Effect of Centripetal Force on Length and Angle of Carrot Plant Growth

Objectives/Goals
Carrots will grow sideways when grown in a constantly spinning cage. Based on my research, I believe that the stem of the plant will grow toward the light but the roots will grow in between and toward both forces (gravitational + centrifugal). Also, the roots will grow longer with a stronger resultant force. The centrifugal force was caused by the rotation of the pots inside the spinner. The resultant force was calculated at a 127.5 degree angle starting from vertical and equal to almost 1.6X the gravity force (51.2ft/s²).

Methods/Materials
1. Construct a structure to hold and rotate the potted plants.
   a. Build frame that holds the plants.
   b. Attach the crosspieces that hold the frame and put it on the bearings.
   c. Take apart dryer to get electric motor and attach it to the frame.
   d. Put in the lights.
   e. Pot and plant the seeds.
   f. Attach the pots to the outside frame.
2. Grow plants in rotating structure and grow non-rotating plants.
   a. Turn on the lights for 12hrs per day and start the electric motor (run 24 hr/day, 7 days/wk)
   b. Water the plants every 2-3 days until they are finished growing.
3. Take the plants out and unearth them to get results after 6 weeks of growth.
   a. Measure root angle and length of 4 rotating and 4 stationary control pots (4 plants in each pot)
4. Organize the results into graphs and write report.

Results
The plants that were in the spinner grew longer than the ones on the ground. The average was a 77% increase in length (1.77times). In addition, the angle of growth was between 114 degrees and 135 degrees (measuring from vertical). The average angle was 125 degrees.

Conclusions/Discussion
My hypothesis was correct. The roots grew at almost exactly the angle than I predicted. The roots of the plants in the spinner grew longer than the roots of the plants on the ground, just as I had predicted.

Summary Statement
How creating artificial gravity in carrot plants changes their growth and development.

Help Received
Dad helped take apart a clothes dryer, set up the drive system and build the structure for the pots, Mom helped typed the report.