Natural Termite Control: A Novel Biomolecular Approach

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Termite infestations pose a threat to infrastructure and crops throughout the world. Many current termiticides contain toxic carbamates, organophosphates, pyrethroids, and chlorinated hydrocarbons. The study aims to identify and apply natural cellulase inhibitors to cellulase found within termites with a goal of disrupting their digestion, thereby safely combatting termite infestations. Three natural inhibitors were identified based on their accessibility and structural similarity to cellulose: curcumin, methylcellulose, and isomalt-polyglycitol-syrup solution. Experimentation involved exposing cellulose samples such as wood to cellulase in the presence of the aforementioned natural inhibitors and measuring the change in mass. Since the molecular structure of methylcellulose is most similar to cellulose, it was believed that methylcellulose solution would preserve the cellulose samples best, followed by artificial sugar, curcumin, and the negative control (no inhibitor). Results provided significant support for the use of curcumin, methylcellulose, or isomalt-polyglycitol syrup as natural inhibitors. Limited by a minute range of experimental groups, future testing must broaden the range of inhibitors used in order to elucidate the most efficient one. By utilizing the most efficient inhibitor of cellulase, it is possible to debilitate termites from digesting crops or wood, effectively starving them without contaminating other materials or humans.

Awards Won:
Arizona State University: Arizona State University ISEF Scholarship (valued at up to $52,000 each)
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