Reactions of molybdenum with soil affecting its availability to wheat plants v. initial residual effectiveness for a range of acidic yellow-brown sandy soils

M M. Riley

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Aim: To relate the molybdenum adsorption capacities of a range of acidic, yellow-brown sandy soils to the initial and residual effectiveness of molybdenum added to these soils for the growth of wheat.

Location: Glasshouse, School of Agriculture, University of Western Australia

Soil: Thirteen virgin topsoils (0-10 cm) collected throughout the wheatbelt, sieved through 3.86 mm, and potted in 3.5 kg aliquots.

Treatments:

I. Nil.

II. Molybdenum as 0.428 mg Na₂MoO₄·2H₂O/pot (equivalent to 200 g/ha) incubated at 30°C for 60 days in root-cooling tanks with soils at field capacity.

III. Molybdenum added fresh i.e. same rate after incubation.
Table 16. Effects of fresh and incubated additions of molybdenum on the growth and fresh weights of shoots of wheat grown on a range of acidic, yellow-brown sandy soils, and the concentrations of molybdenum in the shoots*

<table>
<thead>
<tr>
<th>Soil</th>
<th>Molybdenum added</th>
<th>Zadoks growth stage</th>
<th>Fresh weight of shoots (g/pot)</th>
<th>Concentration Mo in shoots (ng/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pindar</td>
<td>Nil</td>
<td>16.7/21.9/32</td>
<td>44.9</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>Incub</td>
<td>16.7/21.8/32</td>
<td>45.6</td>
<td>228</td>
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<tr>
<td></td>
<td>Fresh</td>
<td>16.7/21.6/32</td>
<td>43.0</td>
<td>327</td>
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<tr>
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<td>16.7/21.4/32</td>
<td>41.8</td>
<td>51</td>
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<tr>
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<td>Incub</td>
<td>17/21.5/32</td>
<td>45.9</td>
<td>183</td>
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<tr>
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<td>Fresh</td>
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<td>45.7</td>
<td>250</td>
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<tr>
<td>Perenjori</td>
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<td>17/21.3/32</td>
<td>49.1</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>Incub</td>
<td>17/21.1/32</td>
<td>48.0</td>
<td>241</td>
</tr>
<tr>
<td></td>
<td>Fresh</td>
<td>17/21.2/32</td>
<td>49.4</td>
<td>376</td>
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<tr>
<td>Wongan Hills</td>
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<td>17/20.8/32</td>
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<tr>
<td></td>
<td>Incub</td>
<td>17/21.0/32</td>
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<td>1170</td>
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<td>Fresh</td>
<td>17/21.0/32</td>
<td>44.5</td>
<td>1710</td>
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<tr>
<td>Beacon</td>
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<td>30.6</td>
<td>31</td>
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<tr>
<td></td>
<td>Incub</td>
<td>16.7/21.4/32</td>
<td>40.3</td>
<td>87</td>
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<tr>
<td></td>
<td>Fresh</td>
<td>16.7/21.3/32</td>
<td>42.2</td>
<td>177</td>
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<tr>
<td>Yelbeni</td>
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<td>26.4</td>
<td>28</td>
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<tr>
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<td>Incub</td>
<td>16.7/21.4/32</td>
<td>33.2</td>
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<tr>
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<td>58</td>
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<td></td>
<td>Incub</td>
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<td>Bodallin</td>
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<td>Incub</td>
<td>17.5/21.6/32</td>
<td>54.0</td>
<td>328</td>
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<td>Fresh</td>
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<td>400</td>
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<td>Mt Walker</td>
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<td>17/21.8/32</td>
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<td>52</td>
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<td>Incub</td>
<td>17.5/21.6/32</td>
<td>59.4</td>
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<tr>
<td></td>
<td>Fresh</td>
<td>17.5/21.8/32</td>
<td>64.6</td>
<td>650</td>
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</table>
Table 16. continued

<table>
<thead>
<tr>
<th>Soil</th>
<th>Molybdenum added</th>
<th>Zadoks growth stage</th>
<th>Fresh weight of shoots (g/pot)</th>
<th>Concentration Mo in shoots (ng/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyden</td>
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<td>17/21.7/32</td>
<td>55.8</td>
<td>76</td>
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<tr>
<td></td>
<td>Fresh</td>
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<td>730</td>
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<td>Lake Grace</td>
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<td>17/21.1/32</td>
<td>48.6</td>
<td>1200</td>
</tr>
</tbody>
</table>

* Concentration of Mo in dry shoots without YEB's, results of analyses of YEB's not yet available.

Results:

Results of analyses of YEB for concentrations of molybdenum, and determinations of molybdenum adsorption isotherms for each soil have yet to be completed. Preliminary results suggest:

1. Responses in the fresh weights of wheat shoots to the soil application of sodium molybdate occurred in the Gutha, Beacon, Yelbeni, Merredin and Mt Walker soils. These soils also had the lowest concentrations of molybdenum in the shoots where no molybdenum had been applied.

2. There appears to be very large differences between the soils in the initial effectiveness of freshly applied Na₂MoO₄.