CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
Shamsher S. Samra

Project Number
S0899

Project Title
Heat of Condensation: A Natural Source of Protective Heat: A Third Year Study

Abstract

Objectives/Goals
This investigation centered on the effects of utilizing heat of condensation of water from an ambient source, induced by a structural net-matrix, on growth and crop development of Raphanus sativus during frost susceptible maturation. Research objectives hoped to develop a more cost effective frost protection than current fossil fuel based sources of protective heat.

Methods/Materials
In conducting the investigation Raphanus sativus seeds were enclosed within overlying net matrixes with hole diameters of .1", .5", porous holes, and within a control group with no overlying protection. Twenty-four seeds were planted within the previous media on December 24, 2002. Raphanus sativus seeds were used in the investigation because the radish crop is harvest in cool temperatures thus is susceptible to frost damage. The rate of germination, percent germination, daily growth, and final masses of the individual crop were recorded. In order to correlate radish development to condensation rates, temperature readings were recorded hourly from all four media throughout the investigation. To obtain temperature readings, a self-designed computer program and thermister interface was used. Relative dew point and humidity readings were acquired nightly through the utilization of a sling phsychrometer. The investigation concluded on March 14, 2003.

Results
My investigation revealed that the Raphanus sativus seeds grown beneath the porous net matrix were the first to germinate, had the highest percentage germination with 23 of the 24 seeds germinating. These plants went on to have the fastest growth rates, and when the radishes were massed the ones grown beneath the porous net matrix had a substantially larger mass relative to the control group. There was a direct correlation between increased relative humidity and temperature gradients beneath the net matrixes. The .1#, .5#, and control group followed in all categories respectively, in correspondence to decreased surface area for water nucleation.

Conclusions/Discussion
Results suggest that net matrixes promoting ambient heat of condensation actually deter frost development and promote growth in cold weather stress, thus presenting an inexpensive alternative to fossil fuel dependence for frost protection.

Summary Statement
To determine if heat of condensation inducing structural net-matrixes can increase growth and crop development of Raphanus sativus during frost susceptible maturation by detering freezing temperatures.

Help Received
Mother Provided transportation; Science Teacher and School Provided Materials (Triple Beam Balance and Sling phsychrometer);