1990


J. D. Warren

Follow this and additional works at: https://researchlibrary.agric.wa.gov.au/rqmsplant

Part of the Agronomy and Crop Sciences Commons, Biodiversity Commons, Fresh Water Studies Commons, Inorganic Chemistry Commons, and the Organic Chemistry Commons

**Recommended Citation**


This report is brought to you for free and open access by the Research Publications at Research Library. It has been accepted for inclusion in Experimental Summaries - Plant Research by an authorized administrator of Research Library. For more information, please contact jennifer.heathcote@agric.wa.gov.au, sandra.papenfus@agric.wa.gov.au, paul.orange@dpird.wa.gov.au.
TITLE: 1. Canola Rapeseed Variety Assessment
2. Canola Agronomy
3. Linseed
4. Tillage

PERSONNEL: Warren, J.D., Tugwell, R., Knight, A., Willey, S., Mitchell, H.

TRIAL NUMBER: 90AB15, 90N68, 90EB39, 90AB16, 90N69, 90EB40, 90WH81, 90AB13, 90AB14, 90KA103, 90KA104, 90MT65, 90MT62, 90KA104/90KA106, 90KA108, 90KA111, 90WH82, 89N45, 90KA107, 90KA109, 90KA119, 90WH83, 90KA112, 90KA113, 90KA114, 90A23, 90EB41, 90N70, 90KA110/90KA105, 90BA65, 90MT63/84KA28, 87KA47, 88KA73, 89KA71, 90KA115, 90KA116, 90KA117, 90KA118, 89BA26, 89LG36, 77M56, 89ME88, 85SG28, 89SG17, 77WH88, 82WH49, 89WH65
TABLE OF CONTENTS

1. Canola Rapeseed Variety Assessment 609
   1.1 Early Maturity Stage 2 609
   1.2 Early Maturity Triazine Resistance 611
   1.3 Stage 1 Early Maturity Selections 613
   1.4 Late Maturity Stage 2 615
   1.5 Late Maturity Triazine Resistance 615
   1.6 Blackleg Race Trial 616
   1.7 Interstate Variety Trials 618

2. Canola Agronomy 621
   2.1 Canola Rotation Trial 621
   2.2 Canola Nitrogen Trials 625
   2.3 Canola Seeding Rate Trials 628
   2.4 Stubble Residues 632

3. Linseed 633

4. Tillage 635
   4.1 Gypsum x Tillage x Nitrogen in continuous crop 635
   4.2 Gypsum x Tillage x Nitrogen in cereal crop x medic 638
   4.3 The effect of gypsum on medin pasture establishment 643
   4.4 Effect of tillage x gypsum on medic regeneration 650
   4.5 Pasture regeneration on tillage trials 653
      4.5.1. 89BA26
      4.5.2. 89LG36
      4.5.3. 77M56
      4.5.4. 90ME88
      4.5.5. 85SG28
      4.5.6. 89SG17
      4.5.7. 77WH88
      4.5.8. 82WH49
      4.5.9. 89WH65
HIGHLIGHTS

CANOLA

* Results identify new varieties BLN 496 and BLN 500 which performed better than Barossa and Yickadee at a high rainfall site. BLN 469 outperformed Eureka and 82N469 at a medium rainfall site.

* Identification of a possible Triazine resistant line for high rainfall areas.

* Yields of Canola up to 2t/ha in trials at Wongan Hills Research Station are indicative of potential yields in the area and a testament to the management skills of the staff.

* The soon to be released line 82N469 shows its suitability to lower rainfall environments by outyielding Maluka and Eureka by up to 15% at Katanning and Newdegate.

TILLAGE

* Application of gypsum to crop in a cereal - medic rotation will give increased medic establishment and production.

* There appears to be differences between medic cultivars response to residual gypsum application in the previous year.

* Data continues to show that minimum soil disturbance crop tillage practices favour subsequent legume pasture establishment in 1:1 rotations. This response is carried over into the second year if paddock stays in pasture.

* A deep ripping treatment increases subsequent pasture regeneration contradicting previous findings.
1. CANOLA.
1.1 Assessment of early maturity Stage 2 lines.

Introduction
Production of Canola in medium rainfall zones offers the opportunity for a rapid expansion of the industry. However presently recommended varieties take too long to mature for the area's shorter growing season. The Stage 2 trials assess Canola lines selected on the basis of earliness from the remnants of Dr Roy's now defunct rapeseed breeding programme as well as selections from Eastern States breeding programmes. The trials are conducted at three sites to account for environmental effects on cultivar performance.

Method
90AB15: GSARI, Katanning
Soil type: Gravelly sand over clay duplex.
Site History: Long term poor pasture
Fertilizer: 100 kg Super Cu Mo Zn topdressed prior to sowing, 56 kg Urea drilled prior to sowing.
80 kg Urea topdressed 13.7.90
Weed Control: 2 x cult, Lontrel(300ml/ha)x Verdict(500ml/ha), 6.8.90
Insect Control: Lemat(150ml/ha), 12.6.90; Lorsban(150ml), 26.6.90; Ripcord(100ml), 30.6.90; Ripcord(200ml), 6.7.90; Ripcord(400ml), 25.7.90; Thiodan (2l/ha), 4.8.90 and 17.8.90; Ripcord(50ml), 8.11.90.
Sowing Date: 11.6.90, Harvest date: 30.11.90

Soil type: Sand over clay duplex
Site History:
Fertilizer: 100 kg/ha Super at sowing, 30kg/ha Urea at sowing.
Weed Control: Sprayseed, 2.0 l/ha 29.5.90; 250ml/ha Fusilade + 0.1% wetting agent + Rogor(80ml), 2.7.90
Insect Control: None other than Rogor.
Sowing Date: 5.6.90, Harvest date: 23.11.90

Soil type: Sand over clay duplex.
Site history:

Fertilizer: 150 kg/ha Super and 60kg/ha Urea at seeding.
60 kg/ha Urea topdressed 13.6.90.

Weed control: Roundup(500ml/ha), Hoegrass(1l/ha) + wetter 14.6.90;
Fusilade (500ml), 14.7.90; Sertin(250ml) + Fusilade(150ml)
+ 1% oil + 0.1% wetter, 9.8.90.

Insect control: Lorsban(900ml/ha), 22.5.90.

Date of sowing: 22.5.90.  Harvest date: abandoned

Results and Discussion

The trial at East Beverley was abandoned due to excessive cruciferous weeds and high levels of insect damage at establishment. Site selection in this area needs to be done with more care as the site is an important location in the development of early maturing Canola lines.

Management at Newdegate was not up to scratch either as Nitrogen was not applied to the trial. This resulted in low yields in the order of half a tonne per hectare. The poor start to the season (cold dry June) affected establishment and in conjunction with the very high levels of vegetable weevil present resulted in lower than desirable plant densities. Canola is capable of compensating for low densities but the small stature of the earlier lines may not have the same capacity. This appears to be the case as none of the early selections in the trial yielded as well as the controls despite doing so in the previous year.

The trials did show the superiority of the line 82N469 which outyielded all other lines by at least 9% at Katanning and 14% at Newdegate (Table 1). In past comparisons Maluka and Eureka usually out perform 82N469 in the Katanning district and the reversal of performance is indicative of the poor season.
Table 1. Yield as a percent of 82N469.

<table>
<thead>
<tr>
<th>TRT NO</th>
<th>CULTIVAR</th>
<th>90AB15</th>
<th>90N68</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>81N106-436 L</td>
<td>82</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>81N106-438 L</td>
<td>76</td>
<td>58</td>
</tr>
<tr>
<td>3</td>
<td>81N106-440 L</td>
<td>77</td>
<td>57</td>
</tr>
<tr>
<td>4</td>
<td>81N106-442 L</td>
<td>79</td>
<td>77</td>
</tr>
<tr>
<td>5</td>
<td>81N106-446 L</td>
<td>59</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>81N106-448</td>
<td>76</td>
<td>63</td>
</tr>
<tr>
<td>7</td>
<td>81N106-449</td>
<td>62</td>
<td>66</td>
</tr>
<tr>
<td>8</td>
<td>81N108-451 L</td>
<td>67</td>
<td>48</td>
</tr>
<tr>
<td>9</td>
<td>81N106-453</td>
<td>43</td>
<td>60</td>
</tr>
<tr>
<td>10</td>
<td>81N106-459 L</td>
<td>65</td>
<td>66</td>
</tr>
<tr>
<td>11</td>
<td>81N106-461 L</td>
<td>74</td>
<td>65</td>
</tr>
<tr>
<td>12</td>
<td>81N106-462 L</td>
<td>72</td>
<td>71</td>
</tr>
<tr>
<td>13</td>
<td>81N106-464 L</td>
<td>68</td>
<td>73</td>
</tr>
<tr>
<td>14</td>
<td>81N106-469 L</td>
<td>73</td>
<td>79</td>
</tr>
<tr>
<td>15</td>
<td>81N106-470 L</td>
<td>62</td>
<td>66</td>
</tr>
<tr>
<td>16</td>
<td>81N106-477 L</td>
<td>71</td>
<td>65</td>
</tr>
<tr>
<td>17</td>
<td>81N106-478 L</td>
<td>72</td>
<td>71</td>
</tr>
<tr>
<td>18</td>
<td>81N106-482 L</td>
<td>62</td>
<td>67</td>
</tr>
<tr>
<td>19</td>
<td>81N107-333 L</td>
<td>72</td>
<td>77</td>
</tr>
<tr>
<td>20</td>
<td>81N107-347 L</td>
<td>75</td>
<td>77</td>
</tr>
<tr>
<td>21</td>
<td>RE 1</td>
<td>79</td>
<td>76</td>
</tr>
<tr>
<td>22</td>
<td>RE 2</td>
<td>91</td>
<td>73</td>
</tr>
<tr>
<td>23</td>
<td>RE 3</td>
<td>91</td>
<td>83</td>
</tr>
<tr>
<td>24</td>
<td>RE 4</td>
<td>88</td>
<td>80</td>
</tr>
<tr>
<td>25</td>
<td>SHIRALEE</td>
<td>84</td>
<td>67</td>
</tr>
<tr>
<td>26</td>
<td>EUREKA</td>
<td>93</td>
<td>83</td>
</tr>
<tr>
<td>27</td>
<td>WESBARKER</td>
<td>81</td>
<td>58</td>
</tr>
<tr>
<td>28</td>
<td>MALUCA</td>
<td>90</td>
<td>86</td>
</tr>
<tr>
<td>29</td>
<td>82N469</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

82N469 Yield 2243 kg/ha 558 kg/ha

1.2 Early Maturity Triazine Resistance

Introduction
The use of triazine herbicides on Canola provides a reliable and relatively cheap form of broadleaf weed control for the crop. Although triazine resistant rapeseed has been developed for some time, yield was up to 40% lower than present varieties in weed free conditions. Recent research has shown that new lines can match the yield of present varieties under certain conditions making them a better prospect for commercial release.
Methods

90AB16: as for 89AB15 plus Atrazine(2.0 l/ha), 14.6.90 on + triazine treatments.

90N69: as for 90N68 plus Simazine(2.0 l/ha), 4.6.90 on + triazine treatments.

90EB40: as for 90EB39 plus Simazine(2.0 l/ha), 12.6.90 on + triazine treatments.

90WH81: J. Ferguson, T Mouritzen, Wongan Hills Research Station.

Soil type: Sandy loam.

Site History:

Fertilizer: 50 kg DAP at sowing plus 30 kg Urea topdressed.
120 kg Urea topdressed, 19.7.90.

Weed Control: Sertin(1.0 l) + 1% oil, 17.7.90; Lontrel(350 ml), 27.7.90.

Insect Control: Rogor(85 ml/ha), 11.6.90; Karate(180 ml), 27.7.90;

Sowing Date: 11.6.90, Harvest date: 5.12.90

Herbicide treatments applied at sowing.

NB Trials 90NO113 and 90NO114 abandoned due to insect damage at establishment.

Results and Discussion

The loss of the trials 90NO113, 90NO114 and 90EB40 severely hampered efforts to select a suitable commercial line. Vegetable weevil was suspected as the problem but control measures were implemented too late. The trial was possibly abandoned prematurely as the plants were not given a chance to recover following control.

Results from the surviving trials gave mixed results which could be in part due to varying levels of weed infestation. Yields at the Katanning site for the resistant lines were only 60 to 70% of the control Maluka (Table 2). Whereas at Wongan they were 70 to 80% and at Newdegate up to 100% in the treated plots and 60 to 70% in the non treated plots. Double gee at Wongan and radish at both sites were present and may have contributed to the responses.

The results highlight the difficulty in obtaining consistent results from these lines and the release of a commercial line will require careful economic analysis on the value of such types to the overall farm system when they are capable of yielding only 60% of the normal lines. The necessity of such lines is related to the need for an extra crop in crop rotations where cruciferous weeds are a problem.
Table 2. Yield of Triazine resistant Canola lines as a percent of the control Maluka under plus and minus triazine application.

<table>
<thead>
<tr>
<th>CULTIVAR</th>
<th>AB16</th>
<th>90WH81</th>
<th>90N69</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Maluka ATR</td>
<td>% Maluka NO ATR</td>
<td>% Maluka ATR</td>
</tr>
<tr>
<td>81N290-11 A</td>
<td>63</td>
<td>66</td>
<td>83</td>
</tr>
<tr>
<td>82N159-23 A</td>
<td>57</td>
<td>75</td>
<td>81</td>
</tr>
<tr>
<td>82N160-63 A</td>
<td>60</td>
<td>64</td>
<td>79</td>
</tr>
<tr>
<td>82N160-74 A</td>
<td>64</td>
<td>66</td>
<td>82</td>
</tr>
<tr>
<td>82N244-17</td>
<td>46</td>
<td>72</td>
<td>98</td>
</tr>
<tr>
<td>MALUKA kg/ha</td>
<td></td>
<td>1952</td>
<td>1216</td>
</tr>
</tbody>
</table>

1.3 Stage 1 Early Maturity Selections.

Introduction

The recently ended WA Canola rapeseed breeding programme had concentrated on developing lines for high rainfall environments and had selected against early maturity because these lines had reduced yields under this environment. Single plants, selected on the basis of early flowering and maturity, were taken from the row assessments in 1989. These were sown in rows again in 1990 at Katanning. Lines that showed appropriate attributes in 1989 were sown in 10m plots for yield assessment.

Method

90AB13, 90AB14: as per 90AB15 except rows harvested 23.11.90 and plots 27.11.90.

Results and Discussion

One hundred and seventy two lines were grown in 5m rows. The dry spell following seeding led to very uneven germination and coupled with high levels of vegetable weevil infestation caused staggered establishment. Germination and emergence of seedlings ranged over 6 weeks. The trial was abandoned as selection was to be done on the basis of early flowering and maturity with the staggered emergence making it impossible to identify these characteristics. The high infestation levels of vegetable weevil were
unusual for Katanning but it is postulated that it may have been due to summer rainfall and associated germination and survival of capeweed allowing two generations of the pest.

The trial will be repeated in 1990.

Table 3. Yield as a percent of Maluka for entries in the Stage 1 yield assessment trial.

<table>
<thead>
<tr>
<th>CULTIVAR</th>
<th>YIELD KG/HA</th>
<th>% MALUKA</th>
</tr>
</thead>
<tbody>
<tr>
<td>586N034-1</td>
<td>1904</td>
<td>95</td>
</tr>
<tr>
<td>586N034-2</td>
<td>2092</td>
<td>104</td>
</tr>
<tr>
<td>586N034-3</td>
<td>1944</td>
<td>97</td>
</tr>
<tr>
<td>586N034-4</td>
<td>1792</td>
<td>89</td>
</tr>
<tr>
<td>586N034-5</td>
<td>1726</td>
<td>86</td>
</tr>
<tr>
<td>586N034-6</td>
<td>1781</td>
<td>88</td>
</tr>
<tr>
<td>586N034-7</td>
<td>1807</td>
<td>80</td>
</tr>
<tr>
<td>586N034-8</td>
<td>1941</td>
<td>96</td>
</tr>
<tr>
<td>586N034-9</td>
<td>1970</td>
<td>98</td>
</tr>
<tr>
<td>586N034-10</td>
<td>2166</td>
<td>108</td>
</tr>
<tr>
<td>586N034-11</td>
<td>1933</td>
<td>96</td>
</tr>
<tr>
<td>586N034-12</td>
<td>1515</td>
<td>75</td>
</tr>
<tr>
<td>586N034-13</td>
<td>2018</td>
<td>100</td>
</tr>
<tr>
<td>586N034-14</td>
<td>1711</td>
<td>85</td>
</tr>
<tr>
<td>586N034-15</td>
<td>1804</td>
<td>90</td>
</tr>
<tr>
<td>586N034-16</td>
<td>1759</td>
<td>87</td>
</tr>
<tr>
<td>586N034-17</td>
<td>2307</td>
<td>115</td>
</tr>
<tr>
<td>586N034-18</td>
<td>1641</td>
<td>81</td>
</tr>
<tr>
<td>586N034-19</td>
<td>1978</td>
<td>98</td>
</tr>
<tr>
<td>586N034-20</td>
<td>2085</td>
<td>104</td>
</tr>
<tr>
<td>586N034-21</td>
<td>1715</td>
<td>85</td>
</tr>
<tr>
<td>586N034-22</td>
<td>1959</td>
<td>97</td>
</tr>
<tr>
<td>90N1-1D</td>
<td>1337</td>
<td>66</td>
</tr>
<tr>
<td>90N1-2D</td>
<td>1374</td>
<td>68</td>
</tr>
<tr>
<td>90N1-3D</td>
<td>1426</td>
<td>71</td>
</tr>
<tr>
<td>90N1-4D</td>
<td>1241</td>
<td>62</td>
</tr>
<tr>
<td>90N1-5D</td>
<td>1070</td>
<td>53</td>
</tr>
<tr>
<td>MALUKA</td>
<td>2007</td>
<td>100</td>
</tr>
<tr>
<td>WESBARKER</td>
<td>1941</td>
<td>96</td>
</tr>
<tr>
<td>MALUKA</td>
<td>2018</td>
<td>100</td>
</tr>
<tr>
<td>WESBARKER</td>
<td>1926</td>
<td>96</td>
</tr>
</tbody>
</table>

Results from the yield assessment plot trial (Table 3) was also affected by the season but despite thin stands a number of lines still yielded as well as or better than Maluka. Also of interest were the Dwarf lines, designated by a D in Table 3, performing creditably despite being extensively rogued. These lines are not early being on a par with Wesbarker in maturity. However they are very short and have a completely different stature to normal lines carry pods in clumps on short branches. Their habit would make harvesting considerably easier and they have the added bonus of having very good tolerance to pod shattering.
1.4 Late Maturity Stage 2

Introduction

The higher rainfall areas still remain an option for Canola cropping especially in times of low wool prices or if farmers have specialized in cropping. Within the local breeding programme a number of new lines suited to this area have been identified as having up to 30% more yield than the present recommended varieties and there is a need for a more comprehensive assessment.

Methods

90KA103: P. Terry, Kojonup.

Soil type: Sandy loam

Site history: Pasture.

Fertilizer: 50 kg/ha Super topdressed by farmer. 100kg/ha Super CuMoZn plus 56kg/ha Urea at seeding. 80kg/ha Urea topdressed, 11.7.90.

Weed Control: Roundup(800m1/ha), (by farmer early May) and cultivated. Verdict, (500ml) plus Lontrel (300ml), 23.8.90.

Insect Control: Lorsban(140ml), 5.6.90; Lemat(50ml), 12.6.90; Ripcord(200ml), 6.7.90; Ripcord(600 ml), 13.7.90.

Date of sowing: 1.6.90. Date of harvest: 26.11.90.

Results and Discussion

Problems with water erosion from a burst drain caused damage to the trial. Harvest results were erratic and of little use however there was an indication that Barossa was the better performing variety.

1.5 Late Maturity Triazine Resistance

Introduction

The use of triazine herbicides on rapeseed provides a reliable and relatively cheap form of broadleaf weed control for the crop. Although triazine resistant Canola has been developed for some time yields have been are up to 40% lower than present varieties in weed free conditions.

Recent research has shown that new lines can yield at least the same as present varieties making them a better prospect for commercial release.
Method

**90KA104:** as for 90KA103 plus Atrazine(2.01/ha) to + triazine plots.

**RESULTS AND DISCUSSION:**

Under conditions of no triazine the resistant lines ranged from 51 to 87% of the control Maluka (Table 4). Where triazine had been applied the range was similar with the exception of the line 82N160-84TA which was 99% of the control. The performance of this line is promising but further testing is required to see if the result is consistent. Vegetatively the trial looked as if it was going to yield considerably greater than the 1.4 tonne of Maluka and suggest a source limitation perhaps micronutrients?

Table 4. Yield as a percent of Maluka for Triazine resistant lines of Canola under conditions of plus and minus triazine application.

<table>
<thead>
<tr>
<th>CULTIVAR</th>
<th>GRAIN YIELD % OF MALUKA TRIAZINE</th>
<th>GRAIN YIELD % OF MALUKA NO TRIAZINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>81N247-6</td>
<td>65</td>
<td>78</td>
</tr>
<tr>
<td>81N247-23</td>
<td>65</td>
<td>53</td>
</tr>
<tr>
<td>81N289-16 A</td>
<td>60</td>
<td>74</td>
</tr>
<tr>
<td>81N289-18 A</td>
<td>75</td>
<td>73</td>
</tr>
<tr>
<td>81N290-11 A</td>
<td>64</td>
<td>60</td>
</tr>
<tr>
<td>82N159-30TA</td>
<td>65</td>
<td>64</td>
</tr>
<tr>
<td>82N160-34 A</td>
<td>67</td>
<td>60</td>
</tr>
<tr>
<td>82N160-63 A</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>82N160-71 A</td>
<td>78</td>
<td>69</td>
</tr>
<tr>
<td>82N160-84TA</td>
<td>99</td>
<td>87</td>
</tr>
<tr>
<td>82N160-89 A</td>
<td>79</td>
<td>64</td>
</tr>
<tr>
<td>82N160-90 A</td>
<td>79</td>
<td>64</td>
</tr>
<tr>
<td>82N160-92 A</td>
<td>74</td>
<td>71</td>
</tr>
<tr>
<td>82N245-23 A</td>
<td>54</td>
<td>56</td>
</tr>
<tr>
<td>82N247-68TA</td>
<td>61</td>
<td>66</td>
</tr>
<tr>
<td>82N247-103TA</td>
<td>69</td>
<td>58</td>
</tr>
<tr>
<td>82N247-105 A</td>
<td>55</td>
<td>51</td>
</tr>
<tr>
<td>82N247-109 A</td>
<td>68</td>
<td>63</td>
</tr>
<tr>
<td>82N247-117 A</td>
<td>73</td>
<td>53</td>
</tr>
<tr>
<td>585N009-5A</td>
<td>79</td>
<td>75</td>
</tr>
<tr>
<td>486N060-2A</td>
<td>79</td>
<td>66</td>
</tr>
<tr>
<td>MALUKA</td>
<td>kg/ha</td>
<td>1418</td>
</tr>
</tbody>
</table>

1.6 **BLACKLEG RACE TRIAL**

**INTRODUCTION**

Blackleg remains the major disease of rapeseed in Australia, and particularly in Western Australia. New cultivars for the southern regions of Australia require high levels of
resistance to Blackleg to perform successfully. To keep track of the various races of the blackleg fungus the W.A. Department in conjunction with Dr P Salisbury of the Victorian Ag Department conducts trials to measure changes in susceptibility of known cultivars as well as investigating which forms of Blackleg are infecting the cultivar.

Methods

90MT65: P. Delane, D. Rowe, Mount Barker Research Station.

Soil type: Karri loam

Site history: Pasture.

Fertilizer: 200 kg/ha Super at seeding, 80kg/ha Urea on 12.7.90.

Weed Control: Sprayseed(1.01/ha) plus Dicamba(0.51/ha), 20.4.90. Sprayseed (1.01/ha) + Lemat(75ml), 22.5.90. Fusilade (250ml) plus Lontrel (300ml), 30.7.90.

Insect Control: Dimethoate(55ml), 26.6.90; Ripcord(400ml), 18.7.90; Pirimor(300ml), 14.9.90.

Date of sowing: 25.5.90. Date of harvest: 21.12.90.

Results and Discussion
The cold and dry weather in June affected emergence to such an extent that seedlings were still emerging up to the start of August. The results are not a good indication of the effect of Blackleg because the two treatments that had the greatest reduction in plant numbers over time were Brassica juncea, a species which is resistant to the blackleg disease (Table 5).

Further more, examination of other Canola trials on the research station revealed that Blackleg infection was extremely low. Therefore the juncea result suggests that some other factor was the main contributor to the plant number reduction. Damping off is a possibility and has occurred at Mt Barker previously. Alternaria was also present in near by Canola trials but did not appear until well after pod set had begun.

The encouraging aspect of the result is that the cultivar Maluka was not affected by the problem whatever it may have been.
Table 5. Plant density as a percent of the control Maluka and the difference in density over time.

<table>
<thead>
<tr>
<th>CULTIVAR</th>
<th>SPECIES</th>
<th>density % Maluka</th>
<th>density % Maluka</th>
<th>% density difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>11.7.90</td>
<td>19.9.90</td>
<td></td>
</tr>
<tr>
<td>BUNYIP</td>
<td>B. campestris</td>
<td>41</td>
<td>43</td>
<td>8</td>
</tr>
<tr>
<td>CHISAYA</td>
<td>B. napus</td>
<td>90</td>
<td>75</td>
<td>-14</td>
</tr>
<tr>
<td>JET NEUF</td>
<td>B. napus</td>
<td>78</td>
<td>49</td>
<td>-35</td>
</tr>
<tr>
<td>JUMBUCK</td>
<td>B. campestris</td>
<td>26</td>
<td>31</td>
<td>27</td>
</tr>
<tr>
<td>MARNOO</td>
<td>B. napus</td>
<td>72</td>
<td>62</td>
<td>-24</td>
</tr>
<tr>
<td>MIDAS</td>
<td>B. napus</td>
<td>78</td>
<td>67</td>
<td>-11</td>
</tr>
<tr>
<td>NIKLAS</td>
<td>B. napus</td>
<td>91</td>
<td>73</td>
<td>-16</td>
</tr>
<tr>
<td>RAFAL</td>
<td>B. napus</td>
<td>96</td>
<td>66</td>
<td>-29</td>
</tr>
<tr>
<td>RX3</td>
<td>B. napus</td>
<td>82</td>
<td>67</td>
<td>-14</td>
</tr>
<tr>
<td>STOEK</td>
<td>B. juncea</td>
<td>54</td>
<td>20</td>
<td>-62</td>
</tr>
<tr>
<td>WESBROOK</td>
<td>B. napus</td>
<td>43</td>
<td>63</td>
<td>29</td>
</tr>
<tr>
<td>ZAIRA</td>
<td>B. juncea</td>
<td>23</td>
<td>5</td>
<td>-76</td>
</tr>
<tr>
<td>TOWER</td>
<td>B. napus</td>
<td>87</td>
<td>63</td>
<td>-24</td>
</tr>
<tr>
<td>MALUKA</td>
<td>B. napus</td>
<td>100</td>
<td>100</td>
<td>5</td>
</tr>
</tbody>
</table>

1.7 Interstate Variety Trials

Introduction

High performance, commercially released and experimental lines of Canola rapeseed are tested in trials throughout Australia under a range of environments. These trials are part of the testing program with a site in a medium rainfall zone of Western Australia for the first time.

Methods

90MT62 see 90MT65 for details

90KA104

Soil type: Clay loam

Site history: 1989 poor legume pasture

Fertilizer: 150 kg/ha Super, 56 kg/ha Urea drilled at seeding. 80 kg/ha Urea topdressed, 13.7.90.

Weed Control: 2 x Cultivation by farmer. Verdict(750ml), 20.6.90; Verdict(500ml) + Lontrel(300 ml), 6.8.90.
Insect Control: Lorsban(140ml), 5.6.90; Lemat(50ml), 12.6.90.
Thiodan(2.0l/ha), 27.10.89.

Date of sowing: 8.6.89. Date of harvest: 28.11.89.

Results and Discussion

The outstanding lines were BLN 496, BLN 500, PAC 21023, Yickadee and Barossa at Mount Barker (Table 7) and BLN 496, and a range of hybrid lines at Katanning (Table 6). It is interesting to note the performance of the hybrid lines from Pacific Seeds yielding well at both sites. However some caution should be applied in interpreting these results as previous hybrid lines had poor resistance to Blackleg. Assessment of the lines at Mount Barker indicate that resistance is improving (Table 8), but it should also be remembered that Blackleg infection was relatively low when compared to other years.

The many summer rainfall events undoubtedly played a role in this situation with the presence of moisture germinating spores early when there was no host plants available.

Table 6. Details of cultivar performance at Katanning.

<table>
<thead>
<tr>
<th>TREATMENT NAME</th>
<th>DAYS TO 50% FLOWER</th>
<th>PLANT HEIGHT (cm)</th>
<th>YIELD AS %</th>
<th>LODGING (a)</th>
<th>SHATTER (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUREKA</td>
<td>110</td>
<td>95</td>
<td>100</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>BAROSSA</td>
<td>114</td>
<td>95</td>
<td>93</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>YICKADEE</td>
<td>112</td>
<td>95</td>
<td>98</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>BLN 496</td>
<td>112</td>
<td>105</td>
<td>114</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>BLN 500</td>
<td>113</td>
<td>93</td>
<td>95</td>
<td>1.25</td>
<td>1.00</td>
</tr>
<tr>
<td>BLN 504</td>
<td>113</td>
<td>90</td>
<td>87</td>
<td>1.50</td>
<td>1.00</td>
</tr>
<tr>
<td>BLN 514</td>
<td>114</td>
<td>90</td>
<td>67</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>82N469</td>
<td>105</td>
<td>93</td>
<td>95</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>RD 6</td>
<td>113</td>
<td>105</td>
<td>82</td>
<td>1.25</td>
<td>1.00</td>
</tr>
<tr>
<td>RD 9</td>
<td>109</td>
<td>93</td>
<td>73</td>
<td>1.25</td>
<td>1.00</td>
</tr>
<tr>
<td>RD 11</td>
<td>107</td>
<td>100</td>
<td>104</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>HYOLA 41</td>
<td>105</td>
<td>103</td>
<td>105</td>
<td>1.50</td>
<td>1.00</td>
</tr>
<tr>
<td>PAC 21005</td>
<td>105</td>
<td>100</td>
<td>88</td>
<td>1.25</td>
<td>1.00</td>
</tr>
<tr>
<td>PAC 21006</td>
<td>106</td>
<td>95</td>
<td>98</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>PAC 21023</td>
<td>107</td>
<td>95</td>
<td>107</td>
<td>1.50</td>
<td>1.00</td>
</tr>
<tr>
<td>PAC 21028</td>
<td>103</td>
<td>103</td>
<td>107</td>
<td>1.25</td>
<td>1.00</td>
</tr>
<tr>
<td>Eureka kg/ha</td>
<td>1597</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SCALE USED (a) 1 = none; 2 = 10%; 3 = more.
(b) 1 = 0 - 5%; 2 = 5 - 10%; 3 = more.
Table 7. Yield as a % of Eureka and lodging and pod shattering ratings for Canola at Mount Barker.

<table>
<thead>
<tr>
<th>CULTIVAR NAME</th>
<th>YIELD AS %</th>
<th>LODGING RATING</th>
<th>SHATTERING RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUREKA</td>
<td>100</td>
<td>0.50</td>
<td>0.25</td>
</tr>
<tr>
<td>BAROSSA</td>
<td>118</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>YICKADEE</td>
<td>122</td>
<td>0.00</td>
<td>0.50</td>
</tr>
<tr>
<td>BLN 496</td>
<td>133</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>BLN 500</td>
<td>138</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>BLN 504</td>
<td>115</td>
<td>0.00</td>
<td>0.26</td>
</tr>
<tr>
<td>BLN 514</td>
<td>97</td>
<td>0.00</td>
<td>0.75</td>
</tr>
<tr>
<td>82N469</td>
<td>89</td>
<td>2.50</td>
<td>0.00</td>
</tr>
<tr>
<td>RD 6</td>
<td>108</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>RD 9</td>
<td>98</td>
<td>0.00</td>
<td>0.76</td>
</tr>
<tr>
<td>RD 11</td>
<td>103</td>
<td>0.00</td>
<td>0.50</td>
</tr>
<tr>
<td>HYOLA 41</td>
<td>92</td>
<td>2.00</td>
<td>0.00</td>
</tr>
<tr>
<td>PAC 21005</td>
<td>109</td>
<td>0.00</td>
<td>0.50</td>
</tr>
<tr>
<td>PAC 21006</td>
<td>105</td>
<td>1.25</td>
<td>0.00</td>
</tr>
<tr>
<td>PAC 21023</td>
<td>125</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>PAC 21028</td>
<td>88</td>
<td>0.25</td>
<td>0.76</td>
</tr>
</tbody>
</table>
| ** SCALE USED 0 = NONE **

Table 8. Blackleg rating for Canola entries in Interstate assessment trial at Mount Barker.

<table>
<thead>
<tr>
<th>CULTIVAR NAME</th>
<th>CLEAN %</th>
<th>MODERATE %</th>
<th>SEVERE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUREKA</td>
<td>40</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>BAROSSA</td>
<td>20</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>YICKADEE</td>
<td>10</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>BLN 496</td>
<td>60</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>BLN 500</td>
<td>40</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>BLN 504</td>
<td>40</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>BLN 514</td>
<td>30</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>82N469</td>
<td>30</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>RD 6</td>
<td>30</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>RD 9</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>RD 11</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>HYOLA 41</td>
<td>0</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>PAC 21005</td>
<td>0</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>PAC 21006</td>
<td>0</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>PAC 21023</td>
<td>10</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>PAC 21028</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>
2. CANOLA AGRONOMY

2.1 Canola Rotation Trials

Introduction
The role of Canola as a break crop is generally acknowledged but poorly quantified. This research aims to collect the appropriate information on breakcrop value over a range of cropping rotation options.

Methods

90KA106 M. Quartermaine, Katanning

Soil type: Red Clay loam

Site history: 1988 wheat, 1989 field peas

Fertilizer: 150kg/ha Superphosphate CuMoZn plus 30kg/ha Urea at seeding. 120kg/ha Urea topdressed 19.7.90.

Weed Control: Roundup(1.0l), 21.5.90; Cultivation, 26.5.90.
Canola: Verdict(750ml) + Lontrel(300 ml), 20.6.90.
Butisan S(2.5l), 19.6.90 for fumitory.
Hoegrass(1.0l) + oil(1%) + wetter, 7.8.90.
Wheat: Glean(15g), 2.7.90.
Hoegrass(1.0l) + oil(1%) + wetter, 7.8.90.

Insect Control: Lemat(150ml), 12.6.90; Thiodan(2.1l), 21.9.90;
Metasystox(300ml), 26.9.90 Canola only.

Date of sowing: 6.6.90. Date of harvest: 13.12.90.

90KA108 A. McNabb, Frankland.

Soil type: Gravelly loam.

Site history: 1988 barley, 1989 processing peas.

Fertilizer: 100kg/ha Superphosphate CuMoZn plus 30kg/ha Urea at seeding. 120kg/ha Urea topdressed 11.7.90.

Weed Control: Cultivation x 2 by farmer.
Canola: Verdict(750ml) + Lontrel(300 ml), 22.6.90.
Hoegrass(2.0l) + oil(1%) , 13.8.90.
Cereals: Glean(15g), 2.7.90.
Hoegrass(1.0l) + oil(1%) , 7.8.90.

Insect Control: Lorsban(140ml), 5.6.90; Lemat(50ml), 13.6.90;
Ripcord(400ml), 19.6.90, Metasystox(300ml), 26.9.90 Canola only.
Date of sowing: 29.5.90. Date of harvest: 12.12.90.

90KA111 M. Quartermaine, Katanning

Soil type: Grey loamy clay.

Site history: 1989 wheat.

Fertilizer: 150kg/ha Superphosphate CuMoZn plus 30kg/ha Urea at seeding. 120kg/ha Urea topdressed 19.7.90.

Weed Control: Sprayseed(1.5l), 6.6.90; Cultivation, 26.5.90. Canola: Verdict(750ml) + Lontrel(300 ml), 20.6.90. Hoegrass(1.0l) + oil(1%) + wetter, 7.8.90. Wheat: Glean(15g), 2.7.90. Hoegrass(1.0l) + oil(1%) + wetter, 7.8.90.

Insect Control: Lemat(150ml), 12.6.90; Thiodan(2.1l), 21.9.90; Metasystox(300ml), 26.9.90 Canola only.

Date of sowing: 6.6.90. Date of harvest: 13.12.90. Wheat reseeded 3.7.90

90WH82 J. Ferguson, Wongan Hills Research Station.

Soil type: Deep sand.


Fertilizer: Block 2EA : 100kg/ha Superphosphate and 30kg/ha Urea seeding. 120kg/ha Urea topdressed 19.7.90. Block 2EB : 50kg/ha DAP at seeding. 120 kg/ha Urea topdressed 19.7.90.

Treatments: Block 2EA : Canola cv Maluka at 7kg/ha. Block 2EB : Wheat cv Spear at 50kg/ha.

Weed Control: Block 2EA : Roundup(1.0l), 20.5.90; Cultivation, 26.5.90. Canola: Verdict(750ml) + Lontrel(300 ml), 20.6.90. Butisan S(2.5l), 19.6.90 for fumitory. Hoegrass(1.0l) + oil(1%) + wetter, 7.8.90. Wheat: Glean(15g), 2.7.90. Hoegrass(1.0l) + oil(1%) + wetter, 7.8.90.

Insect Control: Lemat(150ml), 12.6.90; Thiodan(2.1l), 21.9.90; Metasystox(300ml), 26.9.90 Canola only.
Date of sowing: 6.6.90. Date of harvest: 13.12.90.

NB. Trial area sown to Spear wheat on 21.5.90 for wind erosion purposes and then killed before trial sown. The technique appeared to be successful.

89N45 M. Fowler, G. Bunker, Newdegate R.S.

Soil type: Sand over clay duplex


Fertilizer: 100kg/ha Superphosphate plus 30kg/ha Urea as a basal on appropriate plots at seeding. Nitrogen at (0, 5, 10, 20, 40, 60kg/ha) topdressed 19.7.90.

Weed Control: Roundup(1.0l) + Goal(75ml) + Wetting Agent, 22.5.90.
Hoegrass(1.0l) + wetter(0.1%), 18.7.90 on Site 2.
Hoegrass(1.0l) + Bromocide(1.2l), 31.7.90 on Site 1.

Insect Control: none

Date of sowing: 12.6.90. Date of harvest: 13.12.90.

Results and Discussion
Inputs into these trials was implementing the first phase of the rotational comparisons with the exception of 89N45 which was in its final phase. 90KA106 consisted of Canola, wheat and oats sown into a paddock that was sown to field peas in 1989. The site had problems with high levels of wild oat and radish infestation. Radish was hand weeded from Canola plots and chemically controlled in the wheat. It was not a major problem in the oats. Wild oats was a problem in oats as no control was possible whereas the weed was controlled in the Canola and wheat. Fumitory was present in one block of Canola and was satisfactorily controlled with Butisan S. Yields from the crops were:
Canola = 1.15 t/ha; wheat = 1.51 t/ha and oats 1.76 t/ha.

90KA111 was a similar trial but followed a 1989 wheat crop. Radish and wild oats were also a problem at this site. Yields were Canola = 1.33 t/ha; wheat = 2.76 t/ha and oats which were badly infested by wild oats = 1.60 t/ha.

90KA108 consisted of the same treatments but followed 1989 processing peas. The Canola looked very good throughout the season but final yield was disappointing. Alternaria black spot was very prevalent and appears to have reduced yield as visually the crop appeared to be able to yield in excess of 2t/ha. Whether the rotation with processing peas is responsible for the Alternaria problem is not certain but requires further examination. Yields were Canola = 1.28 t/ha; wheat = 3.91 t/ha and oats = 4.25 t/ha. All three sites will be sown to wheat in 1991 with a range of nitrogen rates.

The trial 90WH82 took advantage of long term paddock on Wongan Hills R.S. to investigate the effect of including Canola in wheat - lupin rotations. Canola following lupins(1989) and wheat(1988) yielded an excellent 1.79 t/ha whereas Canola following...
wheat (1989) and lupins (1988) was yielded 24% less, 1.37 t/ha. Wheat in a wheat lupin
wheat rotation yielded 2.42 t/ha compared to 1.67 t/ha for a lupin wheat wheat rotation.

The trial will be sown to lupins in 1991 to see if the inclusion of Canola will effect lupin
performance. The interesting fact from the trial is the high Canola yields that were
obtained. Exactly why the yields were so good is unclear but the excellent weed control
must certainly be a contributing factor.

The trial 89N45 was in the final stage consisting of wheat with various nitrogen rates on
a range of rotation options incorporating Canola. Results are presented in Table 9.
Points of interest are:

1. Wheat following Canola after lupins yielded 12% more than wheat following wheat
after lupins.
2. There was no wheat response to nitrogen in either rotation.
3. Inserting Canola in continuous wheat increased subsequent wheat yield by 23%.
4. The wheat did not respond to nitrogen following Canola refuting the myth that Canola
"rapes" the soil.

Table 9. Wheat yield response to rotation and nitrogen.

<table>
<thead>
<tr>
<th>1988</th>
<th>1989</th>
<th>1990</th>
<th>N RATES</th>
<th>YIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(kg/ha)</td>
<td>(kg/ha)</td>
</tr>
<tr>
<td>SITE 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LUPINS</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>0</td>
<td>1801</td>
</tr>
<tr>
<td>LUPINS</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>5</td>
<td>1766</td>
</tr>
<tr>
<td>LUPINS</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>10</td>
<td>1862</td>
</tr>
<tr>
<td>LUPINS</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>20</td>
<td>1818</td>
</tr>
<tr>
<td>LUPINS</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>40</td>
<td>1818</td>
</tr>
<tr>
<td>LUPINS</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>60</td>
<td>1910</td>
</tr>
<tr>
<td>LUPINS</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>0</td>
<td>1829</td>
</tr>
<tr>
<td>LUPINS</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>5</td>
<td>1523</td>
</tr>
<tr>
<td>LUPINS</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>10</td>
<td>1644</td>
</tr>
<tr>
<td>LUPINS</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>20</td>
<td>1653</td>
</tr>
<tr>
<td>LUPINS</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>40</td>
<td>1644</td>
</tr>
<tr>
<td>LUPINS</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>60</td>
<td>1636</td>
</tr>
<tr>
<td>SITE 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WHEAT</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>0</td>
<td>1270</td>
</tr>
<tr>
<td>WHEAT</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>5</td>
<td>1253</td>
</tr>
<tr>
<td>WHEAT</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>10</td>
<td>1270</td>
</tr>
<tr>
<td>WHEAT</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>20</td>
<td>1235</td>
</tr>
<tr>
<td>WHEAT</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>40</td>
<td>1270</td>
</tr>
<tr>
<td>WHEAT</td>
<td>CANOLA</td>
<td>WHEAT</td>
<td>60</td>
<td>1296</td>
</tr>
<tr>
<td>WHEAT</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>0</td>
<td>1268</td>
</tr>
<tr>
<td>WHEAT</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>5</td>
<td>1253</td>
</tr>
<tr>
<td>WHEAT</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>10</td>
<td>1270</td>
</tr>
<tr>
<td>WHEAT</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>20</td>
<td>1235</td>
</tr>
<tr>
<td>WHEAT</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>40</td>
<td>1270</td>
</tr>
<tr>
<td>WHEAT</td>
<td>WHEAT</td>
<td>WHEAT</td>
<td>60</td>
<td>1296</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

624
2.2 Canola Nitrogen Trials

Introduction
Current nitrogen recommendations for Canola are based on research conducted in the 1970's. Since then the introduction of new Canola varieties has seen potential yields improve dramatically and the development of earlier maturing lines expand the areas for production. Also, changes in cropping systems has increased the rotations in which Canola can be included. These factors combine to create a need to reassess nitrogen requirements of Canola.

Methods

90KA107  M. Quartermaine, Katanning
Soil type:  Red Clay loam
Site history:  1988 wheat, 1989 field peas
Fertilizer:  150kg/ha Superphosphate CuMoZn seeding.
Nitrogen as 0, 30, 60, 90, & 120kg/ha applied as 15kg/ha as a basal where necessary and remainder topdressed 10.7.90.
Weed Control:  Roundup(1.0l), 21.5.90; Cultivation, 26.5.90.
  Canola: Verdict(750ml) + Lontrel(300 ml), 20.6.90.
  Hoegrass(1.0l) + oil(1%) + wetter, 7.8.90.
  Wheat:  Glean(15g), 2.7.90.
  Hoegrass(1.0l) + oil(1%) + wetter, 7.8.90.
Insect Control:  Lemat(150ml), 12.6.90; Thiodan(2.1l), 21.9.90;
  Metasystox(300ml), 26.9.90 Canola only.
Date of sowing:  6.6.90.  Date of harvest: 13.12.90.

90KA109  A. McNabb, Frankland.
Soil type:  Gravelly loam.
Site history:  1988 barley, 1989 processing peas.
Fertilizer:  100kg/ha Superphosphate CuMoZn at seeding.
Nitrogen as 0, 30, 60, 90, & 120kg/ha applied as 15kg/ha as a basal where necessary and remainder topdressed 11.7.90.
Weed Control:  Cultivation x 2 by farmer.
  Canola: Verdict(750ml) + Lontrel(300 ml), 22.6.90.
  Hoegrass(2.0l) + oil(1%), 13.8.90.
  Cereals:  Glean(15g), 2.7.90.
  Hoegrass(1.0l) + oil(1%), 7.8.90.
Insect Control: Lorsban (140ml), 5.6.90; Lemat (50ml), 13.6.90; Ripcord (400ml), 19.6.90, Metasystox (300ml), 26.9.90 for Canola only.

Date of sowing: 29.5.90. Date of harvest: 12.12.90.

90KA119 M. Quartermaine, Katanning

Soil type: Grey loamy clay.

Site history: 1989 wheat.

Fertilizer: 150kg/ha Superphosphate CuMoZn at seeding. Nitrogen as 0, 30, 60, 90, & 120kg/ha applied as 15kg/ha as a basal where necessary and remainder topdressed 10.7.90.

Weed Control: Sprayseed (1.5l), 6.6.90; Cultivation, 26.5.90. Canola: Verdict (750ml) + Lontrel (300 ml), 20.6.90. Hoegrass (1.0l) + oil (1%) + wetter, 7.8.90. Wheat: Glean (15g), 2.7.90. Hoegrass (1.0l) + oil (1%) + wetter, 7.8.90.

Insect Control: Lemat (150ml), 12.6.90; Thiodan (2.1l), 21.9.90; Metasystox (300ml), 26.9.90 Canola only.

Date of sowing: 6.6.90. Date of harvest: 13.12.90. Wheat reseeded 3.7.90

90WH83 J. Ferguson, Wongan Hills Research Station.

Soil type: Gravelly sand.


Fertilizer: 100kg/ha Superphosphate and 22kg/ha Urea on appropriate plots at seeding. Nitrogen rates as Urea (0, 10, 20, 40, 80kg/ha)
Block 2EB: 50kg/ha DAP at seeding. 120 kg/ha Urea topdressed 19.7.90.

Weed Control: Roundup (625ml), 24.5.90; Cultivation, 25.5.90. Lontrel (350 ml), 27.7.90.

Insect Control: Karate (180ml) plus Rogor (85ml), 29.6.90.

Date of sowing: 8.6.90. Date of harvest: 5.12.90.

Results and Discussion
a) 90KA107: Canola and wheat after field peas - the Canola responded to 30 kg N at flowering with a similar response of grain yield. The wheat responded to 30 kg N at anthesis but showed no grain yield response (Table 10).

Table 10. Wheat and Canola response to nitrogen following Field peas.

<table>
<thead>
<tr>
<th></th>
<th>1989</th>
<th>1990</th>
<th>N RATE</th>
<th>DMP ANTHESIS (kg/ha)</th>
<th>GRAIN YIELD (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEAS</td>
<td>CANOLA</td>
<td>0</td>
<td>2476</td>
<td>755</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>3048</td>
<td>945</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60</td>
<td>3135</td>
<td>972</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>90</td>
<td>3236</td>
<td>1036</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>3996</td>
<td>1223</td>
<td></td>
</tr>
<tr>
<td>WHEAT</td>
<td></td>
<td>0</td>
<td>5986</td>
<td>1986</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>7394</td>
<td>2042</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60</td>
<td>6550</td>
<td>1951</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>90</td>
<td>6441</td>
<td>1803</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>6120</td>
<td>1861</td>
<td></td>
</tr>
</tbody>
</table>

b) 90KA109: Canola and barley after processing peas - barley responded up to 60 kg N at both the anthesis stage and for grain yield (Table 11). The Canola response is more difficult to interpret as the presence of Alternaria appears to have effected yield. Canola responded to 60 kg N at flowering but appears to respond up to 120 kg N for grain yield. However the yield is very low and oil levels in the seed of up to 50% suggest a sink limitation.

Table 11. Canola and barley response to nitrogen following processing peas.

<table>
<thead>
<tr>
<th></th>
<th>1989</th>
<th>1990</th>
<th>N RATE</th>
<th>DMP ANTHESIS (kg/ha)</th>
<th>GRAIN YIELD (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEAS</td>
<td>CANOLA</td>
<td>0</td>
<td>2,615</td>
<td>456</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>3,482</td>
<td>661</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60</td>
<td>3,941</td>
<td>813</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>90</td>
<td>4,082</td>
<td>946</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>4,143</td>
<td>1,142</td>
<td></td>
</tr>
<tr>
<td>BARLEY</td>
<td></td>
<td>0</td>
<td>7,573</td>
<td>3,528</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>4,606</td>
<td>3,659</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60</td>
<td>6,262</td>
<td>4,467</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>90</td>
<td>6,629</td>
<td>3,955</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>120</td>
<td>6,290</td>
<td>3,936</td>
<td></td>
</tr>
</tbody>
</table>
c). 90KA119: Canola and wheat after wheat - wheat responded up to 120 kgN at both sampling times. The Canola response is not as clear and has probably been affected by poor establishment and competition from radish before it was weeded out (Table 12). It appears that the Canola responded up to 60 kgN at anthesis and to 60-90 kgN for grain yield.

Table 12. Nitrogen response of Canola and wheat following wheat.

<table>
<thead>
<tr>
<th></th>
<th>1989 DMP</th>
<th>1990 ANTHESIS</th>
<th>GRAIN YIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHEAT</td>
<td>CANOLA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1073</td>
<td>531</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1845</td>
<td>707</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>2118</td>
<td>932</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>1617</td>
<td>1266</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>1540</td>
<td>939</td>
<td></td>
</tr>
<tr>
<td>WHEAT</td>
<td>CANOLA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>3564</td>
<td>1921</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>3725</td>
<td>1807</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>4482</td>
<td>1979</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>3915</td>
<td>2304</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>4860</td>
<td>2668</td>
<td></td>
</tr>
</tbody>
</table>

d). 90WH83: Canola following wheat or lupins - no response to nitrogen following lupins. A response to 20-40 kgN after wheat. A 19% increase in yield if Canola follows lupins compared to wheat (Table 13). Exceptional yields indicate Canola's potential in this area if management is correct.

Table 13. Canola response to nitrogen following lupins and wheat.

<table>
<thead>
<tr>
<th></th>
<th>1989 NITROGEN RATE</th>
<th>1990 GRAIN YIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHEAT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CANOLA</td>
<td>0</td>
<td>1664</td>
</tr>
<tr>
<td>CANOLA</td>
<td>10</td>
<td>1887</td>
</tr>
<tr>
<td>CANOLA</td>
<td>20</td>
<td>1899</td>
</tr>
<tr>
<td>CANOLA</td>
<td>40</td>
<td>1896</td>
</tr>
<tr>
<td>CANOLA</td>
<td>80</td>
<td>2045</td>
</tr>
<tr>
<td>LUPIN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CANOLA</td>
<td>0</td>
<td>1972</td>
</tr>
<tr>
<td>CANOLA</td>
<td>10</td>
<td>1922</td>
</tr>
<tr>
<td>CANOLA</td>
<td>20</td>
<td>2086</td>
</tr>
<tr>
<td>CANOLA</td>
<td>40</td>
<td>2080</td>
</tr>
<tr>
<td>CANOLA</td>
<td>80</td>
<td>2201</td>
</tr>
</tbody>
</table>

2.3 Canola Seeding Rate Trials
Introduction

The new Canola cultivars are not only higher yielding than the older types but are also considerably shorter. This work investigates if the reduction in stature requires an increase in seeding rate for the expression of optimum yield.

Methods

90KA112 A & R Wilson, Katanning.

Soil type: Gravelly sand.

Site history: 1989 lupins.

Fertilizer: 154kg/ha Superphosphate and 56kg/ha Urea at seeding. Nitrogen topdressed at 80kg/ha of Urea 11.7.90.

Weed Control: Roundup(600ml) + 2,4D ester, 14.5.90, by farmer. Verdict(500ml) and Lontrel(300 ml), 27.7.90.

Insect Control: Lemat(150ml) + Lorsban(150ml), 12.6.90; Ripcord(200ml), 6.7.90; Ripcord(600ml) + Lemat(150), 13.7.90; Metasystox(300ml), 26.9.90.

Date of sowing: 7.6.90. Date of harvest: 3.12.90.

90KA113 B. Smith, Katanning.

Soil type: Loamy sand.

Site history: 1989 pasture.

Fertilizer: 154kg/ha Superphosphate and 56kg/ha Urea at seeding. Nitrogen topdressed at 80kg/ha of Urea 13.7.90.

Weed Control: Cultivation by farmer. Verdict(750ml), 20.6.90; Verdict(500ml) and Lontrel(300 ml), 6.8.90.

Insect Control: Lorsban(140ml), 5.6.90; Lemat(50ml), 12.6.90; Metasystox(560ml), 26.6.90; Ripcord(200ml), 6.7.90.

Date of sowing: 30.5.90. Date of harvest: 26.11.90.

90KA114 P. Terry, Kojonup.

Soil type: Loamy sand.

Site history: 1989 pasture.
Fertilizer: 154kg/ha Superphosphate and 56kg/ha Urea at seeding.
Nitrogen topdressed at 80kg/ha of Urea 11.7.90.

Weed Control: Cultivation by farmer.
Verdict(500ml) and Lontrel(300 ml), 8.8.90.

Insect Control: Lorsban(140ml), 5.6.90; Lemat(50ml), 12.6.90;
Ripcord(400ml), 13.6.90 & 26.6.90; Ripcord(200ml), 26.9.90;
Ripcord(600ml), 13.7.90.

Date of sowing: 1.6.90. Date of harvest: 22.11.90.

90A23 P. Jenkins, Avondale R.S.
Soil type: Paddock 1A.
Site history:
Fertilizer: 110kg/ha Agras, topdressed, 17.5.90.
Nitrogen topdressed at 60kg/ha of Urea 8.6.90.
Weed Control: Cultivation.
Insect Control: Lorsban(900ml), 22.5.90; Lorsban(750ml), 31.5.
Date of sowing: 19.5.90. Date of harvest: 19.11.90.

90EB41 J. Doust, East Beverley Annexe
Trial failed due to insect damage and cruciferous weed infestation.

90N70 G. Bunker, M. Fowler, Newdegate R. S.
Soil type: Sand over clay duplex.
Site history:
Fertilizer: 100kg/ha Superphosphate and 30kg/ha Urea at seeding.
NO Nitrogen topdressed.
Weed Control: Sprayseed(2.0l), 29.5.90; Fusilade(250ml) + wetting agent(0.1%), 2.7.90.
Insect Control: Rogor(80ml), 2.7.90 mixed with Fusilade.
Date of sowing: 5.6.90. Date of harvest: 23.11.90.
Results and Discussion

Results show that there is no yield response to seeding rates from 3 to 11 kg/ha over a range of sites (Table 14) for either variety of Canola. Plant height was reduced slightly with increasing seed rate (Table 15) and plant counts showed the expected response to rates (Table 16).

Table 14. Grain yield (kg/ha) of Canola in response to seeding rate.

<table>
<thead>
<tr>
<th>SEED RATE kg/ha</th>
<th>90A23</th>
<th>90N70</th>
<th>90KA114</th>
<th>90KA113</th>
<th>90KA112</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUREKA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1171</td>
<td>627</td>
<td>2973</td>
<td>1173</td>
<td>2523</td>
<td>1694</td>
</tr>
<tr>
<td>5</td>
<td>1186</td>
<td>596</td>
<td>2787</td>
<td>1127</td>
<td>2462</td>
<td>1632</td>
</tr>
<tr>
<td>7</td>
<td>1129</td>
<td>686</td>
<td>2779</td>
<td>1272</td>
<td>2547</td>
<td>1683</td>
</tr>
<tr>
<td>9</td>
<td>1076</td>
<td>545</td>
<td>3310</td>
<td>1266</td>
<td>2315</td>
<td>1683</td>
</tr>
<tr>
<td>11</td>
<td>1043</td>
<td>483</td>
<td>3281</td>
<td>1011</td>
<td>2316</td>
<td>1622</td>
</tr>
<tr>
<td>WESBARKER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1224</td>
<td>576</td>
<td>2190</td>
<td>795</td>
<td>2246</td>
<td>1406</td>
</tr>
<tr>
<td>5</td>
<td>1133</td>
<td>504</td>
<td>2429</td>
<td>772</td>
<td>2361</td>
<td>1440</td>
</tr>
<tr>
<td>7</td>
<td>1048</td>
<td>576</td>
<td>2771</td>
<td>1026</td>
<td>2207</td>
<td>1541</td>
</tr>
<tr>
<td>9</td>
<td>1086</td>
<td>535</td>
<td>2834</td>
<td>972</td>
<td>2354</td>
<td>1541</td>
</tr>
<tr>
<td>11</td>
<td>1000</td>
<td>524</td>
<td>2505</td>
<td>795</td>
<td>2122</td>
<td>1389</td>
</tr>
</tbody>
</table>

Table 15. Carlola seeding rate on plant height (cm)

<table>
<thead>
<tr>
<th>SEED RATE kg/ha</th>
<th>90KA113</th>
<th>90KA112</th>
<th>90KA114</th>
<th>MEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUREKA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>113</td>
<td>93</td>
<td>128</td>
<td>112</td>
</tr>
<tr>
<td>5</td>
<td>117</td>
<td>102</td>
<td>130</td>
<td>116</td>
</tr>
<tr>
<td>7</td>
<td>105</td>
<td>90</td>
<td>128</td>
<td>108</td>
</tr>
<tr>
<td>9</td>
<td>108</td>
<td>87</td>
<td>132</td>
<td>108</td>
</tr>
<tr>
<td>11</td>
<td>112</td>
<td>83</td>
<td>132</td>
<td>109</td>
</tr>
<tr>
<td>WESBARKER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>122</td>
<td>103</td>
<td>128</td>
<td>118</td>
</tr>
<tr>
<td>5</td>
<td>122</td>
<td>100</td>
<td>132</td>
<td>118</td>
</tr>
<tr>
<td>7</td>
<td>113</td>
<td>88</td>
<td>137</td>
<td>112</td>
</tr>
<tr>
<td>9</td>
<td>115</td>
<td>90</td>
<td>133</td>
<td>113</td>
</tr>
<tr>
<td>11</td>
<td>112</td>
<td>90</td>
<td>130</td>
<td>111</td>
</tr>
</tbody>
</table>
Table 16. Canola density (plants/m²) in response to seeding rate.

<table>
<thead>
<tr>
<th>SEED RATE</th>
<th>90N70</th>
<th>90KA114</th>
<th>90KA113</th>
<th>90KA112</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg/ha</td>
<td>123</td>
<td>63</td>
<td>98</td>
<td>94</td>
</tr>
<tr>
<td>EUREKA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>174</td>
<td>63</td>
<td>101</td>
<td>84</td>
</tr>
<tr>
<td>5</td>
<td>287</td>
<td>132</td>
<td>165</td>
<td>92</td>
</tr>
<tr>
<td>7</td>
<td>338</td>
<td>151</td>
<td>166</td>
<td>124</td>
</tr>
<tr>
<td>9</td>
<td>313</td>
<td>161</td>
<td>183</td>
<td>127</td>
</tr>
<tr>
<td>11</td>
<td>86</td>
<td>60</td>
<td>90</td>
<td>48</td>
</tr>
<tr>
<td>WESBARKER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>116</td>
<td>73</td>
<td>94</td>
<td>62</td>
</tr>
<tr>
<td>5</td>
<td>156</td>
<td>109</td>
<td>120</td>
<td>98</td>
</tr>
<tr>
<td>7</td>
<td>180</td>
<td>112</td>
<td>149</td>
<td>121</td>
</tr>
<tr>
<td>9</td>
<td>244</td>
<td>149</td>
<td>163</td>
<td>153</td>
</tr>
</tbody>
</table>

2.4 Stubble Residue

Introduction

Poor pasture and crop germination and performance following Canola is occasionally reported by farmers. In particular there is a general opinion in the farming community that clover performs poorly following Canola.

However the reverse has been observed by the authors and some farmers. In cases where the problem has occurred the common factor appears to be excessive Canola stubble either on the surface or incorporated.

This trial is testing what levels of stubble will give the effect on a range of crops and on clover.

Methods

90KA110  A McNabb, Frankland.

Soil type: Gravelly loam.

Site history: 1989 good clover pasture.

Fertilizer: 100kg/ha Superphosphate and 30kg/ha Urea at seeding. Nitrogen topdressed at 80kg/ha of Urea 11.7.90.

Weed Control: Cultivation by farmer. Roundup(1.0l), 22.5.90; Verdict(750ml) and Lontrel(300 ml), 22.6.90. Hoegrass(2.0l) + oil(1%), 13.8.90.
Insect Control: Lorsban(140ml), 5.6.90; Lemat(50ml), 13.6.90; Ripcord(400ml), 19.6.90; Metasystox(300ml), 26.9.90.

Date of sowing: 29.5.90. Date of harvest: 19.12.90.

Results and Discussion
The trial was set up in winter with the sowing of Barossa Canola which yielded an average 1498 kg grain/ha. Grain yields on plots ranged from a low of 1362 to a high of 1636 kg/ha. Stubble was collected after harvest and distributed at the appropriate rates on the plots. After the soil was moist in late autumn the stubbles were either rotary hoed into the soil and the plots sown to peas and barley or left on the surface to determine stubble effect on clover.

3. LINSEED

Introduction
The advent of "Linola" linseed means that linseed oil can be used for human consumption. This work is part of an Australian wide project to determine the yield capabilities of the lines over a range of environments. The research is being done in collaboration with Dr Alan Green from CSIRO in Canberra.

Methods
90KA105 B. Smith, Katanning.

Soil type: Loamy sand.

Site history: 1989 pasture.

Fertilizer: 154kg/ha Superphosphate and 56kg/ha Urea at seeding. Nitrogen topdressed at 80kg/ha of Urea 13.7.90.

Weed Control: Cultivation by farmer. Verdict(750ml), 20.6.90;

Insect Control: Lorsban(140ml), 5.6.90; Lemat(50ml), 12.6.90; Metasystox(560ml), 26.6.90; Ripcord(200ml), 6.7.90.

Date of sowing: 30.5.90. Date of harvest: 26.11.90.

90BA65 R. Randal, Badgingarra R. S.

Soil type: Paddock 7D1

Site history:

Fertilizer: 212kg/ha Superphosphate at seeding.
Weed Control: Cultivation in late May. Sprayseed(2.0l), 11.6.90.

Insect Control: Sumicidin(75ml), 6.7.90; Lorsban(900ml), 11.7.90;

Date of sowing: 13.6.90. Date of harvest: 11.9.90.

90MT63 D. Rowe, P. Delane, Mount Barker R.S.

Soil type: Loamy sand.

Site history:

Fertilizer: 200kg/ha Superphosphate seeding.
Nitrogen topdressed at 80kg/ha of Urea 12.7.90.

Weed Control: Sprayseed(1.0l) + Dicamba(0.5l), 20.4.90. Trial area cultivated. Sprayseed(1.0l), 22.5.90; Fusilade(300ml), 30.7.90; Bromicide MA (1.5l), 31.7.90; Brodal(200ml), 28.9.90.

Insect Control: Lemat(75ml), 22.5.90 mixed with Sprayseed. Dimethoate(55ml), 26.6.90; Pirimor(300ml), 28.9.90.

Date of sowing: 25.5.90. Date of harvest: 6.02.91.

Results and Discussion
Raw data has been collected from the three sites an sent to CSIRO, Canberra for processing. To date the information is not available due to the collaborators waiting for results of late spring sown trials.
4. TILLAGE

4.1 Gypsum x Tillage x Nitrogen in Continuous Crop

Trials: 84KA28
File: 4721EX
Location: L. Cheetham, Katanning

Introduction

Twenty per cent of the soils in the Katanning Advisory District are hard setting grey clay loamy sands. Crop establishment problems and waterlogging are a feature of this soil type. The use of gypsum to improve soil structure coupled with continuous cropping using the direct drilling method should enable these soils to become more productive.

Trial details

Treatments

Gypsum: 1. 0 t/ha
(1984) 2. 5 t/ha

Tillage: 1. Conventional (2 workings and a seeding)
2. Direct drill

Nitrogen: 1. 0 kg/ha
(in previous years only) 2. 20 kg/ha
3. 40 kg/ha
4. 80 kg/ha
5. 160 kg/ha


Replicates: 3

2nd working 2/6/84, 10/6/85, 30/5/86, 18/6/87, 30/5/88, 4/6/89, 18/5/90.

Direct drill: Sprayseed 2 L/ha, 31/5/85, 9/6/85, 26/5/86, 20/6/87
10/5/88 = 1.5 L, 24/6/88 = 1.0 L, 31/5/89 = 1.5 L, 16/5/90 = 2.0 L.
Sown 1/6/84, 10/6/85, 30/5/86, 23/6/87, 9/6/88, resown 1/7/88, 1/6/89, 18/5/90.

Gypsum: Topdressed 11/5/84

Crop Details: Aroona at 60 kg/ha.

Fertilizer:
No nitrogen or phosphorus applied in 1988
200kg Agras 2 drilled at seeding in 1989.
200kg Agras 2 drilled at seeding in 1989.

Post-emergent Herbicides:
1984 Hoegrass 1.5 L/ha on 5/7/84 (wild oats)
Igran 1.0 L/ha on 6/8/84 (wireweed)
1985 Hoegrass 1.5 L/ha on 3/7/85
Igran 1.0 L/ha on 13/8/85
1986 Hoegrass 1.5 L/ha on 3/8/86
Barrel 1.5 L/ha on 24/7/87
1987 Hoegrass 1.5 L/ha on 24/7/87
1988 Hoegrass 1.0 L/ha on 5/8/88
MCPA 1.0 L/ha on 5/8/88
1989 Hoegrass 1.5 L/ha on 3/7/89
Buctril 1.4 L/ha on 18/7/89
1990 Hoegrass 1.5 L/ha on 7/8/90

Insect control:
1989 Lorsban 140 ml/ha on 15/6/89
Rogor 85 ml/ha on 15/6/89

Harvest: 14/12/90.

Results and Discussion

The Direct Drill treatments were sown on the 18/5/90 with no problems with seeding experienced. At this date, rainfall events were such that under the conventional system the second working was applied. Limited rainfall after this date delayed seeding on the conventional plots until 7/6/90.

The site is infested with a range of grass weeds including rye grass, wild oats and brome grass. The staggered sowing made it impossible to spray for rye grass and wild oats in the Direct Drill treatments with spraying delayed until the conventional treatments were able to be sprayed. This would have undoubtedly reduced the Direct Drill treatments potential yield. No control of Brome grass was possible and the site will be sown to peas in 1990 to facilitate control of the species. The peas will also give a break crop effect on wheat diseases which have built up to high levels during the 10 years of continuous cropping on the site.
Plant establishment results (Table 1) are half of what would be expected for the seeding rate with the low levels probably due to disease and in the case of the conventional treatments the dry conditions following seeding.

Grain yield (Table 2) results showed the advantage of early sowing that direct drilling allows on these soil types and there appears to be a continuing response to the effect of gypsum on soil structure. Soil structure measurements will be conducted over summer.

Table 1: Crop Density (plants/m²)

<table>
<thead>
<tr>
<th>Gypsum t/ha 1984</th>
<th>Tillage</th>
<th>Nitrogen Rate kg/ha 1987</th>
<th>Plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Conventional 0</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>160</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Direct Drill 0</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>160</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Conventional 0</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>160</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Direct Drill 0</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>160</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>

Mean Gypsum: 0 = 35; 5 = 38.
Mean Tillage: DD = 44; Con = 29
Mean Nitrogen: 0 = 31; 20 = 34; 40 = 37; 80 = 40; 160 = 39.

Another point of interest is the suggestion that there is still a residual effect of the nitrogen treatments applied from 1984 to 1987. However the low yields, high disease incidence and very high grass weed burden make interpretation of the results difficult.
Table 2: Machine harvested grain yield (kg/ha)

<table>
<thead>
<tr>
<th>Gypsum t/ha 1984</th>
<th>Tillage</th>
<th>Nitrogen Rate kg/ha 1987</th>
<th>Plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Conventional</td>
<td>0</td>
<td>217</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>294</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>344</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>357</td>
</tr>
<tr>
<td></td>
<td></td>
<td>160</td>
<td>469</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mean</strong></td>
<td><strong>336</strong></td>
</tr>
<tr>
<td>0</td>
<td>Direct Drill</td>
<td>0</td>
<td>855</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>851</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>882</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>1127</td>
</tr>
<tr>
<td></td>
<td></td>
<td>160</td>
<td>1182</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mean</strong></td>
<td><strong>979</strong></td>
</tr>
<tr>
<td>5</td>
<td>Conventional</td>
<td>0</td>
<td>505</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>656</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>332</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>669</td>
</tr>
<tr>
<td></td>
<td></td>
<td>160</td>
<td>1183</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mean</strong></td>
<td><strong>669</strong></td>
</tr>
<tr>
<td>5</td>
<td>Direct Drill</td>
<td>0</td>
<td>858</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>979</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>1015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>983</td>
</tr>
<tr>
<td></td>
<td></td>
<td>160</td>
<td>729</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mean</strong></td>
<td><strong>913</strong></td>
</tr>
</tbody>
</table>

Mean Gypsum: 0 = 658; 5 = 791.
Mean Tillage: DD = 946; Con = 503
Mean Nitrogen: 0 = 609; 20 = 695; 40 = 643; 80 = 784; 160 = 891.

4.2 Gypsum x Tillage x Nitrogen in a Cereal x Medic Rotation

Trials: 87KA47

File: 4721EX

Location: L. Cheetham, Katanning

Introduction
Twenty per cent of the soils in the Katanning Advisory District are hard setting grey clay loamy sands. Crop establishment problems and waterlogging are a feature of this soil type. The use of gypsum to improve soil structure coupled with cropping using the direct drilling method and a medic component in the system should enable these soils to become more productive.

Results from this trial have demonstrated the superiority of the medic-crop over continuous cropping. In 1989 various tillage treatments were superimposed over the standard district practice and direct drill plots to investigate the effect of varying crop tillage on medic establishment and performance. This year the trial is in the medic phase and measurements on establishment and production were taken.

Trial details:

Treatments

Gypsum:  
1. 0 t/ha  
2. 5 t/ha

Tillage:  
1. Conventional (2 workings and a seeding)  
2. Direct drill  
3. 1989: Previous 1989  
   1. Con  
   2. Con  
   3. Con  
   4. DD  
   5. DD  
   6. DD

1989:  
1. Con  
2. Con 1 Working  
3. Con 1 Working  
4. DD  
5. DD  
6. DD 1 Working

Nitrogen:  
1. 0 kg/ha (1987)  
2. 20 kg/ha  
3. 40 kg/ha  
4. 60 kg/ha  
5. 120 kg/ha

Replicates: 3


2nd working 2/6/84, 10/6/85, 30/5/86, 18/6/87, 3/6/89.  
Sown 1/6/84, 10/6/85, 30/5/86/ 23/6/87, 4/6/89

Direct drill: Sprayseed 2 L/ha 31/5/85, 9/6/85, 26/5/86, 20/6/87, 31/5/89 1.5 L.  
Sown 1/6/84, 10/6/85, 30/5/86, 23/6/87, 4/6/89.

Gypsum:  Topdressed 11/5/84.

Crop details: Sown 1/6/84, 10/6/85, 30/5/86 = sown to Circle Valley medic, 23/6/87, 1988 - Regenerating medic. Medic lightly grazed until flowering.  
1990 - Regenerating medic. Medic moderately grazed until flowering.
Herbicides:

1984 Hoegrass 1.5 L/ha on 5/7/84 (wild oats)
   Igran 1.0 L/ha on 6/8/84 (wireweed)
1985 Hoegrass 1.5 L/ha on 3/7/85
   Igran 1.0 L/ha on 13/8/85
1986 Hoegrass 1.5 L/ha on 4/8/86
   Barrel 1.5 L/ha on 15/5/86
1987 Hoegrass 1.5 L/ha on 24/7/87
   Barrel 1.4 L/ha on 13/8/87
1988 Fusilade 0.5 L/ha on 22/6/87
1989 Hoegrass 1.5 L/ha on 3/7/89
   Buctril 1.4 L/ha on 18/7/89
1990 Verdict 750ml/ha on 20/6/90

Insecticide:
1990 Lorsban 200ml/ha on 23.5.90

Results and Discussion

The various crop tillage treatments imposed in 1989 had little effect on medic establishment (Tables 3 and 4). Establishment appears to be influenced by residual effects of previous crop tillage. For example at the early counts density was low in the DD + 5t/ha gypsum treatment except where conventional tillage had been applied in 1989. This suggests that the improved soil structure and hence improved water infiltration has resulted in faster drying of the surface leading to either less moisture for germination or insufficient moisture for successful establishment. This results confirms findings in the trial 88KA76. The final establishment count shows that the establishment densities are greater under the direct drilling and strengthens the argument for using this tillage system in medic-crop systems.

Late winter production measurements also showed little effect of the 1989 crop tillage treatments but showed a response to the long term tillage history. Dry matter production was greater in the conventional system (Table 5). There were no effects of tillage on seed yields (Table 6).
Table 3: Medic Density (plants/m²) on the 6.3.90.

<table>
<thead>
<tr>
<th>Tillage</th>
<th>Gypsum 0</th>
<th>Gypsum 5</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1989</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional</td>
<td>335</td>
<td>382</td>
<td>359</td>
</tr>
<tr>
<td>One working</td>
<td>363</td>
<td>414</td>
<td>389</td>
</tr>
<tr>
<td>Mean</td>
<td>349</td>
<td>398</td>
<td>374</td>
</tr>
<tr>
<td>Direct Drill</td>
<td>341</td>
<td>251</td>
<td>296</td>
</tr>
<tr>
<td>Conventional</td>
<td>391</td>
<td>340</td>
<td>366</td>
</tr>
<tr>
<td>One working</td>
<td>397</td>
<td>213</td>
<td>305</td>
</tr>
<tr>
<td>Mean</td>
<td>376</td>
<td>268</td>
<td>322</td>
</tr>
<tr>
<td>Mean gypsum</td>
<td>363</td>
<td>333</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Medic Density (plants/m²) on the 16.6.90.

<table>
<thead>
<tr>
<th>Tillage</th>
<th>Gypsum 0</th>
<th>Gypsum 5</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1989</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional</td>
<td>792</td>
<td>689</td>
<td>741</td>
</tr>
<tr>
<td>One working</td>
<td>779</td>
<td>612</td>
<td>696</td>
</tr>
<tr>
<td>Mean</td>
<td>786</td>
<td>651</td>
<td>719</td>
</tr>
<tr>
<td>Direct Drill</td>
<td>962</td>
<td>810</td>
<td>886</td>
</tr>
<tr>
<td>Conventional</td>
<td>919</td>
<td>876</td>
<td>898</td>
</tr>
<tr>
<td>One working</td>
<td>931</td>
<td>1147</td>
<td>1039</td>
</tr>
<tr>
<td>Mean</td>
<td>937</td>
<td>944</td>
<td>941</td>
</tr>
<tr>
<td>Mean gypsum</td>
<td>862</td>
<td>798</td>
<td></td>
</tr>
</tbody>
</table>
Table 5: Dry matter production (kg/ha) taken on 10.8.90.

<table>
<thead>
<tr>
<th>Tillage</th>
<th>&lt;1989</th>
<th>1989</th>
<th>0</th>
<th>5</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One working</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>4699</td>
<td>4117</td>
<td>4408</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Drill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional</td>
<td>3928</td>
<td>3564</td>
<td>3746</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One working</td>
<td>3128</td>
<td>4448</td>
<td>3788</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>3868</td>
<td>3818</td>
<td>3843</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean gypsum</td>
<td>4284</td>
<td>3968</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6: Seed yields(kg/ha).

<table>
<thead>
<tr>
<th>Tillage</th>
<th>&lt;1989</th>
<th>1989</th>
<th>0</th>
<th>5</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One working</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>854</td>
<td>856</td>
<td>856</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Drill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional</td>
<td>826</td>
<td>796</td>
<td>811</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One working</td>
<td>810</td>
<td>831</td>
<td>821</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>783</td>
<td>826</td>
<td>805</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean gypsum</td>
<td>819</td>
<td>841</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.3 The effect of gypsum on medic pasture production
(88KA73, 89KA71, 90KA115, 90KA116, 90KA117, 90KA118,)

Introduction

The application of gypsum to hardsetting soils has been shown to increase crop yields through improved soil structure particularly in relation to water infiltration. Research in 1988 suggested that gypsum applied in the year of Medic establishment could reduce both production and seed yield. The trial 88KA38 was continued to see if there is a residual gypsum effect and another trial was instigated to investigate whether there is differences between medic cultivars to the gypsum effect.

In 1990 the trials were continued and new trials sown to further test residual effects of gypsum on medics.

Methods


Location: Great Southern Agricultural Research Institute

Soil type: Hard setting salmon gum loam

Site history: Long term pasture.

Treatments: 1988:
- Gypsum: 0, 2.5, 5.0, 10.0 t/ha. 3.6.88
- Medic: Circle Valley x Santiago mix @ 12 kg/ha, 1st sowing; 10 kg/ha, 2nd sowing.
- Wheat: Aroona @ 60 kg/ha

1989:
- Medic and wheat sown to appropriate plots as per 1988 management.

1990:
- Medic: Regenerating after crop.
- Wheat: Replicates 1 & 2 accidently sown at 200kg/ha of Aroona on 17/5/90. Rep 3 sown at 60kg/ha on 7/6/90.

Fertilizer: 1988:
- Medic: 100 kg/ha Super mixed with seed, 53 kg/ha Super at 2nd sowing.
- Wheat: 150 kg/ha Agras No 1.

1989:
- Medic: 150 kg/ha Super mixed with seed.
- Wheat: 125 kg/ha Agras 2.

1990:
- Medic: regenerating after crop, no fertilizer.
- Wheat: 150kg/ha Agras 2.
**Weed control:**
- Sprayseed: 10/5/88 @ 1.8 L/ha, 8/6/88 @ 2 L/ha, 24/6/88 @ 1 L/ha, 26/5/89 @ 1.5 L/ha plus 500ml Dicamba, 16/5/90 @ 1.5L/ha.
- Glyphosate: 22/5/89 @ 2 L/ha.
- Hoegrass: 5/8/88 @ 1 L/ha, 3/7/89 @ 1.5 L/ha, 18/7/89 @ 1.5L/ha.
  - 3/7/90 @ 1.0L on reps 1 & 2, 7/8/90 @ 1.5L/ha on rep 3.
- Fusilade: 9/6/89 @ 300ml/ha, medic only.

**Insect Control:**

**Date of Seeding:**
- 9/6/88, Resown 1/7/88; Direct drilled at both attempts 5/6/89, 17/5/90 Reps 1 & 2, 7/6/90 Rep 3.

89KA71 The effect of gypsum on medic cultivars.

**Location:**
- Cheethams, Katanning.

**Soil Type:**
- Hard setting grey clay.

**Site History:**
- Three years extremely poor pasture.

**Treatments:**
- 1989:
  - 3 x Medic cultivars, Circle Valley, Serena, Santiago sown at 12 kg/ha.
  - 1 x wheat cultivar, Aroona. 60 kg/ha.
  - 4 x Gypsum rates, 0, 2.5, 5.0, and 10.0 t/ha, 19/5/89.
  - 1990:
    - Medic plots allowed to regenerate.
    - 1989 Wheat plots sown to three medic cvs at 10kg/ha.

**Fertilizer:**
- 1989:
  - Medic - 150 kg/ha Super mixed with seed.
  - Wheat - 200 kg/ha Agras 2 drilled at seeding.
  - 1990:
    - Medic on wheat - 10kg/ha seed + 100kg/ha Superphosphate.

**Weed Control:**
- Glyphosate @ 2 L/ha on 22/5/89.
- Sprayseed @ 1.5 L/ha on 31/5/89.
- Hoegrass @ 1.5 L/ha on 3/7/89.
- Sprayseed @ 1.5 L/ha on 21/5/90 on 1989 wheat plots.
- Verdict @ 750ml/ha on 20/6/90.

**Insect Control:**
- Lorsban @ 140 ml/ha on 15/6, 5/9, 14/9/89. Rogor @ 85 ml/ha on 15/6/89, @ 175 ml/ha on 14/9/89. Lorsban @ 200ml/ha on 23/5/90.

**Date of Seeding:**
- 1/6/89, 7/6/90 for medic on 1989 wheat plots.

90KA115 The effect of gypsum on established medic.

**Location:**
- B. O'Donnell, Katanning.
Soil type: Hard setting grey clay.
Site history: Poor medic pasture.
Fertilizer: 100kg/ha Superphosphate at seeding.
Treatments: Gypsum 0, 2.5, 5.0, and 10.0 t/ha applied 10/5/90 and 25/9/90.
Weed Control: Verdict @ 750ml/ha on 20/6/90.
Insect Control: Metasystox @ 560ml/ha on 26/6/90.

90KA116 The effect of gypsum on establishing medic.
Location: B. O'Donnell, Katanning.
Soil type: Hard setting grey clay.
Site history: Poor medic pasture.
Fertilizer: 100kg/ha Superphosphate at seeding.
Treatments: Gypsum 0, 2.5, 5.0, and 10.0 t/ha applied 10/5/90 and 25/9/90.
Weed Control: Verdict @ 750ml/ha on 20/6/90.
Insect Control: Metasystox @ 560ml/ha on 26/6/90.

90KA117 The effect of gypsum on medic Cultivars.
Location: L. Cheetham, Katanning.
Soil type: Hard setting grey clay.
Site history: Extremely poor pasture.
Fertilizer: 100kg/ha Superphosphate at seeding.
Treatments: Gypsum 0, 2.5, 5.0, and 10.0 t/ha applied 10/5/90.
Medic cultivars = Circle Valley, Serena, Santiago.
Weed Control: Verdict @ 750ml/ha on 20/6/90.
Insect Control: Metasystox @ 560ml/ha on 26/6/90.

NO MEASUREMENTS TAKEN DUE TO VERY POOR ESTABLISHMENT.
90KA118  The effect of gypsum on established medic.

Location:  D. Webse, Katanning.

Soil type:  Hard setting grey clay.

Site history:  Excellent medic pasture.

Fertilizer:  100kg/ha Superphosphate at seeding.

Treatments:  Gypsum 0, 2.5, 5.0, and 10.0 t/ha applied 10/5/90.

Weed Control:  Verdict @ 750ml/ha on 20/6/90.

Insect Control:  Rogor @ 85ml/ha on 10/5/90.

TRIAL ABANDONED DUE TO SPRAY DRIFT AFFECTING MEDICS.

Results and Discussion

Research on the effect of gypsum on medics in 1990 consisted of continued monitoring of trials 88KA73 and 89KA71 plus the instigation of a series of trials to investigate the effect of applying gypsum to established medic pastures. Trial 90KA117 was abandoned due to very poor establishment of the sown medic which was a consequence of the extremely cold and dry weather experienced in June. Trials on regenerating medic at O'Donnell's also had poor establishment and one site was sown to medics in lieu of no medics being present on the trial. Results on medic cultivar response to gypsum suggest that there is a cultivar difference with Circle Valley appearing to show a positive response to the residual gypsum application (Table 7). There didn't appear to be a carry over of the negative response however data was extremely variable due to the early season weather conditions. The results do show the superiority of Santiago over Circle Valley and Serena in the Katanning district. In plots sown to medic in 1990 following gypsum application on wheat in 1989 medic seed yield decreased in response residual gypsum (Table 8).

The improved yield in response to 10.0 versus 2.5 or 5.0 t/ha of gypsum follows similar trends from 1989 and suggests that some form of equilibrium between the deleterious effects of gypsum on medic performance and soil structure improvement from the application of gypsum. Results from 88KA73 which investigates the effect of gypsum in the medic-crop system showed no response of wheat or medic to residual gypsum (Table 9). The data does show the improvement of wheat production when grown in a medic crop system as opposed to continuous wheat.

Data from trials investigating the effect of gypsum on established medic pasture was highly variable and it is difficult to determine if any responses are occurring. The effect of gypsum on sown medics at O'Donnell's did not produce the usual negative effect (Table 10) on seed yield although densities showed the expected response. Application
of gypsum in spring did not appear to affect the medics however again the variability of
the data makes interpretation difficult.

Work on the effect of gypsum in medic-cereal system needs to be continued to further
define response particularly in relation to chemical and physical characteristics of the
soil.

Table 7. The effect of Gypsum on Medic Cultivars. (89KA71)

<table>
<thead>
<tr>
<th>TRT</th>
<th>CULTIVAR</th>
<th>GYPSUM 1989</th>
<th>Plant Density (15.6.90) (plants/m²)</th>
<th>DMP (7.9.90) (kg/ha)</th>
<th>Seed Yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td></td>
<td>t/ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CIRCLE VALLEY</td>
<td>0</td>
<td>516</td>
<td>1517</td>
<td>123</td>
</tr>
<tr>
<td>2</td>
<td>CIRCLE VALLEY</td>
<td>2.5</td>
<td>637</td>
<td>2497</td>
<td>107</td>
</tr>
<tr>
<td>3</td>
<td>CIRCLE VALLEY</td>
<td>5</td>
<td>1004</td>
<td>2263</td>
<td>170</td>
</tr>
<tr>
<td>4</td>
<td>CIRCLE VALLEY</td>
<td>10</td>
<td>927</td>
<td>2278</td>
<td>158</td>
</tr>
<tr>
<td>5</td>
<td>SERENA</td>
<td>0</td>
<td>587</td>
<td>2251</td>
<td>108</td>
</tr>
<tr>
<td>6</td>
<td>SERENA</td>
<td>2.5</td>
<td>587</td>
<td>2553</td>
<td>134</td>
</tr>
<tr>
<td>7</td>
<td>SERENA</td>
<td>5</td>
<td>495</td>
<td>2357</td>
<td>63</td>
</tr>
<tr>
<td>8</td>
<td>SERENA</td>
<td>10</td>
<td>566</td>
<td>2055</td>
<td>120</td>
</tr>
<tr>
<td>9</td>
<td>SANTIAGO</td>
<td>0</td>
<td>750</td>
<td>3156</td>
<td>193</td>
</tr>
<tr>
<td>10</td>
<td>SANTIAGO</td>
<td>2.5</td>
<td>1082</td>
<td>3294</td>
<td>234</td>
</tr>
<tr>
<td>11</td>
<td>SANTIAGO</td>
<td>5</td>
<td>912</td>
<td>2888</td>
<td>257</td>
</tr>
<tr>
<td>12</td>
<td>SANTIAGO</td>
<td>10</td>
<td>679</td>
<td>2816</td>
<td>225</td>
</tr>
</tbody>
</table>
Table 8. The Effect of Residual Crop Gypsum on Medic Cultivars. (89KA71)

<table>
<thead>
<tr>
<th>1989 CROP</th>
<th>GYPSUM 1989 (t/ha)</th>
<th>1990 MEDIC CULTIVAR</th>
<th>SEED YIELD (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHEAT</td>
<td>0</td>
<td>CIRCLE VALLEY</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SERENA</td>
<td>213</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SANTIAGO</td>
<td>323</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>210</td>
</tr>
<tr>
<td>WHEAT</td>
<td>2.5</td>
<td>CIRCLE VALLEY</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SERENA</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SANTIAGO</td>
<td>194</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>131</td>
</tr>
<tr>
<td>WHEAT</td>
<td>5</td>
<td>CIRCLE VALLEY</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SERENA</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SANTIAGO</td>
<td>133</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>57</td>
</tr>
<tr>
<td>WHEAT</td>
<td>10</td>
<td>CIRCLE VALLEY</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SERENA</td>
<td>149</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SANTIAGO</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>131</td>
</tr>
</tbody>
</table>
Table 9. The Effect of Gypsum in Medic-Crop Systems. (88KA73)

<table>
<thead>
<tr>
<th>ROTATION</th>
<th>GYPSUM</th>
<th>PLANT DENSITY</th>
<th>PASTURE PRODUCTION</th>
<th>GRAIN YIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>88/89/90</td>
<td>1988 (t/ha)</td>
<td>30.7.90 (plants/m²)</td>
<td>6.7.90 (kg/ha)</td>
</tr>
<tr>
<td>P/P/C</td>
<td>0.00</td>
<td>101</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.50</td>
<td>101</td>
<td>2075</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.00</td>
<td>109</td>
<td>2325</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.00</td>
<td>99</td>
<td>2259</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>103</td>
<td></td>
<td>2293</td>
</tr>
<tr>
<td>P/C/P</td>
<td>0.00</td>
<td>1698</td>
<td>1522</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.50</td>
<td>1563</td>
<td>1029</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.00</td>
<td>1528</td>
<td>1585</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.00</td>
<td>1719</td>
<td>1253</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>1627</td>
<td></td>
<td>1347</td>
</tr>
<tr>
<td>C/C/C</td>
<td>0.00</td>
<td>120</td>
<td>1325</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.50</td>
<td>121</td>
<td>1302</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.00</td>
<td>119</td>
<td>1391</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.00</td>
<td>118</td>
<td>1164</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>120</td>
<td></td>
<td>1295</td>
</tr>
<tr>
<td>C/P/C</td>
<td>0.00</td>
<td>128</td>
<td>1621</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.50</td>
<td>121</td>
<td>1483</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.00</td>
<td>121</td>
<td>2048</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10.00</td>
<td>118</td>
<td>1438</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>122</td>
<td></td>
<td>1648</td>
</tr>
</tbody>
</table>
Table 10. The Effect of Autumn and Spring Application of Gypsum on Regenerating Pasture and Sown Medic Pasture. (90KA115/116)

<table>
<thead>
<tr>
<th>GYPSUM RATE (t/ha)</th>
<th>APPLIED</th>
<th>SOWN 18.9.90</th>
<th>REGEN 18.9.90</th>
<th>SOWN 18.9.90</th>
<th>REGEN 18.9.90</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MEDIC DENSITY (plants/m²)</td>
<td>CLOVER SEED DENSITY (plants/m²)</td>
<td>YIELD (kg/ha)</td>
<td>MEDIC DENSITY (plants/m²)</td>
<td>CLOVER SEED DENSITY (plants/m²)</td>
</tr>
<tr>
<td>0.0 Autumn</td>
<td>127</td>
<td>99</td>
<td>220</td>
<td>127</td>
<td>70</td>
</tr>
<tr>
<td>2.5 Autumn</td>
<td>156</td>
<td>42</td>
<td>189</td>
<td>56</td>
<td>127</td>
</tr>
<tr>
<td>5.0 Autumn</td>
<td>86</td>
<td>14</td>
<td>165</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td>10.0 Autumn</td>
<td>84</td>
<td>56</td>
<td>198</td>
<td>70</td>
<td>99</td>
</tr>
<tr>
<td>0.0 Spring</td>
<td>170</td>
<td>14</td>
<td>84</td>
<td>113</td>
<td>141</td>
</tr>
<tr>
<td>2.5 Spring</td>
<td>99</td>
<td>14</td>
<td>150</td>
<td>113</td>
<td>113</td>
</tr>
<tr>
<td>5.0 Spring</td>
<td>113</td>
<td>42</td>
<td>236</td>
<td>127</td>
<td>85</td>
</tr>
<tr>
<td>10.0 Spring</td>
<td>166</td>
<td>66</td>
<td>134</td>
<td>70</td>
<td>184</td>
</tr>
</tbody>
</table>

4.4 Effect of tillage x gypsum on medic regeneration (88KA76)

Introduction

Limited sampling of tillage trials showed increased pasture regeneration with reduced tillage. This project aims to quantify and qualify this response in relation to soil structure, crop yield and pasture regeneration and production.

Methods

Collaborator: D. Webse, Kwobrup, Katanning.

Soil type: Hard setting grey clay.

Site history: Ryegrass pasture 1986; sown to medic 1987

Treatments: (a) Gypsum: 1. 0 t/ha
2. 5 t/ha applied in 1988.
(b) Tillage: 1. Minimum soil disturbance - Triple Disc Drill
2. Medium soil disturbance - Direct Drill
3. Maximum soil disturbance - Work up, work back, sow.

Excessive rainfall prevented tillage seeding treatments being applied until 28.8.88. As a consequence no crop was sown but the machinery was run across the plots.

1989:
Medic was allowed to regenerate. Area received a topdressing of 50 kg/ha of Super on 9/5/89.
1990:

Fertilizer: 150kg/ha Agras 2 seeding.

Treatments: Aroona wheat at 60kg/ha.
Tillage, 1988 tillage plots divided in half.
1988 1990
T1 T1, T2
T2 T1, T2
T3 T2, T3

Weed Control: Roundup @ 1.0L on 5/4/90.
Sprayseed @ 1.5L + Dicamba @ 200ml on 19/5/90.
Glean @ 10g/ha on 10/6/90.

Insect Control: Metasystox @ 560ml/ha on 26/6/90.

Results and Discussion

The combination tillage treatments had no major effect on wheat production (Table 11). However mean results for the minimum and maximum soil disturbance tillage treatments in 1990 showed slightly reduced grain yield. Of particular interest was the performance of wheat sown with the narrow tines. The fact that establishment was good and yield comparable is encouraging as it may indicate that crop tillage disturbance can be further reduced without dramatically reducing crop yield on these soil types. Caution must be taken in extrapolating the data as the results have only been obtained in one season and under moderately good seeding conditions.
Table 11. Effect of Residual Crop Tillage and Gypsum Effects on Wheat Production.

<table>
<thead>
<tr>
<th>Gypsum (1989)</th>
<th>Tillage*</th>
<th>Tillage#</th>
<th>Emergence (plants/m²)</th>
<th>Dry Matter (kg/ha)</th>
<th>Grain Yield (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t/ha)</td>
<td>1988</td>
<td>1990</td>
<td>18.8.90</td>
<td>28.9.90</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>98</td>
<td>4639</td>
<td>2738</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>98</td>
<td>4357</td>
<td>2993</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>88</td>
<td>4148</td>
<td>2800</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>108</td>
<td>3908</td>
<td>2957</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>96</td>
<td>4649</td>
<td>2827</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>88</td>
<td>4348</td>
<td>2896</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td>96</td>
<td>4341</td>
<td>2869</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>96</td>
<td>4088</td>
<td>3155</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>106</td>
<td>4264</td>
<td>2979</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>117</td>
<td>5065</td>
<td>2815</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>102</td>
<td>4500</td>
<td>3092</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
<td>84</td>
<td>4338</td>
<td>2728</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>99</td>
<td>4537</td>
<td>2844</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td></td>
<td>101</td>
<td>4466</td>
<td>2935</td>
</tr>
</tbody>
</table>

Tillage Means 1988-1
- 1: 100 | 4337 | 2966
- 2: 104 | 4405 | 2916
- 3: 92 | 4468 | 2824
1990-1
- 1: 98 | 4471 | 2875
- 2: 104 | 4257 | 3005
- 3: 90 | 4494 | 2778
1990-1.1
- 1.2: 102 | 4311 | 2986
- 2.1: 103 | 4607 | 2808
- 2.2: 105 | 4204 | 3025
- 3.1: 90 | 4494 | 2778
- 3.3: 94 | 4443 | 2870

* 1 = Minimum soil disturbance - sown with Triple Disc Drill.
2 = Moderate soil disturbance - sown with Combine.
3 = Maximum soil disturbance - work up, work back, sown with Combine.

# 1 = Minimum soil disturbance - sown with Combine with 5cm tines.
2 = Moderate soil disturbance - sown with Combine with 10cm tines.
3 = Maximum soil disturbance - work up, work back, sown with Combine.
4.5 Pasture regeneration on tillage trials

Trials

89BA26: Cultivation/CDM Combine/Banding P for wheat after pasture.
89LG36: Conservation seeder evaluation and demonstration.
77M56: Minimum tillage heavy land: rotational
89ME88: The effect of crop tillage on subsequent pasture regeneration.
85SG28: Minimum tillage under three rotations.
89SG17: Phosphate banding for wheat - Residual effects on Serena pasture.
77WH88: Minimum tillage investigations: rotational
82WH49: Times and depths of cultivation.
89WH65: Cultivation and seeding methods for wheat.

Introduction

The effect of crop tillage practices on subsequent pasture performance has been poorly quantified in the past. Tillage in conjunction with herbicides would be the major factors affecting pasture seed bank dynamics following cropping and there is a need for a better understanding of the process involved.

The monitoring of long term tillage and other trials from Ron Jarvis' programme is an attempt to address the paucity of information on the role of tillage in the ley farm system.

Methods

For specific details of trial methods please refer to Ron Jarvis' summaries.

Sampling:

<table>
<thead>
<tr>
<th>Trial</th>
<th>Date of Sampling</th>
<th>Quadrat Size (cm²)</th>
<th>Number quadrats/plot</th>
<th>Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>88BA26</td>
<td>5.7.90</td>
<td>78.5</td>
<td>6</td>
<td>Species density</td>
</tr>
<tr>
<td>89LG36</td>
<td>22.8.90</td>
<td>78.5</td>
<td>32</td>
<td>Species density</td>
</tr>
<tr>
<td>77M56</td>
<td>11.6.90</td>
<td>78.5</td>
<td>20</td>
<td>Species density</td>
</tr>
<tr>
<td></td>
<td>12.9.90*</td>
<td>2500</td>
<td>1</td>
<td>DMP</td>
</tr>
<tr>
<td>89ME88</td>
<td>11.6.90</td>
<td>78.5</td>
<td>30</td>
<td>Species density</td>
</tr>
<tr>
<td>85SG28</td>
<td>25.6.90</td>
<td>78.5</td>
<td>15</td>
<td>Species density</td>
</tr>
<tr>
<td>89SG17</td>
<td>25.6.90</td>
<td>625</td>
<td>6</td>
<td>Species density</td>
</tr>
<tr>
<td>77WH88</td>
<td>13.6.90</td>
<td>78.5</td>
<td>10</td>
<td>Species density</td>
</tr>
<tr>
<td>82WH49</td>
<td>13.6.90</td>
<td>78.5</td>
<td>10</td>
<td>Species density</td>
</tr>
</tbody>
</table>

cages placed on 30.6.89
Legend For Symbols in Tables

DD/TDD = direct drill with Triple Disc Drill
SC/TDD = shallow cultivation, seed with Triple Disc Drill
DDC = direct drill with combine
DP = district practice (usually 2 cultivations and sowing)
CLTC = cultivated then sown with combine.
DR/DDC = deep ripped at some stage, sown with a combine.

4.5.1. 89BA26

Comments

1. The trial was set up to measure the effect of deep banding of P in crops on subsequent pasture performance. Pasture species were sown to give acceptable seed levels before tillage treatments are applied. These results are pasture species densities following the second year in pasture and are all at acceptable levels.

Cultivation / combine / banding P for wheat after pasture.

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>SEEDING</th>
<th>RUN</th>
<th>BLOCK1</th>
<th>BLOCK 2</th>
<th>BLOCK 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>plot</td>
<td>1</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>MUREX</td>
<td></td>
<td>1</td>
<td>330</td>
<td>660</td>
<td>508</td>
</tr>
<tr>
<td>ZODIAC</td>
<td></td>
<td>2</td>
<td>457</td>
<td>584</td>
<td>762</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>584</td>
<td>203</td>
<td>508</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>508</td>
<td>610</td>
<td>508</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>457</td>
<td>457</td>
<td>381</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>432</td>
<td>508</td>
<td>279</td>
</tr>
<tr>
<td></td>
<td></td>
<td>plot</td>
<td>3</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>SERRADELLA</td>
<td></td>
<td>1</td>
<td>1219</td>
<td>1245</td>
<td>813</td>
</tr>
<tr>
<td>TAURO</td>
<td></td>
<td>2</td>
<td>660</td>
<td>1219</td>
<td>2692</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>1118</td>
<td>1194</td>
<td>1676</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>813</td>
<td>1194</td>
<td>1676</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>1448</td>
<td>711</td>
<td>737</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>1372</td>
<td>1168</td>
<td>737</td>
</tr>
<tr>
<td></td>
<td></td>
<td>plot</td>
<td>2</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>CLOVER</td>
<td></td>
<td>1</td>
<td>787</td>
<td>914</td>
<td>940</td>
</tr>
<tr>
<td>DALKEITH</td>
<td></td>
<td>2</td>
<td>940</td>
<td>914</td>
<td>660</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>940</td>
<td>1295</td>
<td>762</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>762</td>
<td>787</td>
<td>991</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>1118</td>
<td>1194</td>
<td>991</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>889</td>
<td>864</td>
<td>737</td>
</tr>
</tbody>
</table>
4.5.2. 89LG36

Comments

1. Pasture counts were done on this trial of Kevin Bligh's to investigate the effect of crop tillage treatments using different types of narrow points and associated seeding systems on subsequent pasture performance.

2. There did not appear to be any negative effect on pasture regeneration following the use of narrow tines for crop establishment. The narrow deep bladed points gave the highest clover densities.

<table>
<thead>
<tr>
<th>TILLAGE **</th>
<th>CLOVER (plants/m2)</th>
<th>BROADLEAF (plants/m2)</th>
<th>GRASS (plants/m2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300</td>
<td>106</td>
<td>388</td>
</tr>
<tr>
<td>2</td>
<td>204</td>
<td>70</td>
<td>389</td>
</tr>
<tr>
<td>3</td>
<td>356</td>
<td>128</td>
<td>346</td>
</tr>
<tr>
<td>4</td>
<td>353</td>
<td>112</td>
<td>268</td>
</tr>
<tr>
<td>5</td>
<td>226</td>
<td>93</td>
<td>492</td>
</tr>
<tr>
<td>6</td>
<td>283</td>
<td>94</td>
<td>389</td>
</tr>
<tr>
<td>7</td>
<td>234</td>
<td>108</td>
<td>284</td>
</tr>
</tbody>
</table>

**

T1 = narrow winged points
T2 = narrow winged points + press wheels
T3 = narrow deep bladed points
T4 = narrow deep bladed points + press wheels
T5 = conventional points (no cultivating tines)
T6 = conventional points + press wheels
T7 = tillage prior to conventional sowing
4.5.3. 77M56

Comments

1. In this season it was the CLTC crop tillage treatment that gave the highest medic establishment. However all tillages gave higher medic densities than the DP treatment.

2. Increased medic densities in response to previous application of gypsum on only the CLTC and DDC treatments.

3. Production highest for DDC, but the responses due primarily to the large response of medic to residual gypsum effect under this treatment.

<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>old medic 11.6.90</th>
<th>new medic 11.6.90</th>
<th>total medic 11.6.90</th>
<th>grass</th>
<th>dmp kg/ha 12.9.90</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>plants/ m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DD NARROW PTS</td>
<td>GYP 93 36 129 180</td>
<td>NO GYP 81 53 134 119</td>
<td>GYP 87 45 132 150</td>
<td>734</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CULT + COMBINE</td>
<td>GYP 98 91 189 265</td>
<td>NO GYP 72 74 146 236</td>
<td>GYP 85 83 168 250</td>
<td>629</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DDC</td>
<td>GYP 79 47 125 242</td>
<td>NO GYP 62 40 102 142</td>
<td>GYP 70 44 114 192</td>
<td>856</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISTRICT PRACTICE</td>
<td>GYP 32 32 64 365 707</td>
<td>NO GYP 53 42 95 367 709</td>
<td>GYP 42 37 80 366 708</td>
<td>708</td>
<td></td>
</tr>
</tbody>
</table>
4.5.4 88ME88

Comments

1. The trial site suffered from bad waterlogging in 1989 and the crop performed poorly. Evidence of waterlogging from summer and autumn rainfall was apparent on pastures.

2. Survival of medics germinating from early rains was best under the ploughing treatment.

3. Late autumn germination was best following the SSC and DDC2 treatments. Overall final medic establishment was similar with the exception of the DDC4. This result is surprising and the role of waterlogging on the results must be questioned.

<table>
<thead>
<tr>
<th>Tillage</th>
<th>old medic plants/m²</th>
<th>new medic plants/m²</th>
<th>total plants/m²</th>
<th>broad plants/m²</th>
<th>grass plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11.6.90</td>
<td>11.6.90</td>
<td>11.6.90</td>
<td>11.6.90</td>
<td>11.6.90</td>
</tr>
<tr>
<td>D.P.</td>
<td>89</td>
<td>153</td>
<td>242</td>
<td>109</td>
<td>13</td>
</tr>
<tr>
<td>S.S.C.</td>
<td>81</td>
<td>174</td>
<td>255</td>
<td>103</td>
<td>4</td>
</tr>
<tr>
<td>D.D.C. 4</td>
<td>88</td>
<td>108</td>
<td>195</td>
<td>102</td>
<td>17</td>
</tr>
<tr>
<td>D.D.C. 2</td>
<td>75</td>
<td>170</td>
<td>245</td>
<td>86</td>
<td>8</td>
</tr>
<tr>
<td>D.P.L.</td>
<td>108</td>
<td>119</td>
<td>226</td>
<td>88</td>
<td>8</td>
</tr>
</tbody>
</table>

DP = district practice
SSC = shallow scarification, sow with combine
DDC 4 = direct drill combine (standard points 4")
DDC 2 = direct drill combine (standard points 2")
DPL = disc plough, sown combine
Comments

1. Counts were taken on this trial to see if any differences existed between pastures in a long term direct drill vs conventional crop system in a 1:1 rotation with Serena medic. Medic establishment was greater in the system using direct drill for crop sowing (660 versus 424 plants/m²) as was grass density (369 versus 187 plants/m²). There were no significant levels of broadleaf weeds present in either treatment.

<table>
<thead>
<tr>
<th>CROP</th>
<th>TILLAGE</th>
<th>medic density plants/m²</th>
<th>grass density plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIRECT</td>
<td>DRILL</td>
<td>660</td>
<td>369</td>
</tr>
<tr>
<td>CULT</td>
<td></td>
<td>424</td>
<td>187</td>
</tr>
</tbody>
</table>
4.5.6. 89SG17

Comments

1. Counts were taken to ascertain the effects of Phosphate banding for wheat on subsequent pasture establishment.

2. Trial site was raked and this had the effect of dragging seed to one end of the trial and possibly off the trial. The raking may have also influenced seed and burr burial much the same as an "autumn tickle" will on medics. Management techniques to facilitate pasture measurement should be avoided as they invariably affect pasture performance and the trial's integrity.

3. Keeping in mind the possible interference with responses caused by raking it appears that deep banding does not effect subsequent pasture establishment.

4. Including scarification in the crop seeding process does appear reduce pasture establishment.

<table>
<thead>
<tr>
<th>TRT NO</th>
<th>TREATMENT</th>
<th>clover density plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Direct drill std float</td>
<td>389</td>
</tr>
<tr>
<td>2</td>
<td>Cult narrow points-seed -P</td>
<td>349</td>
</tr>
<tr>
<td>3</td>
<td>Cult narrow points-seed +P</td>
<td>342</td>
</tr>
<tr>
<td>4</td>
<td>Cult narrow at banding, seed -P</td>
<td>369</td>
</tr>
<tr>
<td>5</td>
<td>Scarify -band P -seed -P</td>
<td>205</td>
</tr>
<tr>
<td>6</td>
<td>Scarify -narrow cult-seed+P</td>
<td>239</td>
</tr>
<tr>
<td>7</td>
<td>Scarify -narrow cult-seed-P</td>
<td>344</td>
</tr>
<tr>
<td>8</td>
<td>Scarify -seed-P</td>
<td>205</td>
</tr>
</tbody>
</table>
Comments

1. The trial remained in pasture for two years to investigate the carryover effect of the crop tillage treatments.

2. The sub-treatments of DD and CLTC had no effect on clover density in the long term DR/DDC treatment.

3. Cultivating at different times had no carryover effect.

<table>
<thead>
<tr>
<th>TREATMENT</th>
<th>SUB TRT</th>
<th>12.6.90</th>
<th>plants/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>CULT / COMB</td>
<td>CULT:T1</td>
<td>293</td>
<td>242</td>
</tr>
<tr>
<td></td>
<td>CULT:T2</td>
<td>229</td>
<td>267</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>242</td>
<td>280</td>
</tr>
<tr>
<td></td>
<td>total mean</td>
<td>274</td>
<td>152</td>
</tr>
<tr>
<td>D R / DDC</td>
<td>CULT</td>
<td>229</td>
<td>242</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>221</td>
<td>242</td>
</tr>
<tr>
<td></td>
<td>total mean</td>
<td>242</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>DD</td>
<td>263</td>
<td>242</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>261</td>
<td>242</td>
</tr>
<tr>
<td></td>
<td>total mean</td>
<td>242</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>CULT</td>
<td>229</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>231</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>total mean</td>
<td>225</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>DDC</td>
<td>297</td>
<td>318</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>340</td>
<td>318</td>
</tr>
<tr>
<td></td>
<td>total mean</td>
<td>318</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>DR</td>
<td>242</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>208</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>total mean</td>
<td>225</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>DDC</td>
<td>242</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>208</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>total mean</td>
<td>225</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>DP</td>
<td>123</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>161</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>total mean</td>
<td>161</td>
<td>152</td>
</tr>
</tbody>
</table>
DR/DDC = Deep ripped 1986, direct drilled with combine.
    Cult = Scarified to 10cm 1988.
    DD = Direct drill with combine 1988.
CULT/COMB = Scarified and then sown with combine.
    Cult:T1 = Scarified first time of DP working.
    Cult:T2 = Scarified second time of DP working.
DDC = Direct drilled with combine.
    DR = Deep ripped, 1988 to 30cm, sown with combine.
DP = District practice, work up, work back, sown with combine.

4. A carryover effect was evident in the Deep ripping treatment following DDC. Clover densities were greater than other treatments which is a reversal of the previous year’s response. The response also contradicts data from other deep ripping trials which have shown the negative effect of deep ripping on pasture can continue for up to three years. Work is required to define factors that are effecting the response.

5. District practice again gave lowest levels of clover density.
Comments

1. The negative effect of deep ripping on pasture densities appears to have carried on for 4 years in treatment 6 where deep ripping at 30cm occurred in August 1986. Conversely, treatment 3 which was deep ripped in May 1988, showed a dramatic improvement in density. This result suggests timing and technique may influence pasture establishment.

<table>
<thead>
<tr>
<th>CROP TILLAGE TREATMENTS</th>
<th>Clover density plants/m²</th>
<th>% DD</th>
<th>Clover density plants/m</th>
<th>% DD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.6.80</td>
<td></td>
<td>16.6.89</td>
<td></td>
</tr>
<tr>
<td>1982/83</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AG 30 AUG</td>
<td>DD</td>
<td>DD</td>
<td>245</td>
<td>85%</td>
</tr>
<tr>
<td>SW 10 AUG</td>
<td>AG 20</td>
<td>DD</td>
<td>300</td>
<td>104%</td>
</tr>
<tr>
<td>MOD COM</td>
<td>DD</td>
<td>AG 30</td>
<td>314</td>
<td>109%</td>
</tr>
<tr>
<td>DD</td>
<td>AG 30</td>
<td>DD</td>
<td>265</td>
<td>88%</td>
</tr>
<tr>
<td>AG 30</td>
<td>AG 30</td>
<td>DD</td>
<td>211</td>
<td>73%</td>
</tr>
<tr>
<td>DD</td>
<td>DD</td>
<td>AG 30/36</td>
<td>101</td>
<td>95%</td>
</tr>
<tr>
<td>AG 20</td>
<td>DD</td>
<td>DD</td>
<td>173</td>
<td>60%</td>
</tr>
<tr>
<td>AG 30</td>
<td>DD</td>
<td>DD</td>
<td>261</td>
<td>87%</td>
</tr>
<tr>
<td>SC 10</td>
<td>SC 10</td>
<td>SC 10</td>
<td>201</td>
<td>70%</td>
</tr>
<tr>
<td>DD</td>
<td>DD</td>
<td>DD</td>
<td>288</td>
<td>100%</td>
</tr>
</tbody>
</table>

AG 30 = Deep ripped with Agrow plough to 30cm.
AUG = August 1982
AG 20 = Deep ripped with Agrow plough to 20cm.
Modified combine = cultivate deep (10cm) sow shallow.
DD = Direct drill with combine.
SC 10 = Scarify to 10 cm, seed with combine.
SW 10 AUG = Cultivated with sweeps in August 1982.
Comments

1. Use of narrow points in crop sowing increased clover establishment.

<table>
<thead>
<tr>
<th>TREATMENTS</th>
<th>SUPER</th>
<th>SEED</th>
<th>POINTS front/back</th>
<th>Clover density mean</th>
<th>13.6.90 mean</th>
<th>plants/m² total mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIRECT DRILL</td>
<td>TD</td>
<td>TD</td>
<td>7(\frac{1}{4})</td>
<td>225</td>
<td>187</td>
<td>206</td>
</tr>
<tr>
<td>TD</td>
<td>D</td>
<td>7(\frac{1}{4})</td>
<td>344</td>
<td>204</td>
<td>274</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>7(\frac{1}{4})</td>
<td>233</td>
<td>195</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>TD</td>
<td>7(\frac{1}{4})</td>
<td>310</td>
<td>246</td>
<td>278</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>N</td>
<td>306</td>
<td>365</td>
<td>335</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>TD</td>
<td>N</td>
<td>297</td>
<td>289</td>
<td>293</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CULTIVATED</th>
<th>(a)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>0</td>
<td>TD</td>
<td>7(\frac{1}{4})</td>
<td>280</td>
<td>140</td>
<td>210</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>D</td>
<td>7(\frac{1}{4})</td>
<td>170</td>
<td>153</td>
<td>161</td>
</tr>
<tr>
<td>9</td>
<td>D</td>
<td>TD</td>
<td>7(\frac{1}{4})</td>
<td>221</td>
<td>187</td>
<td>204</td>
</tr>
<tr>
<td>10</td>
<td>D</td>
<td>D</td>
<td>7(\frac{1}{4})</td>
<td>259</td>
<td>212</td>
<td>238</td>
</tr>
<tr>
<td>11</td>
<td>TD</td>
<td>TD</td>
<td>7(\frac{1}{4})</td>
<td>233</td>
<td>127</td>
<td>180</td>
</tr>
<tr>
<td>12</td>
<td>TD</td>
<td>D</td>
<td>7(\frac{1}{4})</td>
<td>208</td>
<td>221</td>
<td>214</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CULTIVATED</th>
<th>(b) at seeding</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>D</td>
<td>D</td>
<td>7(\frac{1}{4})</td>
<td>289</td>
<td>191</td>
<td>240</td>
</tr>
<tr>
<td>14</td>
<td>D</td>
<td>TD</td>
<td>7(\frac{1}{4})</td>
<td>225</td>
<td>195</td>
<td>210</td>
</tr>
<tr>
<td>15</td>
<td>D</td>
<td>D</td>
<td>N</td>
<td>297</td>
<td>242</td>
<td>269</td>
</tr>
<tr>
<td>16</td>
<td>D</td>
<td>TD</td>
<td>N</td>
<td>301</td>
<td>306</td>
<td>303</td>
</tr>
</tbody>
</table>

CULT (a) = points 7\(\frac{1}{4}\) for cult and seeding, no super at seeding
CULT (b) = super drilled at seeding (0 at cult)
points are 7\". 4\" and N = narrow modified wing
seed & super drilled together (down spout) Tr 3,5,13,15.
7\(\frac{1}{4}\) cult 10cm deep; N cult 13cm to tips
TD = topdressed
D = drilled