REDUCTION IN SEDIMENT MOVEMENT IN PLASTICULTURE

S. B. Sterrett, H. E. Hohlt, and C. P. Savage, Jr. Virginia Tech, Eastern Shore Agricultural Research and Extension Center, Painter, VA

Tomato plasticulture is currently one of the most profitable agricultural enterprises on the Eastern Shore of Virginia. The advantages of plastic mulch include soil warming, weed suppression, water and fertilizer conservation and early yield enhancement. However, runoff and sediment movement may adversely impact the rapidly expanding clam aquaculture enterprises that are extremely sensitive to changes in water quality, including sediment movement.

The Eastern Shore Vegetable and Shellfish Growers Advisory Committee was appointed by the Virginia Commissioner of Agriculture to address the concerns of individuals engaged in either plasticulture or aquaculture. The Best Management Practices subcommittee recommended development of a comprehensive conservation system for plasticulture production. These included improved infiltration between beds (subsoiling), use of soil amendments to reduce soil erosion, and changing the width of the mulched beds to reduce the percentage of land covered with water imperiable plastic mulch. These recommendations were based upon theory but the actual effectiveness was not known.

The objectives of these studies were to: 1) Determined the influence of between-row treatments on off-site sediment movement of summer and fall production, and. 2) Compare biomass production and root density of grass species for planting between rows.

Methods and Materials

The study was established on a 3.5% slope using 5 treatments , standard (1.07m beds); standard + polyacrylamide gel between beds; standard + subsoil between beds; standard + annual rye grass (Lolium multiforum) sown between bed; and narrow (0.66m) beds in 2000 and 2001. Rye grass was chemically desiccated at a height of approximately 30-cm. Plots consisted of the area between two beds, with a wier made of plywood having a 2inch PVC pipe outlet at the soil surface. Runoff from each plot was collected in plastic tubs inside plastic film-lined boxes. Coarse sediment was collected in the tub as the sediment carrying capacity was diminished as the runoff water collected in the tub (Fig. 1). A randomized complete block design was used with 4 replications.

Grass Species Study. Six grass species (Annual ryegrass, Kentucky 31 fescue, (Festuca arundinacea), sorghum, (Sorghum bicolor), pearl millet, (Pennisetum glaucum), brown top millet (Panicum fasciculatum), and black oats (Avena strigosa) were planted in 5 ft by 20 ft plots in a randomized complete block design with 4 replications in 2001, 2002, and 2003. Above ground biomass production was assessed weekly, starting 2 weeks after planting.

Results

Sedimentation Study. Total sediment movement was greatly reduced by establishing rye at bed establishment (Fig. 2). Sediment was greatest in rye plots early in the season, before the rye was well established. However, cultural management of rye to facilitate foot traffic and control weeds is critical. Coarse sediment movement with either addition of polyacrylamide gel, more narrow beds, or subsoiling was not different from the standard, clean culture treatment. Results from this study indicate that establishment of vegetation between beds can significantly reduce cumulative off-site movement of sediment.

Grass Study. Biomass production was greatest with sorghum, pearl millet and brown top millet; the least biomass with fescue and annual ryegrass (data not shown). Variability of biomass production of black oats reflected yearly growing conditions. Fescue and Italian ryegrass had the greatest percentage of roots in the top 5 cm of the soil profile and the smallest percentage of roots below 30 cm (Table 1). Growth response of Annual ryegrass, fescue, and black oats was linear over the length of this study, while that of sorghum, and the millets was curvilinear. Increasing growth rate of these three warm weather grasses suggest that management may be difficult, particularly when adverse weather conditions delay desiccation.

Additional research is needed to determine optimum grass population and to coordinate weed management with grass establishment and timing of grass desiccation for control of sediment movement. Identification of a low-growing grass that will develop sufficient biomass to provide adequate weed suppression but ceases to grow under warmer weather would be a valuable asset.

Figure 1. Setup of sedimentation plots. Standard treatment to left, narrow beds in center, and desiccated rye to right.. Photo. taken after 0.3inch rain in September. Note reduced water in tub and box for rye plot

Table 1. Root density for grass species

Grass Species	Total root density roots/cm3
Rye	1.11a
KY Fescue	1.17a
Black Oats	.094b
Sorghum	0.41d
Pearl Millet	0.57c
Brown Top Millet	0.45cd

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