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N-P COMPOUND FERTILISERS

By M. G. MASON (B.Sc. Agric.), W. J. COX (B.Sc. Agric.) and R. N. GLENCROSS (B.Sc. Agric.), Officers, Plant Research Division, assisted by Wheat and Sheep Division Advisers*

FARMERS were able to buy the two compound fertilisers N-P Compound Fertiliser 28:14 and N-P Compound Fertiliser 24:24 in the 1967 season.

Advantages
For handling, these fertilisers offer an attractive proposition to farmers. They are granulated and contain both the nitrogen and phosphorus which may be needed by the crops (Table 1). Because of their granulated form they run through the combine or drill much more easily than superphosphate with much fine material, or urea which takes up moisture from a damp atmosphere and has variable rates of application. Urea and superphosphate cannot be mixed for application because they form a sticky mess and must therefore be applied separately.

Disadvantages
The main disadvantage at present is the relatively high cost compared with equivalent rates of urea and superphosphate (Table 1). This would be overcome if the compound fertilisers were much more effective than urea plus super.

Unlike superphosphate the compounds do not contain any sulphur. The lack of this nutrient will be a disadvantage where it is deficient in the soil. Also the compound fertilisers do not contain any added trace elements and could not be used on new land where copper, zinc or molybdenum were needed, unless these nutrients

Table 1.—Comparative costs of N-P compound fertiliser and urea + superphosphate

<table>
<thead>
<tr>
<th>Rate of Urea + Superphosphate (lb. per acre)</th>
<th>*Cost of Equivalent N-P Compound Fertiliser 28 : 14 ($)</th>
<th>*Cost of Equivalent N-P Compound Fertiliser 24 : 24 ($)</th>
<th>†Cost of Urea + ‡Superphosphate ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea 25, Super 50</td>
<td>1.83</td>
<td>1.28</td>
<td>2.11</td>
</tr>
<tr>
<td>Urea 50, Super 100</td>
<td>3.66</td>
<td>2.56</td>
<td>6.22</td>
</tr>
<tr>
<td>Urea 75, Super 150</td>
<td>5.49</td>
<td>3.34</td>
<td>8.83</td>
</tr>
<tr>
<td>Urea 100, Super 200</td>
<td>7.32</td>
<td>5.12</td>
<td>12.44</td>
</tr>
<tr>
<td>Urea 150, Super 300</td>
<td>10.98</td>
<td>7.68</td>
<td>18.66</td>
</tr>
<tr>
<td>Urea 25, Super 25</td>
<td>1.57</td>
<td>1.03</td>
<td>2.59</td>
</tr>
<tr>
<td>Urea 50, Super 50</td>
<td>3.14</td>
<td>2.06</td>
<td>5.20</td>
</tr>
<tr>
<td>Urea 75, Super 75</td>
<td>4.71</td>
<td>3.09</td>
<td>7.80</td>
</tr>
<tr>
<td>Urea 100, Super 100</td>
<td>6.28</td>
<td>4.12</td>
<td>10.40</td>
</tr>
<tr>
<td>Urea 150, Super 150</td>
<td>9.42</td>
<td>6.18</td>
<td>15.60</td>
</tr>
<tr>
<td>Urea 200, Super 200</td>
<td>12.56</td>
<td>8.24</td>
<td>20.80</td>
</tr>
</tbody>
</table>

* N-P Compound Fertilisers—$85.50/ton at Kwinana Works.
† Urea—$68.40/ton at Perth Works.
‡ Superphosphate—$23.05/ton in polythene bags at Perth Works.

Table 2.—Nutrient contents in compound fertilisers, urea and superphosphate

<table>
<thead>
<tr>
<th>Fertiliser</th>
<th>Content of Nitrogen (N)</th>
<th>Content of Phosphorus (P₂O₅)</th>
<th>Content of Sulphur (S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-P Compound Fertiliser 28 : 14</td>
<td>28</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>N-P Compound Fertiliser 24 : 24</td>
<td>24</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Urea</td>
<td>46</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Superphosphate</td>
<td>0</td>
<td>22</td>
<td>13</td>
</tr>
</tbody>
</table>

* Advisers from Geraldton, Moora, Merredin, Katanning, Lake Grace and Bridgetown District Offices.
New N-P compound fertilisers, first tested by the Department of Agriculture in 1967, gave very promising results for wheat growing when compared with equivalent rates of urea plus superphosphate. The compound fertilisers gave higher yields in nine out of the 12 trials and, despite their high price, were more profitable than urea plus superphosphate in five of them and equally profitable in two more.

Yields and returns were averaged for the four trials with N-P compound fertiliser 28 : 14 and also for seven of the trials with N-P compound fertiliser 24 : 24. The results of these are represented in figures 1 to 4. The trial at Boyup Brook was not included because the rates used were different from the other trials.

The average yields for N-P compound fertiliser 28 : 14 were higher than for urea + super at all rates (Fig. 1). N-P compound fertiliser 24 : 24 outyielded urea + super at all except the lowest rate (Fig. 2). The monetary return from N-P compound fertiliser 28 : 14 was higher than urea + super at all rates except one (Fig. 3). Urea + super gave greater profit than N-P compound fertiliser 24 : 24 at the lowest rate but at the other rates the compound fertiliser was more profitable (Fig. 4).

The compound fertiliser to be used in a particular situation would depend on the relative need for nitrogen and phosphorus. Where high levels of phosphate are needed, N-P compound fertiliser 24 : 24 would be used. Where the phosphorus requirement is lower and the nitrogen requirement is relatively higher, N-P compound fertiliser 28 : 14 may be used.

From the results obtained in this one season no recommendations can be made as to which sources of nitrogen and phosphorus should be used in a particular situation. There was no apparent effect of site characteristics such as soil type and past history on the relative performance of the compound fertilisers. These results can only be taken as a guide and will be used with results obtained in

were applied separately. This would add to costs. The composition of these fertilisers is shown in Table 2.

Another disadvantage of the compound fertilisers is that the proportions of nitrogen and phosphorus in them is fixed. If one of these nutrients has to be increased the other has to be increased in the same proportion.

Trials
In 1967, 12 trials were carried out to test one or the other of the N-P compound fertilisers with urea and superphosphate. N-P Compound fertiliser 28 : 14 was tested in four trials and N-P Compound fertiliser 24 : 24 was tested in the other eight. Details of the sites are set out in Table 3.

Falcon wheat was sown at Mt. Madden and Boyup Brook. Gamenya wheat was sown in the other trials. When trace elements were needed they were mixed with sand and topdressed before seeding.

Results
Details of results are set out in Tables 4 and 5.

Crops grown with the N-P compound fertilisers outyielded equivalent urea + super treatments in nine of the 12 trials, including all four trials with N-P 28 : 14 compound. In the trial at Mingenew, although the compound fertiliser gave higher yields overall, the urea and super treatments gave higher yields at some rates. Similarly, in one experiment at Jacup, where urea + super gave higher yields overall, the compound fertiliser gave higher yields at some rates.

When cash return for fertiliser used was considered, in one of the trials where the compound fertilisers gave higher yields, urea + super was more profitable because the yield differences were not great enough to make up for the higher price of compound fertiliser. However, the N-P compound fertilisers were still more profitable overall in eight of the trials at Yerecoin, Mt. Madden (2), Jacup, Gairdner River, Dongara, Mingenew and Belka. At Mingenew and Belka, the compound fertilisers were more profitable at some rates. The difference between overall returns from the two sources at Mingenew and Belka was small but in favour of the compound fertilisers.
Table 3.—Details of experimental sites

<table>
<thead>
<tr>
<th>Location</th>
<th>Past History</th>
<th>Soil Type</th>
<th>Vegetation</th>
<th>Fertiliser Tested</th>
<th>Date Sown</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. Carson, Dongara</td>
<td>First crop on old land after non-legume pasture</td>
<td>Black calcareous sand</td>
<td>Wattle</td>
<td>N-P Compound Fertiliser 28 : 14</td>
<td>14/6/67</td>
</tr>
<tr>
<td>P. Smart, Mingenew</td>
<td>Lupins in 1966, ½ ton super previously</td>
<td>Yellow sand over yellow loamy sand at about 24 inches</td>
<td>Low scrub</td>
<td>N-P Compound Fertiliser 28 : 14</td>
<td>8/6/67</td>
</tr>
<tr>
<td>Badgingarra Research Station</td>
<td>New land—fallowed 1966</td>
<td>Gravelly sand over gravel at shallow depth</td>
<td>Low scrub</td>
<td>N-P Compound Fertiliser 24 : 24</td>
<td>2-3/6/67</td>
</tr>
<tr>
<td>B. McDonald, Yerecoin</td>
<td>Wheat in 1966 after clover pasture 1965, 900 lb./acre super previously</td>
<td>Grey loamy sand with gravel clay increasing with depth</td>
<td>White Gum</td>
<td>N-P Compound Fertiliser 28 : 14</td>
<td>1/6/67</td>
</tr>
<tr>
<td>H. Van Nus, Mt. Madden</td>
<td>New land—non-fallow</td>
<td>White sand over gravelly clay at 6–10 inches</td>
<td>Mallee</td>
<td>N-P Compound Fertiliser 24 : 24</td>
<td>18/5/67</td>
</tr>
<tr>
<td>L. Gleeson, Gairdner River</td>
<td>New land—non-fallow</td>
<td>Sandy gravel over clay at 6 inches</td>
<td>Blue Mallee</td>
<td>N-P Compound Fertiliser 24 : 24</td>
<td>15/6/67</td>
</tr>
</tbody>
</table>
Fig. 1.—Wheat yields from N-P compound fertiliser 28 : 14 compared with yields from equivalent urea + super applications (average of four trials)

<table>
<thead>
<tr>
<th>Rate of fertiliser application—pounds per acre</th>
<th>1/2 UREA + 1/2 SUPERPHOSPHATE</th>
<th>N.P. COMPOUND FERTILISER 28 : 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>41 50 82 100 123 150 164 200 246 300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean yield (bus./ac.)</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>

Fig. 2.—Wheat yields from N-P compound fertiliser 24 : 24 compared with yields from equivalent urea + super applications (average of seven trials)

<table>
<thead>
<tr>
<th>Rate of fertiliser application—pounds per acre</th>
<th>1/3 UREA + 2/3 SUPERPHOSPHATE</th>
<th>N.P. COMPOUND FERTILISER 24 : 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>48 75 96 150 144 225 192 300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean yield (bus./ac.)</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>
Fig. 3.—Returns from N-P compound fertiliser 28 : 14 compared with returns from equivalent urea + super applications (average of four trials)

Gross return minus fertiliser cost ($)

Rate of fertiliser application—pounds per acre

Fig. 4.—Returns from N-P compound fertiliser 24 : 24 compared with returns from equivalent urea + super applications (average of seven trials)

Gross return minus fertiliser cost ($)

Rate of fertiliser application—pounds per acre
later seasons before a final conclusion can be reached as to which is the best source.

In 1967, many of the trials were carried out on new land, because in this situation large responses to both phosphorus and nitrogen could be expected and the sources could be more easily compared.

ACKNOWLEDGMENTS

Thanks are due to the Manager, Mr. R. Randell, and the staff of Badgingarra Research Station who planted the trial at this station.

Thanks are also due to the farmers who cooperated in allowing these trials to be carried out on their properties. They are Messrs. J. Carson, Dongara; P. Smart, Mingenew; B. McDonald, Yerecoin; Westonia Farms Ltd., Westonia; S. A. J. Fletcher, Belka; R. W. Crawford, Mt. Madden; H. Van Nus, Mt. Madden; Christie Bros., Jacup; J. Johnson, Jacup; L. Gleeson, Gairdner River; D. Miller, Boyup Brook.

Table 4.—Yield results of trials comparing compound fertilisers and urea + superphosphate

<table>
<thead>
<tr>
<th>Location</th>
<th>Compound Fertilisers (bu./ac.)</th>
<th>Urea + Super Treatments (bu./ac.)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dongara</td>
<td>17.1</td>
<td>15.3</td>
<td>Compound fertilisers gave higher yields at all rates</td>
</tr>
<tr>
<td>Mingenew</td>
<td>23.5</td>
<td>22.2</td>
<td></td>
</tr>
<tr>
<td>Badgingarra</td>
<td>9.8</td>
<td>9.4</td>
<td>Compound fertilisers gave higher yields at all but one rate</td>
</tr>
<tr>
<td>Yerecoin</td>
<td>22.6</td>
<td>18.1</td>
<td>Compound fertilisers gave higher yields at all rates</td>
</tr>
<tr>
<td>Westonia</td>
<td>7.3</td>
<td>8.3</td>
<td>Compound fertilisers gave lower yields at all rates</td>
</tr>
<tr>
<td>Belka</td>
<td>16.2</td>
<td>15.3</td>
<td>Compound fertilisers gave higher yields at all but one rate</td>
</tr>
<tr>
<td>Mt. Madden</td>
<td>14.6</td>
<td>12.7</td>
<td>Compound fertilisers gave higher yields than urea + super treatments with higher super rates</td>
</tr>
<tr>
<td>Mt. Madden</td>
<td>16.1</td>
<td>14.9</td>
<td>Compound fertiliser gave higher yields at all rates</td>
</tr>
<tr>
<td>Jacup</td>
<td>23.5</td>
<td>25.2</td>
<td>Urea + super rates higher than compound fertilisers. Compound fertiliser better than urea + super at two out of four rates</td>
</tr>
<tr>
<td>Jacup</td>
<td>17.2</td>
<td>11.2</td>
<td>Compound fertiliser gave higher yields than higher rates as urea + super</td>
</tr>
<tr>
<td>Gairdner River</td>
<td>22.6</td>
<td>16.2</td>
<td>Compound fertiliser gave higher yields than higher rates as urea + super</td>
</tr>
<tr>
<td>Boyup Brook</td>
<td>18.0</td>
<td>18.9</td>
<td>Compound fertiliser gave lower yields at all except the lowest rate</td>
</tr>
</tbody>
</table>

* Mean of all rates used. Compound fertilisers and urea + super are at comparable rates.
Table 5.—Profitabilities of treatments in trials comparing compound fertilisers and urea + superphosphate

<table>
<thead>
<tr>
<th>Location</th>
<th>*Average Monetary Return Compound Fertiliser ($)</th>
<th>*Average Monetary Return Urea + Super ($)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dongara</td>
<td>14.22</td>
<td>13.50</td>
<td>Compound fertiliser more profitable at all but two highest rates</td>
</tr>
<tr>
<td>Mingenew</td>
<td>21.84</td>
<td>21.44</td>
<td></td>
</tr>
<tr>
<td>Badgingarra</td>
<td>4.98</td>
<td>5.88</td>
<td>Compound fertiliser less profitable at all but two lowest rates</td>
</tr>
<tr>
<td>Yerecoin</td>
<td>20.92</td>
<td>16.65</td>
<td>Compound fertiliser more profitable at all rates</td>
</tr>
<tr>
<td>Westonia</td>
<td>2.16</td>
<td>4.58</td>
<td>Compound fertiliser less profitable at all rates</td>
</tr>
<tr>
<td>Belka</td>
<td>13.35</td>
<td>13.00</td>
<td></td>
</tr>
<tr>
<td>Mt. Madden</td>
<td>11.96</td>
<td>10.40</td>
<td>Compound fertiliser gave higher profits than urea + super treatments</td>
</tr>
<tr>
<td>Mt. Madden</td>
<td>13.63</td>
<td>12.07</td>
<td>Compound fertiliser more profitable than urea + super treatments</td>
</tr>
<tr>
<td>Jacup</td>
<td>21.13</td>
<td>23.13</td>
<td>Compound fertiliser less profitable at lowest and highest rates</td>
</tr>
<tr>
<td>Jacup</td>
<td>13.88</td>
<td>7.01</td>
<td>Compound fertiliser more profitable at all rates</td>
</tr>
<tr>
<td>Gairdner River</td>
<td>20.04</td>
<td>12.76</td>
<td>Compound fertiliser more profitable at all rates</td>
</tr>
<tr>
<td>Boyup Brook</td>
<td>10.16</td>
<td>13.47</td>
<td>Compound fertiliser less profitable at all but lowest rate</td>
</tr>
</tbody>
</table>

* On farm value of wheat minus cost of fertiliser. Mean of all rates used.
1 Bushel wheat = $1.15.
Application of urea = 50c/acre.
Average freight taken as $4.00/ton.
Super after freight (polythene bags) = $27.05/ton.
Compound fertiliser after freight = $89.50/ton.
Urea after freight = $72.40/ton.

RESEARCH STATION FIELD DAYS

The Department of Agriculture extends an open invitation to all farmers and other interested members of the public to attend its Cereal Area Research Station field days. The field days which start at 11 a.m. will be held at the following places.

- Avondale Research Station (Beverley), Tuesday, September 17.
- Esperance Downs Research Station, Friday, October 4.
- Salmon Gums Research Station, Tuesday, October 8.
- Newdegate Research Station, Wednesday, October 16.
- Merredin Research Station, Tuesday, October 22.
- Wongan Hills Research Station, Thursday, October 24.

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