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RELATIONSHIP BETWEEN YIELD LOSS OF SORGHUM CAUSED BY THE HOUSE MOUSE, *MUS DOMESTICUS*, AND NUMBER OF MICE

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ABSTRACT: The house mouse, *Mus domesticus*, has been reported to cause substantial pre-harvest yield losses of grain crops (e.g.; Mwanjabe *et al.* 2002; Singleton 2003; Stenseth *et al.* 2003; Brown 2004). The relationships between yield losses and number of mice have not been studied systematically (Brown 2001; Hone 2004). By quantifying and modeling the relationship between different densities of mice and yield losses, appropriate ecologically and economically-based management strategies can be established. This has been examined by using 16 rodent proof enclosures (pens) each one 225 m² in size on Gatton campus, UQ, QLD, Australia from December 2002 to May 2004. The pens allow us to determine and quantify the relationship between different numbers of adult mice which have been introduced in 4 different densities to each 4 pens and yield losses caused by mice to particular crops types for the period of 7 weeks from milky stage to ripening stage. Crop type examined was sorghum.

Yield losses caused by different density of mice have been assessed by comparing average dry grain weight for 4 excluded plots and 8 at-risk plots with 4 replicate for each level of mice densities to determine differences amongst enclosures. Also we caught all mice out, using live traps (Elliott) to monitoring population growth, population impact and possibly contribute to the differences in the yield loss. Using mix model to find out the effect of high abundances of mouse(15, 32, 63 and 125 mice/pen) on mean yield loss expressed as g/head showed a significant effect of mice on yield loss ($\mathbf{F}_{3, 12} = 5.07$: $\boldsymbol{p} = 0.0439$: mix model). Also the results of the comparisons of least squares mean showed that yield loss in the pens with 32, 63 and 125 were remarkably similar. The result of trapping for find out the final population confirm that mice population within the pens with 63 haven not increased and even the population within the pens with 125 mice has decreased significantly, it maybe caused by stress because there is no limitation of food (carry capacity) and natural predator pressure.

The data from 2004 trial were analyzed by following ANOVA and GLM procedure to find out the effect of low abundances of mice (4, 8, 12 and 16 mice/ pen) on mean yield loss expressed as g/head. The results showed even low number of mice has a significant effect on yield loss ($\mathbf{F}_{3, 12} = 5.57$; $\boldsymbol{p} = 0.013$: ANOVA).

There is a very strong positive linear relationship for low densities and non-linear relationship for high densities of mice and percentage of yield loss/head.

$$(y = 1.1885x + 3.0118;\ \boldsymbol{p} = 0.037),\quad ((y = \text{Max}\ (1\text{-}e^{-kx}));\ \boldsymbol{p} = 0.00045).$$

According to modeled relationships between pest damage and pest abundance by Hone (2004), the functional relationship appears to be type **II** (Concave-up relationship). These data will be used to develop a predictive model of cost and effect of mice on cereal crop, economically-based management strategies and to improve on farm monitoring methods.