Combating Hepatocellular Carcinoma in the Developing World: A Novel Discovery of the Fungicidal Potential of Bicarbonate Solutions Against Aspergillus flavus

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The aim of this investigation is to determine the inhibitory effects of sodium bicarbonate and potassium bicarbonate on Aspergillus flavus and its hepatocarcinogenic metabolite Aflatoxin B1 . The extent of inhibition is evaluated two-fold. First, Study 1 investigates how varying the solute concentrations of $NaHCO_3$ and $KHCO_3$ affects the surface area of exterminated A. flavus. Second, Study 2 investigates how molar absorbance at 425nm (i.e. peak absorbance of Aflatoxin B1) varies among samples of A. flavus cultures with differing [$NaHCO_3$] and [$KHCO_3$]. From Study 1, both [$NaHCO_3$] and [$KHCO_3$] are positively correlated with the surface area of exterminated A. flavus. However, potassium bicarbonate is shown to have a more positive ($m=40.994$) and more statistically significant ($R^2 = 0.938$) correlation. From Study 2, spectrophotometric measures indicate a negative correlation between [$NaHCO_3$] and [$KHCO_3$] and molar absorbance at 425nm in the A. flavus cultures. Potassium bicarbonate was shown to have a more negative ($m=-1.4028$) and more statistically significant ($R^2 = 0.8747$) correlation with blue absorbance at 425nm. The conclusions reached by this investigation are significant. No prior published study has investigated the inhibition of A. flavus by sodium bicarbonate and potassium bicarbonate; and hence, this investigation provides novel evidence of both bicarbonates' effectiveness as potential fungicidal inhibitors of A. flavus. The use of bicarbonates as ecological, cost-effective fungicides offers opportunity in mitigating the prevalence of hepatocellular carcinoma in agrarian regions of Asia and sub-Saharan Africa. Chemical manufacturers will be contacted for the production of a bicarbonate fungicide.

Awards Won:

Third Award of $1,000