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## Crop competition trials

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DEPARTMENT OF AGRICULTURE  
Western Australia

SUMMARY OF EXPERIMENTAL RESULTS 1978

Crop Competition Trials

- 78WH69. Rates of nitrogen on mixtures of wheat and ryegrass.
- 78WH70. Rates of Nungarin subclover under a wheat crop with and without applied nitrogen.
- 78WH71. Rates of seeding wheat on competition between wheat and ryegrass.
- 78WH72. Rates of ryegrass on wheat and barley yields.

Results of other trials conducted in 1978 will be reported elsewhere. This applies particularly to the sunflower programme which was not harvested when this report was prepared.

M. L. Poole  
Research Officer  
Plant Research Division

78WH69

Rates of Nitrogen on Mixtures of Wheat and Ryegrass

- Site : Wongan Hills Research Station
- Aim : To determine whether the competition between wheat and ryegrass is affected by different rates of nitrogen. Particularly to assess whether the relative competitiveness of the ryegrass is increased at higher nitrogen rates.
- Soil Type : Wongan Loamy Sand. Wheat stubble.
- Details : Randomized block design with sixteen treatments and three replications. Gamenya wheat 50 kg/ha. Ryegrass established on appropriate plots by mixing with superphosphate and topdressing at 225 kg/ha. Rates of nitrogen topdressed by hand immediately after sowing. Treatments involving repeat nitrogen application topdressed six weeks after seeding. Plot size 50 m x 2.1 m.
- Sampling : a) Wheat density: 140 plants/m<sup>2</sup>  
b) Ryegrass density: 8 quadrats per plot each 7.5 x 10 cm. Ryegrass density achieved on appropriate plots was 404 plants/m<sup>2</sup>.
- Results : Results of the separate replications are given. The site varied from fertile section upslope (rep 3) through intermediate (rep 2) to relatively infertile (rep 1). This is reflected in the yields.

Replication 1. Wheat Yields Kg/Ha

Rate of N kg/ha	Weed free yield	Yield with ryegrass	Weedy Weedfree %
0	2427	1770	72.9
10	2589	1914	73.9
20	2494	1866	74.8
30	2542	1999	78.6
40	2437	1999	82.0
50	2665	2037	76.4
60	2446	2037	83.3
60 x 2	2570	1999	77.7

Replication 2. Wheat Yields

Rate of nitrogen kg/ha	Weed free yield	Weedy yield	<u>Weedy</u> Weedfree %
0	1751	1285	73.4
10	2332	1761	75.5
20	1818	1371	75.4
30	1884	1209	64.2
40	1818	1951	107.3
50	2503	1332	53.2
60	1999	1323	66.2
60 x 2	2256	1523	67.5

Replication 3. Wheat Yields

Rate of nitrogen kg/ha	Weed free yield	Weedy yield	<u>Weedy</u> Weedfree %
0	1380	1047	75.8
10	1237	1104	89.2
20	2113	1047	49.5
30	1570	1161	73.9
40	1923	1275	66.3
50	1580	1170	74.0
60	1780	1447	81.3
60 x 2	1894	1294	68.3

Comment

The variability of this site was such that little useful information can be extracted from the data. It is interesting that quite large absolute yield differences were obtained between reps yet applied nitrogen did little to improve yields on the poorer rep. The trial will be repeated in 1979.

78WH70

Rates of Nungarin subclover under a wheat crop  
with and without applied nitrogen

- Aim : To determine :
- (1) The effects of various rates of Nungarin subclover under a wheat crop on wheat yield.
  - (2) The effects of applied nitrogen on the wheat/sub competition.
  - (3) The effects on subclover seed yield under the crop compared with a pure stand.
  - (4) The effects of (1-111) on the re-establishment of the clover in 1979
- Details :
- (a) Randomized block design with 21 treatments and 2 reps. Each plot randomly split into  $\frac{1}{2}$  N at Agran 50 kg/ha.
  - (b) Gamanya wheat 50 kg/ha.
  - (c) Subclover rates mixed with plain superphosphate at 225 kg/ha and topdressed onto appropriate plots and harrowed in.
  - (d) Wheat drilled following subclover topdressing. This had the effect of burying much of the subclover too deep such that the sub emerged in 14" rows. It is likely that the sub seeding rates were roughly halved by this. The sub density counts support this.
- Sampling :
- (1) Wheat Yields: harvested with Hege.
  - (2) Subclover counts: 10 quadrats each 40 x 7.5 cm per sub plot.  
Subclover yields: 4 quadrats each 0-2 m<sup>2</sup> per sub-plot.

Wheat Yields Kg/Ha

Treatment	No Nitrogen	Undersown Wheat only %	+ Nitrogen	Undersown Wheat only %
Wheat only	2337	100%	2337	100%
Wheat + 1 kg/ha clover	2256	96.5	2265	96.9
" 2 " "	2265	96.9	2294	98.2
" 4 " "	2018	86.3	2418	103.4
" 6 " "	2303	98.5	1999	85.5
" 8 " "	2094	89.6	2380	101.8
" 12 " "	2065	88.3	2304	98.5
" 16 " "	2008	85.9	2351	100.5
" 32 " "	1923	82.3	2246	96.1
" 64 " "	1713	73.3	1913	81.8
" 128 " "	1780	76.2	1808	77.4

### Glover Seed Yields Kg/Ha

Treatment Rate Clover Sown Kg/Ha	Clover Density Plants/m <sup>2</sup>	Clover Only Yields	Clover + Wheat No Nitrogen	Clover + Wheat + Nitrogen
Nungarin 1	21	64.5	29.8	25.3
" 2	27	60.8	57.7	55.7
" 4	45	71.8	51.3	28.5
" 6	82	120.1	51.5	39.2
" 8	104	168.1	42.8	47.6
" 12	132	188.4	51.6	49.2
" 16	142	200.4	118.6	74.0
" 32	256	299.7	131.0	85.0
" 64	364	328.3	132.8	99.4
" 128	401	399.9	148.2	116.6

### Comments

#### 1. Wheat Yields

The undersown clover caused reductions in wheat yields. In the absence of applied nitrogen the reduction in yield over the clover seeding rate range 1-12 kg/ha was 4 through to 10%. When nitrogen was applied to the crop - clover mixture there was little if any yield reduction over this range. At the highest rate undersown a 25% reduction in yield occurred. Remember that only half the clover emerged due to the sowing method used.

#### 2. Clover Yields

Sowing clover under the crop reduced the clover seed yield by half to two thirds compared with clover sown alone. When nitrogen was added to the wheat/clover mixture the clover yield was further reduced. That is, the nitrogen increased the competitiveness of the wheat. This fits in with the lesser effect of the clover on wheat yield in the situation where N was applied.

N.B. The clover only plots included capeweed, doublegees and wild turnip, constituting up to 50% of the groundcover achieved.

78WH71

Rates of Seeding on Competition between Wheat & Ryegrass

- Site : Wongan Hills Research Station
- Aim : To determine whether the competition between wheat and ryegrass is affected by the seeding rate of wheat, particularly to assess whether the relative competitive ability of the ryegrass is diminished at higher seeding rates.
- Soil Type : Wongan Loamy Sand. Wheat stubble.
- Detail : Randomized block design with seventeen treatments and three replications. Gamenya wheat seeded at the rates shown, actual densities achieved shown in results.  
Sown June 16.  
Superphosphate at 225 kg/ha topdressed with ryegrass onto appropriate plots.  
Agran 34:0 at 95 kg/ha T.D after seeding.  
Plot size 2.1 m x 50 m.
- Sampling : (a) Ryegrass densities were calculated from eight quadrats each 7.5 cm x 40 cm from each ryegrass plot.  
(b) Wheat densities were calculated from six quadrats each 15 cm x 35 cm from each wheat plot, the long axis of the quadrat lying across two rows.

Results

Rate of Wheat sown kg/ha	Wheat density achieved <sub>2</sub> Plants/m <sup>2</sup>	Yield in absence of ryegrass	Yield with ryegrass at 453 plants/m <sup>2</sup>	Weedy Weedfree %
15	69	1346	828	61.5
30	100	1777	1181	66.4
45	141	1933	1396	72.2
60	191	1914	1548	80.0
75	238	2390	1428	59.7
90	293	2244	1844	82.2
105	320	2076	1672	80.5
120	317	2146	1872	87.2

Density of Ryegrass 453 plants/m<sup>2</sup>.

Comment

Except for the 75 kg/ha rate which seems an aberrant result, there was a general trend for the weedy yield to be closer to the weed free yield at the higher seeding rates of wheat.

78WH72

Rates of ryegrass on wheat and barley yields

Site : Wongan Hills Research Station

Aim : To determine the effects of different rates of ryegrass on wheat and barley yields with particular emphasis on differences in the competitive ability of the two crops.

Soil Type : Wongan Loamy Sand, Wheat stubble.

Detail : Randomized block design with thirty two treatments and two replications. Gamenya wheat and Clipper barley sown with 15 rates of ryegrass with planned densities of 25 to 2000 ryegrass plants/m<sup>2</sup>. Actual densities achieved shown in results.  
Wheat and barley alone control plots  
Sown June 15.  
Superphosphate drilled 225 kg/ha.  
Agran 34.0 topdressed at seeding at 95 kg/ha.  
Ryegrass sown mixed with superphosphate  
Topdressed on and harrow in immediately prior to sowing cereals.  
Plots 2.1 m x 50 m.

Results : Ryegrass densities achieved VS/theoretical densities.  
Two methods of ryegrass counting tried.

Method 1 Counting seedlings in 10 quadrats each  
40 x 7.5 cm per plot.

Method 2 Pulling out and counting in 10 quadrats  
per plot each 40 x 7.5 cm.

Method 2 proved much more accurate at the higher rates.

Table 1. Grain Yields Kg/ha

Ryegrass Density Plants/m <sup>2</sup>	Wheat Yields		Barley Yields	
	Kg/ha	% Weed free	Kg/ha	% Weed free
0	2180	100%	1970	100%
49	2089	95.0	1970	100
91	2037	93.4	2103	106.7
129	2127	97.5	1975	100.2
161	1923	88.2	2027	102.8
198	1694	77.7	2023	102.6
267	1742	79.9	1799	91.3
338	1533	70.3	1509	76.6
412	1666	76.4	1695	86.0
463	1775	81.4	1309	66.4
547	1542	70.7	1423	72.2
624	1718	78.8	1714	87.0
748	1556	71.4	1571	79.7
832	1528	70.1	1447	73.5
1121	1257	57.6	1314	66.7
1463	1214	55.7	1447	73.5



# Comment

1. Wheat appeared to be more severely affected by the presence of ryegrass than barley. From the results barley was little affected up to 200 plants/m<sup>2</sup> and at the highest rate suffered about a 30% yield depression. Wheat suffered a 20% depression at the 200 plants/m<sup>2</sup> level and a 45% depression at the highest ryegrass rate.
2. These results are supported by observation of the trial where the vigorously tillering barley appeared to compete better than the more sparse wheat

This result is in line with farmer folklore concerning the competitive ability of the two crops and with Canadian results on competition wheat, barley and wild oats.

Table 2

78WH72

Sowing Rate ryegrass kg/ha	Planned density Plants/m <sup>2</sup>	Method 1 Counting <sub>2</sub> Plants/m <sup>2</sup>	Method 2 Pulling out Plants/m <sup>2</sup>
16.5	25	36	49
33	50	59	91
49.5	75	129	129
66.0	100	138	161
99	150	228	198
132.0	200	252	267
165.0	250	304	338
198.0	300	367	412
264.0	400	513	463
330.0	500	454	547
396.0	600	507	624
398.0	800	676	748
528.0	1000	528	832
660.0	1500	768	1121
990.0	2000	884	1463
1320.0			

Method 2 results were accepted.

Wheat density established 200 plants/m<sup>2</sup>  
Barley density established 150 plants/m<sup>2</sup>