



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Emily T. Nguyen	Project Number S2312
Project Title Effects of Dietary Supplements on Pesticide-Induced Neurodegeneration Using Taguchi Method in Dugesia tigrina	
Abstract Objectives/Goals This experiment used malathion and carbaryl, known neurotoxicants, at a sub-lethal concentration (0.05 mg/L, approximately 1/100 of LC50) to induce neurodegeneration in <i>Dugesia tigrina</i> to investigate the effects of <i>G. biloba</i> and <i>H. erinaceus</i> on neuronal activity with the application of Taguchi orthogonal design array L-8 (2^7). Methods/Materials Behavioral assays were used to assess whether proper neuronal functions are maintained after toxicant exposure and after treatment with <i>G. biloba</i> and <i>H. erinaceus</i> . Neurobehavioral changes were observed before and after exposure to malathion and carbaryl with and without treatment. Phototaxis assays were conducted before and after treatments. Cognitive tests, phototaxis and chemotaxis assays, were performed at 500 and 1000 lux. The next set of experiments sought to determine the optimum concentrations and the significant contributing factors of each dietary supplement for cognitive enhancement. Three additional dietary supplements were added: <i>P. quinquefolius</i> , <i>G. lucidum</i> , and <i>C. militaris</i> . They were chosen based on documented effectiveness and the dosages were reformulated based on the amounts recommended for humans. The Taguchi method was employed in the cognitive test at 500 lux using Qualitek-4 software. Results The hypothesis stating that <i>G. biloba</i> and <i>H. erinaceus</i> will show significant neuroregenerative effects in planarians was supported by the neurobehavioral changes and phototaxis assays; however, it was not supported by the cognitive tests. The Taguchi method indicated that <i>H. erinaceus</i> (1), <i>G. biloba</i> (2), <i>P. quinquefolius</i> (1), <i>G. lucidum</i> (2), and <i>C. militaris</i> (1) are the optimum concentrations for the cognitive test at 500 Lux. The statistically significant contributing factors which show promising cognitive enhancing properties were <i>P. quinquefolius</i> , <i>H. erinaceus</i> , and <i>C. militaris</i> , but not <i>G. biloba</i> and <i>G. lucidum</i> . Conclusions/Discussion The treatment results showed a positive in behavior changes and Taguchi cognitive tests. This study suggests that <i>H. erinaceus</i> , <i>G. biloba</i> , and <i>P. quinquefolius</i> may be used in the treatment of dementia, Alzheimer's, and other neurodegenerative diseases in human.	
Summary Statement Using specified dietary supplements to treat pesticide-induced neurodegeneration was found to have positive effects on behavior changes in <i>Dugesia tigrina</i> .	
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