NORTH DAKOTA – Cold-Tolerant Forage Sorghum as a Potential Bioenergy Feedstock

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Forage sorghum is a warm-season annual biomass crop grown for silage or hay production with potential as a bioenergy feedstock. Seeding it early in the growing season is limited by its minimum growth temperature (60˚F). Thus, genotypes with cold tolerance allow an earlier seeding in the North Central Region (NCR). The study objective was to screen and select genotypes with increased cold tolerance and biomass productivity. Experiments were conducted in Fargo and Hickson, ND, in 2017. First, 74 commercial cultivars and 10 check genotypes of grain sorghum were tested at 75˚F and 54˚F in growth chambers and were ranked on a high to low vigor index. The eight highest and two lowest genotypes, and two check genotypes, were planted on two seeding dates: normal (27 May) and early (10 May). Evaluations at two harvest dates: emergence index, chlorophyll content, normalized difference vegetation index (NDVI), leaf area index (LAI), intercepted photosynthetically active radiation (PAR) under the canopy, plant height, and biomass yield. Field emergence index differed among genotypes for early and normal seeding dates but values were greater for normal- compared to early-seeding date. PAR and LAI were affected by seeding date at 58 days after seeding but not in later growing stages. At early vegetative stages, NDVI was affected by seeding dates. Since seeding date did not affect chlorophyll content at any time, results indicate NDVI is likely a better measurement of plant vigor and growth at early vegetative stages than chlorophyll content. Seeding date main effect was significant for plant height at the second harvest. Plants seeded later in the season were taller than those seeded earlier, when averaged across genotypes and locations. Total dry matter yield was significantly different for seeding date, genotype, and genotype by seeding date interaction. In the field, cv. SPX-901 was among the best yielding (7.32 tons/ac) with Forage King, Hay King, and 1990 producing above average or similar yields for both dates. Results suggest seeding these earlier than normal did not affect crop performance and yield. Since some commercial cultivars have increased cold tolerance and yield when planted earlier than normal, they may have utility for breeding cold tolerance into forage sorghum adapted to grow in the NCR as forage or feedstock for bioenergy.