Changes in Leaf Nitrogen of Olive Trees Sprayed With Urea

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ABSTRACT

The use of foliar urea sprays as a method of nitrogen fertilization for certain crops, particularly under certain circumstances is a known horticultural practice. This preliminary work has been shown that repeated applications of four urea sprays during one growing season, did not give a net increase in leaf nitrogen content of non-irrigated olive trees in poor vegetative condition.

INTRODUCTION

Nitrogen is essential for olive production, as for other tree crops. In fact, olives respond markedly to nitrogen applications in soils of low natural fertility, such as is the case in many Libyan soils. Undoubtedly, in non-irrigated olive plantations, the use of nutritional foliar sprays should prove to be a useful method of application. This is particularly important where special problems are encountered and where the nutrient is readily absorbed by the leaves.

The use of urea sprays in the nitrogen fertilization of several crops has been studied intensively and reviewed by Boynton (1). For diagnostic purposes, the nitrogen level of olive leaves has been reported by various workers. Hartmann *et al.* (2) referred to a survey by Lilleland and Brown, of 70 olive orchards in 5 districts in California (1944–1947). They found that leaf nitrogen varied from 0.9 to 2.0% on dry weight basis; the average being 1.3%. Values below 1.1% nitrogen were frequently associated with pale foliage and poor shoot growth.

The objective of this preliminary work was to evaluate the effect of repeated applications of urea sprays during one growing season on the possibility of increasing the nitrogen level in the leaves of non-irrigated olive trees in poor vegetative condition.

MATERIALS AND METHODS

Olive trees in obviously poor vigor were used in this study. They varied in trunk circumference between 46 and 87 centimeters at 50 centimeters above ground level. The selected trees were sprayed with: a) a urea solution of 1.5% in water and b) the same urea concentration plus sucrose to make a one-tenth molar sugar solution. No lime but a spreading material was added to the spray tank as recommended by the manufacturer.

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For each treatment four trees were sprayed, each representing one replicate. In addition, a third set of four trees were unsprayed for comparison. The same trees under test were thoroughly covered by the spray material at four different dates, timed about 7 weeks apart, during spring and summer beginning March 20, 1975. All trees were practically unfruitful during this season.

About 100 leaves were collected 24 hours before spraying and the same number of leaves 8–9 days after spraying. The leaves were washed in 0.1% detergent solution then rinsed thoroughly in distilled water before drying over-night in a draft oven at 65°C. The dried leaves were ground in a hammer mill adapted with a 0.5 millimeter screen. Analysis for total nitrogen was determined in redried samples of 30 to 40 milligrams, using the micro-kjeldahl method.

The results obtained were subjected to analysis of variance to test the significance between the three treatment means, the eight sampling dates and their interaction, if any.

RESULTS AND DISCUSSION

The data obtained from this study are summarized in Table 1, together with the statistical significance between the various means obtained. It was evident beyond any reasonable doubt that, on the average, foliar application of urea alone or mixed in 0.1

Table 1 The effect of urea spray on the leaf nitrogen content of olive trees.

Date of spray	Sampling time	No spray	Urea alone	Urea & sugar	Mean	Significance[e]
		Per Cent Nitrogen in Dry Leaves[a]				
First spray	Before[b]	1.10	1.25	1.18	1.18	abc
March 20, 1975	After[c]	1.08	1.33	1.35	1.25	c
	Change[d]	−1.8%	6.4%	14.4%		
Second spray	Before	0.96	1.17	1.16	1.10	a
May 8, 1975	After	0.97	1.33	1.34	1.21	bc
	Change	1.0%	13.7%	15.5%		
Third spray	Before	1.06	1.24	1.21	1.17	abc
June 24, 1975	After	1.05	1.32	1.27	1.21	bc
	Change	−0.9%	6.5%	5.0%		
Fourth spray	Before	0.97	1.18	1.18	1.11	ab
August 12, 1975	After	0.98	1.37	1.25	1.20	bc
	Change	1.0%	16.1%	5.9%		
Mean		1.02	1.27	1.24		
Significance[e]		a	b	b		

[a] Each figure represents the average of four trees.
[b] Leaf samples collected 24 hours before spraying.
[c] Leaf samples collected 7–9 days after spraying.
[d] Figures indicate per cent change in leaf nitrogen after each treatment.
[e] Mean values represented by same letter are not significant at P = 0.01 according to Duncan's Multiple Range Test.

molar sucrose solution increased the nitrogen content in the leaves of sprayed olive trees when compared with the non-sprayed trees. This temporary increase, as it showed to be, was always noticeable, regardless of the date of spraying. Meanwhile, no significant difference was observed between either urea alone or with sucrose added. However, by the following date of urea application; i.e. seven weeks later, leaf nitrogen had always dropped back to the level present in the leaves before spraying. In other words, there was no net build up in leaf nitrogen after four urea applications. The trees utilized the nitrogen in one way or another after its intake through the leaves. The non-sprayed trees showed no variability in their leaf nitrogen content during the duration of this work. In fact, it remained practically unchanged at a low level. By adding and comparing the results before and after treatments, it was found that there was an average overall increase in leaf nitrogen of 10.7% from the urea treatment and a similar increase of 10.2% after the urea plus sugar application. The addition of sugar did not show any beneficial effects.

It can be concluded from this study that olive trees in poor vegetative condition did not show any appreciable increase in leaf nitrogen level in response to four foliar urea sprays applied within one growing season.

LITERATURE CITED

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