nitrogen level caused about 93% yield increase over the control. For the 250 g nitrogen level, about 86% and 32% increases over the control were

TABLE II

Yield and flesh oil content of 'Fuerte' avocado trees receiving 0, 250 or 500 g of actual nitrogen either as soil or foliage application. ** = significant at 1% level

No. of treatments g N/tree/year	Yield				Flesh oil content			
	First season		Second season		First season		Second season	
	g/tree	% increase from control	g/tree	% increase from control	% oil content	% increase from control	% oil content	% increase from control
1 250 (calcium nitrate)	27.8	+ 12.55	20.2**	+ 32.02	59.30	+ 0.51	61.30	— 0.65
2 500 (calcium nitrate)	33.00**	+ 33.60	29.5**	+ 92.81	58.30	— 1.19	60.30	— 2.26
3 250 (urea spray)	32.3**	+ 30.76	28.5**	+ 86.27	57.30	— 2.88	60.10	— 2.59
4 500 (urea spray)	34.7**	+ 40.48	34.0**	+ 122.22	57.30	— 2.37	60.16	— 2.49
5 Control	24.7	—	15.3	—	59.00		61.70	—
L.S.D. 5%		—	3.40	—	—		—	—
L.S.D. 1%		—	4.44	—	—		—	—

TABLE III

Mean fruit weight and size of 'Fuerte' avocado from trees receiving 0, 250 or 500 g of actual nitrogen either as soil or foliage application. * = significant at 5% level.

No. of treatments: g N/tree/year	Fruit weight				Fruit size			
	First season		Second season		First season		Second season	
	g/fruit	% increase from control	g/fruit	% increase from control	Fruit size (cc)	% increase from control	Fruit size (cc)	% increase from control
1 250 (calcium nitrate)	306.3	+ 2.00	323.7	+ 2.44	312.7	+ 1.85	329.7	+ 1.85
2 500 (calcium nitrate)	307.7	+ 2.47	329.0*	+ 4.44	315.7	+ 2.83	334.7*	+ 3.39
3 250 (urea spray)	312.0	+ 3.90	331.3*	+ 5.17	321.0	+ 4.56	340.7*	+ 5.25
4 500 (urea spray)	311.0	+ 3.57	341.0*	+ 8.25	319.0	+ 3.91	325.0*	+ 9.04
5 Control	300.3		315.0		307.0		325.7	
L.S.D. 5%	—		11.73				10.76	

due to urea sprays and soil application, respectively. From the above data urea sprays seemed to be more effective than soil application (with equal amounts of elemental nitrogen) in both seasons. Also, trees receiving 500 g of nitrogen from either source gave higher yields than the trees receiving 250 g.

Comparing the yields of the two seasons, it becomes evident that the yield of the first season was higher than that of the second season. This same trend occurred in the control trees and indicates that 'Fuerte' may be an alternate bearer. If this is true, then one can say that the high level of nitrogen fertilization not only increased tree yield, but also reduced the effect of alternate bearing.

These results are in agreement with those reported by Blasberg (1953), Lynch et al. (1954) and El-Tomi et al. (1968).

Oil content. — Table II (right part) shows that the effect of nitrogen fertilization treatments either as urea spray or soil application on the flesh oil content was rather slight. This was true in both seasons. However, there was a slight but non-significant decrease in both seasons. These results are in agreement with those reported by El-Tomi et al. (1968).

Fruit weight and size. — Data in Table III illustrate that in the first season the weight and size of fruit from trees given the soil application (calcium nitrate) were not much different from those of the control trees, while trees sprayed with urea had larger fruits. In the second season (light crop) all treatments including the control reflect a superiority in fruit weight and size compared with the first season. All treated trees in this year had significantly bigger fruits than the control trees, except those receiving 250 g of actual nitrogen as soil application. Urea sprays seemed to be little better than calcium nitrate as soil application as far as fruit weight and size are concerned. These results are in agreement with those reported by De la Rocha and Flores (1955), and Maximos et al. (1969).

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