



# AVOIDING LODGING AND BRACKLING IN SPRING BARLEY



 **BASF**

We create chemistry



# INTRODUCTION

Lodging in spring barley has become more common in recent years.

Several factors drive this, including:

- 1) Spring barley yields have increased by about 0.4 t/ha per decade since the 1980s
- 2) Almost all varieties have a moderate or low lodging resistance score of 7 or less

**Early severe lodging can reduce yield by up to 50%** and even late brackling has been shown in ADAS trials to reduce yield by up to 1.4 t/ha.

Lodging also causes additional costs through greater drying requirements, reductions in grain quality (e.g. specific weight and germination) and combining time.

Managing crops to minimise the risk of lodging should therefore be a priority.

## Mechanisms of lodging

Three types of lodging commonly occur in spring barley:

- **Root lodging:** When the root anchorage system fails
- **Stem lodging:** When the stem buckles
- **Brackling:** When the upper third of the stem buckles

### ROOT LODGING



### STEM LODGING



### BRACKLING



**BASF**  
We create chemistry

The primary cause of lodging can either be a weak root anchorage system, weak stems, and/or a high leverage force exerted on the stems and roots arising from heavy yield and/or tall plants.

The greatest yield losses are usually caused by early lodging, which is often root lodging caused by rainfall softening the topsoil.

**Only a few mm of rain are needed to weaken the topsoil enough for root lodging.**

The likelihood of stem lodging or brackling increases as the crop matures because stems become progressively weaker.

### **Crop management to minimise lodging risk**

Several management factors have a large influence on lodging risk including variety choice, plant population density, nitrogen (N) fertiliser rate and timing and plant growth regulators (PGRs).

A series of field trials conducted by ADAS have quantified the effect of these management factors on the varietal lodging resistance score – see Table 1 below.

This summarises the trade-offs between managing crops for high yield and low lodging risk and quantifies how much crop management can reduce lodging risk – illustrated in Figure 1.

**TABLE 1. EFFECT OF MANAGEMENT FACTORS ON THE VARIETAL LODGING RESISTANCE SCORE**

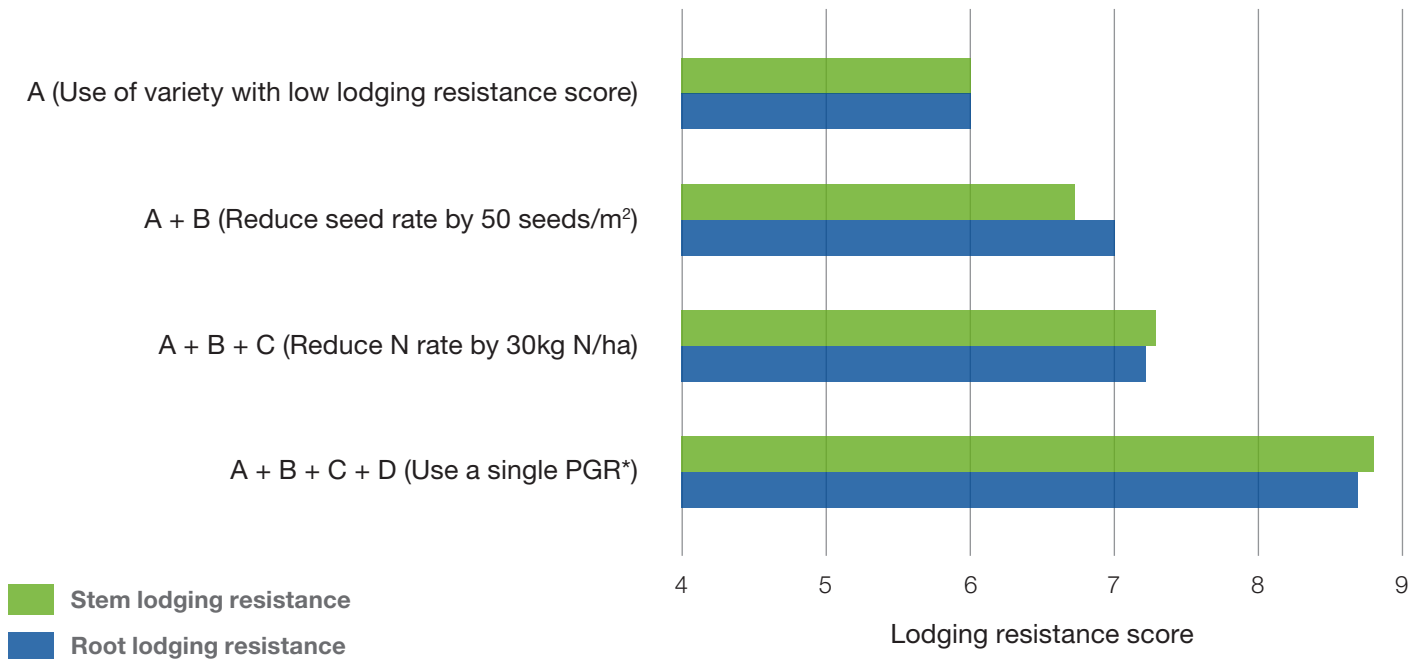
	Effect on the varietal lodging resistance score	
	Root lodging	Stem lodging
Decrease seed rate by 50 seeds/m <sup>2</sup>	Increase by 1 point	Increase by 0.75 points
†Decrease N rate by 30 kg N/ha	Increase by 0.3 points	Increase by 0.6 points
††Delay 1st N split from seed bed to tillering / GS30	No effect	Increase by 1 point
A single PGR application	Increase by 1 to 2.5 points	Increase by 1 to 2.5 points

† Reducing N rate by 30 kg N/ha would be expected to reduce yield by 0.2 t/ha on average, compared with the N rate recommended by RB209.

†† This treatment reduced yield by 1.2 t/ha in field experiments.



**FIGURE 1. EXAMPLE OF THE IMPACT OF CROP MANAGEMENT ON LODGING RESISTANCE**



\*Assume PGR shortens height by 8cm

**Reducing crop height by just 5 cm is sufficient to increase the variety lodging resistance score by one point**, which in turn can reduce the risk of lodging from one in four to one in seven years.

A single PGR application generally reduces height by between 4 and 8 cm, with shortening as much as 14 cm possible. Even greater height reductions are possible with sequential applications at for example GS30 and GS37.

PGRs containing gibberellic acid inhibitor active substances are particularly effective at shortening lower and mid internodes, with ethephon containing PGRs effective at shortening mid and upper internodes.

**PGRs that shorten upper internodes are effective at reducing brackling**, resulting in yield increases of up to 0.7 t/ha in severe brackling conditions.



**BASF**  
We create chemistry

## Predicting lodging risk

**Crops with large canopies at GS30 are more prone to lodging** because they produce plants with thin weak stems in the summer.

An increase in the green area index (GAI) at GS30 from a typical value of about 1 unit to 1.5 units would be expected to reduce the varietal lodging resistance score by the equivalent of one point.

**GAI = 1 UNIT**



**GAI = 1.5 UNIT**



It's possible to get a rough estimate of GAI from the fraction of soil covered by crop using the table below.

Fraction of soil covered by crop	GAI estimate
One third	0.5
One half	1.0
Two thirds	1.5

## Learning from experience

Previous lodging events can be a guide for future lodging risk management.

It is often the case that some fields or parts of fields are more lodging prone than others. So when lodging does occur it is good practice to identify whether the cause of lodging was stem or anchorage failure, investigate which factors may have caused this and try out different lodging risk management options.