CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)

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Project Number

J1603

Project Title

Characterization of Two Alleles Affecting Hypocotyl Length in Arabidopsis thaliana

Abstract

Objectives/Goals

Characterizing genes that control photomorphogenesis in Arabidopsis thaliana. Knowledge from this may allow crops to be genetically engineered so that they may grow under different light conditions and to control the height of crops.

Methods/Materials

Strains: Arabidopsis strain ARR21 and ARR90 (long hypocotyl), and 2CAC/COL (wild type) were obtained from Dr. Tom Schultz.

Segregation Analysis: ARR21 and ARR90 were crossed with A. Landsberg erecta (Laer). Seeds from the ARR90xLaer and ARR21xLaer F-2 generations; ARR90(M3), ARR21(M3), and 2CAC/COL grown in a 23oC incubator for 7 days. The plants received 8 hours white light / 16 hours of dark. After 7 days, the hypocotyls of all plants were measured.

Light and Hypocotyl Length: ARR21, ARR90 and 2CAC/COL were grown in continuous red, blue, or no light; 8 hours light / 16 hours dark, 12 hours light / 12 hours dark, 16 hours light / 8 hours, or continuous white light . After seven days, the hypocotyl lengths were measured.

PCR Mapping: Pooled DNA was isolated from twenty long hypocotyl plants from ARR90xLaer(F2) and ARR21xLaer(F2). PCR using chromosome specific primers was done to map Hy21 and Hy90 to specific chromosomes.

Results

Segregation analysis showed that the gene that causes the long hypocotyl phenotype in ARR21 (Hy21) is recessive and that gene that causes the long hypocotyl phenotype in ARR90 (Hy90) appears to be co-dominate. PCR mapping indicates that Hy21 is located on chromosome number 3. ARR21 and ARR90 were shown to be sensitive to continuous white light but when they were put under short and long day conditions, their long hypocotyl phenotype became clearer. When grown in continuous red light, ARR90 exhibited the long hypocotyl phenotype, but ARR21 did not. Both ARR21 and ARR90 were sensitive to continuous blue light.

Conclusions/Discussion

Hy21 is recessive and Hy90 is co-dominant. Hy21 appears to be located on chromosome number 3. ARR21 and ARR90 were sensitive to continuous white light, but when grown under short and long day

Summary Statement

To identify and characterize genes in Arabidopsis thaliana that affect photomorphogenesis.

Help Received

Dr. Steve A. Kay from TSRI for allowing me to work in his lab. Dr. Tom Schultz for teaching me about genetics and for mentoring me. Leo for teaching me how to do PCR reactions.