CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
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Project Number
S1902

Project Title
Plant-Derived Smoke: The Effect of Karrikin on Water Stressed Yemeni Watermelon (Citrullus lanatus) Landrace Seeds

Abstract

Objectives/Goals
Drought is an environmental stress that affects the establishment, survival, and growth of plants. Researchers have discovered that karrikin, a compound found in smoke, accelerates seedling growth and resistance to stresses in many plants.

The objective of this experiment was to measure the effect of karrikin, a butenolide plant derivative, on germination, leaf length, and dry weights of plants, roots and shoots of Yemeni watermelon (Citrullus lanatus) landrace seeds exposed to a period of water stress.

Methods/Materials
Using a bee hive smoker and bee fuel pellets to create smoke fumigation, watermelon (Citrullus lanatus) landrace seeds from Yemen were subjected to karrikin exposure (50 seeds per length of time) for 2, 4, 8, 16 and 32 minutes. Fifty untreated seeds were used as a control group. The seeds were planted in trays, grown indoors, and observed for thirty days. On Days 1-14 seeds were given 5mL of reverse osmosis (RO) water every 12 hours. On Days 15-30, seeds were given 5 mL of RO water to establish a moisture level below 4.0, the wilting point for cucurbits. A digital moisture meter was used to measure daily moisture levels. Fresh and dry plant measurements were taken at the end of the 30 day trial. There were two trial periods.

Results
The seeds exposed to aerosol smoke karrikin treatments prior to planting had better plant growth during the period of water stress than the control group. The karrikin treated seeds produced seedlings with heavier dry plant, dry root, and dry shoot weights than control seeds. Karrikin treatment also resulted in seedlings with more leaves and greater leaf length than control.

Conclusions/Discussion
The results of the experiment suggest that pretreating Yemeni watermelon (Citrullus lanatus) landrace seeds with karrikin prior to planting is beneficial to the growth and development of seedlings during a period of water stress. The use of karrikin could possibly be a convenient low-cost way for traditional farmers to minimize watermelon plant sensitivity to water shortage.

Summary Statement
I used a beehive smoker to pretreat Yemeni watermelon landrace seeds with karrikin and studied the growth and development of the seeds after a period of water stress.

Help Received
I designed this experiment myself after speaking with Mohamed A. Al Jumai about traditional farming in Yemen and researching the practice of adding wood ashes to soil. Mr. Al Jumai provided the seeds for my project.