

# EFFECTS OF PRE-PLANT FERTILIZERS APPLIED IN AUGER HOLE ON THE GROWTH OF CHANDLER CULTIVAR WALNUTS

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## ABSTRACT

A planting of Chandler cultivar walnuts was arranged to validate research indicating that although recommendations are sometimes made, little benefit is derived from pre-plant fertilizers in the auger hole when applied to high fertility soils. In evaluating tree growth, measurements of trunk caliper, scion caliper, and height of the main leader were used. Treatment differences between two brands of starter fertilizer, zinc oxide, and untreated controls were not significant. Differences in leaf nutrient levels between treatments were negligible.

## INTRODUCTION

It is often recommended that pre-plant fertilizers be used to get walnut trees off to a good start. Previous research indicates that although recommendations are sometimes made for applying a pre-plant "starter" fertilizer in the auger hole, substantial benefits in terms of tree growth and leaf nutrient levels are not achieved from these treatments when applied to high fertility soils. This trial duplicates research and looks at two other "starter" fertilizers also in a high fertility soil.

## PROCEDURE

The planting site chosen for this trial was the California State University, Chico Farm. The ten acre orchard was planted primarily with the Chandler cultivar on Hybrid (Paradox) rootstock and Chandler on Northern California Black rootstock in alternate rows. The soil texture is clay loam and the site has been primarily farmed dry land with crops such as oat hay and safflower. The site had no previous walnut history and preparation of the site did not include any fumigation. The soil was ripped to six feet in two directions and trees were planted at a 30x30 foot spacing.

To insure proper development of a strong trunk, one growing shoot was encouraged to dominate by pinching the growing tips of the lateral branches. The remaining leader on each tree was allowed to grow until late October when the trees were tipped at a height of twelve feet to prevent breakage.

A randomized complete block design was constructed to evaluate the efficacy of the four "in-hole" fertilizer treatments. The four treatments were replicated nine times for each of the two rootstocks. Except for the untreated control, each tree received one of the following pre-plant fertilizer treatments in the auger hole at planting: 6 oz. of zinc oxide (72 %); 6 oz. zinc oxide + 8 oz. of "Scotts" brand starter (24-6-10); or 6 oz. of zinc oxide + 8 oz. of "Helena" brand starter (7-12-2 + 7% Zn, 5% Fe, 3.6% S, .47% Mn). These treatments were applied at planting on March 22, 1996. The orchard did not receive an irrigation until shoot growth was ten inches tall, however, more than three inches of rain fell between planting and initiation of shoot growth.

Tree growth was evaluated using the following three criterion: height of the main leader, diameter of the trunk (rootstock), and diameter of the scion. The height of the main leader was measured upward from the lowest point of the scion on October 10, 1996. The diameter of the

trunks were measured four inches above the soil surface using an electronic caliper on October 8, 1996. The scion diameters were measured two inches above the base of the graft union using an electronic caliper on October 12, 1996.

Leaf analysis was performed to determine levels of iron, zinc, nitrogen, phosphorus, and potassium in trees of each of the four treatments. Two leaflets were selected from two different mature leaves on each tree for the leaf analysis.

## RESULTS AND DISCUSSION

No significant difference occurred between the four treatments in either height of the main leader, diameter of the scion, or diameter of the trunk. The lack of significant differences in the four treatments held true for both the Northern California Black and the Paradox Hybrid rootstock plantings. Trees on both rootstocks achieved the height and calipers desired for the first season's growth. Trees planted to the Paradox Hybrid rootstock, however, did consistently perform better for the three criterion used to evaluate growth.

## CONCLUSIONS

In situations where walnuts are to be planted in high fertility soils, especially a site such as this which has not been cropped intensively, little benefit can be derived from pre-plant fertilization. The brand of fertilizer used had little or no effect on tree growth. A potential orchard site which has somewhat lower soil fertility or has been cropped intensively could respond differently to pre-plant, "in-hole" fertilizers.

# PRE-PLANT FERTILIZER EXPERIMENT IN CHANDLER WALNUTS

(Planted March 22, 1996 in Chico, Calif.)

## HEIGHT of MAIN LEADER (inches)

(measured upward from the graft union on October 10, 1996)

REP. #	HYBRID ROOTSTOCK				N.C. BLACK ROOTSTOCK			
	Helena + zinc oxide	Scotts + zinc oxide	zinc oxide	Untreated Control	Helena + zinc oxide	Scotts + zinc oxide	zinc oxide	Untreated Control
1	45	112	98	76	96	110	65	103
2	105	111	117	82	72	88	72	47
3	108	100	106	99	92	97	108	85
4	90	59	97	104	108	103	107	92
5	106	99	105	110	93	64	82	25
6	93	101	89	64	92	118	84	79
7	121	76	97	108	77	89	43	82
8	79	88	81	77	103	106	101	111
9	104	102	117	121	95	82	99	47
Mean	94.6A	94.2A	100.8A	93.4A	92A	95.2A	84.6A	74.6A

## DIAMETER of SCION (mm.)

(measured 2 inches above the graft union on October 12 1996)

REP. #	HYBRID ROOTSTOCK				N.C. BLACK ROOTSTOCK			
	Helena + zinc oxide	Scotts + zinc oxide	zinc oxide	Untreated Control	Helena + zinc oxide	Scotts + zinc oxide	zinc oxide	Untreated Control
1	20.8	27.5	26.5	19.2	22.3	24.2	17.5	25.9
2	26	29.7	30.6	22.8	20.8	18.3	18.2	14.8
3	25	22.8	24.8	26	19.2	22.1	24.9	21.5
4	26.6	20.3	25.3	27.8	27.2	23.3	23.7	20.5
5	26.3	25.1	22.5	28.4	20.2	16.1	19.3	11.9
6	23.2	23.1	24.1	23.1	23.6	26.7	19.8	20.2
7	29.1	25.4	24.3	27.5	18.8	21.5	15.6	19.2
8	23.1	23.5	19.6	24.9	22.9	20.1	24.5	23.7
9	21.2	24.7	29.9	28.4	23.9	21	22.5	16.3
Mean	24.6A	24.6A	25.3A	25.3A	22.1A	21.5A	20.7A	19.3A

Treatment means not followed by a common letter are significantly different from one another at the 5% level of significance according to Duncans Multiple Range Test.

**DIAMETER of TRUNK (mm.)**

(measured 4 inches above soil surface on October 8, 1996)

REP. #	HYBRID ROOTSTOCK				N.C. BLACK ROOTSTOCK			
	Helena + zinc oxide	Scotts + zinc oxide	zinc oxide	Untreated Control	Helena + zinc oxide	Scotts + zinc oxide	zinc oxide	Untreated Control
1	39.8	44.5	38.8	37.3	40.9	31.5	31	46.4
2	49.4	44.9	52.7	42.3	37.7	25.8	31.5	32.9
3	41.2	42	42.8	39.1	26.6	28.2	43.1	33.5
4	45	37.2	41.8	47.7	36.3	31.6	46.8	27.1
5	44.2	41.7	42.1	46.1	37.7	36.8	38.6	28.8
6	40.2	42.4	40.7	35.5	37.7	40.8	27.4	24
7	49.4	43.5	41.8	41.1	34.8	38.7	31.6	39.6
8	45.6	46	40.9	43.9	37.8	40.7	41.2	38
9	39.6	40.8	42.9	43.2	40.1	38.9	39.5	30.2
Mean	43.8A	42.6A	42.7A	41.8A	36.6A	34.8A	36.7A	33.4A

Treatment means not followed by a common letter are significantly different from one another at the 5% level of significance according to Duncans Multiple Range Test.

**LEAF TISSUE ANALYSIS**

(Samples taken on October 14, 1996)

	HYBRID ROOTSTOCK				N.C. BLACK ROOTSTOCK			
	Helena	Scott	Zinc oxide	Untreated	Helena	Scott	Zinc oxide	Untreated
% total N	3.273	3.244	3.296	2.615	3.193	3.141	2.586	3.182
% total P	0.2	0.19	0.22	0.2	0.19	0.2	0.19	0.18
% total K	1.04	1.06	1.25	1.08	1.18	1.27	1.18	1.29
Zinc ppm	50	37	43	39	94	61	52	40
Iron ppm	984	984	892	865	720	668	668	720