Grower Summary

SF 012 (GSK221a)

Blackcurrants: Evaluation of soil nitrogen assessments and the use of controlled release nitrogen fertilisers

Final 2010

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Further information

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GROWER SUMMARY

Headline

- A survey of 12 blackcurrant plantations in March 2010 showed that residual soil nitrogen levels were higher than in 2009 but still well below levels recorded in an earlier (1992) survey.

Background and expected deliverables

The current UK fertiliser recommendations for blackcurrants are largely based on the work of Bould and subsequently Bradfield (1969) at Long Ashton Research Station. Since that work was carried out cultivars and growing systems have changed. Whilst modern cultivars are high yielding, some can be excessively vigorous. There can be a conflict between achieving optimum growth, flower production, fruit set and quality with excessive growth causing problems with Botrytis.

In order to optimise applications of nitrogen, existing and potential soil nitrogen levels could be taken into account when making recommendations. Two methods of assessing soil nitrogen levels are available. Soil mineral nitrogen (SMN) is an estimate of the immediately available nitrogen in the soil profile. The anaerobic mineralisable nitrogen (AMN) (also referred to as potential mineralisable nitrogen) is a laboratory test that estimates the amount of nitrogen likely to become available to the crop during the season.

Earlier work by Marks (1995) showed that SMN levels could be quite high in UK blackcurrant plantations. More recently, New Zealand research (Craighead *et al* 2007) has shown that the use of soil anaerobic mineralisable nitrogen (AMN) tests gave a useful estimate of additional nitrogen likely to become available through mineralisation. The AMN level plus amount of fertiliser applied, gave the best correlation with yield when compared with other methods. The New Zealand researchers did not use SMN measurements in their study because previous experience there had shown nitrogen levels to be transient and the results somewhat variable (Craighead, pers. com.).

The main part of this study was a survey of soil N levels in a range of blackcurrant plantations and an assessment of the possible benefits in using soil mineral nitrogen (SMN) and/or anaerobic mineralisable nitrogen (AMN) tests to refine nitrogen recommendations for

blackcurrants. All but two of the plantations were the same as those surveyed in a similar study in 2009.

A further study within this project assessed the value of using a controlled release nitrogen fertiliser compared with straight nitrogen formulations. Environmental considerations require growers to match more closely the nitrogen applications to crop requirements and avoid excessive nutrient leaching. The use of controlled release fertilisers offers the possibility of matching release more closely with demand thereby improving the efficacy of nitrogen use, but this has not been evaluated on blackcurrants.

Summary of the project and main conclusions

Soil samples were taken from 12 blackcurrant plantations in Kent, Norfolk and Herefordshire in early March 2010 prior to the application of fertilisers. The soil was tested for SMN in two profiles 0-30 cm and 30-60 cm, and the 0-30 sample was also tested for AMN. Sampling was repeated immediately after harvest in 5 plantations.

Soil nitrogen measurements in most of the plantations tested were moderately low, averaging 36.7 kg N/ha AMN and 39.7 kg N/ha SMN, but higher than in 2009 where the equivalent averages were 27 kg N/ha AMN and 20 kg N/ha SMN. AMN levels were on average about one half of those recorded in a survey of New Zealand plantations (Craighead *et al* 2007) where AMN is routinely used for assessing Nitrogen requirements. The higher levels of organic matter in New Zealand soils compared with UK probably accounts for this difference. Although increased compared with 2009, SMN levels were still much lower than in the 1992 survey of UK plantations by Marks (1995). Nitrogen applications by UK blackcurrant growers have been reduced over the last 15 years and this may have resulted in a reduction in the levels of SMN.

Unlike in 2009 there was no correlation between total N and yield in 2010. These results suggest that seasonal and climatic factors other than nitrogen nutrition (e.g. poor fruit set due to weather conditions) were largely influencing yield in 2010. In 2009 positive correlations between total N and yield were only found when low N utilization sites were excluded (i.e. sites with < 80 kg fruit per kg of total N). If the same criteria had been employed in 2010 all except two sites would have been excluded as soil N levels were higher but yields were generally lower.

Considering the relatively modest soil N levels in UK blackcurrant plantations and the strong seasonal factors that can limit yields it would appear that the routine annual testing of soil N is not really justified at this stage although ideally growers should be aware of typical levels in their plantations. To further refine the recommendations for UK blackcurrants it would be necessary to undertake replicated nitrogen response experiments on sites where SMN and AMN are monitored.

Measurement of a limited number of sites post-harvest indicated that in all cases there was a good reserve of soil nitrogen available. It is therefore unlikely that any of these sites would have benefited from additional nitrogen applied post-harvest.

A small additional study assessed the effect of applying the nitrogen fertiliser in controlled release (CRF) form (Agroblen Base, Scotts Company) compared with straight fertiliser. The CRF treatment was compared with the farm standard programme using straights in an un-replicated observation applied to a mature plantation of Ben Hope at Gorgate Ltd, Gressenhall, Dereham, Norfolk (Table 1).

The row receiving the Agroblen Base CRF had noticeably yellower foliage but yielded 8.7 tonnes/ha – identical to the farm standard treatment applied to the rest of the field even though the latter received an additional 30 kg/ha N.

Soil conditions were dry after applying the fertilisers. At the end of May the crop was at 100% fruit set stage (growth stage I3) and with rapid growth the demand for nitrogen was likely to be relatively high. The nitrogen demand at this time appears to have been better met by a straight nitrogen fertiliser top dressing with immediate release than by the CRF although the apparent N deficiency was not reflected in reduced yields at this site.

Table 1. Treatments for controlled release fertiliser trial in blackcurrants

Treatment No.	Fertiliser	Product rate (kg/ha)	Nutrients applied (kg/ha)				Date applied
			N	P_2O_5	K_2O	Mg	
1	Agroblen (35:0:0)	171	60				1/4/10
	Potassium sulphate	240			120		21/5/10
	Magnesium sulphate	185				30	21/5/10
2	Compound (9.8:0:19.5:4.8)	612	60		120	30	1/4/10
	Ammonium nitrate		30				21/5/10

Financial benefits

The project has not shown a clear cost benefit in using routine soil N analysis. The combined AMN + SMN analysis cost is quite high at £48 per sample plus the cost of sampling (which requires a specialist auger). Therefore financial benefits would only be possible if there was a saving of 96 kg N per site sampled. As growers are generally applying nitrogen at rates on average of around 70 kg N/ha further saving are unlikely to be made.

There are however important environmental benefits in avoiding nitrogen applications in excess of the crops' requirements.

In the CRF study identical yields were achieved using 30 kg less nitrogen per ha giving a saving of £15 per ha assuming a cost of £0.50 per kg N as straights. However the cost of Agroblen Base N is £3.45 per kg N, so the additional cost of applying 60 kg N/ha by CRF compared with straight is £177 / ha. Therefore the study has not shown any financial benefit from the use of nitrogen in controlled release fertiliser form.

Action points for growers

- Annual testing for soil N is not recommended but growers could consider taking a limited number of soil samples for AMN and SMN analysis from representative fields on their farms to check general levels of soil N.

- If soil analysis is not carried out allowance could be made for around 40 kg N/ha to be available from soil reserves when estimating the crop requirements.

- There is no financial benefit from using CRF forms of nitrogen although a potential saving of 30 kg N/ha was demonstrated.