

# **PUBLICATIONS**

**1987**

FRUIT AND NUT CROPS RESEARCH IN TEXAS, 1987

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3, 5	David H. Byrne	Peach
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7	J. Dan Hanna	Apricots
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11, 12	T. Lynn Littleton	Pecans
10	G. R. McEachern	
19, 20, 48	Bert Johnson	
12	J. Benton Storey	
48	Berry Tompkins	
15	R. D. Marquard	Pecan
17	L. Austin Stockton	Grapes Apples
19, 20, 21, 23	John A. Lipe	Peach
19, 20	Dusty Menzies	Pecan

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**SUBJECT TOPIC:** Deciduous Fruits and Pecans

**INVESTIGATOR(S):** J. W. Worthington - TAES, Stephenville  
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 Larry Stein - TAES, Stephenville  
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**CROP(S):** 1. Peaches  
 2. Pecans  
 3. Other deciduous fruits and berries

**ABSTRACT:**

Objectives:

To determine the water, nutrient, and cultural requirements of deciduous fruit, nut and berry crops in north central Texas.

General Approach and Findings:

1. Water use of Peaches and Pecans as Compared to Pan Evaporation and Other Meteorological Parameters

Water use of well-watered peach and pecan trees will be measured with weighing lysimeters and compared to weather data. Leaf and soil water potentials will be monitored.

2. Influence of Soil Moisture Stress on Water Use of Pecans

Water use of pecans will be monitored with weighing lysimeters as soil moisture is varied from field capacity to permanent wilt. Leaf and soil moisture potentials will be recorded. Since only two weighing lysimeters are available, one tree will be stressed while the other serves as a standard. The procedure will be reversed to see if the results are responsible.

3. Automation of Thermocouple Psychrometer Measurements Using an Apple Computer

At the present, measuring soil or leaf water potentials with thermocouple psychrometers involves manual hookup of sensors, and manual switching to apply the cooling current on which the determinations are based.

A computer program and hardware is being developed to automate the operation of thermocouple psychrometers using an Apple 2E computer. The program will allow unattended operation of the system in the greenhouse, lab or field enclosure, and greatly reduce the time lag between readings. The program being developed will sample the thermocouple output for a zero base, then apply the required voltage in the preferred direction to create cooling, and finally read the thermocouple output at the appropriate point in the warming cycle. The zero value will be subtracted from the reading after cooling to correct for thermocouple offset. The corrected number will be fit to the appropriate calibration curve for the thermocouple involved so that readings will be saved to disk and hard copy in kilopascals.

#### 4. Determining Water Requirements of Peaches With Infrared Temperature Sensors

The temperature of peach trees in weighing lysimeters will be measured using an infrared thermometer during various stages of stress as determined by soil moisture tension. Water use, meteorological parameters, and canopy temperatures will be correlated in an attempt to formulate a model for predicting water requirements in the field with this technique. This is a cooperative project with Michael Glenn at the Kearneyville Fruit Station in W. Va.

#### 5. Design and Operation of Non-Weighing Lysimeters

Non-weighing lysimeters have been fabricated out of sheet metal and lined with 6 mil polyethylene film. Water will be applied as called for by switching tensiometers. Water applied will be measured with flow meters. Water use by peaches at .2, .3, .4, and .5 centibars of soil moisture tension will be recorded.

#### 6. The Influence of Chemical Mowing on the Growth and Water use of Pecan Trees Under Sod Conditions

Twenty pecan trees are being grown in non-weighing lysimeters as described in other abstracts. Water will be applied as demanded by switching tensiometers, and the amount applied will be measured. Treatments include 1) clean culture, 2) Bermudagrass sod unmowed, 3) mowed Bermudagrass sod, and 4) Bermuda sod that has been stunted by applying sub-lethal doses of "Round-up".

## 7. Design and Operation of Small, Inexpensive Fertilizer Injectors

Small injectors suitable for application of soluble fertilizers through a single emitter have been designed and tested. A second type for single trees or single lines is also being tested. These are not proportioners, but rather apply a slug of fertilizer. Rate of discharge of the nutrient element depends upon its solubility. URAN is injected within the first two hours of operation, while the less soluble K and Mg from  $K_2SO_4$ - $Mg_2SO_4$  took several days to go into solution and be carried into the soil. K from KCl and nitrogen from calcium or ammonium nitrate were intermediate in the time required to dissolve and be injected.

## 8. The Influence of Supplemental Potassium Application on the Production and Quality of Pecans Growing in Upland Soils of the West Cross Timbers.

Potassium ( $K_2O$ ) at 0, 168, and 335 kg per hectare have been applied to Wichita pecan trees growing on upland sands in Comanche Company. Treatments include broadcast, placed close to emitters, and injection in trickle irrigation lines. Potassium from KCl is included in all tests, and additional treatments with  $K_2SO_4$ - $Mg_2SO_4$  are included (broadcast only). There are 4 reps of 10 trees each.

Leaf nutrients are being monitored monthly, and yield, percent kernel, and size are also being evaluated.

First year data indicate an increase in foliar K through July but not in August or September. There is no treatment effect on size, quality or yield.

High potassium levels in August and September are positively correlated with size and percent kernel.

This project is a cooperative one with Larry Stein.

## 9. The Influence of Potassium Applications on the Growth, Productivity and Disease Resistance of Peach Trees

Supplemental potassium is being applied through trickle irrigation lines to 'Monroe' on Nemaguard rootstock at 67 and 134 lbs per hectare. Tree growth, foliar nutrient levels, productivity and disease resistance will be monitored. Test involves 4 tree plots and 4 reps.

## New Initiatives:

### Split Root Studies on Peach and Pecan in Relation to Reverse Water Flow

In 1985, four peach and four pecan trees were planted in the greenhouse in non-weighing lysimeters (1.8 x 0.46 m) fabricated from sheet iron and lined with 6 mil plastic. A sheet iron division was riveted across the center of the "cans" in such a way to divide the pot in half. The trees were planted and watered to encourage equal root growth in each half of the pot.

The original intent was to allow one half of the root zone to "dry down" then treat the other half with labeled water and measure the "reverse flow" water through the root system. Reduced funding made isotope work impossible, and forced the following changes:

Heater wires have been attached to a major root on each side of the root system, and to the trunk of the tree. Thermocouples have been attached above and below the point of heating. Preliminary results indicate a rise in temperature above the thermocouples during daylight hours, with little if any heat rise at night. We anticipate that we will see a reverse of heat transfer in the dry root zone during night hours. A more sophisticated sap flow meter is being designed to try to quantify the water movement through the trunk.