

SOIL TYPE AND MOISTURE LEVEL INFLUENCE ON ALAMO SWITCHGRASS EMERGENCE AND SEEDLING GROWTH

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Background. Switchgrass (*Panicum virgatum* L.) is a native warm-season perennial grass that is grown throughout the Great Plains and eastward to the Atlantic Coast. It is used for pasture, hay, soil conservation, wildlife cover, and recently as a crop for fuel ethanol and biomass-generated electricity. As with most warm-season perennial grasses, switchgrass establishment is difficult because of erratic seed germination and poor seedling growth. Because of poor emergence, weed competition is also a major problem. More risk is associated with establishment on sandy Coastal Plain soils because of their low water holding capacity and rapid drying of the soil surface after a rainfall event. There is no information on how emergence might differ on various soils or what the critical rainfall interval is for seedling survival.

A greenhouse study was conducted to determine the influence of soil series and moisture level on 'Alamo' switchgrass emergence and seedling growth. Soils used were Bowie very fine sandy loam and Darco loamy fine sand which are upland Coastal Plain soils from near Overton in Rusk County. Weswood silt loam is a Brazos River bottom soil collected south of College Station in Burleson County. The Houston Black clay is an upland soil from Temple in Bell County. Soils were put in plastic pots (5 in. wide x 5 in. tall) and placed in the greenhouse. Twelve seed of Alamo switchgrass were placed on the soil surface of each pot and covered with a ½ in. of soil. Pots were watered every 3-4, 7, 10-11, or 14 days. Emergence was recorded daily for the first 28 days and seedlings removed at 6 weeks to compare seedling traits. The study was initiated on March 30, 2001 and repeated on May 29 and July 24.

Research Findings. The Bowie very fine sandy loam and the Darco loamy fine sand had similar soil moisture levels. Moisture levels were frequently near 0% at the 10 and 14 day watering intervals with maximum moisture levels of 10 to 15 % at the 3 day watering interval. Moisture levels in the Weswood silty loam were never below 5 % with maximum levels from 20 to 25% at the 3 day watering interval. The Houston clay had the greatest moisture retention with minimum soil moisture levels at approximately 10% with levels up to 30% for the 3 day watering interval.

There were not any consistent differences among soil series for switchgrass emergence. There was a tendency for switchgrass to have greater and more rapid emergence when watered at least every 7 days, especially under the high temperatures during the July 24 run. Seedling

survival was always good in the Houston Black clay regardless of watering interval because of its high moisture holding capacity. Seedling survival decreased rapidly in the Darco loamy fine sand and Weswood silty loam when watered only every 10 or 14 days. A watering interval of 7 days or less was necessary for seedling survival of 90% or more in all soils.

The general trend was for seedling development to be more advanced and shoot and root weights to be heavier in the two sandier soils than in the Weswood silt loam and Houston clay soils if the seedlings survived. The Weswood silt loam cracked very badly, especially at the 10 and 14 day watering interval, which limited seedling growth. Differences in shoot stage among soil types only occurred at the 10 and 14 day watering intervals. Shoot weight differences among soil types were more pronounced than for shoot stage. There was a general decline in shoot weight as the watering interval increased for all runs. Shoot weight differences occurred among soils at each watering interval for every date. The highest shoot weight was in the Darco loam fine sand and lowest in the Weswood and Houston soils.

There was a general decline in root development as watering interval increased. If watered every 3 days, there were no differences among soil series. If the seedlings survived, root stage was more advanced in the sandier soils than in the loam and clay soils. The trends in root weight were identical to that of shoot weight with differences among soil series at every watering interval. As with the other seedling traits, there was a general decline in root weight as watering interval increased, especially at the higher temperatures in the July 24 run. Root weights were always greater in the Darco soil and usually in the Bowie soil if the seedlings survived.

Application. The Darco and Bowie soils are representative of most soils found in East Texas. Switchgrass seedling growth and development was good in these soils, but it was very critical that the seedlings received water every 7 to 10 days. Switchgrass should be planted from late April through mid-May when temperatures are mild and rain chances are good. Necessary rainfall at least every 10 days is one of the factors for unreliable switchgrass establishment on sandy soils in the Lower South.