

Abstract 40 – Paper ID: 063**Essential Oil-Loaded Montmorillonite Clay-Based Formulation for Sustained Bioherbicidal Activity**

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Abstract

Ocimum basilicum essential oil, with its rich composition of bioactive compounds like linalool and methyl chavicol, has shown promising weed control potential. Montmorillonite nano-clay (M-NC) can enhance the effectiveness of volatile essential oil herbicide through sustained release mechanisms. The oil of *O. basilicum* was loaded on M-NC (NC-OF) and examined for sustained-release and bioherbicidal properties. Results indicated that NC-OF show successful loading of key oil constituents, i.e., linalool and methyl chavicol. Characterization of the formulation suggested that binding between oil constituents and NC-OF occurred through hydrophobic, hydrogen bonding, and π – π interactions. NC-OF demonstrated sustained release ($t_{50}\%$ up to 30 days) at $32 \pm 1^\circ\text{C}$. Different experiments revealed that the formulation disrupted weed stomata and epidermal cells, causing cellular damage and vascular irregularities in roots. Field tests demonstrated inhibitory effects on various weeds, NC-OF formulation showing 100% population reduction for *A. arvensis* and *S. arvensis*. In addition, the formulation did not harm soil enzymatic activity, suggesting a reduced ecological impact.

Keywords: Formulation, Linalool, Methyl chavicol, Hydrophobic interaction, Sustained release