Height Mutations in Commercial Grain Sorghum

Characteristics Of Height Mutations

In grain sorghum fields, it is not uncommon to find random plants that are significantly taller than the rest of the crop. While this can be unsightly to growers, it is widely accepted that they are of little consequence, and do not cause significant yield loss.[1]

There are five groups of variants, or off-types, in commercial grain sorghum: 1) grain off-types, 2) height mutations, and 3) outcrosses of forage sorghum, johnsongrass, or shattercane. The first three listed, while not desirable to the eye, are essentially harmless. Outcrossing with johnsongrass or shattercane could potentially lead to weed problems; however, the frequency of either occurring is considered relatively low.

Figure 1. Height mutations in grain sorghum.

Height mutations are the most common off-type and can occur naturally when crossing two inbreds. They are genetically identical to the product except for one gene that has mutated to a form that results in a taller plant which has the same grain color and head type. The main drawback is field appearance from the lack of uniformity. There is an increased tendency for these taller plants to lodge, and they may get knocked over by the combine reel or get wrapped in the reel during harvest. Height mutations do not shatter their seed, and do not develop into a weed problem in future years.

Grain sorghum plant height is a measurable trait that is controlled by four major genes. Grain sorghum products utilize recessive dwarfing alleles (a version of a gene) at three of the four major genes which promote short plants and one in a form that promotes taller plants.[2] Therefore, typical US grain sorghum products are called 3-dwarf products. However, one of those recessive genes is somewhat unstable and can revert to the tall form at a relatively low frequency. The result is a taller plant that is called a height mutation. The height difference can be about 1 to 2 feet (Figure 1), depending somewhat on growing conditions. Using the same terminology as above, these would be considered 2-dwarf plants. On average, it is expressed in about 1 to 2% of the crop and only affects the visual aspects of the field.[1] A sorghum plant with zero dwarfing genes could be about 9 to 12 feet tall or more.

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Managing height mutation in sorghum seed production

There are differences between grain sorghum products in the frequency of height mutations that occur. Products that produce very high frequencies of height mutations are eliminated during research and testing. Rouging of tall mutant off-types in a seed production field is often required to help manage the frequency of height mutations; however, it does add to the cost of goods of that product. Mutations can be reduced, but not eliminated by rouging. Growing conditions in the production field can influence the effectiveness of the rouging operation since good growing conditions such as adequate water and moderate temperatures, promote good height expression and allow for accurate identification and removal of tall plants. Conversely, more stressful conditions, water limitations and high heat, lead to poorer expression of height and less accurate removal of tall plants.

Sources:

[1]McClure, A. University of Tennessee Extension. 2015. Tall plants scattered in your grain sorghum? Tall Plants Scattered in Your Grain Sorghum? - UT Crops News

[2]Tuinstra, M. New stable-dwarf sorghum varieties. Purdue University, College of Agriculture. Stable-Dwarf Sorghum (purdue.edu)

Web sources verified 4/3/2023.

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