CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

Sarah Hansen

Project Number

J1812

Project Title

How Much Seed Do You Need?

Abstract

Objectives

The purpose of this study was to determine how much seed is needed to grow a viable plant and to try to induce the growth of true leaves which are indicators of viability. There are several key parts of a seed. The hypothesis is that any seed cut or otherwise treated will grow if it has an intact hull with intact radicle and plumule. A second hypothesis is that light influences the production of a plant s true leaf more strongly than plant size or time post germination.

Methods

Freshly harvested squash seeds were cut, planting each part as a condition. Seeds were cut in half horizontally, vertically, the top removed, the bottom removed, middle of the seed isolated, seed coat removed, seed coats roughed up by sanding, soaked in vinegar, and dried before planting. They were planted in soil at a controlled depth with controlled watering. Plants were measured daily to monitor growth. Time until true leaf appearance was recorded. During a second experiment plants were grown under different light conditions, ambient, dark, and light to test if light was a significant factor in inducing true leaf growth.

Results

Only seeds in which the top (point) was planted germinated. The shape of the embryonic leaves was determined by the shape of the cut seed; the top of the seed was oriented towards the stem of the plant. Seeds with the smallest fraction of seed removed generally grew to a greater height. The time-to-true-leaf was less variable (7% CV) than the height at which plants produced a true leaf (21% CV). The percentage of plants that grew a true leaf correlated with the percentage of seed planted with an exception being the dried seed conditions. After growing for 312 hours in different light environments, 100% of the plants in the light condition, 0% of plants in the dark, and 67% of plants in the ambient light had produced a true leaf.

Conclusions

Any seed that does not have a radicle and plumule will not germinate. If the seed is split vertically both halves will germinate, but only one will grow a true leaf and be viable. Time until appearance of a true leaf was less variable than plant height at which the true leaf appeared. Seeds planted later in the season with less daylight took longer to generate a true leaf. I hypothesized that light was a dominant factor in inducing true leaf growth. A controlled light experiment to test the effect of light on initiation of true leaf growth was performed. In the dark, no true leaves were observed after 312 hours, 67% of plants in the ambient light produced true leaves and 100% of plants in the lighted environment produced true leaves.

Summary Statement

I determined what fraction of a seed is needed to produce a viable plant and showed that light is a significant factor in inducing true leaf formation.

Help Received

Bob Dubrow acted as a science fair mentor. My parents helped with laying out my poster and watering plants with me.