Effects of *Zumsil* and *Microsoil Foundation* on the growth and resistance of rockmelon (*Cucumis melo* L. var. *Dubloon*) to *Fusarium oxysporum* f.sp. *melonis*

Frew, A. and Gurusinghe, S.

This project investigated the potential beneficial impacts of *Zumsil* and *Microsoil Foundation* application on the growth and resistance of rockmelon (*Cucumis melo* L. var. *Dubloon*), against the fungal pathogen *Fusarium oxysporum* f.sp. *melonis*. *Zumsil* was applied either at a 'full rate' (equivalent of 300ml/HA) or half this rate; *Microsoil Foundation* was applied at the equivalent of 2.5L/HA (in combination with *Zumsil* at half rate). This was carried out under controlled conditions (day:night; 12h : 12h; 21°C : 30°C; humidity 50%). Infection with *F. oxysporum* dramatically reduced survival (up to 80% mortality); both *Zumsil* and *Microsoil Foundation* increased survival, this effect was greatest when *Zumsil* was applied at full rate, or when both *Zumsil* and *Microsoil Foundation* were applied together at half rate. With infection of *F. oxysporum*, biomass had a similar response, with an increase in growth when *Zumsil* was applied at full rate, or when *Zumsil* and *Microsoil Foundation* were applied together at half rate. These results suggest that application of *Zumsil* alone at full rate, or combined half rate application of *Zumsil* and *Microsoil Foundation* may offer significant protection from *F. oxysporum*.

Plant survival was significantly impacted by *F. oxysporum* and *Zumsil* treatments. Infection with *F.oxysporum* significantly increased plant mortality ($P = 0.03$). This mortality rate was greatest when no products were applied, between 70 - 80% ; this was reduced to around 50% mortality when Zumsil was applied at full rate (Fig. 1). Overall, survival from infection with *F.oxysporum* was highest when *Zumsil* was applied at full rate, or when *Zumsil* and *Microsoil Foundation* were applied together at half rate (Fig. 1).

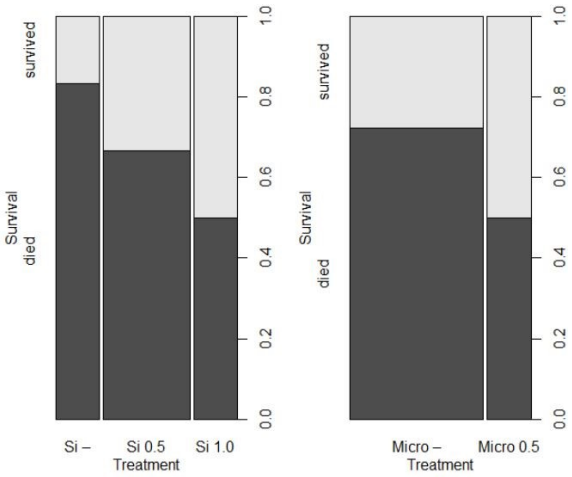

Figure 1. ↑ Effects of *Zumsil* (left plot) and *Microsoil Foundation* (right plot) on the survival of rockmelon (*Cucumis melo*) infected with *Fusarium oxysporum* f.sp. *melonis*. Proportion individuals who survived (light bars) and who died (dark bars) are shown under different treatments. Product (treatment) application rates are indicated.

At harvest, plant biomass was significantly affected by inoculation with *F. oxysporum* ($F_{1,21} = 37.78$, $P < 0.001$), with a 62.7% reduction in biomass from infection of *F. oxysporum*. Application of *Zumsil* at full rate increased biomass of the infected plants (which survived) by 34.9% compared to application at half rate alone (0.5 *Zumsil*), (Fig.2). Application of *Zumsil* (at half rate) alone was 73.4% less effective at promoting biomass compared to using both *Zumsil* and *Microsoil Foundation* together at half rate, although this effect was not statistically significant (most likely due to low number of replicates as a result of mortality from *F. oxysporum*).

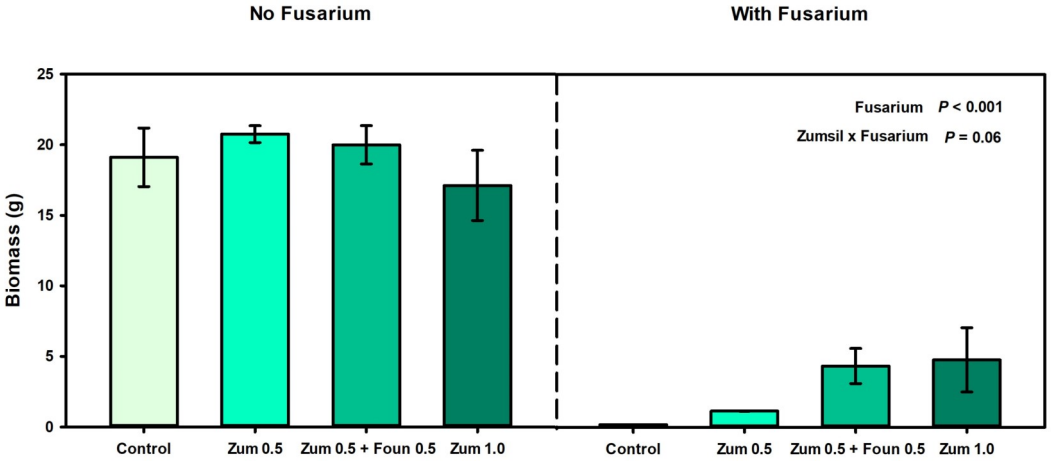

Figure 2. ← Effects of *Zumsil* and *Microsoil Foundation* on the total biomass (g) of rockmelon (Cucumis melo) grown for nine weeks, with and without *Fusarium oxysporum* f.sp. *melonis* infection. Values are means ± standard error. Significant ($P<0.05$) and marginally significant ($P<0.1$) factors are indicated.

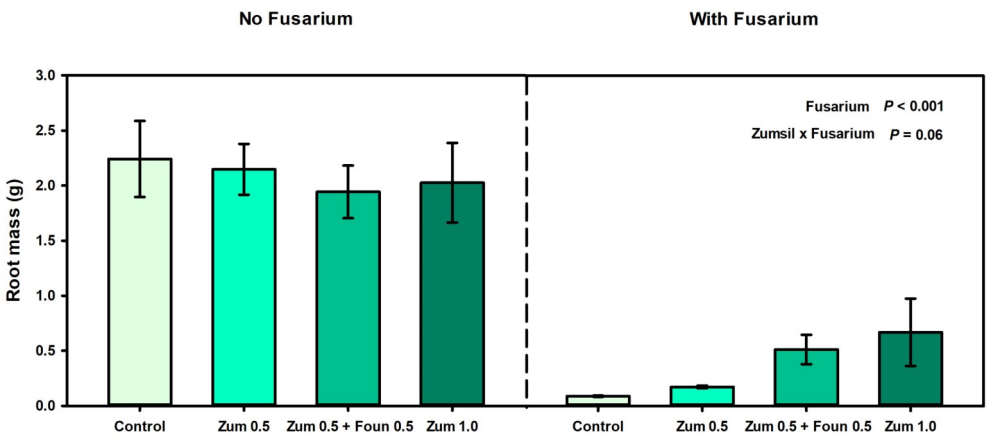

Figure 3. ← Effects of *Zumsil* and *Microsoil Foundation* on the root mass (g) of rockmelon (*Cucumis melo*) grown for nine weeks, with and without *Fusarium oxysporum* f.sp. *melonis* infection. Values are means ± standard error. Significant (P<0.05) and marginally significant (P<0.1) factors are indicated.

Root mass was significantly affected by inoculation with *F. oxysporum* ($F_{1,20} = 20.5$, P<0.001), with a 300% reduction in root mass from infection of *F. oxysporum*, compared to uninfected individuals. Application of Zumsil at full rate increased root growth by more than 280% overall compared to application of Zumsil at half rate alone (Fig.3). With no pathogen stress, total biomass and root mass were not significantly affected by application of Zumsil or Microsoil Foundation at nine weeks of growth (Figs. 2, 3).

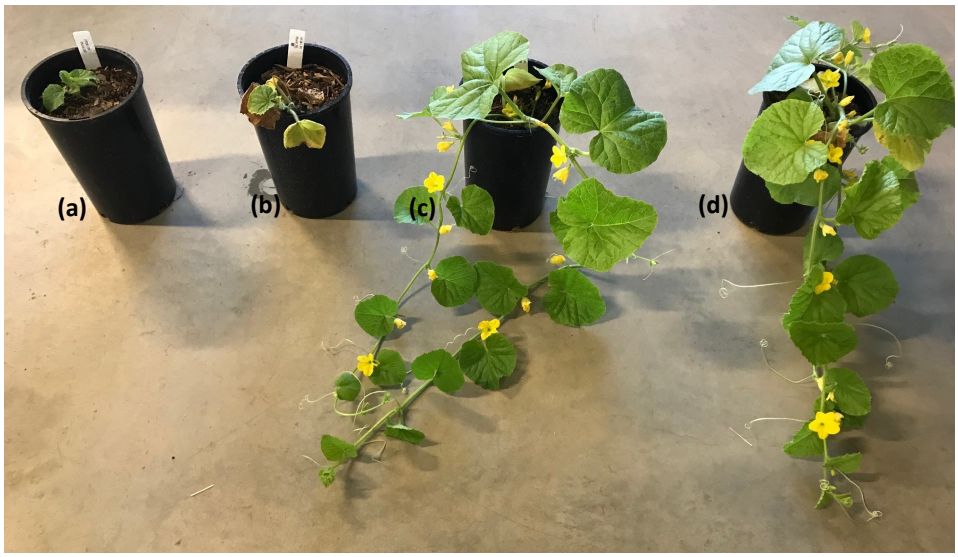

Figure 4. ↑ Rockmelon (*Cucumis melo*) inoculated with *Fusarium oxysporum* f.sp. *melonis*. Examples shown of individuals **(a)** with no product applied, **(b)** Zumsil applied at half rate, **(c)** Zumsil and Microsoil Foundation applied at half rate or **(d)** Zumsil applied at full rate.

The data from this project suggest that application of *Zumsil* at full rate, or *Zumsil* at half rate applied with *Microsoil Foundation* at half rate, provides the most effective resistance against deleterious effects of *F. oxysporum* infection. A reduction in the number of replicates from infection mortality limited statistical analyses of some responses, future trials should look to include larger number of replicates. However, the mortality rate allowed for analyses of survival (logistic regression) which highlighted the protective impacts of *Zumsil* (at full rate) and *Microsoil Foundation* (at half rate combined with *Zumsil* at half rate). Therefore, for some responses (e.g. biomass responses without *F. oxysporum*) there were no significant effects observed, which may have been observed with higher number of replicates.

Overall, the application of *Zumsil* enhanced growth and tolerance of rockmelon to *F.oxysporum*, even at a low rate of application (300ml/HA) under controlled conditions. Further research is required to build a more comprehensive understanding of the effects of *Zumsil*. Future work should look to assess the responses of different plant species and varieties, and how these may interact with varying soil abiotic and biotic factors, both in the field and under controlled conditions.