**Sulphur and grain quality in autumn sown milling wheat cv. Monad**

M.D. Craighead

Ravensdown Fertiliser Co-op Ltd., PO Box 1049, Christchurch

**Abstract**

Two experiments on winter wheat involving sulphur treatments showed variable herbage and grain protein responses to sulphur (S). In one experiment herbage S levels were increased through sulphate S application at tillering or mid stem extension but grain S did not differ. In a second experiment, the use of spring nitrogen fertilisers containing ammonium sulphate significantly increased grain protein values over those not containing S.

**Experimental and Discussion**

Sulphur (S) is an important component of several proteins and S deficiency can have an influence on grain protein and the baking quality of wheat, in particular reduced extensibility and increased resistance to stretching of dough (Moss et al., 1981; Moss et al., 1983; Wooding et al., 1993). Randall et al. (1981) established that wheat was likely to be sufficiently S deficient to affect baking quality if grain S was < 0.12% and grain N:S ratio was wider than 17:1, although Byers and Bolton (1979) suggested a N:S ratio of 15:1.

Two trials at the Ravensdown Seadown Farm in 1995/96 on a low S site looked at the effects of timing, rates and form of S fertilisers, and the use of early spring nitrogen-sulphur fertilisers on autumn sown wheat cv. Monad. These trials were fully replicated randomised block designs and will be more fully reported at a later date. In the first trial treatments included planter S (range 16-47 kg S/ha), 30 or 60 kg S/ha applied at Feekes GS2, 5 or 9, split applications of S (3 x 10 kg S/ha) and a single high rate (103 kg S/ha). The second trial consisted of fertiliser products containing nitrate and/or ammonium nitrogen with and without S, (urea, ammonium sulphate – Amsul; calcium ammonium nitrate – CAN; and ammonium sulphate nitrate – ASN). Treatments were applied at 92kgN/ha split into two early spring applications.

In the first trial sulphate S applications in the spring either at tillering (GS2) or mid stem extension (GS5) increased herbage S levels within 14-18 days of application, whereas booting applications (GS9) did not. Planter S responses were variable and for farmers their use is likely to depend on the risk of S deficiency caused by winter leaching. Higher rates (30-103kg S/ha) were more likely to initially increase herbage levels compared to low S rates (10-20kg S/ha). Irrespective of treatment, S levels in the grain were good (0.14-0.15%S) and N:S ratios were 14-16:1, reinforcing previous work by Randall et al. (1981) and Haneklaus and Schnug (1992) in that large differences in herbage S are only reflected in minor differences in grain S, and that if S is applied it should be applied early in the spring.

In the second trial (Table 1), while those treatments containing nitrate nitrogen increased early spring dry matter and N uptake as had been previously reported on pasture (Craighead et al., 1997), it was the S fertilisers, ASN in particular that increased grain protein. As the N:S ratios in the grain were similar, it appeared S enhanced nitrogen uptake and translocation to the grain. This has been previously demonstrated by Archer (1974), although Byers and Bolton (1979) found the opposite effect.

It is doubtful low S levels impact greatly on wheat quality in New Zealand, even though organic S reserves are not high on many of our cropping soils. This is...
Short Communication

Table 1. Effect of early spring fertiliser on yield and quality of wheat cv. Monad.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dry matter&lt;sup&gt;2&lt;/sup&gt; (kg/ha)</th>
<th>Grain yield (kg/ha)</th>
<th>N:S ratio</th>
<th>Grain protein %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>490</td>
<td>7690</td>
<td>14.23</td>
<td>11.74</td>
</tr>
<tr>
<td>Urea</td>
<td>520</td>
<td>7960</td>
<td>14.92</td>
<td>12.31</td>
</tr>
<tr>
<td>CAN</td>
<td>610</td>
<td>8010</td>
<td>14.60</td>
<td>12.45</td>
</tr>
<tr>
<td>Amsul</td>
<td>555</td>
<td>8030</td>
<td>14.65</td>
<td>12.73</td>
</tr>
<tr>
<td>ASN</td>
<td>625</td>
<td>8250</td>
<td>15.05</td>
<td>12.86</td>
</tr>
<tr>
<td>LSD&lt;sub&gt;p&lt;sub&gt;ain&lt;/sub&gt;&lt;/sub&gt;</td>
<td>118</td>
<td>540</td>
<td>1.16</td>
<td>0.39</td>
</tr>
</tbody>
</table>

<sup>1</sup> Control received 176kgN/ha, treatments 268kgN/ha

<sup>2</sup> measured 30<sup>th</sup> September

because superphosphate, elemental S fortified S supers, ammonium sulphate and products such as Cropmaster 20 (20-10-0-12) are widely used on wheat. In addition, cropping rotations including pasture allow for S mineralisation from built up organic reserves, while winter leaching is not often high in Canterbury, the major milling wheat growing area of New Zealand.

**Acknowledgements**

The author thanks Bill Burgess and Joy Hayward for field assistance and Andy Howie for chemical analysis.

**References**


