

Solving a Menace to Rice? TCCE Repellent: An Effective and Eco-friendly Turmeric and Clove Combined Extract as *Nilaparvata lugens* Repellent

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Brown planthopper (BPH, *Nilaparvata lugens*), the most destructive pest of rice (*Oryza sativa* L.) causes 'hopperburn', inducing 100 million USD crop losses annually. Synthetic insecticides against BPH pollute the environment whilst harming humans. Thus, our aim of developing an effective and eco-friendly BPH repellent to be used in agriculture is crucial. Here, we propose the novel repellent, Turmeric and Clove Combined Extract (TCCE) to repel BPH by activating the olfactory response mechanism. Turmeric and clove extracts containing phytochemicals ar-turmerone and eugenol are yielded into 3 groups: Turmeric, Clove and TCCE Repellents at varying concentrations. Repellency percentage (RP) and bioassay of groups, probit regression of TCCE, correlation between RP and soluble sugar loss percentage (SSLP) are studied. RP is determined by choice test method while degrees Brix is obtained using Brix meter. Results in 24hrs showed 2500ppm TCCE reached a plateau and had the highest RP of $(96.667 \pm 2.887)\%$. One-Way ANOVA showed significant difference of $F(2,6)=28.000$, $p < .001$ between groups of repellents. Post Hoc Tukey HSD showed non-significant difference ($p = .109$) between TCCE and Turmeric, but TCCE enhanced effectiveness at 14.191% compared to Turmeric alone. Repellency bioassay of 2500ppm TCCE ($RI = 93.333 \pm 5.774$) showed efficacy as BPH repellent. In TCCE probit regression, RC_{50} was 1133.504 (95% CI 989.694-1268.156) and RC_{90} was 2319.289 (95% CI 2133.543-2555.547). Pearson correlation proved significant strong negative correlation between RP and SSLP, $r(64) = -.992$, $p < .001$. Therefore, we conclude it is viable to utilise TCCE at 2500ppm as an effective and eco-friendly BPH repellent to ensure the stability of food supply and is a more beneficial option to farmers all around the globe.

Awards Won:

Fourth Award of \$500