

EFFECTS OF ONE "IN TREE HOLE" FERTILIZER ON  
FIRST YEAR GROWTH OF WALNUT TREES PLANTED  
IN A HIGH FERTILITY SOIL

G. Steven Sibbett

ABSTRACT

Although efficacy and safety to new trees are unknown, placing fertilizers into tree holes at planting time is being recommended. In a very fertile soil, this experiment found no difference in total shoot growth or trunk diameter between Chandler walnut trees fertilized with one commonly recommended "in tree hole" fertilizer or those untreated. Little difference in leaf levels of those nutrients contained in the fertilizer was detected between treated and untreated trees. No phytotoxicity was observed on any treated tree that could be assigned to the fertilizer treatment.

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INTRODUCTION

A walnut grower's objective the first growing season is to encourage enough vigorous growth from a newly planted tree to ensure one shoot grows sufficiently to become a satisfactory trunk. To accomplish this objective, the common practice is: cut the tree back at planting to several buds; allow these to "leaf-out" and grow; then, once they reach 6" - 8" long, pinch back all but one to encourage its continued growth for the eventual trunk of the tree. "In-season" nitrogen fertilization is usually also recommended to ensure the most possible shoot growth. "Starter" fertilizers, placed in the tree-hole at planting, have not been recommended; there is both concern for such concentrated fertilizers damaging ("burning") the newly emerging roots and questions about their overall efficacy when compared to an in-season program or no fertilization at all. Some agricultural chemical companies and walnut nurseries recommend placing pre-plant fertilizers in the tree-hole before planting regardless of the situation and, via anecdote, have reported optimal growth with no adverse effect on tree growth. As no data existed corroborating these claims, This report compares growth of newly planted walnut trees treated with one pre-plant fertilizer program (widely recommended by a well respected walnut nursery and agricultural chemical company) with that of non-treated trees.

PROCEDURE

A proposed new planting of Chandler walnut was selected for the experiment. The site where they were to be grown was 20 acres located in Tulare California consisting of Foster Fine Sandy Loam, a fairly light textured soil considered excellent for walnut production. The site had no recent previous walnut history and had, for the past 10 years, been planted to field crops including cotton, corn and barley. Corn was grown during the summer prior to planting, 1992. Site preparation included deep ripping and leveling flat in the direction of irrigation. The site was not fumigated.

The orchard was designed as a square planting with the trees placed 28 feet by 28 feet, approximately 56 trees per acre. The nursery trees were the Chandler cultivar and were at least one inch in caliper when delivered. One half were grafted to Paradox Hybrid ("Hybrid") rootstock and one half to Northern California Black

("NCB") walnut rootstock. These rootstocks were configured into the planting so Hybrid and NCB rootstocks alternated down each tree row; the grower felt crowding could be minimized by such a strategy.

The experiment was configured into a randomized complete block design consisting of two treatments, pre-plant fertilizer and non-treated, replicated ten times (individual trees) for each rootstock. The pre-plant fertilizer treatment consisted of placing 6 oz of zinc oxide (72% zinc) and 4 oz of a "tree starter" formula, [7% N (2.59% ammoniacal and 4.5% organic), 12% P<sub>2</sub>O<sub>5</sub>, 2% K<sub>2</sub>O, 4% S, 7% Zn, and 5% Fe], into "auger dug" tree holes prior to planting. In addition, 4 oz of the tree starter was also mixed into the soil of the treated trees used to fill the tree holes. The non-treated trees received no fertilizer in the tree hole or during the season. The treatments were applied 6 February 1993 and the trees planted immediately thereafter. The newly planted trees were not irrigated at planting and no fertilizer was applied during the growing season. The orchard was irrigated with district water which is essentially devoid of nutritional elements.

At planting, the experimental trees were cut back to approximately six buds above the graft union. Those buds that leafed out (2 - 4 per tree) were allowed to grow to approximately 10 inches in length. Then, the first week in May, all but one shoot on each tree had approximately 2 inches of the growing tip removed to suppress their growth while promoting growth to the remaining shoot. No other summer pruning was done. At season's end, each experimental tree had at least one shoot that had developed sufficient length to be a suitable trunk from which to develop scaffold branches.

The following measurements were made on each tree for each treatment on each rootstock. Total shoot growth was measured on 11 October 1993. This included adding measurements of shoot growth from lateral growth as well as the terminal shoot to arrive at the final total for each tree. Trunk and scion calipers (diameters) were measured on 15 October 1993. Trunk caliper was measured 4 inches from the soil level while scion caliper was measured on the shoot left to be the trunk 2 inches from its union with the original trunk. These data were analyzed by ANOVA. A composite leaf analysis for nutritional status of each treatment on each rootstock was made 5 August 1993.

## RESULTS AND DISCUSSION

No significant difference in total shoot growth or trunk caliper occurred due to treatment in this experiment regardless of rootstock. All experimental trees made excellent growth and attained a size consistent with first year objectives, that of developing one shoot of sufficient size to be the eventual trunk. Whereas all trees grew satisfactorily, those on NCB root were consistently less vigorous than those on Hybrid, see tables 1 and 2. No phytotoxicity was observed on any treated tree in this

experiment. Although pre-plant soil samples were not taken, I believe the inherent fertility following the previous year's corn crop was substantial and in this case probably sufficient to maintain adequate growth and vigor of the untreated trees.

Leaf analyses from this experiment revealed slightly improved levels of Nitrogen, Phosphorous, Potassium, and Zinc from the fertilized treatments within each rootstock. No differences in Iron content were revealed, see table 3. In all cases, treated or untreated, nutritional levels were sufficient for optimal growth (note, % P for the non-fertilized hybrid trees appears to be erroneously reported from the laboratory). It is unknown, had these analyses been replicated, if real differences would have been detected.

#### CONCLUSIONS

- 1) Certain fertilizers placed in the tree hole at planting do not result in observable tree damage.
- 2) Where excellent soil, with essentially no previous tree crop history, exists and those with inherent fertility, little benefit from fertilizer applied in the tree hole at planting can be expected. It should be noted that under less favorable conditions, fertilizers applied in the tree hole or during the growing season would be expected to provide benefit. It is unknown if certain tree hole applied fertilizers perform better than those applied during the growing season.



Table 2      WALNUT PRE-PLANT FERTILIZER EXPERIMENT  
 Chandler Walnut - Tulare Ca  
 1993

Trunk Calipers (mm) 1/ 2/

Rep	Rootstock		N.C. Black	
	Hybrid + Fert.	- Fert.	+ Fert.	- Fert.
1	68	69	53	48
2	55	49	35	55
3	57	53	55	43
4	57	48	46	45
5	67	52	58	65
6	49	52	60	56
7	64	68	57	52
8	69	54	55	58
9	59	71	42	51
10	69	63	69	51
Avg.	61	58	53	52

NS

NS

Rep	Scion (mm)		N.C. Black	
	Hybrid + Fert.	- Fert.	+ Fert.	- Fert.
1	33	38	35	31
2	43	38	24	36
3	33	40	34	32
4	40	43	27	31
5	40	29	37	30
6	30	37	40	37
7	37	50	31	37
8	45	36	34	34
9	34	51	32	33
10	47	46	39	32
Avg.	38	41	33	33

NS

NS

- 1/ Calipers taken 10/15/93  
 Rootstock: 4 inches from soil level.  
 Scion: on terminal shoot, 2 inches above union with trunk.
- 2/ Fertilizer applied pre-plant in planting hole 2/6/93.  
 No fertilizer applied to control trees.

Table 3      WALNUT PRE-PLANT FERTILIZER EXPERIMENT  
 Chandler Walnut - Tulare Ca  
 1993

Nut.	Leaf Nutrient Levels 1/			
	Hybrid Rootstock		N.C. Black Rootstock	
	+ Fert.	- Fert.	+ Fert.	- Fert.
N (%)	3.102	2.898	3.058	2.990
P (%)	.170	.030	.140	.140
K (%)	1.450	1.380	1.540	1.520
Zn (ppm)	34	29	36	31
Fe (ppm)	775	961	1080	920

1/ Composite samples, 2 mature leaves/rep/treatment,  
 taken 8/5/93.