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Summer Open Days 2016

Don’t forget to take advantage of the 2016 Summer Open Days which promise to provide an excellent opportunity to hear the latest technical presentations, and to meet industry colleagues and trade exhibitors.

Wissington
21st June

Wimblington
March
Cambs

Bury St. Edmunds
23rd June

Ixworth Thorpe
Bury St. Edmunds
Suffolk

Cantley
28th June

Morley
Wymondham
Norfolk

Newark
30th June

Hibaldstow
Brigg

BASIS / FACTS CP/43853/1516/g
2 CPD points (1CP, 1E)

NRoSO NO461497f
2 CPD points
British Sugar update

Currently it’s difficult to read a newspaper or watch TV without seeing sugar being blamed as the sole cause of obesity in the UK which is misleading and confusing for consumers. This is underlined by the fact that the Government’s own statistics show that total sugar consumption per capita in the UK has fallen by over 12.5% since 2001(1) whilst obesity has risen over the same period.

You may remember towards the end of last year Richard Pike, Managing Director outlined, in the winter edition of the Beet Review, the actions we at British Sugar are taking in response to the confusion around the role sugar can play in the diet and some of the misleading information published in the media.

Twelve months on from the launch of the ‘Making Sense of Sugar’ campaign and given the interest shown by you at the recent NFU Sugar/British Sugar Grower’s event in Peterborough, I thought it would be timely to update you on the progress that’s been made so far.

Over the last year we have been actively engaging with opinion formers and other forums to bring greater balance to the wider obesity debate. The campaign has certainly achieved its aims so far. 1.5 million more adults believe sugar can be part of a healthy balanced diet – now totalling 40% of the general population. In addition 2.5 million more adults now understand there is no such thing as ‘good’ or ‘bad’ sugar and despite the amount of current misinformation regarding sugar, only one person in ten now believes that sugar is the lead cause of obesity.

We have also provided a further unrestricted educational grant to 2020Health, an independent social enterprise ‘think tank’ to develop their second report ‘Fat Chance’, which was published earlier in November. Their first report was published towards the end of last year ‘Careless Eating Costs Lives’. Both of these reports demonstrate the extent to which obesity is a multi-faceted and complex issue. There

BBRO update

BBRO has always focused on developing the science behind the beet crop, working closely with a range of technical specialists including seed breeders and chemical specialists to provide UK growers access to the latest technologies and expertise. We keep growers to harness their interest, ensuring we develop every opportunity for them to understand and engage with the science directly. We are therefore restructuring the business to improve the accountability of BBRO and a route for direct input and outcome for the UK sugar beet industry.

Consequently, in June this year, we launched the BBRO Stakeholder Board. Its remit is to provide direction and guidance on the future areas of work and help to develop our knowledge exchange programme. The Stakeholder Board is chaired by Alison Lawson a farmer and contractor in the Diss area, she is supported by fellow farmers Mark Fletcher and Simon Smith; both previous participants of the Sugar Industry Programme (SIP) and passionate sugar beet growers. Dr. Simon Bowen from AB sugar brings a range of industry experience and a link to international research, whilst Paul Simmonds and Nick Morris from British Sugar provide a link to the factory teams and a remit for yield improvement.

Increased engagement with growers is particularly important to us and we are pleased to welcome Suzie Emmett of Green Shoots Productions to the Board. Suzie brings a wealth of knowledge and experience which I am sure will be required as we develop our communications plan going forward.

NFU update

Growing beet after quotas – the options

The 400 growers who packed into the East of England Showground on 13th November left with a clearer picture of how new contracting arrangements may give growers choice when the EU sugar regime ends on 30th September 2017. With negotiations on the horizon for the first beet crop in this liberalised market, NFU Sugar and British Sugar are wasting no time in trying to ascertain appetite amongst the grower base for how they are paid for their beet.

No one really knows how the EU sugar market will develop following the end of quotas, although what we do know is that the EU can produce and export as much sugar as it wants. Martin Todd, MD of sugar consultants LMC International, set the scene with his view for ‘Life After Quotas’. He described that with cane yields flat, EU beet yields had grown by 60% since 1995 and were competitive with the world market. He believes that efficient growers and processors will be the linchpin to success within a continuing volatile market, and his view was clear – “contracting options for growers will be key in maximising the industry’s potential in this new environment”.

Valerie Vercammen, General Secretary of the Belgian Beet Growers’ Association spoke of how the end of quotas is chaired by Alison Lawson a farmer and contractor in the Diss area, she is supported by fellow farmers Mark Fletcher and Simon Smith; both previous participants of the Sugar Industry Programme (SIP) and passionate sugar beet growers. Dr. Simon Bowen from AB sugar brings a range of industry experience and a link to international research, whilst Paul Simmonds and Nick Morris from British Sugar provide a link to the factory teams and a remit for yield improvement.

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Valerie Vercammen, General Secretary of the Belgian Beet Growers’ Association spoke of how the end of quotas
is no silver bullet to solving the obesity crisis and this is why
we continue to believe that collaborative action is required
to find real and workable solutions.

The Making Sense of Sugar website has also evolved
significantly and now includes:
- Videos – From getting to grips with sugar to labelling and
  lunchbox ideas;
- A Blog – A running commentary from us and a place for
  leading experts to post their thoughts;
- A Guide to Sugars – helping people understand the calorie
  and sugars breakdown of some everyday kitchen and seasonal
  favourites;
- Twitter – 500 followers already and rising steadily; and
- Quizzes – helping separate fact from fiction in an
  informative but fun way.

We remain committed to balancing the debate and educating
the general public by providing clear, simple advice on healthy
eating and the role sugar can play in the diet all based on
robust science.

We have an excellent home grown sugar industry in the UK
that we are rightly proud of. We support 13,000 jobs in the
regions we operate and contribute approximately £1 billion to
the economy on an annual basis. Let’s not let misinformation
confuse consumers and all be advocates for this superb
industry of ours.

To find out more about the campaign please visit
www.makingsenseofsugar.com and for all the campaign news
follow @senseofsugar.

Colm McKay
British Sugar
Agriculture Director

Each member of the stakeholder board has an area of
responsibility which listed below:
- Outward facing communications – Susie Emmett and Paul
  Simmonds
- Internal communications – Nick Morris
- Variety Programme – Mark Fletcher
- Knowledge Exchange – Simon Bowen
- Farm Innovation/grower trials – Simon Smith
- Project accountability – Alison Lawson and potentially
  Debbie Sparkes.

Dr. Debbie Sparkes is a scientist based at Nottingham University
and will be an integral part of our next phase of development
which is the launch of the BBRO Technical Board. This Board
will focus on the science: ensuring research meets the needs of
the industry, providing robust quality data and ultimately
delivering the key messages for delivery directly to growers.

We hope that growers will make the most of the opportunity
to meet the BBRO team and Stakeholder Board at the
forthcoming Technical events in February.

Colin MacEwan
Head of BBRO

was affecting negotiation in her country – “Beet growers are
entrepreneurs – they need a profit margin, with a beet price
that must be remunerative to cover both cost and profit. It
must also be competitive”. Recognising that the processor has
a profit to be made too her position “is to defend the fair
division of added value under the IPA”. Laura Rous, NFU Sugar
board member described that for her farming business the
preference for price stability is important: “If possible, a 3 to 5
year fixed contract would be something we would like. If the
option not to lift early wasn’t available, then we would have
to think very hard about whether we would want to
grow beet”.

So what options could be available for growers? British Sugar
MD Richard Pike described four scenarios: Longer term, multi-
annual contracts, a beet price with a sugar market linkage, a
price linked to alternative arable crops and a price linked
to the choice of delivery date. William Martin, NFU Sugar
chairman affirmed that the existing annual contract
announced in advance would remain, along with the NFU’s
right to collective negotiation. He also stressed that those
currently growing will have first opportunity to contract post
2017. With over an hour of questions, there is no doubt that
growers have thought about, and are ready to face the
opportunities and risks that 2017 brings.

The meeting at the Showground was only the start of
involvement with growers in readiness for the end of quotas.
Follow up meetings have taken place in each factory
area, further probing growers’ appetite for change and
establishing what is realistic from what is unrealistic – this
is your opportunity to influence beet contracting and
pricing as part of the biggest ever change to the EU sugar
market. Talk to your NFU Sugar board member or email
beet growers@nfu.org.uk or speak with your British Sugar
area manager.

Pamela J. Forbes
NFU Chief Sugar Adviser
Vydate update: latest consequences for FLN control in sugar beet

As all growers are acutely aware, due to the fire at the DuPont production facilities in North America and the sad loss of four lives, there will be no fresh supplies of Vydate for spring 2016. In sugar beet, Vydate (active ingredient oxamyl) is used by approximately 5% of growers in the Bury St. Edmunds, Cantley and Newark factory areas. However, up to 25% of growers can use the product in the Wissington factory area (British Sugar Specific Field Survey data). Vydate is used primarily for free living nematode control (FLN; Longidorus and Trichodoris species), particularly on the lighter sandy soil types; it also gives early aphid control too. Unfortunately, sugar beet growers who currently rely on this product for nematode control in beet have no alternative methods available and should consider the consequences and implications for their rotation for the coming season.

Usually, FLN tends to be patchy in nature but those growers with an issue on farm are acutely aware of the consequences and impact on final yield without control options. If spring conditions are dry and the water table low, then beet are normally able to grow without any significant direct feeding damage, and these pests will not cause major economic problems. However, if the spring is wet and fields are at full water holding capacity, then nematodes are higher in the soil profile and closer to the emerging roots; they are then able to feed directly on the roots causing damage. Smaller, fangy roots result at harvest, impacting on final yield.

Consequently, the BBRO recommends that any suspected fields coming into beet production during 2016 (or growers at risk from FLN) should be assessed to determine the extent of the FLN burden. This can be achieved by undertaking soil tests now; these can be organised and arranged by your local British Sugar area manager. It should be remembered that, even when nematicides are available, established FLN thresholds exist (e.g. Use Vydate when over 1000 Trichodorus or 100 Longidorus nematodes are found per litre of soil) which should be used to guide product usage.

Unfortunately, there are currently no alternative nematicides approved for sugar beet to replace Vydate. An emergency off-label approval for an alternative nematicide will only be considered and granted by CRD of the H&S Executive if deemed essential and proportionate. This would have to be supported by a relevant data package from a supporting company and submitted on behalf of the sugar industry by the BBRO.

With this in mind, the BBRO has received several enquiries from growers and agronomists as to whether nematicides approved in other crops such as nemathorin (Fosthiazate), Mocap (ethophrophos) or NEMGuard (garlic extract) can be used in sugar beet. Currently, none of the companies who own these products have registered them for sugar beet, although the BBRO is currently in discussions to ascertain whether these products would have value for affected growers in the future. If necessary, the BBRO will undertake efficacy trials but are conscious that this does not solve the immediate problem for the commercial crop. Also, we are aware that it is unlikely that the above products will be registered for beet in the immediate future and tests carried out with Nemathorin in the past on sugar beet showed that crop safety was not sufficient to justify development in this crop. While varieties have changed over time it highly unlikely that the product would be adequately safe on current varieties to be commercially viable.

The current Vydate issue highlights an ongoing concern for overall nematode control (regardless of crop) as pressures mount on remaining products and the pipeline to identify new active ingredients becomes harder to achieve. Alternative methods or cultural control systems are needed and the BBRO are encouraged that breeders are evaluating their germplasm for tolerance or resistance to the FLN complex. In addition, biofumigant cover crops may offer an alternative approach too, although a series of experiments would be needed to verify any potential control/suppression benefits. Again, any of these new approaches will not solve the immediate problem.

The BBRO will continue to monitor the current Vydate situation very closely and, if any further information or data come to light to support any product for the 2016 campaign, the industry will be notified immediately via the BBRO bulletins.
The beet chaser trailer

By Philip Ecclestone, British Sugar plc

The transport of agricultural produce at harvest time has advanced greatly in the last one hundred years or so and we have come a long way since the horse and cart and the early tractor and trailers. Whilst we are still reliant on the tractor, today’s machines are considerably bigger, can pull large trailers, and make full use of modern electronics and GPS technologies.

For many of today’s crops, the main objective at harvest is to get the produce from the field to a store or a processing plant as fast as possible. Time is of the essence, either to satisfy the urgent demands of the processor or simply to turn the field around for the next crop while the weather permits.

At one time, carting three tonnes of loose, bulky material behind a ‘little grey Fergie’ was a major step forward. Today, we want to haul considerably more, up to ten times that weight, so we need tractors approaching 200 hp. These heavy tractors require wider tyres to reduce the ground pressure and thus prevent damage to the soil structure; an issue that never occurred with the horse and cart and seldom with the early tractors. With bigger fields and farms, produce is now transported a lot further than previously, so fleets of tractors and trailers are needed. This often involves travel on the road, so mud can be a real danger for other road users, particularly during the autumn and winter.

Sugar beet is no exception, with demand for transport having developed tremendously in recent years. By its very nature, sugar beet is bulky and, in some instances, more than 100 t of dirty roots are produced on a single hectare: last season the average adjusted yield in the UK was almost 80 t/ha. As yields climb, so more transport is needed to deliver the crop, either to a clamp or store or directly to the sugar beet factory. In the UK the average distance from farm to factory is 28 miles, with the majority of beet being delivered by lorry.

Transport in field

In the field the tractor and trailer still dominate as they can operate when conditions worsen. Whilst today’s harvesters can unload themselves to build clamps, this is time-consuming when the primary objective should be to keep the harvester lifting the crop. These days, self-propelled sugar beet harvesters with large holding tanks are the mainstay, operated mainly by contractors, large growers or groups of growers. Usually six rows are lifted at a time, but some larger machines can lift nine or even twelve. High yields mean that a lot of material needs to be collected, mainly on the move, and transported to either an in-field store, normally in the form of a Maus clamp, or back to a yard or area where a clamp can be built, usually on a concrete base. Tractors and trailers perform...
these functions very well, but could the logistics of the operation be improved to prevent damage to the soil and engender road safety?

**The Chaser trailer**

In essence, the idea of having a ‘chaser’ or transfer trailer is not new; the concept has been implemented in combinable crops for a number of years. Here the objective is to have an outfit which can carry a large load, has wide low-flotation tyres but stays in the field where it collects grain from the combine and then takes it to waiting trailers on the edge of the field or on the roadside. These tractors and trailers then transport the produce to the store, mainly along public roads. This concept has now been extended to handling maize silage and, more recently, sugar beet.

There are a number of different types of chaser trailer available on the market, and one of the first to be used as a ‘beet chaser’ is currently being operated this campaign in the UK. It is a product of Hawe-Westen GMBH & Co. in Germany, and is under evaluation by Suffolk Farm Machinery; they have one on a long-term test with Richard Ivatt who is using it alongside his six-row Holmer sugar beet harvester in the Spalding area.

The chaser trailer has a flat floor with floor chains, which move the beet to the front of the trailer for unloading with a 4.5 m elevator. Its holding capacity is 32 t, spread over three axles and it uses wide flotation tyres to support its weight and prevent the soil from being rutted and damaged. This large capacity means that a large self-propelled harvester, like a Holmer, can completely unload into a single chaser trailer; this would be impossible using a conventional, smaller trailer.

Unlike conventional trailers, a chaser has two options to unload in the field: it can produce a conventional heap or build a long ‘Maus clamp’, raising or lowering the elevator to adjust the height and width. Running alongside the clamp, it eliminates the problem of rutting under the clamp that sometimes occurs with conventional trailers.

If the sugar beet is being carted off to a store, on concrete back at the main farm for example, the chaser trailer can unload into trailers parked on the headlands, or even on the roadside. By lowering the elevator, the drop height is decreased to reduce beet breakage and bruising. These tractors and trailers no longer need to come into the field where, under very wet conditions, they could damage the soil structure; this also avoids excessive mud coming out onto the road and causing possible safety issues.
Another attractive feature of chaser trailers is a full body swap system chassis, which enables them to be highly versatile throughout the whole season. For example, the beet chaser body could be removed and a grain chaser, self-unloading silage body, muck spreader, tipping body or a water bowser could be added. The whole operation only takes 15 to 20 minutes to swap one body for another.

The price of the 32 t model is £91,000, although a smaller 23 t chaser trailer is available for £75,500.

To improve traction when conditions deteriorate it is now possible to fit rubber tracks. These have just been released following a recent development with Claas in Germany.
The role of sugar beet in controlling black-grass

This article reviews current knowledge on combined cultural and chemical control of black-grass in the sugar beet crop. Methods available in the 'out of crop' period are discussed together with control within the crop including the effective use of herbicides drawing on results from recent BBRO black-grass work. Current BBRO advice is summarised and case studies from two growers highlight how the crop is helping in the overall strategy for reducing black-grass levels on their farms.

The problem

The prevalence of early autumn-sown cropping established by minimum tillage is considered the main reason why black-grass is an increasing problem in the UK. (Ref. 1) Black-grass plants tend to emerge alongside those crops, with the bulk of emergence (89%) occurring in early autumn from seeds within 5 cm of the soil surface. More than 50% of winter cereals and virtually all oilseed rape is drilled by the end of September, and herbicides no longer offer reliable control of black-grass emerging in these crops, as multiple-herbicide resistance occurs on most farms.

Black-grass is favoured by water-retentive soils, so tends to be more of a problem on heavy clay or silt rather than light sandy soils. In recent years, levels of black-grass seen in sugar beet on some of the lighter soil types as well, has increased concern (Pic. 1).

Populations can decline rapidly if seed return is prevented or minimised; however 97% control is needed to prevent weed populations from increasing in a non-inversion tillage system (Ref. 1).

The benefit of spring cropping

Spring cropping offers the best control of all non-chemical options, giving a consistently good reduction in weed infestation (88%) in trials at Rothamsted over five different years between 2001 and 2012 (Ref. 2).

Whilst crops can be established outside the main black-grass emergence period, the key is to manage ‘out of crop’ time effectively to reduce black-grass numbers prior to drilling, and then to follow with effective integrated control in the spring crop itself.

Managing ‘out of crop’ time for sugar beet

Shallow cultivating in the autumn followed by consolidation should induce seed to germinate within the top 5 cm. Seedlings can be sprayed off before the three-leaf stage and the process repeated as necessary during the period of autumn germination. It is important to ensure that glyphosate spraying is effective; a summary recently produced by the AHDB, and supported by the Weed Resistance Action Group (Ref. 3), gives guidelines on minimising the risk of glyphosate resistance.

An opportunity may arise again in the spring to use stale seedbed techniques; however this can be more difficult as often the black-grass will not appear until the crop does. A clean seedbed is essential and any black-grass present should be controlled by spraying off, or during seed-bed cultivation (generally the latter is considered less reliable and only effective if seedlings are very small and conditions are dry).

Many growers plough as a primary cultivation before sugar beet; this can effectively bury the problem from a bad seed shed, allowing a clean start, but may bring up some old seed from the past. However black-grass seeds are relatively non-persistent in the seedbank (74% average decline per year) (Ref. 1), so usually fewer old, buried seed are brought to the
surface, especially if ploughing is done on a rotational basis, such as once every three to six years.

The use of cover crops to maximise black-grass control prior to spring drilling has gained interest and research effort, mainly in the combinable crop sector. However, it is early days, with differing opinions on techniques and levels of effectiveness, but some of the practices may be transferable and helpful prior to establishing sugar beet. Several articles have appeared in the press recently discussing general principles:

■ Use stale seedbeds to remove early black-grass flushes prior to drilling the cover crop.
■ Choose a mix of species which allows further black-grass to germinate in an open canopy initially (but see point below), yet has sufficient growth at low temperature to dry the ground and improve soil structure.
■ Opinion differs concerning whether the cover should act to inhibit black-grass emergence and suppress growth or, on the other hand, allow or even encourage it so that the seed bank near the surface can continue to be diminished when the black-grass plants are destroyed with the cover crop.
■ It is claimed that some cover crops may have a biofumigant effect which can affect black-grass populations.
■ Minimise soil disturbance when establishing the spring crop.

**Using herbicides effectively for black-grass control within the sugar beet crop**

Black-grass control in sugar beet has become more difficult, due in part to resistance developing to the ACCase group of herbicides. There are three types of resistance and these can occur independently in different plants in a field or they can occur together, even in the same plant (Table 1). It is important to know the resistance status of your black-grass; this will identify which chemistry should be effective on your farm.

<table>
<thead>
<tr>
<th>Resistance type</th>
<th>Herbicides affected</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced Metabolism EMR</td>
<td>Most herbicides to varying degrees</td>
<td>Results in herbicide detoxification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Most common mechanism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Only in severe cases results in complete loss of control. Develops slowly</td>
</tr>
<tr>
<td>ACCase-target Site Resistance ACCase TSR</td>
<td>Specific to ‘fop’, ‘dim’ &amp; ‘den’ chemistry</td>
<td>Blocks site of activity. Often results in very poor control and can increase rapidly</td>
</tr>
<tr>
<td>ALS Target Site Resistance ALS TSR</td>
<td>Sulfonyleureas &amp; related herbicides</td>
<td>Blocks site of activity. Can result in poor control. Less common than ACCase TSR but increasing</td>
</tr>
</tbody>
</table>

BBRO identified non-ACCase sugar beet herbicides with activity against black-grass (Table 2) and used these in field trial programmes to:

■ determine the relative value of each component
■ better understand the best way to use them in a programme.

### Table 2 – Sugar beet herbicides with activity against resistant ‘ACCase TSR’ black-grass.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mode of action</th>
<th>Chemical family</th>
<th>Active</th>
<th>Product (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>inhibition of acetolactate synthase ALS</td>
<td>sulfonylureas</td>
<td>triflusulfuron-methyl</td>
<td>Debut</td>
</tr>
<tr>
<td>C</td>
<td>inhibition of photosynthesis at photosystem II</td>
<td>triazinones</td>
<td>metamitron</td>
<td>Betti Flo</td>
</tr>
<tr>
<td>N</td>
<td>inhibition of lipid synthesis</td>
<td>thiocarbamates</td>
<td>tri-allate</td>
<td>Avadex Excel 15G</td>
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<td>metamitron</td>
<td>Betti Flo</td>
</tr>
<tr>
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<td>inhibition of lipid synthesis</td>
<td>thiocarbamates</td>
<td>tri-allate</td>
<td>Avadex Excel 15G</td>
</tr>
</tbody>
</table>

* Maximum permitted total dose of 1.0 kg/ha ethofumesate over a three-year period on the same field.

In the BBRO trials a base post-emergence programme (Table 3) was applied alone and in combination with additional components.

### Table 3 – Base post-emergence programme – BBRO trials.

<table>
<thead>
<tr>
<th>Timing – Black-grass growth stage</th>
<th>Betanil Maxim (desmedipham + phenedipham)</th>
<th>Goltix Flowable (metamitron)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 – 1-2 lvs 0.75 l/ha 0.75 l/ha</td>
<td>0.75 l/ha 0.75 l/ha</td>
<td>0.75 l/ha 1.0 l/ha</td>
</tr>
<tr>
<td>T2 – 2 lvs 0.75 l/ha</td>
<td>0.75 l/ha</td>
<td>1.0 l/ha</td>
</tr>
</tbody>
</table>

Results from a BBRO trial in Lincolnshire in 2013, on a loam soil where 86 black-grass heads/m² were recorded in the untreated in the untreated in mid-July, showed that the base programme gave 56% control. Ethosat 500 applied pre-emergence tended to boost activity (Fig. 1). Recent work by UPL Europe Ltd. in containers has demonstrated that pre-emergence application of ethofumesate gave better control than post-emergence applications, and levels of control fell off as black-grass moved from the 1 to 2-3 leaf stage (Ref. 4). This highlights the value of the active at the pre-emergence timing. However, see BBRO advice over; it is advisable to keep back some of the total dose of ethofumesate permitted to help to boost post-emergence herbicide activity for both grass and broad-leaved weed control.

<table>
<thead>
<tr>
<th>Timing</th>
<th>% control</th>
<th>Betanil Maxim (desmedipham + phenedipham)</th>
<th>Goltix Flowable (metamitron)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>70</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>T2</td>
<td>80</td>
<td>70</td>
<td>60</td>
</tr>
<tr>
<td>T3</td>
<td>90</td>
<td>80</td>
<td>70</td>
</tr>
</tbody>
</table>

**Fig. 1 – Weed control for selected treatments (rates as l, kg or g/ha)**

BBRO – Lincolnshire 2013.
In the BBRO Lincolnshire trial control from programmes including ACCase graminicides Aramo (tepraloxydim) and Centurion Max (clethodim) was significantly higher than the base treatment (Fig. 1), even though seed collected from the untreated plots showed moderate levels of resistance (RR). Control from incorporated Avadex granules included in the trial was similar to the Goltix + Ethosat 500 pre-emergence treatment (results not presented here) but the effect was not additive where both were applied in sequence.

Post-emergence Ethosat 500 + Debut (included at T1 and T2) gave significantly better control than the base treatment alone (Fig. 2). However Debut belongs to the sulfonylurea family of herbicides and, if there is resistance to ALS chemistry in the field population, Debut could be less effective.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>% Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE + Ethosat 500 (0.6) + Debut (30g)</td>
<td>90</td>
</tr>
<tr>
<td>BASE + Ethosat 500 (0.6)</td>
<td>70</td>
</tr>
<tr>
<td>BASE + Ethosat 500 (1.0) + Debut (30g)</td>
<td>80</td>
</tr>
<tr>
<td>BASE + Ethosat 500 (2.0) + Debut (30g)</td>
<td>85</td>
</tr>
<tr>
<td>BASE + Ethosat 500 (2.0)</td>
<td>70</td>
</tr>
<tr>
<td>BASE + Ethosat 500 (1.0)</td>
<td>60</td>
</tr>
</tbody>
</table>

Results from these trials together with manufacturers’ data and field experience have helped to shape BBRO advice on herbicide use targeted at black-grass in beet:

- Tri-allate can be a useful part of a ‘stacked’ programme on soils with < 10% OM (limited data).
- Consider using ethofumesate pre-emergence with the addition of metamitron as an anti-resistance strategy. Hold some ethofumesate in ‘reserve’ for post-emergence applications.
- Post-emergence treatments containing triflusulfuron-methyl and ethofumesate appear to show useful, increased black-grass control.
- ACCCase inhibitors may offer some control, depending on degree of resistance, when used as part of a programme. Aim to use early on small black-grass (1-2 leaf). They are best applied alone and not in tank-mixes (Ref. 4).
- In the overall programme aim to include 2-4 modes of action.
- Picture 2 shows effective control of small black-grass.

Integrated control – case studies

Case studies from two growers highlight integrated methods being employed on farms to successfully deal with black-grass and outline how strategies, prior to and within the sugar beet crop, are of benefit.

Case study – South Cambridgeshire

Edd Banks farms 1,100 ha in South Cambridgeshire on a mixture of soils, from heavy boulder clay to chalk with an area of fenland black silt. Crops grown are winter wheat, oilseed rape, sugar beet, winter and spring barley and spring beans. Edd took over the farm in 2008; at that time it had endemic populations of multiple-herbicide resistant black-grass over the majority of the land. Previously, regular ploughing had resulted in difficult seeded conditions and unlevel fields that affected sprayer and spray efficiency. It had also been ineffective in burying seeds, as they were continually turned back to the surface. A change to min-till cultivations aimed to keep seeds near the surface where they could be encouraged to germinate, with ploughing only used for spring bean establishment.

In the cereal before sugar beet the combine places the chaff in a row with the straw ready for baling in order to remove as much black-grass seed from the field as possible. Shallow cultivations with a Vaderstad ‘Carrier’, two or three times post-harvest, encourages the field to green up; each flush of black-grass can then be destroyed. A primary cultivation in preparation for sugar beet follows in late October using a Vaderstad ‘Top Down’, to loosen the top 20 to 25 cm and to remove any compaction at lower levels. The soil weathered over winter and further black-grass emergence can be sprayed off in the spring prior to sowing with minimal soil movement using a Kvernland Monopill mulch drill. The aim is to avoid spring cultivations so that a fresh flush of black-grass is not encouraged.

Within the sugar beet crop a hooded band sprayer (Pics. 3 and 4) applies a desiccant to around 70% of the field and the normal prescribed herbicide to the remaining 30% over the
Sugar beet in a rotation on fields plagued with black-grass offers useful control options. There is an opportunity to integrate the use of cultural methods in combination with effectively targeted herbicides (integrated weed management). Case studies from two growers highlight different approaches on how to deal successfully with black-grass in sugar beet by taking the whole rotation into consideration.

Acknowledgements

The work of Gillian Champion and the BBRO trials’ team investigating ‘Herbicide combinations to optimise control of black-grass in sugar beet’ is acknowledged. Results from a BBRO trial conducted in Lincolnshire in 2013 are presented here.

References

Industry Sugar Beet Harvesting and Haulage Scheme

The Industry Sugar Beet Harvesting and Haulage Scheme, a joint initiative between British Sugar and the NFU, began in 2010 with pilot trials at Newark and Wissington. These proved successful, and the following year the scheme was rolled out to all four factory sites; it is now in its sixth year of operation.

How the scheme works
The scheme is voluntary and open to all sugar beet growers. Participating growers who sign up on an annual basis are paid an ex-farm price for sugar beet; they do not receive a transport allowance. British Sugar arranges to clean, load and deliver the growers’ sugar beet to the factory at its own cost and rates are negotiated centrally. British Sugar also offers growers a harvesting service for the crop. This option allows the harvesting and delivery to be fully co-ordinated (Pic. 1). Growers who do not participate in the scheme continue to receive their transport allowance and arrange their own individual contractors for harvesting, cleaning and haulage.

History of the scheme
In 2009, the NFU and British Sugar commissioned transport consultants, WSP and Transport and Travel Research Ltd, to make an independent assessment of the efficiency of the transport process, by which approximately 7 million tonnes of sugar beet are delivered from 3,500 growers to the four British Sugar factories at Bury St. Edmunds, Cantley, Newark and Wissington. The study determined the costs involved, and identified ways to improve efficiency. One of the main conclusions was a recommendation for a new operational structure, leading to a more strategic approach to managing the beet supply chain. It is from this recommendation that the idea of the Industry Harvesting and Haulage Scheme was created.

The 2015-16 campaign sees a new method of calculation of transport allowance, following the end of the 2011

Table 1 – Predicted transport allowance 2015-16 (£/clean tonne).

<table>
<thead>
<tr>
<th>Distance (miles)</th>
<th>£/tonne</th>
<th>Distance (miles)</th>
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</tr>
<tr>
<td>3</td>
<td>2.55</td>
<td>13</td>
<td>3.68</td>
<td>23</td>
<td>4.81</td>
<td>33</td>
<td>5.94</td>
<td>43</td>
<td>7.07</td>
</tr>
<tr>
<td>4</td>
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<tr>
<td>5</td>
<td>2.77</td>
<td>15</td>
<td>3.90</td>
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<td>6.16</td>
<td>45</td>
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<tr>
<td>6</td>
<td>2.89</td>
<td>16</td>
<td>4.02</td>
<td>26</td>
<td>5.15</td>
<td>36</td>
<td>6.28</td>
<td>46</td>
<td>7.41</td>
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<tr>
<td>7</td>
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<td>3.11</td>
<td>18</td>
<td>4.24</td>
<td>28</td>
<td>5.37</td>
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<td>6.50</td>
<td>48</td>
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<tr>
<td>9</td>
<td>3.23</td>
<td>19</td>
<td>4.36</td>
<td>29</td>
<td>5.49</td>
<td>39</td>
<td>6.62</td>
<td>49</td>
<td>7.75</td>
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<tr>
<td>10</td>
<td>3.34</td>
<td>20</td>
<td>4.47</td>
<td>30</td>
<td>5.60</td>
<td>40</td>
<td>6.73</td>
<td>50</td>
<td>7.86</td>
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</tbody>
</table>
Inter-Professional Agreement. The previous Euro-linked allowance is replaced by one which is linked to the true cost of haulage as determined by the Industry Scheme. This will include an additional fixed amount for cleaning and loading, therefore, will result in an increased payment to growers. The predicted increase is approximately £1.30/tonne higher than in 2014-15 (Table 1).

Numbers on the scheme

Over the six years of the scheme’s operation, its popularity has increased as growers have recognised the benefit of participating. The increasing number of growers and tonnage delivered can be seen from Figs. 1 and 2.

![Fig. 1 – The number of growers participating in the scheme each year.](image)

![Fig. 2 – The CTE and dirty tonnes delivered on the scheme each year.](image)

How can a grower get involved?

The Industry Sugar Beet Harvesting and Haulage Scheme will continue to operate for the 2016-17 campaign and in the future. As in previous years, the campaign will be split into delivery periods. Table 2 shows the delivery schedule for the 2015-16 campaign. Growers have the option to have their sugar beet crop delivered across one or more of these delivery periods. This is calculated as a percentage of their CTE entitlement, until permit allocations are made pre-campaign when the schedule is converted into permits to be delivered. There is flexibility within the scheme to match soil types and field sizes to the percentage of the crop to be delivered in each delivery period. Growers can sign up as a group to deliver the crop evenly throughout the campaign; the members of the group agree which of their crops will be delivered early, mid and late in the campaign. There is also the option for a grower to be grouped with other individuals by the local area manager, thus allowing the timing of delivery to suit individual farm circumstances. Please contact your local area manager for more details.

Growers can decide to have their harvesting done through the scheme along with the cleaning, loading and delivery of the crop. British Sugar annually negotiates a competitive harvesting rate with experienced contractors who tender for the work. For the 2015-16 campaign, the rate agreed is £71.50/acre (£176.68/ha) which includes the cost of one tractor and trailer. The grower will be invoiced through a self-bill deduction to their beet account and the contractor will be paid directly by British Sugar.

If a grower decides to participate, a scheme contract will be signed in April at crop drilling time, and British Sugar will commence the formal tender process to allocate the harvesting, loading and haulage work. In June growers will be advised of their allocated contractors who will arrange a site visit prior to the campaign. Participation in the scheme takes away the pressure on growers to negotiate competitive rates with the haulage and harvesting contractors. It also saves administration time as all invoicing will be done by British Sugar, and growers can be confident that their sugar beet will be delivered as per their agreed schedule.

There was an option on the sugar beet contract in the summer for growers to register interest in participating in the scheme; interested growers will be contacted by their local British Sugar area manager in the coming months, to discuss the delivery options. Growers who missed the earlier opportunity may contact their local area manager or the Agriculture Helpdesk on 0870 2402314 / agriculture@britishsugar.com. Communications will also be sent out in the early part of next year to explain the scheme in more detail and to invite all growers to register their interest for the 2016-17 campaign.

A grower’s perspective

James Black, of David Black & Son Ltd, is a sugar beet grower from Stowmarket in Suffolk, and is part of the Bury Beet Group management team. The group is in its second year of participation in the scheme. James explained how the growers in this group have been working together for eight years, aiming for just-in-time lifting and haulage, with a pre-planned lifting schedule co-ordinated to achieve the best agronomic and economic advantage through having an overall even delivery schedule during the campaign; therefore pre-empting the principles outlined by the industry scheme. James has found that dealing with fewer hauliers has meant permit utilisation has been optimised, which is a fundamental principle of the group. From an individual point of view, James found that his business saved on the net cost of beet transport last year, and he did not experience any disappointment from beet not being cleared when expected. On the other hand, James believes that there are still many areas to be improved from the haulier perspective. For example, longer term contracts with contractors would contribute to the group’s long term sustainability, enabling investment in the machinery required to continue to drive the industry forward.

Mark Fletcher, of R P Fletcher, grows sugar beet in Walsingham, Norfolk, and also joined the scheme two years ago after looking at the difference in costs between the haulage allowance

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Table 2 – Delivery schedule for 2015-16 (% contracted tonnes – CTE + I.C.E.).

<table>
<thead>
<tr>
<th>Campaign week</th>
<th>Week 1 - 3</th>
<th>Week 4 - 6</th>
<th>Week 7 - 9</th>
<th>Week 10 - 12</th>
<th>Week 13 - 15</th>
<th>Week 16 - 18</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>% contracted tonnes</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>
paid on clean beet and the haulage rate paid on dirty beet. Although he received an excellent service from his previous haulier, for Mark it was a price-driven decision to join the scheme. Mark enjoys the flexibility that the scheme provides but feels that the communication between British Sugar and the grower could be more interactive around choices and planning of deliveries. As long as the flexibility remains, and Mark sees a benefit to his business, then he plans to continue to participate in the haulage scheme in the future.

What does the future look like?

In 2014, a joint NFU and British Sugar Logistics Working Group was formed to look at further opportunities to improve beet haulage efficiency, following the success of the improvements made on the advice of the Transport Efficiency Study in 2009.

One of the key areas of focus is a project to measure the potential inefficiencies of the current process. A series of harvesters, loading machines and lorries have been fitted with GPS devices to generate a series of reports. These reports will be used to increase the understanding of the current efficiency of the process and identify where there might be an opportunity for improvements to be made. Communication between all parties involved has also been recognised as an important factor in success, and several projects are being planned to investigate this.

By understanding the level of efficiency that currently exists in the harvesting, cleaning, loading and haulage of the crop, the industry can continue to work together to further co-ordinate these operations alongside the processing. A reduction in inefficiency will maximise the yield and remove any unnecessary costs to all stakeholders in the industry, resulting in a better return for growers from the sugar beet crop.

SUMMARY

The Industry Harvesting and Haulage Scheme has grown in size each year, and it is planned that this will continue in the future. The scheme delivers a series of potential benefits to growers and contractors. There is a choice for growers in how they deliver and are paid for their crop: whether it includes or excludes transport allowance. The grower agrees for the crop to be delivered in specified delivery periods which are flexible to suit their farm. For the contractors, the scheme provides a schedule of deliveries to be made, which helps with planning and co-ordination between the contracting parties. There is still work to be done to develop the scheme, and a series of projects are being planned and undertaken to continue to remove cost, and to drive the industry forward.

If you would like to find out more about the Industry Harvesting and Haulage Scheme, please contact your local British Sugar area manager.
Sugar beet growing in the Ukraine

The soils of Ukraine are legendary in global terms and the rich black organic ‘chernozems’ (black earths) have historically been the breadbasket of Europe. They constitute over a quarter of the black organic soils in the world, and are so highly productive that Ukrainian farmlands have been coveted throughout history. Chernozems can rightly claim to have been pivotal in the outcome of the Second World War: if Hitler had not split his advancing armies between a push for Moscow and an attempt to secure the fertile arable fields of the Ukraine, then Moscow might well have been captured, and the Russians defeated, over 75 years ago. These soils provide immense potential, not only for wheat and maize, but also for root crops such as potatoes and sugar beet, but only if moisture is adequate, and therein lies the crux of beet production in Ukraine. With the need to increase global food production by over 50% over the next three decades, Ukraine has a crucial role to play, despite the current political difficulties and frozen conflict in the East.

The main limiting factors in Ukrainian beet production are climatic, with yield potential limited by the inadequate rainfall in the east, exacerbating the effects of the short growing season and harsh winters. This means that beet-lifting is a race against time before the November frosts arrive and damage beet in the field. Winter temperatures can drop to minus 35°C, so late-lifting is a no-go situation that limits final yields. The main weeds are similar to the UK, with Polygonum spp. a common threat and cercospora a common leaf disease controlled by mixtures of triazoles and strobilurins. There are no GM crops grown legally in Ukraine, but an estimated 80% of the soya crop is from pirated GM glyphosate resistant seed.

The majority of Ukraine is rolling plain; only in the west and south do mountains form its border. When we started farming in the West of Ukraine in 2005, it was these Carpathian mountains that provided the key to adequate rainfall for root crop production, offering high potential for both beet and potatoes without the need for irrigation; annual rainfalls of 750 mm in Lviv Oblast being the norm, three times greater than in the East! On the dissolution of the large state collective farms following Ukrainian independence in the early nineties, most of the agricultural land was returned to the ownership of individual villagers in small 0.5 to 2.0 ha parcels. This was overdue historical justice, of a sort, for the Holodomor or ‘Holocaust by hunger’ of 1931-33 when the Stalinist Russian state starved to death over 5M Ukrainians by collectivising their farms and seizing the land to feed the Soviets.
Following independence, the individual owners lacked the finance and machinery to succeed, and much of this land, particularly in the west of the nation, lay fallow and moribund for over a decade, producing nothing other than weeds and encroaching trees! This land was secured by a small number of brave foreign investors and was remediated, aggregated and secured on long-term leases, creating large fields with many individual landowner landlords; there is a moratorium on agricultural land sales to prevent landgrabs by oligarchs or foreigners and to keep the land in possession of the locals. Land rents are from $60-100/ha and so represent good value when coupled with low labour costs. By using modern technology, including optimal variety and fertilisation, yields and sugar content can be significantly improved; up to 60 t/ha can be achieved, and even surpassed under irrigation in the south of the country near Odessa.

Though we have tripled local wheat and barley yields, improvement in the national sugar yield is proving more difficult. The sugar industry in Ukraine is in a state of decline in terms of both infrastructure and area cropped, despite increasing yields per hectare, and new investment is required. In 1990, Ukraine produced over 43 million tonnes of sugar from 1.6 m ha, with average yields of 27 t/ha, providing large exports to the Soviet bloc. This dropped spectacularly after independence, to 13 million tonnes and 17 t/ha ten years later in 2000 from an area that had halved. In 2014, the area had dropped further to only 322,000 ha, but production had increased to 15 m tonnes due to an increase in average yield to 48 t/ha of beet. For the 2015 season, production is forecast to drop further to 9.6 million tonnes, due to a 26% drop in area (to 239,000 ha) and a drop in average yield of 16%. This is an effect of both the poorer growing conditions and reduced investment in inputs, as sugar prices fell and input costs rose, due to the fall in the value of the hryvnia (UAH) and rampant annual inflation, currently running at over 50%. Sugar production in the 2015/16 marketing year may be only 1.2 to 1.3 mt, which is 38-43% less than last year, with carry-over stocks of only 550k tons. Last year 48 factories were in operation, but this year there are likely to be around 30, and production may just be in balance with consumption.

The troubled economy has led to significant problems and even failure for some large domestic and foreign farming companies who were over-borrowed, poorly managed or both. Asset prices have more than halved in the last 18 months, and there is good value to be had for the adventurous investor. Wholesale sugar prices are just over 10 UAH/kg with around 25 UAH to the pound sterling, which is only a quarter of the value ten years ago. Prices are likely to rise after harvest and into the spring. The collapse in the currency due to the war in the East of Ukraine has had severe effects on all farmers and the population as a whole, and almost 2 m refugees have fled the frozen conflict in the East. Many agricultural workers have been conscripted to fight in the East and over 8,000 people have been killed there. With the capture of Ukraine's industrial heartland, agriculture becomes even more important to the country's economy. Despite the current difficulties, the fundamentals of Ukrainian agriculture are strong, with excellent soils, low rents and labour costs and a good climate. There is no doubt that Ukraine will continue to have a strong role in providing food for the growing billions as it has done throughout history, despite the current difficulties.
Making the most of the online Beet Account

British Sugar’s online Beet Account is now used by the majority of growers for entering their sugar beet contracts and associated crop data, as well as for accessing all campaign delivery results and financial information. However, some recent working groups with growers, hauliers and NFU representatives have highlighted many features of the online Beet Account that are not currently recognised or widely used. This article provides an update on the Beet Account, with some useful hints and tips on how to get the best from it.

What is available on the online Beet Account for GROWERS

**Campaign delivery results**

The system allows all growers and hauliers to see ‘live’ results from their loads of sugar beet delivered to all factories. The system displays results from loads as soon as the sample data has been allocated to the load. Screens allow many different ‘views’ of results, including weekly, delivery-day and campaign totals along with comparisons with factory averages. It is also possible to ‘allocate’ loads to their fields of origin, so that field reports can be displayed with field yield and quality information.

- A ‘Download All Data’ button is available from the ‘Totals’ screen which extracts all data from loads delivered and will open a file (csv format) that can be saved as a spreadsheet to enable any analysis you wish to do.
- You can compare your own delivery results against the averages for the factory area from which your sugar beet was delivered.
- The ‘Field Report’ screen contained within Delivery Results shows the amount of Potassium (K) which has been removed from the field as measured from the beets delivered from the field (Ref. 1)

**Contract Offer**

Completing the Contract Offer is very simple and fast, ensuring that the contract can be submitted to British Sugar instantly, without postal and/or data-entry delays.

- After submitting the contract offer this, and all other information relevant to your contract, can be seen via the ‘Contract Status’ tab from within the contract screens area. It is also possible to see information for the past three years.

**Seed order**

Selecting the seed you need for each crop is a simple process requiring merely the entry of the number of units you require of the various varieties and seed treatments available. The data-entry grid is very similar to the paper-based form and allows fast selection.

- A handy ‘seed units required’ calculator is available to show how many units you need according to seed spacing, row width and crop area to be sown.
- If you want to refer your seed order selection to your British Sugar area manager, simply click the button (Pic. 1).

Pic. 1 – The seed order screen has a simple calculator to determine units/ha required.
Crop Declaration

All your growers’ fields are available for you to select which fields have been sown for a specific year. It is then easy to record drilling date and seed variety before submitting the ‘Crop Declaration’.

- You can identify all fields on the farm by adding a ‘Familiar Name’ as well as IACS numbers.
- It is possible to enter information field-by-field and ‘save for later’ so that you can return to the screen as more information becomes available; once data for all drilled fields has been entered the ‘declaration’ is made.

Update grower’s details (and third parties)

Growers can update their address and contact details (email address, telephone number and mobile number etc.) to ensure they can be contacted easily.

- You can add ‘other users’ to your account so that they can complete online transactions for you; ‘read only’, ‘limited’ and ‘full access’ rights to your account are available, according to the ‘delegated’ authority you wish to give.
- Updating details here allows British Sugar and the BBRO to have accurate details for emails and SMS etc.

To-do List

Whenever you logon and access the online Beet Account you are presented with a useful To-do List (Pic. 2) that ‘defaults’ to your current activities for the current season. This shows quickly what actions you have completed and what is outstanding. Actions are also colour coded to show those completed in green, still to complete in black and overdue in red.

- You can select ‘other seasons’ to see the actions that you completed for previous contract years.
- If you have multiple accounts (contracts) that you administer, you can see the actions for all of your contracts here.

What is available on online Beet Account for HAULIERS

Loads (permits) schedule

This screen effectively replaces the ‘Road Delivery Schedule’ of old that shows a haulier’s schedule for the entire campaign. It has all the details of loads allocated by week, day and daily ‘time slots’. Loads are shown according to factory ‘call-up’ so it is effectively a ‘live screen’ of loads to deliver (Pic. 3).

- The screen uses colour to highlight loads not delivered (red), delivered according to schedule (black) and ‘over’ delivered (blue).
- A haulier who delivers to more than one factory can easily view schedules for different factories via a drop-down box.

My Group

The My Group screen shows full details of all the growers in the delivery group and, if relevant, the haulage rates for each grower.

- Where you see the icon next to each grower’s name, you can ‘hover’ over the icon and it will display all that grower’s contact details (telephone numbers and email address).
- A column on the screen shows which growers use the online Beet Account to complete their sugar beet contract.
All financial documents are available for a ‘rolling three-year’ period so you can use this area as an archive of your financial account with British Sugar.

General site facilities
The site has been designed to be easy to use, but many of the screens are not frequently used (e.g. Contract Offer screen is accessed just once in the year to submit the contract). Therefore, ‘how to’ information is available from ‘hover’ icons in many places on the pages.

Any screen can be printed on your local printer by clicking the icon at the bottom of the screen, which will produce a pdf file that will print a page that looks exactly like the screen you are viewing. It is also possible to ‘save’ the pdf file or send to another party via email if required.

Future direction
It is clear that the use of internet administration and information provision in UK agriculture is now a popular and valuable service. The benefits of online data entry compared to paper-based systems include faster and easier processing as well as access to more information than previously available.

British Sugar and NFU Sugar aim to provide an efficient contract administration process, and have an aspiration to move towards 100% of growers contracting in this way. We are working on many improvements and a recent ‘release’ has enabled more internet browsers to be used (Google Chrome in particular). Improved speed of operation is a constant preoccupation and we continue to listen to growers’ feedback to improve all areas of the system where possible.

A selection of ‘how to’ video’s are currently being produced to help users operate the screens more easily and get the best from the online Beet Account. These will be attached as links from the relevant screens as well as referred to in the emails sent to inform users of new actions.

Growers wishing to switch to online contracting can do so easily by signing a mandate available from a ‘search’ for ‘mandate’ on the BritishSugar Beet Portal www.bsonline.co.uk, call 0870 240 2314 or email agriculture@britishsugar.com. Further assistance is available from British Sugar area managers.

References
Health & Safety is very important to British Sugar and our sites are often held up as good examples of safety standards. We also try to replicate these standards off site, using our knowledge and experience to increase awareness in the wider agricultural community. Two examples of this relate to overhead powerlines and mud on the road.

Last autumn, we published an article in the Beet Review about the dangers of overhead powerlines, and what to do in the event of making contact with them. In addition, we gave specific awareness training to our staff, and also issued stickers about the subject, to be placed in the cabs of machinery.

This initiative was a great success over the course of the campaign. We were able to heighten the awareness of the dangers of powerlines and, undoubtedly, behaviours have changed, as exemplified by changes in the method of loading, and physically moving the location of beet clamps.

The original intention was to load under the wires into lorries. However, following a discussion with ourselves, the beet was loaded from the other side of the clamp where, fortunately, the land was firm enough to take the lorries.

Mud on the road – your responsibilities

With the campaign in full swing, it is important to remind ourselves of our responsibilities concerning mud on the highway. Not only is it illegal, but it has caused serious accidents and fatalities, and has led to prosecutions and fines.

What is the law?

The Highways Act 1980 makes it an offence to deposit mud and other things on the highway (Section 148). In addition, if a person without lawful authority or excuse deposits anything whatsoever on a highway in consequence of which a user of the highway is injured or endangered, that person is guilty of an offence (Section 161). As a result, if you are responsible for depositing mud on the road, you are at risk of committing a criminal offence and may face a prosecution or fine.

If mud is deposited on the road, the local authority has the power under the Highways Act 1980 (Section 149) to notify the person responsible for depositing the mud, requiring them to remove it. If the individual fails to comply with the notification, the authority can then make a complaint to the Magistrates’ Court for a removal and disposal.
order. This allows the local authority to remove the mud themselves and charge the cost to the person responsible for depositing the mud.

**Other considerations**

It is important to be aware that civil action may also be taken if mud on the road is deemed to be a public nuisance, or results in loss or injury which can lead to a claim for negligence. This can also include personal injury, damage to property and any other loss or inconvenience caused. This applies to both landowner and contractor but it is highly likely that the landowner will be held responsible, even if it was his contractor who deposited the mud on the road.

**What should you do?**

- Be prepared to hire cleaning equipment. A list of road sweepers available for hire in the sugar beet area can be accessed on the British Sugar Beet Portal (www.bsonline.co.uk), search for ‘Road Sweepers’.
- Keep to your own farm roads and minor roads wherever possible.
- Keep to low speeds – especially when travelling a short distance – to help retain mud on the vehicle.
- Keep a written record of your decision on whether or not to deploy signs and/or to clean the road. This information may assist in your defence in the event of any accident or injury.

**What must you do?**

- Do everything possible to prevent mud being deposited on the road. This includes cleaning mud from vehicles as far as practicable before they are taken on the road.
- If there is a danger of mud accidentally being deposited on the road, use the ‘slippery road’ signs with a ‘mud on road’ sub plate to alert other road users. Check with your local highways authority their requirements for warning signs on the side of the road. British Sugar has secured a good discount on signage for mud on road, please see the below advert for details.
- Clean the road as necessary during the working day and always at the end of the working day.
- Ensure that labour and equipment is present and is suitable for the soil and weather conditions.
- Where a contractor is used, ensure that prior agreement is reached on who is responsible for mud on road issues (signage, cleaning etc.) and ensure that adequate public liability insurance is in place.

This outlines your responsibility for dealing with mud on road. For full information on the Highways Act 1980 please go to www.legislation.gov.uk/ukpga/1980/66/RoadTrafficRegulationAct

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IIRB Seminar 2015: resistance management

The IIRB seminar in 2015, covering the management of resistance, was held on 10th and 11th September, in Frauenkirchen (Austria) in cooperation with AGRANA Research and Innovation Centre (ARIC) and AGRANA Zucker GmbH. Resistance of pests, diseases and weeds to pesticides and herbicides is one of the biggest problems that growers face across all arable areas, so it is important to understand why and how it occurs, and to use this knowledge in the development of more effective control methods for sugar beet.

Fungicide resistance

Following an introduction to the Austrian sugar beet sector by Dr. Ulrich Fisher (AGRANA) the first session of the meeting covered management to minimise problems caused by fungicide resistance. The key message of this session was the importance of the dose and the timing of application of the chemicals. Most of the speakers highlighted the need to mix different modes of action of fungicides used in control programmes; all agreed that the lower the exposure to a fungicide, the lower the probability of resistant strains of parasitic fungi developing on sugar beet plants.

The first speaker, Dr. Lise Nistrup Jorgensen from Århus University in Denmark, explained the mechanisms behind the development of resistance in the fungal pathogens that cause septoria leaf blotch, mildew, rust and eyespot on wheat. She presented research work with strobilurin fungicides and Septoria tritici, which clearly showed that high doses caused the selection of resistant fungal strains. The second part of her talk introduced the current recommendations of FRAC (Fungicide Resistance Action Committee), which supports a strategy to limit the exposure of the pathogen population to the fungicide by reducing the number of fungicide applications each season, combining fungicides with different modes of action, and avoiding applications when the disease is already well developed in the crop.

Other talks in this session focused on fungicide resistance in Cercospora beticola, the cause of cercospora leaf spot (CLS). Dr. Gary Secor, from the Department of Plant Pathology in North Dakota State University, spoke about management strategies against CLS resistance in the USA, their testing procedures, and the changes in resistance over time. Management of CLS in the USA relies mainly on rotation, fungicides and variety resistance. Dr. Secor pointed out the difficulty in breeding hybrids of sugar beet that have high resistance to C. beticola, and high yield potential. Results from their survey suggest that resistance to triphenyltin almost disappeared during 2003-2010 but has increased slightly over the past four years. In contrast, resistance to thiophanate methyl (TM) is common and continuous, although its occurrence fluctuates directly with the extent of its use of TM. Resistance to tetraconazole and difenoconazole have also increased, as has resistance to pyraclostrobin, which seems not to disappear with time. Based on these results, the threat of highly resistant C. beticola is real and, if this trend is prolonged, there will be serious effects on CLS management.

NSDA recommendations for control of CLS emphasise alternation of fungicides in usage, and the combination of modes of action with the correct timing. They advise using only one triazole and one strobilurin (a quinone outside inhibitor QoI) per season, and a three-year crop rotation. Current strategies to manage CLS in Austria were described by Dr. Fredrich Kempl from Agrana who showed data from trials involving strains of C. beticola resistant to QoI and TM. Like Dr. Secor, Dr. Kempl advised combining fungicides with...
different modes; his programmes included triazoles with formulations of older, broad-spectrum compounds of copper and dithiocarbamates. He emphasised that the avoidance of susceptible cultivars of sugar beet is crucial to the control of disease spread.

Efficacy of CLS fungicides was also the subject of Dr. Franco Cionii, who gave an overview of CLS management in Italy. Field trials carried out during 2012-2013, together with monitoring in the laboratory, confirmed the loss of efficacy of QoI and triazole products. Also, in Northern Italy and in Austria, decreased sensitivity of *C. beticola* to difenoconazole, tetraconazole and prochloraz was observed. Dr. Cionii presented practical use of an agrometeorological forecasting model to support decisions on the timing of sprays to minimise the number of fungicide applications. Finally, Dr. Melvin Bolton (USDA) described the molecular aspects of CLS resistance to fungicides. He showed that, by using the latest sequencing tools, certain steps in ergosterol metabolism can be identified as potential targets for fungicides, offering improved efficacy.

**New threats from rhizomania?**

Rhizomania is caused by Beet necrotic yellow vein virus (BNYVV); its main symptoms are excessive lateral root proliferation, stunting, chlorosis and drastically reduced root yield. After its first appearance in Europe, in the 1980s, the spread of the disease was the subject of industry and government regulation to retard its spread, until the first resistant sugar beet cultivars became available in the 2000s. Since then, resistant cultivars have been the primary defence against the disease and, as such, those cultivars have become widely grown. However, more recently, strains of the pathogen capable of overcoming the resistance genes have...
evolved. Research to understand and combat this evolution is a major preoccupation of plant breeders and molecular biologists, and was the subject of the second session of this seminar.

The introduction and first research data were presented by Dr. Mark Varrelmann (IfZ Germany), who focused mainly on the genetic background of resistance in certain isolates of the virus; it is clear that these isolates have the ability to overcome the first gene (Rz1) that breeders had been able to introduce into sugar beet. The sugar beet research community have been able to identify the points in the virus genome where mutations conferring increased aggressiveness have occurred.

Other speakers focused on resistance of the sugar beet plant to the virus. Dr. Thomas Kraft (Syngenta) described work to map the positions of natural resistance genes on the chromosomes of sugar beet, and showed that several genes (major and minor) interacted to produce the desired resistance to BNYVV. His work suggests that several different resistance mechanisms, brought together, could give the best security against the evolution of resistance-breaking strains of the virus. However, information on sources of resistance genes is seriously lacking, an issue which is being addressed by Dr. Gina G. Capistrano, based at the University of Kiel, whose molecular screening of a collection of wild Beta vulgaris ssp maritima characterised new resistance sources (the Rz2 gene) from the wild beets growing near the coast in Denmark.

The session concluded with updates from each country concerning the current situation of resistance-breaking isolates of rhizomania, and began with Dr. Mark Stevens (BBRO) reporting results from the UK. From The Netherlands the situation was presented by Dr. Bram Hanse followed by Dr. Herbert Eigner (ARIC), in Austria, Dr. Franco Cioni of BETA in Italy, and Dr. Melvin Bolton (USDA-ARS) in USA.

During the afternoon of the first day a field excursion was organised allowing all delegates an opportunity to see sugar beet growing systems in Austria. We were shown field trials of new varieties, including some which were resistant to Cercospora, trials on interactions between rhizomania and nematodes, as well as plots for testing fungicides to re-enforce some of the messages given in the morning sessions.

Insecticide resistance

The second day was devoted to the management of resistance to insecticides and herbicides. The session was opened by Dr. Stephen Foster (Rothamsted) speaking about insecticide resistance in peach-potato aphids (which carry the beet yellowing viruses). According to his latest findings, in 2014 and 2015 there has been a continuation of the high frequency of resistance to pyrethroids and pirimicarb. The good news is, that aphids carrying strong resistance to neonicotinoids appear not to be moving far from the peach/nectarine orchards in southern Europe, where they were first observed.

The issues faced, particularly by the UK, from virus yellows was highlighted by Dr. Mark Stevens (BBRO). In light of the resistance issues developing in the peach-potato aphids, the importance of the removal of sources of infection, general farm hygiene and the use of insecticide seed treatment, together with the forecast risk maps were highlighted. This is because there are currently no options other than seed treatments, and it is not anticipated that there will be any virus yellows resistant varieties in the near future.

One solution might be to reduce pest exposure to insecticides, as discussed by Steve Ellis from ADAS. Using the UK as an example, he considered pollen beetles on oilseed rape. The assumption from his work was, that oilseed rape produces more buds than it requires for maximum potential yield, and the loss of excess buds therefore has no impact on yield, so the threshold for spraying against pollen beetle could be raised, resulting in less insecticide being used. Work to give greater confidence in the spray threshold for pollen beetle will reduce unnecessary sprays and prolong the life of insecticides.

Herbicide resistance

The closing session was opened by Prof. Per Kudsk from Aarhus University, in Denmark. He summarised the principles of integrated weed management (IWM) plus results from previous, and more recent research. The on-going loss of active ingredients, and the total absence of new herbicide modes of action, are serious challenges to the sustainability of weed management strategies. The need for new solutions is required to manage weeds, assuming a future scenario with fewer herbicides and, in particular, modes of action available to farmers. Solutions should involve several technologies and not rely solely on the use of herbicides. If herbicides are required to manage a weed problem, they should be used more judiciously than they are today. Also, preventive and cultural methods will continue to be important elements in any integrated strategy.

Dr. Stephen Moss from Rothamsted outlined resistance management: how to slow down resistance development in relation to weed ecology and agricultural practices (dose, cropping systems and IWM). This will increase in importance as the EU Sustainable use of Pesticides Directive (2009/128/EC) requires farmers to give priority to non-chemical methods.

Dr. Benny Cauwer from Gent University, Belgium described the basics of metamitron resistant Chenopodium album in sugar beet. His latest research indicates that herbicide-resistant C. album populations are persistent and maintain their adaptive capacity, challenging future weed management because no replacement herbicide is readily available.

The last speaker of the seminar, Dr. Mohamed Khan from North Dakota State University explained the current weed situation in the USA, and strategies to control the risk of resistance development by adjusting crop rotations to include herbicide-resistant GM crops and allowing rotation of herbicides.
Samples taken in Beet Intake and their analysis in the Tarehouse

The Inter Professional Agreement (IPA) between the NFU and British Sugar sets out the requirements for the way in which sugar beet is sampled and then analysed in the tarehouse at Wissington; this analysis is used in calculating payments made to growers for the beet that they deliver. Sugar beet is the main raw material for the factory, responsible for around 2/3 of the total cost of producing sugar; this highlights the importance of ensuring that the crop is paid for correctly. The NFU are present on all sites and in the tarehouse, to ensure that growers’ interests are upheld; this feature is unique to the sugar industry; no other large-scale crop in the UK has this level of supplier involvement in the sampling and payment process.

Beet is delivered to all four sites across the country. The beet arrives at the In-Weighbridge as shown in Fig. 1 below, from where it proceeds as follows:

The driver swipes in the Driver Access Card (shows that the driver has been inducted to drive on site) followed by the Grower Identity Card (GIC) and then the Vehicle Identity Card (VIC). It is absolutely vital that the correct GIC is submitted with the load otherwise the wrong grower will be paid for the beet delivery. The VIC is used as the ‘load tracker’ around the beet reception part of the factory, and as a link to the loading point for growers on the Industry Haulage Scheme. Provided that the haulier has a permit to deliver on the day, in the given time period, and the grower has submitted the Crop Area Declaration and crop assurance, then the load can be delivered. It is ONLY at this point in the delivery process that the decision is made whether or not a sample is to be taken from the delivery vehicle. The frequency of sampling on a contract is dependent on the grower contract size (Contract Tonnage Entitlement (CTE) and Industrial Contract Entitlement (ICE) combined). Refer to the Campaign Handbook (Ref. 1) or the IPA for the levels of sampling.

Fig. 1 – The process of beet following arrival at the In-Weighbridge.
If a sample is required, then a **unique identity stub card** (small barcode card) is generated at the In-Weighbridge, given to the driver and taken, with the load, to the Automatic Beet Sampling (ABS) area. If no sample is required, then the driver will receive a receipt for the load which can proceed directly to the wash-off or flat pad to deliver the beet, as can be seen in Fig. 1. Whether the delivery requires a sample or not, every load delivered receives a unique serial number which is used against all data recorded with respect to that load. This ensures anonymity for each delivery throughout the reception process and is the number seen on growers’ returns.

**Sampling**

The driver passes the **unique identity stub card** to the ABS operator who scans the stub card; this determines the position in the load from which a sample will be taken from (computer-generated position); six positions are possible (Fig. 2).

A sample is taken by an auger drilling into the load in accordance with procedures agreed as part of the IPA. Immediately before the sample is taken, the unique identity stub card is placed into a small pot which is put in the sample bucket (Fig. 3). The sample bucket is rotated under the front of a conveyor where it randomly catches part of the sample that has been taken from the load. The full sample buckets are then sent to the Wissington warehouse (Pic. 2) on a daily basis for analysis and subsequent load payment.

**Vehicle unloading**

Beet can be off-loaded for factory supply by three methods: at all four sites they can be tipped onto a beet pad (a large area of concrete with a central flume channel), but at Wissington and Cantley they may also be washed off through an Elfa wash (Pic. 1) whilst at Newark they may be off-loaded onto a wet tip. Both the Elfa wash and the wet tip methods supply the factory directly by feeding into a storage hopper.

Where a load is rejected, or a warning issued, an agreed protocol is followed. Please note that a rejection or warning on a load is given according to what is **seen in a load** and not what the sample analysis shows; this is because sample analysis can occur up to 24hrs after the receipt of a load into a factory. Load inspection can take place at any location in Beet Reception at the factory sites but it is usually conducted either...
at the ABS or on the flat pad. A photograph is always taken of any load quality issues, and can be made available to the grower via the British Sugar area manager.

Once the beet has been off-loaded the vehicle proceeds to the Out-Weighbridge to weigh out and record its tare weight against the load delivered.

Tarehouse analysis

All samples at all four British Sugar sites, as well as from the BBRO variety trial harvest, are analysed at the Central Tarehouse at Wissington. It should be noted that, whether at receipt of the load into the factory or through the analysis process in the tarehouse, each stage of the operation is closely monitored, not only by British Sugar, but also by a NFU representative. This ensures that jointly agreed procedures are followed to pay growers properly for the deliveries of their beet.

Figure 4 shows the process flow of the samples through the Wissington Tarehouse.

The sample and its identification stub card are then emptied into a revolving washer consisting of a long slatted drum containing two spray bars. An internal spiral moves the sample through the washer where dirt, mud etc., is washed off and eventually a ‘clean’ sample of roots is collected (Pic. 5). Water pressure, temperature and speed of the washer barrel are all critical and are monitored to ensure all operate within agreed specification.

The sample comes out of the washer into the clean scale area. In this area the sample is segregated initially into two lots – beet material and non-beet material:

- Non-beet material, including any mud scraped from the beet, is removed from the sample, weighed and recorded and then that material is discarded.
- The beet material is then segregated into correctly-crowned and over-crowned material. (Crown tare is fixed at 6.61%. Correctly-crowned or over-crowned beet weights do not affect the direct payment to the grower.)
- The correctly-crowned beet are placed into the saw and weighed and then the over-crowned roots and correctly-crowned roots are weighed together in the saw. This is to be able to report on the level of over-crowned beet in the sample, thus enabling growers to understand how they can achieve more yield (Ref. 2). The clean weight of beet material is captured by swiping the unique identity stub at the ABS or on the flat pad. A photograph is always taken of any load quality issues, and can be made available to the grower via the British Sugar area manager.

Figure 4 shows the process flow of the samples through the Wissington Tarehouse.

The complete contents of the sample bucket are emptied, weighed and recorded at the dirty scale against the sample stub card – the weight recorded at this stage is called the Sample Dirty Weight. The sample stub card accompanies the sugar beet roots in the grower’s sample through all operations but is not part of the collected weight of the sample.

Picture 4 shows an example of how the sample is recorded.

Fig. 4 – The process flow of samples at Wissington Tarehouse.

Pic. 3 – The Dirty Scale area.

Dirty Scale area

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Picture 4 shows an example of how the sample is recorded.
card through a reader which automatically captures the weight (Pic. 6). The stub card is dispensed with from this stage, as the rest of the operation is completely automated and a computer takes control of the location of the sample.

The combined weight of correctly-crowned beet and over-crowned beet is called the **Sample Clean Weight**

Now that **Sample Dirty and Clean Weights** are available then a dirt tare percentage can be calculated:

$$\text{Dirt tare percentage} = \frac{(\text{Sample Dirty Weight} - \text{Sample Clean Weight}) \times 100}{\text{Sample Dirty Weight}}$$

After weighing, the beet material is passed through a single-blade revolving in an enclosed chamber. The material cut from the beet sample (the equivalent of sawdust from wood) is collected, mixed into a homogeneous mixture and collected under the saw. This homogeneous mixture is called a brei sample.

This brei sample is then transported into the laboratory to be analysed for sugar content and impurities (Amino N, Potassium, Sodium)

**Laboratory**

A sample of brei is automatically weighed out to specific agreed limits and a proportionate amount of dilute lead acetate is added and mixed together with the brei. The lead acetate is a clarifying agent which provides a clear filtrate suitable for sugar and impurity analysis.

This solution is then stirred which releases all the sugar from the brei into solution, together with any other impurities which may be present. A filter aid is added to the solution to assist in the filtration of this mix of brine and lead acetate.

The solution is split into three parts; the first to measure the **sugar content** and the second to measure the Amino Nitrogen and the final part to measure the levels of Sodium and Potassium in the sample (see Pic. 7).

**Sugar content** is determined by polarimetry as sugar solutions have the capacity to rotate the plane of a polarised light beam. The degree of optical rotation can be used to calculate sugar content (percentage sugar) based on an internationally recognised scale. The level of sugar is measured to two decimal places.

**Summary**

The beet-purchase process is highly regulated to ensure that the entire crop is purchased correctly and in accordance with the jointly agreed IPA. The NFU employ staff to monitor all of the purchase process from receiving beet into the factory through to sampling from a load and the analysis of the load for payment purposes. This is a unique process employing growers’ representatives (NFU staff) to monitor the purchase of sugar beet; a process that does not currently happen in any other arable sector and should give growers a high level of confidence that the crop is being paid for correctly.

If any growers wish to visit the Beet Reception area at their local factory, or visit the Tarehouse at Wissington, then they should contact their NFU local representatives or their British Sugar area manager. Contact details can be found in the 2015/16 Campaign Handbook (Ref. 1).

**References**

In this article, several of the common sugar beet fungal diseases seen in 2015 will be highlighted, and the identification methods of the Plant Clinic explained.

**Rust** – *Uromyces betae*

Rust is probably the easiest sugar beet fungal disease to see as it causes considerable red-brown colouration of infected leaves (Pic. 1). This is due to an abundance of red-brown pustules (Pic. 2), full of spores which are easily spread as a red-brown powder, visible on clothing and machinery from the field. Late in the season, elliptical spots can appear on the petioles (Ref. 1).

**Alternaria** – caused by *Alternaria species* e.g. *Alternaria alternata*

*Alternaria* is considered a poor parasitic fungus and is often associated as a secondary pathogen. It usually invades leaf tissue previously damaged by other diseases (e.g. beet yellows) or pests (e.g. beet cyst nematode) and therefore is fairly unimportant. Generally, the fungus develops at the end of the growing season, on the oldest leaves, and turns them brown and necrotic at the edges (Pics. 3 and 4: Ref. 2).

Don’t judge a leaf by its symptoms...

In natural habitats, plants are constantly exposed to a myriad of potential enemies. Virtually all ecosystems contain a variety of bacteria, viruses, fungi, nematodes, mites, insects and mammals. However, due to their sessile nature, plants are often helpless against this tide of pathogens and herbivores. Consequently, it is estimated that 20-40% of annual crop losses are attributed to plant pests and diseases, with sugar beet being a prime example.
visible in the centre of spots. Due to the temperature and humidity requirements of the pathogen, attacks are most frequent in areas with warm summers and heavy rain. In these conditions the infection proliferates rapidly causing spots to coalesce, generating dark brown areas of dead tissue. As a result, in continental Europe cercospora leaf spot is a

**Powdery mildew – *Erysiphe betae***

Like rust, powdery mildew is easy to spot from a distance as it covers the whole leaf in a white-grey powder (Pics. 5 and 6). Initially, the infection is present on isolated plants, but the disease can rapidly cover a whole field when environmental conditions are optimum as small patches e.g. a temperate climate with low humidity (Ref. 3). Powdery mildew is detrimental to sugar beet as it decreases photosynthesis, speeds senescence and ultimately reduces yield by up to 20%. Severely infected leaves may become yellow and die prematurely.

**Cercospora leaf spot – *Cercospora beticola***

*Cercospora* leaf spots causes round spots on the leaf, typically 2-3 mm in diameter (Pics. 7 and 8). Under humid conditions, tiny black eruptions bearing a grey felt of spores may be
serious disease that can decrease yield by up to 40%. Consequently, regular fungicide applications are required to prevent the build-up of the disease, although pathogen resistance to certain fungicides is becoming an issue, particularly in Germany, Austria, Italy and the Red River Valley, ND, USA.

**Ramularia leaf spot – Ramularia beticola**

*Ramularia* (Pic. 9) is another fungal pathogen that causes brownish-grey spots similar in appearance to cercospora but there are a few key differences. Firstly, cercospora leaf spot usually has a darker margin around the spot making the contrast to the centre greater. Normally, the spots of ramularia are slightly bigger, 4-10 mm (Pic. 10) and more irregular than those of cercospora. Upon closer inspection of ramularia, small white points may be seen, indicating spore-bearing conidiophores (an asexual reproductive stalk like structure that bears spores (conidia) in fungi) emerging from the leaf through stomata. Similar to cercospora, warm, damp conditions promote the spread of infection.

**Are visual symptoms on leaves always reliable?**

Disease identification in the field can be challenging, particularly late in the season when ‘perfect’ textbook symptoms are not exhibited, as is often the case depending on field conditions.

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on the stage and severity of the infection. For example, the colours of cercospora spots fade with time making them indistinguishable from ramularia. However, the BBRO Plant Clinic can attempt to diagnose the cause of infection by searching for spores from an infected leaf. Through detailed analysis, this often reveals a mixed infection (Pic. 18) for which there are no precisely indicative symptoms.

‘Spot the Spore’ diagnosis

To confirm the presence of any leaf fungi and ensure correct diagnosis a small drop of water is transferred to a site of infection or spot on the sample leaf (rust spore in Pic. 11) and the spot gently disrupted so that spores become suspended in the water (Pic. 12). A drop of the water is then transferred to a slide with a cover slip (Pic. 13) and viewed under a light microscope (Pic. 14).

Fortunately, different fungal disease spores exhibit peculiarities at the micro level making diagnosis more straightforward. Pictures 15-18 are the spores of some of the aforementioned diseases; such images enable the BBRO to make a definite diagnosis.

Sugar beet leaf spots can be caused by a range of factors throughout the season, and are often caused by pests and disease. However, confirmation by eye or hand lens is not always 100% effective. The BBRO Plant Clinic receives a number of samples each year to inspect, analyse, diagnose, confirm and re-assure agronomists and growers of their specific problem so that appropriate actions can be taken, either immediately or for future seasons.

References


Author background – Robert Blundell, BBRO

I recently graduated from the University of East Anglia with a 1st class degree in Biological Sciences. I joined the BBRO Norwich team back in June 2015 as a technician working on the Innovate UK project on virus diseases, so I am fairly new to the world of sugar beet. I have laboratory experience in cereal crops, notably wheat and barley having interned at John Innes. I look to do a PhD in future at the NRP in the field of crop protection and sustainability.
That time of year has come around again; the time when all the hard work, meticulous recording of information and great passion to deliver results reaches its pinnacle: plot harvesting and the gathering of yield data!

Harvest, for the BBRO team, began on the 23rd September with a RL trial on a heavy soil type at Rougham. This site was the first of eight RL trials to be harvested during the campaign. At the start of the season, the weather was providing some helpful rain, ensuring the beet were harvested in favourable soil conditions that allowed as much of the tap root as possible to be retained. Approximately 90% of the trials are harvested by a bespoke six-row Garford V6 machine with a Grimme, rubber-flailed defoliator to achieve the correct topping of the beet. This harvests two three-row plots at a time, placing the contents of each plot separately into large bags. Each plot has an individual identification stub card that follows the sample from the field through the whole of the analysing process, ensuring the correct data remains associated with the correct plot. These stub cards are just like those that are issued to samples from loads delivered into the British Sugar factories, and are placed into a pocket on the large bags. The labelled bags are then delivered to the BBRO Plot Tarehouse at Wissington for full analysis.

The trials harvest team aims to harvest, each day, as many plots as the tarehouse can handle. Communication and team work is needed to ensure that the process works smoothly, and can react to changes in work plans. This flexibility is vital when delivering trials that have time constraints within their protocols.

Following issues related to the occurrence of downy mildew in some areas of the country this year, the BBRO harvested a fully replicated trial that had been monitored during the season to record the progress and effects of the disease on yield. Such comprehensive data have not been gathered before and, in addition to other downy mildew trials, will give the first insight into what might be done to help growers face this increasing challenge.

This work is the foundation for further studies planned for the 2016/17 season.

Open Days 2016

Four sites have been selected for the 2016 Open Days:
- Bury St. Edmunds – F. Hiams, Ixworth Thorpe,
- Cantley – David Jones, Morley Farms,
- Newark – Clifford Ellis, Field House Farm, Hibaldstow.

The planning of these days has already begun, with guidance from the stakeholder board. These Open Days will again double as demonstration sites, giving opportunities for growers and advisers to visit, and discuss the BBRO trials and other topics, all with the aim of improving yield and profitability.

At Norwich, the BBRO team continues to receive photographs, queries and plant samples from growers and advisers for analysis in the Plant Clinic. These have been concerned with the identification of the different fungi that cause leaf spots (see article by Robert Blundell, page 29) and, more recently as the season has progressed, the determination of pathogens causing the first signs of root rots.

As well as operating the Plant Clinic, the team at Norwich have been collating information gathered during the season from the entire disease trials programme, including data from the yellow water pan aphid traps that are placed at the 30 different sites across the beet-growing area. These data, which were gathered between May and the end of July, will provide valuable information for aphid population modelling, as part of the InnovateUK SPOREID project that BBRO are currently leading (Ref. 1). This work should lead to further field research to improve the UK sugar beet crop.

References
Germain opens new state-of-the-art laboratory at Norwich Research Park

The bespoke facility at Centrum, Norwich Research Park’s research, innovation and business hub, accommodates senior members of Germain’s Research and Development team with a strategic focus on the science of seed priming and crop development. Dr. Sally Ann Forsyth, chief executive officer at Norwich Research Park, welcomed Germain to the £11.5m Centrum building saying:

“We are delighted Germain Seed Technology has chosen Norwich Research Park as a location to further research seed priming and crop development. This reinforces our global position in creating a unique cluster of business and research organisations with world-leading science credentials.”

In addition to existing Research and Development facilities in the UK, Netherlands and the US, the opening of the latest state-of-the-art laboratory further strengthens Germain’s existing links with scientific and business partners at Norwich Research Park. Demonstrating commitment to science and development, work has now started in the new laboratory.

Deere announces agreement to acquire Monosem

MOLINE, Illinois (2nd November, 2015) – Deere & Company said today it has signed a definitive agreement to acquire Monosem, the European market leader in precision planters. The purchase includes the company’s four facilities in France and two in the United States.

“Through this action, we continue to build on our leadership position in precision agriculture,” said John May, president, Agricultural Solutions and Chief Information Officer. “Monosem is admired for its innovation and success in precision planter technology that helps farmers increase production. Acquiring this market leader positions John Deere to serve more customers worldwide.

Deere does not plan to change the independent nature of Monosem. May said the business will retain its own brand and trademark and will leverage its own operational strengths. Monosem has been a family-owned enterprise through three generations since it was founded in 1948.

The acquisition of Monosem, May added, helps accelerate John Deere’s market reach in precision planting equipment and adds engineering expertise to further develop planting technology.

“We remain focused on helping our customers increase their productivity,” he said.

Deere & Company is a world leader in providing advanced products and services and is committed to the success of customers whose work is linked to the land – those who cultivate, harvest, transform, enrich and build upon the land to meet the world’s dramatically increasing need for food, fuel, shelter and infrastructure. Since 1837, John Deere has delivered innovative products of superior quality built on a tradition of integrity. For more information, visit www.JohnDeere.com
Grimme showcases new sugar beet drill at Agritechnica

Agritechnica 2015 saw the launch of Grimme’s new precision drill for sugar and fodder beet, chicory and canola. The MATRIX will be available as a 12- or 18-row machine, either with 45, 48 or 50 cm row widths.

The MATRIX has been developed by the beet technology manufacturer Kleine, which was taken over by Grimme in 2012. Production will be limited in 2016.

Standard features include a mulch seed unit with two front running cutter discs; two Farmflex wheels for depth control as well as a 4-times adjustable mechanical load of the seeder unit with up to 90 kg/row (hydraulic adjustment up to 190 kg is available as an option). A standard seed unit is also available.

Individual seeds are positioned exactly into the furrow – dropping only 2.5 cm from the seed plate into the furrow. Heavy, free swinging, rubber covered pressure rollers ensure good seed to soil contact and good covering of the seed. Four different units to suit various soil conditions are available.

The MATRIX’s Clever Planting drives the inner-filled seed plate by electro motors and also creates the planting tracks and allows closer planting to the next seeder unit. Clever Planting is standard as is the option to plant in triangular (delta or matrix planting) or parallel planting. When used with GPS the MATRIX can be automatically stopped from planting at headlands and for beds where no planting is needed. This system is called Section Control.

The MATRIX colour touch-screen terminal – CCI 100 – is ISOBUS compatible and is operator friendly.

Two boxes allow room for carrying extra seed and a vacuum cleaner for remaining seed emptying etc. The seed plate has a tool-free and spring-loaded emptying flap. The MATRIX fitted with a granulate castor is available as an option.
factory news

BURY ST. EDMUNDS FACTORY

Campaign progress 2015/16
The campaign started full operations on Thursday 24th September 2015 and very quickly started delivering above budget daily throughputs. Apart from the normal maintenance programme there have been no major changes in the factory operational areas. The factory has performed consistently well at the time of writing with the normal daily slice rate in excess of 15,000 t/day, however to balance sugar crystal volumes we will reduce the factory throughput in the second half of campaign. Work is progressing well on the Bury AD plant with much of the civil work nearing completion.

Safety behaviour
Please take care when planning your clamp positions. On average, five people a year are killed at work, and many more are seriously injured, when they come into contact with live overhead electricity power lines (OHPLs). If a machine touches or gets too close to an overhead wire, then electricity may be conducted to earth which may cause a fire or explosion and electric shock to anyone touching the equipment. An overhead wire does not need to be touched to cause serious injury as electricity can sometimes ‘arc’ or jump across small gaps.

Crop yield
To date crop yields are looking encouraging, plant populations are as good as they ever have been and the mild autumn has resulted in favourable later season crop growth. Sugar content increased over the first few weeks and has now levelled off in the low to mid 17% region.

Please continue to liaise with your British Sugar area manager on your crop yield as this will help to determine decisions on campaign planning.

Please be aware that Bury factory will finish processing in the middle of January. All beet needs to be lifted in good time prior to this date.

Forthcoming dates for you diary:
- BBRO Technical Meeting – Tuesday 2nd February at the Granta Centre, Great Abington, Cambridge.
- BBRO Summer Open Day – Thursday 23rd June.

Best wishes for the rest of the campaign and for the festive season from everyone in the Bury Agriculture Team.

Mark Culloden
Head of Agriculture

CANTLEY FACTORY

2015/16 crop prospects
Based on the root dig information that is collated throughout the summer months there was a good reason for optimism on the yields of this year’s crop. Since the campaign started the data that we have received is giving us further confidence that there is a very good crop to be delivered this campaign. Sugar percentages have not raised as quickly as we first anticipated at Cantley (started at 16.8%, currently running at 17.4%), this is probably due to the high levels of rainfall we have seen to date. This has, however, had a positive effect on root weight. The relatively mild weather has meant that the crop has continued to develop with the first real frost being recorded in mid-November. Crop canopy still looks healthy despite some late onset of rust in some areas. This should give a reasonable level of protection against any colder weather that may arrive later in the season. As I write this article the weather forecast is expected to be unsettled over the coming weeks with forecasts ranging from severe cold to wet and windy. When planning your harvesting please bear in mind the shorter campaign this year will mean a much earlier finish than normal. Current end date for Cantley is forecast to be the first week in February.

Factory performance
This year’s start up profile for the factory has been the best for some years. However, as the campaign has developed there have been two incidents on site that have led to significant reductions in slice. The first occurred in the second week of October when the main drive shaft that runs one of our two diffusers failed. The 9” shaft sheared which meant that there was no drive to this unit. This meant that the factory was reduced to half slice until this could be repaired. The repair was completed within two working days to return the factory to normal operations. The second incident took place in early November when our turbine tripped and left the site with no power. Beet intake remained open on both occasions, albeit with a reduced letter call. Finally, we are pleased to announce that the installation of the gas main to the factory has now been completed although full commissioning will not take place until next year. This is a significant investment in the factory that will bring many benefits. We would like to thank all road users for their continued patience whilst this project has been in progress.

John Sanderson
It is with great sadness that I must inform you that John Sanderson passed away very suddenly on the 12th November. Many people involved in the beet industry and beyond would have known John who was an area manager at Cantley for almost 40 years before his retirement in 2008. Our thoughts and prayers go to his family at this very sad time.

Andrew Dear
Agricultural Business Manager
The focus for the remainder of campaign needs to be maximising crop recovery and being prepared for changeable conditions. Areas of focus should be:

- Minimising root breakage at harvest
- Harvester adjustment to optimise crownng and whole beet delivery
- Ensuring beet is clean, free of soil, stone and trash entering clamp
- ‘Just in Time’ harvesting before delivery while conditions are mild
- Longer term storage – properly constructed, levelled, and managed clamps with sheets available for when ambient temperature drops below -3°C
- Never push beet up when filling clamp

With the significant potential of the crop in the ground every effort should be made to harvest and deliver as much yield as possible. Your area manager can assist you in assessing harvesting and storage losses, and provide advice on how to mitigate these. Yield continues to increase at a significant rate, with the 129 Newark growers who have already finished cropped achieving around 68 t/ha and 108% of contract after ten weeks of campaign.

2016/17 crop

Attention should also be focused on preparing land for next year’s crop and learning from the experiences of 2015 to improve yield in 2016. One challenge for a minority of growers will be the absence of the nematicide Vydate. Vydate is produced in a factory in North America which suffered a fire in November 2014, sadly taking four lives; the manufacturer has confirmed there will be no fresh supplies of Vydate for Spring 2016. In sugar beet, Vydate is used on around 5% of the national crop for free-living nematode control, normally only found on the lightest of soils; and living nematode control, which causes Virus Yellows infection. Growers affected by this must also ensure a seed insecticide is used in place of Vydate, as that is the only effective method available for controlling aphids, which causes Virus Yellows infection.

Factory operations

Campaign got underway on the 23rd September, Newark factory very quickly exceeded budget throughput levels and we’re currently averaging 9,600 t/day, well in excess of our budget slice of 9,150 t/day. Best wishes for the festive season and the remainder of campaign.

Wissington Factory

Campaign progress 2015/16

The campaign started full operations on Saturday 26th September 2015 for accepting beet loads and commenced slicing on Monday 28th September. Target slice rate was achieved on day four of the campaign; a couple of days later than planned as there was a problem pumping carbon dioxide into the process. Filtration has been more difficult this year especially during week three and four of the campaign as a blockage in the carbonation area of the factory resulted in lower throughputs for a number of days. This problem was corrected quicker than expected as the gas line was cleared without requiring new parts. Since then there have been the usual campaign variation on slice rate due to running maintenance routines, filtration has continued to be difficult this year.

Focus on Farm Safety – Mud on the Road

Anyone who has been on site at Wissington will have realised there is a high standard of safety behaviour required by everyone on site. The local workforce developed a ‘Safety Charter’ with key statements that are simple thoughts and practices that help the safety culture on site.

These principles are being shared with the farming community and raise the awareness of safety in everything we do. The initiative being started in November is ‘Mud on the Road’. Leaflets are available for all growers and haulers to help us all be aware of our legal responsibilities and advice on how to prevent taking mud on the road, as well as easy methods to warn other road users of the hazards to them when mud on the road cannot be avoided completely. Information is available via your local British Sugar area manager. Mud on the Road warning signs can be purchased through the initiative for a discounted price.

Crop yield

Sugar content this year has proved to be more promising than indicated by root samples. Root weight yields have also been reported as improving since campaign start, finished field yields have increased as the campaign continues, this is a common trend in past years, the mild weather in October and November has helped to increase crop yields. Growers have also been taking advantage of ‘Just in Time’ harvesting to maximise crop yield, as roadside stocks have generally been fairly low.

Best wishes for the rest of the campaign and for the festive season from everyone in the British Sugar Wissington Agriculture Team.

Dan Downs
Head of Agriculture

Nick Morris
Agricultural Business Manager
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