

Lodging resistance in sorghum

Defensive traits are a plant's ability to cope with stress caused by environmental factors such as extreme temperatures, diseases and lack of moisture.

Craig Choice, Pioneer Hi-Bred Australia's sorghum product manager, says Pioneer's modern grain sorghum hybrids contain defensive traits because growers have said they consider the most important factor in hybrid choice to be consistent, harvestable yield.

"No season is the same so we have bred our new G series grain sorghum hybrids to contain high levels of as many defensive traits as possible," Craig says.

Defensive traits include cold tolerance, midge tolerance and disease resistance but he says one of the most important is lodging resistance. He says lodging can impact greatly on final yield, and in severe cases, it can lead to total crop loss.

According to Dr David Jordan, the principal sorghum breeder with Queensland Primary Industries and Fisheries, between 20 and 30 per cent of sorghum crops are affected by some degree of lodging each year, with considerable variation between regions, soil types and seasons.

High yields, more risk

David says high yielding crops are more at risk because they have higher demand

for assimilate (nitrogen and carbohydrate) to fill their grain.

He says lodging can occur with all grain sorghum hybrids but it is more severe in seasons with 'soft starts and hard finishes'. This is when the crop sets up high yield potential but moisture stress at the end of the season makes the plant move more of its reserves from the stem, roots and leaves to try to fill the grain. This leads to leaf senescence and, in severe cases of moisture stress during grain fill, reduced grain size and increased screenings.

David says stem breakage leading to lodging is also common. This is caused by weakening of the stem from senescence and is often accompanied by an invasion of disease organisms causing fusarium stalk rot and charcoal rot. These diseases further weaken the stem increasing the severity of the lodging. He says if plant health can be maintained, even when there is moisture stress at the end of the season, then lodging will be reduced because the plant will have less need to draw on its reserves in its leaves, stem and roots.

David says that grain sorghum hybrids with the staygreen trait are able to maintain green leaves and stems for longer than those without this trait.

"Our experiments indicate that there is little or no trade-off in yield with hybrids containing the staygreen trait in a year

with a 'soft finish'. But in a year with post-flowering drought, staygreen hybrids generally have increased yield and grain size compared with similar hybrids without the trait."

Dr Malcolm Ryley, principal plant pathologist with QPI&F, says there is also evidence that staygreen hybrids have better tolerance to invasion by charcoal rot pathogens than non-staygreen hybrids.

Commercially available

Craig Choice says that grain sorghum hybrids with high levels of staygreen have only recently become commercially available – two of these are Pioneer hybrid G56 (released in 2008) and new Pioneer hybrid G99 (released in 2009). He says Pioneer's breeding trials over several years and recent commercial experience have shown that these hybrids are less prone to moisture stress lodging.

Craig says staygreen hybrids will resist senescing at the end of the season so they require different management to other hybrids to prepare them for harvest.

"Glyphosate is typically used by grain sorghum growers to desiccate crops and to stop stubble regrowth using up soil moisture after harvest. Staygreen hybrids can also be sprayed out with glyphosate but they may take longer to dry down for harvest."



A non-staygreen hybrid showing crop lodging in Central Queensland after a dry finish to the season (left). Note the sprouting in the rows from sorghum heads on the ground. Right: In the same paddock the staygreen hybrid is showing excellent standability.