

FACTORS AFFECTING PERFORMANCE OF MB ALTERNATIVES – A SOUTH ATLANTIC PERSPECTIVE

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Fumigant application methods and equipment were identified as a source of variability in the performance of methyl bromide alternatives during several field demonstration trials conducted in 2007. Shank injection systems incorrectly modified to accommodate reduced fumigant flow rates through delivery tubes resulted in the erratic distribution of fumigants in the soil after application. Equipment designed to detect disruptions or permutations in fumigant flow through manifold and delivery tubes were not correctly installed preventing the identification of fumigant flow problems until after the fumigant had been applied. Installment of fumigant delivery tubes with smaller interior diameters to accommodate reduced fumigant flow rates and sight valves and pressure gauges for monitoring fumigant flow that are visible to the applicator is recommended. To assist the education and training of fumigant applicators on use of low rate technology, a portable, self-contained fumigation simulator was designed and fabricated. Using water instead of fumigants to measure flow rates, the simulator was used to educate and train growers on the modification and use of application equipment to reduce application rates of chemical fumigants.

Low fumigant concentrations in soil detected after full tarp (broadcast) applications of alternatives were attributed to soil disturbance during the application procedure and the use of highly permeable plastic films. Voids or fissures in the vertical soil profile created by injection shanks and tractor tires during the application process provided large air channels for fumigants to rapidly disperse through. The use of rollers to provide a physical seal on the soil surface prior to application and vertical coulters to minimize soil disturbance during fumigant injection is recommended to improve retention of fumigants in the soil. Development of new technology or adaptation of current gluing technology to join sheets of virtually impermeable film in the field is also recommended to improve retention of fumigants in the soil.

Soil physical properties were also identified as a factor contributing to variability in fumigant performance in the field. Soil moisture exceeded field capacity in 10 alternative field demonstration trials (Table 1). In four trials, soil moisture exceeded field capacity by greater than 50%, thus impacting the movement of fumigants through soil air space. The coefficient of variation (relative variability) for soil moisture in samples collected from demonstration trials exceeded 10% in many sites, indicating that soil moisture was not consistent across the field. Although observed soil bulk densities averaged between 1.3 and 1.5 g cm⁻³, the coefficient of variation in samples ranged from 1.8% to 8.7%, indicating fluctuations in soil physical properties across the field.

Table 1. Soil physical characteristics during application of soil fumigants

Trial	Location	Soil moisture during fumigation		Soil moisture at field capacity (-0.3 bars soil water potential)	Soil bulk density (g/cm ³)	
		Mean	Coefficient of variation		Mean	Coefficient of variation
1	Duette, FL	11.3%	6.4%	7.4%	1.3	2.6%
2	Duette, FL	12.2%	14%	4.6%	1.3	8.7%
3	Moultrie, GA	7.7%	4.5%	6.5%	1.4	3.1%
4	Ft. Pierce, FL	9.6%	14.3%	5.6%	1.4	2.8%
5	Lake Park, GA	5.0%	13.3%	4.4%	1.4	2.6%
6	Ty Ty, GA	NS	NS	NS	NS	NS
7	Beaufort, SC	12.2%	16%	6.7%	1.4	7.0%
8	Beaufort, SC	14.4%	12%	11.1%	1.4	8.0%
9	Jesup, GA	11.4%	5.8%	7.7%	1.4	1.8%
10	Ft. Pierce, FL – north end	11.3%	17.2%	11.2%	1.5	1.9%