

# Potassium (K)ey in times of drought

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**P**otassium plays many roles in the cereal plant: boosting straw strength; enabling more efficient uptake of nitrogen and other nutrients; helping the plant resist certain diseases such as powdery mildew.

In a dry year such as 2018, it also has a huge role to play in water regulation in the plant. Water regulation in cells is a big part of the plant's drought resistance strategy. Adequate amounts of K in the soil and sufficient K applied to the growing crop are crucial if we aim to give the plant every chance to realise its yield potential under the drought conditions such as those we endured this season.

For many years, the primary research focus been on the efficient use of nitrogen and phosphorus on farms. However, in the last three years in Wicklow, Teagasc has been conducting trials on potassium too. This year, another trial is being carried out in spring barley to further explore the relationship between K and grain yield, grain quality and straw quality.

## Trial site

The trial is on the tillage farm of Clinton Brownrigg, just outside Rathdrum, Co Wicklow. Clinton farms 60ha, primarily spring barley, with some winter barley, maize and grass. The site chosen for the trial is a field that was in grass for the last seven years.

A number of cuts for silage were taken each year from this field which led to a gradual decline in the soil K level. A recent soil test confirmed that the soil K level was low at 47 mg/L (Index 1). The soil type is a light shingly shale soil, which is prone to drought.

## Knowledge transfer and on-farm trials

For the past few years, Teagasc has carried out some very important on-farm trials on tillage farms in Wicklow. In 2017, a K trial on spring barley near Arklow generated some much needed information that can greatly help the tillage industry.

Yield responses of up to 4.5t/ha



A trial was carried out in spring barley this year to further explore the relationship between K and grain yield, grain quality and straw quality.



Martin Brennan, Teagasc Oakpark, cutting the spring barley K trial in Rathdrum.



Dr Patrick Forrestal, Johnstown Castle, assessing the level of straw brackling in the K trial.

were recorded showing the potential yield losses that can occur when soil K fertility is neglected.

Tillage KT groups from the south-east region all visited the trial site and were greatly impressed with the findings. The trial site hosted a num-



Host farmer Clinton Brownrigg.

ber of events for the local trade and industry representatives.

Potassium plays a major role in maintaining the water content and hence the turgor (rigidity) of each plant cell. A large concentration of potassium in the cell sap (i.e. the liquid inside the cell) creates conditions that cause water to move into the cell (osmosis) through the porous cell wall.

Turgid cells maintain the leaf's vigour so that photosynthesis can proceed efficiently.

Potassium helps to ensure that the salt concentration within the cell sap is correctly maintained, helping the plant to combat the adverse effects of drought.

## Other potassium functions

If a soil has inadequate levels of K, other nutrients such as nitrogen will not be taken up by the plant as efficiently. In a spring barley scenario, the excess nitrogen not taken up by the plant remains in the soil after harvest as nitrate, and risks being lost.

In 2015 in a spring barley trial in Oak Park, Mark Plunkett Teagasc soil nutrition specialist, observed that plots which received no K fertiliser developed high levels of powdery mildew disease. This site had a low soil K level (index 1). Similar findings were observed in a winter barley trial in Wicklow in 2016. This reinforces considerable previous research that suggests potassium boosts the plant's

immunity against disease.

Applied potassium also helps to reduce straw brackling in barley at harvest time where the soil K level is low. Straw brackling occurs when the straw breaks or kinks along the stem as the straw dries out and becomes more brittle approaching harvest. This was observed in 2016 and 2017 in the Teagasc K trials.

## Results from the 2017 spring barley K trial

There was a very large yield response to K fertiliser in 2017. The site had extremely low levels of soil K (26 mg/L). Applying just 40kg K/ha lifted the untreated yield by 4.5t/ha. But the yield kept rising as K applied was

increased by another 40kg/ha.

As levels of K fertiliser applied increased, the percentage of brackling reduced considerably.

## The 2018 spring barley K trial

While 2018 plot yield results are not available yet, it is expected that a significant yield response to the application of K fertiliser will be observed again this year.

As the initial soil K level was slightly higher than in 2017, the yield responses may not be of the same magnitude. Brackling differences were not as pronounced in the 2018 trial, however the zero K plots could still be visually observed as having more straw brackling.