Effectively Managing the Germination of Ambrosia artemisiifolia Through Allelopathic Plant Species as a Bioherbicidal Substitute

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Ambrosia artemisiifolia is an invasive weed that significantly suppresses immune systems and outcompetes monocrops in Mississippi due to its pollen distribution. The primary objective of this experiment was to investigate the relationships between Ambrosia artemisiifolia and allelopathic compounds found in plant species to manage the germination process effectively, thus creating a bioherbicidal alternative while preserving biodiverse ecosystems. The allelopathic species tested included the following: Sorghum bicolor, Secale cereale, Oryza sativa L., Bouteloua gracilis, Helianthus annuus, Tagetes patula, Mimosa pudica, Eucalyptus pulverulenta, and Fagopyrum esculentum. The set-up consisted of ten plant trays, each growing forty "pods." Nine out of the ten trays grew twenty seeds of an allelopathic plant and twenty Ambrosia artemisiifolia seeds. The tenth tray, the control, grew forty Ambrosia artemisiifolia seeds. After thirty days, the Sorghum bicolor significantly inhibited the germination of Ambrosia artemisiifolia, confirmed by ANCOVA testing. The tests resulted in "extremely strong confidence of variance," indicating that the Sorghum-influenced Ambrosia artemisiifolia measured, on average, 1.1 centimeters less than the control. In addition, through spectrophotometry, the Sorghum-influenced Ambrosia artemisiifolia averaged 2.445 micrograms per milliliter in carotenoid content, signifying an excessive amount of reactive oxygen species (ROS). This reading was positively correlated with allelopathy, as the abiotic variables were neutralized through consistent alterations. Overall, this study provided valuable insights into allelopathy and its influence on Ambrosia artemisiifolia, necessitating further consideration of the efficacy of allelopathy on invasive plants.

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