



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Sushant Sundaresh	Project Number S1420
Project Title Host-Bacterial Specificity during Legume-Rhizobium Symbioses	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The research examined the control sequence between host plants and nitrogen fixing bacteria and determined whether such bacteria were screened at successive host-regulated checkpoints during the nodulation process. It was hypothesized that while host-bacterial symbioses had multiple control doors, Nod factor signaling was the most important checkpoint during legume-Rhizobium symbiosis.</p> <p>Methods/Materials Rhizobium meliloti, specific to Alfalfa, and NGR 234, specific to Macroptilium, were utilized because of their non-overlapping host-specificity. Fifty specimens each of Alfalfa and Macroptilium were grown and inoculated, cross tested under all possible combinations of host plants and bacteria; the resulting nodulation statistics were analyzed to empirically map the control sequence for nodulation.</p> <p>Results Each host plant evinced specificity to the Nod factors of its bacteria in naturally occurring symbioses. For example, Alfalfa rejected NGR 234, only allowing R. meliloti to infect its root hairs and nodulate. However, when bacteria were injected directly into the host, the plant's control system failed to regulate the invading bacteria and allowed nodulation to occur.</p> <p>Conclusions/Discussion During artificially instigated symbioses, the Nod factor control door was bypassed, disproving the hypothesis that Nod factors alone determine specificity. By demonstrating that nitrogen fixing bacteria are less host-specific than previously assumed, this research opens up the possibility for the mass production of crops with a clean, natural nitrogen source, which could reduce fertilizer usage and greenhouse gas emissions simultaneously.</p>	
Summary Statement This research set out to prove that host-bacterial specificity was absolute and rigid, but ended up challenging that premise, opening up the possibility for environmentally beneficial and economically attractive agricultural production.	
Help Received Dr. Gage, of the University of Connecticut, sent me Alfalfa and Macroptilium seeds. Dr. Harley, of the Harker High School, let me work in his classroom.	