# EFFICACY OF A MUSTARD BASED SOIL AMENDMENT "MUSTGROW" FOR USE IN FUMIGANT FREE HIGH VALUE CROPPING SYSTEMS.

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Abstract: Green biomass of many brassicacious crops such as field mustards, Canola, and some common vegetable Cole crops have long been known to contain glucosinolates that degrade in soils to active forms of naturally produced soil fumigants. These include several degradation bi-products, but the most important and abundant are allyl isothiocyanate and methyl isothiocyanate. Both of these compounds exhibit powerful fumigant properties, and over the past decade have demonstrated control of nematodes, soil borne plant pathogens, and weeds in a number of published research studies. In commercial soil management programs, these compounds are usually supplied by rotational mustard cover crops in off-season plantings. Mustards are rotated with a primary crop such as lettuce, tomato, or others where historically, soil fumigation has been the primary soil pest management practice. However, the resulting pest intensity may vary in post-treatment soils, since many factors can influence glucosinolate/AITC-MITC efficacy, including weather conditions, soil temperatures and moisture at the time of application, and the physiological stage of cover crop at the time of incorporation. In addition to these factors, using a cover crop in an annual crop management program at times is not economically feasible, since several months are required to grow the cover crop, incorporate it into preconditioned soil, and allow time for biomass degradation and liberation of the fumigant precursors. Hence, any product that can provide large amounts of glucosinolates to the soil as a single short-term event, and achieve natural fumigant concentrations that approach conventional metham sodium or metham potassium usage, has great commercial potential in agricultural production districts that currently rely on chemical fumigants. It is to this objective that pelletized mustard extracts have been formulated by Mustard Products & Technologies, and researched by our group as a methyl bromide alternative in American high value cropping systems.

2011-2012 Field Research.

Beginning in early 2011, field trials were initiated in both California and Florida by our research group. Several test crop systems were established and studied, but for the purpose of this presentation, data will focus primarily on strawberry and tomato, both production systems with long histories of soil fumigant usage. Overall, results from our field trials were promising for commercial viability of the product, however, data were not typical of a traditional chemical fumigant. While nematode control data were similar to other fumigant products, control of soil-borne fungi did not follow the same predictable trends. Instead of repeatable linear reductions in

fungal presence in soil with increasing rates of product applied, across many studies, crop growth and yields were significantly improved without corresponding reductions in soil fungi, or , a dramatic reduction in root injury. This included the fungal plant pathogens *Fusarium*, *Verticillium*, and *Macrophomina*. Also, in almost all cases, yields with Mustgrow at rates of 1500 and 2000 lbs/acre were comparable to or greater than fumigant standards. Since pest populations were not reduced to the extent to cause higher yields than standards, a possible explanation would be increased plant nutrition from the quantity of Mustgrow applied. In 2012, this hypothesis was tested by including an increased fertilizer treatment for comparison, as well as the use of soil solarization in combination with Mustgrow. Results from these additional studies were inconclusive to explain the product's benefit to strawberry and tomato plant growth and yield. Instead, the Mustgrow treatments again increased yields, but not the enhanced fertilizer treatment. To study this phenomenon further, additional studies are planned to: 1. Further elucidate beneficial effects to treated crops, and, 2. Test additional plant nutrition treatments to approximate potential contributions from the Mustgrow biomass. In any case, numerous growers are now interested in this product as an alternative to soil fumigation following larger scale on-farm demonstrations conducted by our group this past season in both Eastern and Western growing regions of the US.