Increasing Sorghum Cold Tolerance

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BACKGROUND:

Sorghum is an important crop for the Great Plains, as well as many other regions of the world, because of its drought resistance and water-use efficiency, low-input requirements and suitability in crop rotation. Although sorghum is more tolerant to cool temperatures than other warm-loving cereals, it is still sensitive to temperatures lower than 15 °C. These temperatures occur in the Great Plains primarily during germination and early stages of vegetation. Therefore, development of hybrids with increased tolerance to cold temperatures during germination, emergence and early plant growth is beneficial for sorghum cultivation in such areas and its extension in northern regions of the United States.

Some studies have shown that sorghum cold-tolerant cultivars had optimum temperatures for growth that were 6 to 10 °C less than those of cold-susceptible ones, and they maintained respiration rates that were 20 to 25 percent higher. Preliminary studies at the Texas AgriLife Research Station at Bushland have shown respiration rates of germinated seed are positively correlated with germination and elongation rates. Identification of a metabolic process, i.e. respiration, associated with sorghum germination, elongation and early season vigor holds potential for development of less empiric selection of cold-tolerant genotypes in a breeding nursery and, at the same time, can elucidate the physiological bases for cold-tolerance in sorghum.

RESULTS:

Our data show there is genetic variability for the respiration, germination, elongation and relative growth rate in sorghum seedlings and that these traits are correlated. Therefore, selection for higher respiration rate in order to improve early season vigor (germination, elongation and growth rate) in sorghum genotypes is feasible.