



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Kapil Sinha	Project Number J1515
Project Title Organic Remedy for Tomato Plants: Effects of Vicia sativa and Rye Secale cereale for Protection from Verticillium dahliae	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Tomato plants often suffer from a fungus, <i>Verticillium dahliae</i>, which stunts the plant and wilts their leaves. In the fields, for commercial production, farmers fumigate the plants with methyl bromide, as this is the only known technique to get rid of this fungus. In my project, I tried to find ways to eliminate or reduce the effects of <i>Verticillium dahliae</i> using organic techniques. Rye <i>Secale cereale</i> AGS104 and <i>Vicia sativa</i> are cover crops that are used in farming to add organic material to the soil and improve soil structure. I used these plants to check if they can help prevent or reduce the effects of <i>Verticillium dahliae</i> in tomato plants.</p> <p>Methods/Materials I crushed the Rye <i>Secale cereale</i> AGS104 and <i>Vicia sativa</i> and put it in the soil of the tomato plants to see if that could supply the tomato plants with enough nutrients to allow them to fight the effects of <i>Verticillium dahliae</i>. I used dilution plating and a microscope to count the number of fungus spores in the soil to see which plant, <i>Vicia sativa</i> or Rye, will get rid of the most fungus. I also measured the height and counted the number of leaves to see their visible effect on the tomato plants.</p> <p>Results Both cover crops drastically reduced the fungus in the soil. Rye <i>Secale cereale</i> AGS104 had over 83% fewer CFUs per gram than the control and <i>Vicia sativa</i> had over 78% fewer CFUs per gram than the control. Both were effective in preventing stunting in the tomato plants. <i>Vicia Sativa</i> was 40% and Rye was 44% more effective in plants with fungus than in plants without. Both cover crops were also effective in stimulating leaf growth in the tomato plants. <i>Vicia Sativa</i> was 117% and Rye was 112% more effective in plants with fungus than in plants without.</p> <p>Conclusions/Discussion <i>Rye Secale cereale</i> AGS104 and <i>Vicia sativa</i> helped reduce the impact caused by <i>Verticillium dahliae</i>. Rye and <i>Vicia sativa</i> had a beneficial impact on the soil- with significantly less fungus (CFUs per gram) than the control. They also had a beneficial impact on the tomato plants- both in terms of plant height and number of leaves when <i>Verticillium dahliae</i> was present. The Rye was not as effective as the <i>Vicia Sativa</i> in increasing growth (plants without fungus). I found that this was because another "mystery fungus" (<i>Fusarium</i>) affecting the Rye plants besides the <i>Verticillium dahliae</i>.</p>	
Summary Statement My project is about finding an organic remedy for tomato plants that suffer from the fungus, <i>Verticillium dahliae</i> , by using <i>Vicia sativa</i> and Rye <i>Secale cereale</i> AGS104.	
Help Received I used lab equipment at USDA. My parents drove me to and from USDA. Lorena Ochoa, Biological Science Aid, taught me how to use the different pieces of equipment. Dr. Klosterman, Research Molecular Biologist, was my mentor. He gave me advice and guidance on my project.	