CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
S1613

Project Title
The Effect of Gibberellic Acid on Salt Tolerance of Pisum sativum

Abstract

Objectives/Goals
To learn if gibberellic acid has any effect on the salt tolerance of Pisum sativum macrocarpon.

Methods/Materials
125 P. sativum seedlings were cultivated for 11 weeks in soil containing different concentrations of table salt. Four salinity groups were established, 0 control, 1700 ppm, 5000 ppm and 10000 ppm. These were matched by 4 groups grown under the same conditions except that they were treated with topical GA3 once a week. Plant height, and number of flowers and peas were measured and recorded once a week. On week 11, I removed plants from the soil and measured the fresh weight of the surviving groups. After 12 days of drying in room air, I obtained total dry weights and root weights. Soil samples were then sent to the lab for salinity measurements.

Results
All plants in both of the 10000 groups and in the 5000 control group died by the 7th week, and only 1 plant from the 5000 GA-treated group survived to week 10. However GA-treated high salinity groups had a slightly greater proportion of plants surviving slightly longer. All GA-treated groups showed progressive increase in mean height compared to controls for each salinity level. By week 5 the difference became statistically significant. Surviving GA treated groups also showed greater biomass compared to the controls. Finally, GA treated groups showed greater absolute flower production, but produced fewer peas by week 11. Absolute # of combined pea and flower production was nearly equal between 0-C, 0-GA and 1700-GA groups at 42, 41 and 43 respectively, compared to 31 for the 1700 control. The 1700 GA group outperformed its control and closely approached the performance of the 0C group in all criteria, despite a greater than 7 fold increase in salinity.

Conclusions/Discussion
GA treated groups did better than non-treated groups in terms of growth, biomass and potential harvest. It is uncertain whether GA strengthened plants by general effects, such as dilutional effect from increased cell volume, or whether it may have specifically made the plant more salt tolerant. GA treatment may have enabled the plant to dispose excess salt more readily at the cellular level producing more contractile vacuoles. At the gene level, the SOS1 gene (salt overly sensitive) in Arabidopsis is known to code for a sodium-hydrogen antiporter that can expel salt from the plant. Whether GA has any influence in any of these areas is unknown.

Summary Statement
My project demonstrates the effect of topical gibberellic acid on the salt tolerance of Pisum sativum.

Help Received
My father helped prepare plant containers and shelter and assemble the presentation board. Mr. Mosso at the Soil and Plant Lab provided salinity and pH measurements for my soil samples. My mother helped me find references, taught me to construct tables and graphs and edited my report.