

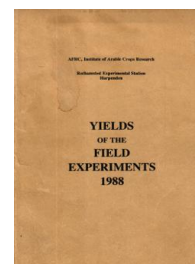
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## Yields of the Field Experiments 1988

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### 88/R/RA/1 Factors Limiting Yield - W. Oilseed Rape

#### Rothamsted Research

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WINTER OILSEED RAPE

FACTORS LIMITING YIELD

**Object:** To study the effects of a range of factors on the incidence of pests and diseases and on the growth and yield of w. oilseed rape - Black Horse II.

**Sponsors:** C.J. Rawlinson, R.J. Darby, P.G.N. Digby, K. Evans, J.E. Leach, I.H. Williams, D.P. Yeoman.

**Associate sponsors:** P.B. Barraclough, J. Lacey, S.P. McGrath, A.H. Weir.

**Design:** A half replicate of  $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 + 3$  replicates of  $2 \times 6 + 12$  extra plots.

**Whole plot dimensions:** 3.0 x 21.0.

**Treatments:** Combinations of:-

1. **VARIETY** Varieties, sown at 8 kg in rows 17 cm apart:  
ARIANA  
BIENVENU
2. **SOW DATE** Dates of sowing:  
19 AUG 19 August, 1987  
10 SEP 10 September
3. **N RATE** Amounts of N fertilizer (kg N), as 'Nitro-Chalk', in addition to a basal application of 50 kg N as 'Nitram' to the seedbed:  
150  
250
4. **N DIVIS** Division of N fertilizer application:  
SINGLE All on 16 Feb, 1988  
DIVIDED 50 kg to N RATE 150, 75 kg to N RATE 250 on 16 Feb, remainder on 17 Mar
5. **GROWREG** Growth regulator:  
NONE None  
TRIAPEN Triapenthenol at 0.70 kg in 220 l on 8 Apr, 1988 to SOWDATE 19 AUG and on 18 Apr to SOWDATE 10 SEPT
6. **INSCTCDE** Insecticides:  
NONE None  
DE+MA+TR Deltamethrin at 0.0062 kg in 220 l on 5 Oct, 1987 and 9 Oct  
Malathion at 1.26 kg in 220 l on 8 Apr, 1988 and 18 Apr  
Triazophos at 0.42 kg in 220 l on 14 June

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7. **FUNGICIDE** Fungicide in autumn, spring and summer:

NONE None  
PR+IP Prochloraz in autumn and in spring at 0.50 kg in 220 l on 27 Nov, 1987 and 5 Apr, 1988, iprodione in summer at 0.50 kg in 220 l on 14 June

plus combinations of the following (Ariana, sown later in rows 17 cm apart and all given seedbed nitrogen, divided nitrogen, growth regulator, insecticides and fungicides):

1. **SEEDRA N** Seed rate, (kg):

8  
16

2. **N RATE N** Amounts of N fertilizer (kg N) as divided applications on 16 Feb and 17 Mar:

0+0  
25+25  
25+75  
50+100  
75+175  
125+225

plus two extra treatments (Ariana, sown later at 16 kg in rows 12 cm apart and all given seedbed nitrogen, divided nitrogen, growth regulator, insecticides and fungicides):

**N RATE P** Amounts of N fertilizer as divided applications on 16 Feb and 17 Mar (kg N):

25+25  
125+225

plus two extra treatments (all Ariana, sown later, at 8 kg in rows 17 cm apart and given 150 kg as divided nitrogen, given fungicides as above and oxamyl at 5 kg to the seedbed)

**TR IN OX** Growth regulator or insecticide given to oxamyl treated plots

TR+OX Triapenthenol in spring, no insecticide

IN+OX Insecticide in autumn and spring, no growth regulator

**NOTE:** A planned test of foliar nutrients was omitted in error.

**Basal applications:** Manures: 'Nitram' at 140 kg. Weedkillers: TCA at 16.2 kg in 200 l. Paraquat at 0.40 kg ion in 200 l (to SOWDATE 10 SEP only). Metazachlor at 0.75 kg and later at 0.50 kg in 380 l (to SOWDATE 19 AUG) and at 1.2 kg in 380 l (to SOWDATE 10 SEP). Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

**Seed:** Varieties, dressed gamma HCH, thiram and fenpropimorph.

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**Cultivations, etc.:-** Ploughed: 12 Aug, 1987. Discd: 17 Aug. TCA applied, N applied: 18 Aug. Seed sown for SOWDATE 19 AUG: 19 Aug. First metazachlor applied to SOWDATE 19 AUG: 21 Aug. Paraquat applied (to SOWDATE 10 SEP): 9 Sept. Oxamyl treatments applied, harrowed in, seed sown for SOWDATE 10 SEP: 10 Sept. Second metazachlor applied to SOWDATE 19 AUG and only application to SOWDATE 10 SEP: 2 Oct. VARIETY BIENVENU, SOWDATE 19 AUG plots desiccant with wetting agent applied: 19 July, 1988. These plots combine harvested, remaining plots desiccant with wetting agent applied: 26 July. These remaining plots combine harvested: 1 Aug. Previous crops: W. wheat 1986, w. barley 1987.

**NOTE:** Detailed observations were made during the season on diseases, pests, N in plants and soil, dry matter accumulation, leaf areas, light interception and lodging. Microflora of leaf and pods were assessed up to harvest and some seed analysed for glucosinolate content. Percentage of oil in grain was measured.

**GRAIN (AT 90% DRY MATTER) TONNES/HECTARE**

\*\*\*\*\* Tables of means \*\*\*\*\*

| SOW DATE        | 19 AUG | 10 SEP  | Mean |
|-----------------|--------|---------|------|
| <b>VARIETY</b>  |        |         |      |
| ARIANA          | 3.19   | 3.16    | 3.17 |
| BIENVENU        | 3.58   | 3.63    | 3.61 |
| Mean            | 3.38   | 3.40    | 3.39 |
| <b>N RATE</b>   |        |         |      |
|                 | 150    | 250     | Mean |
| <b>VARIETY</b>  |        |         |      |
| ARIANA          | 3.12   | 3.23    | 3.17 |
| BIENVENU        | 3.57   | 3.64    | 3.61 |
| Mean            | 3.35   | 3.43    | 3.39 |
| <b>N RATE</b>   |        |         |      |
|                 | 150    | 250     | Mean |
| <b>SOW DATE</b> |        |         |      |
| 19 AUG          | 3.26   | 3.50    | 3.38 |
| 10 SEP          | 3.43   | 3.37    | 3.40 |
| Mean            | 3.35   | 3.43    | 3.39 |
| <b>N DIVIS</b>  |        |         |      |
|                 | SINGLE | DIVIDED | Mean |
| <b>VARIETY</b>  |        |         |      |
| ARIANA          | 3.12   | 3.23    | 3.17 |
| BIENVENU        | 3.65   | 3.56    | 3.61 |
| Mean            | 3.38   | 3.40    | 3.39 |
| <b>N DIVIS</b>  |        |         |      |
|                 | SINGLE | DIVIDED | Mean |
| <b>SOW DATE</b> |        |         |      |
| 19 AUG          | 3.43   | 3.34    | 3.38 |
| 10 SEP          | 3.34   | 3.46    | 3.40 |
| Mean            | 3.38   | 3.40    | 3.39 |



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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

\*\*\*\*\* Tables of means \*\*\*\*\*

|                 |        |          |      |
|-----------------|--------|----------|------|
| <b>N DIVIS</b>  | SINGLE | DIVIDED  | Mean |
| <b>N RATE</b>   |        |          |      |
| 150             | 3.34   | 3.35     | 3.35 |
| 250             | 3.43   | 3.44     | 3.43 |
| Mean            | 3.38   | 3.40     | 3.39 |
| <b>GROWREG</b>  | NONE   | TRIAPEN  | Mean |
| <b>VARIETY</b>  |        |          |      |
| ARIANA          | 2.98   | 3.37     | 3.17 |
| BIENVENU        | 3.48   | 3.74     | 3.61 |
| Mean            | 3.23   | 3.55     | 3.39 |
| <b>GROWREG</b>  | NONE   | TRIAPEN  | Mean |
| <b>SOW DATE</b> |        |          |      |
| 19 AUG          | 3.23   | 3.53     | 3.38 |
| 10 SEP          | 3.22   | 3.58     | 3.40 |
| Mean            | 3.23   | 3.55     | 3.39 |
| <b>GROWREG</b>  | NONE   | TRIAPEN  | Mean |
| <b>N RATE</b>   |        |          |      |
| 150             | 3.23   | 3.46     | 3.35 |
| 250             | 3.22   | 3.65     | 3.43 |
| Mean            | 3.23   | 3.55     | 3.39 |
| <b>GROWREG</b>  | NONE   | TRIAPEN  | Mean |
| <b>N DIVIS</b>  |        |          |      |
| SINGLE          | 3.18   | 3.59     | 3.38 |
| DIVIDED         | 3.27   | 3.52     | 3.40 |
| Mean            | 3.23   | 3.55     | 3.39 |
| <b>INSCTCDE</b> | NONE   | DE+MA+TR | Mean |
| <b>VARIETY</b>  |        |          |      |
| ARIANA          | 3.10   | 3.25     | 3.17 |
| BIENVENU        | 3.48   | 3.73     | 3.61 |
| Mean            | 3.29   | 3.49     | 3.39 |
| <b>INSCTCDE</b> | NONE   | DE+MA+TR | Mean |
| <b>SOW DATE</b> |        |          |      |
| 19 AUG          | 3.21   | 3.55     | 3.38 |
| 10 SEP          | 3.37   | 3.43     | 3.40 |
| Mean            | 3.29   | 3.49     | 3.39 |

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

\*\*\*\*\* Tables of means \*\*\*\*\*

| INSCTCDE      | NONE | DE+MA+TR | Mean |
|---------------|------|----------|------|
| <b>N RATE</b> |      |          |      |
| 150           | 3.24 | 3.45     | 3.35 |
| 250           | 3.34 | 3.53     | 3.43 |
| Mean          | 3.29 | 3.49     | 3.39 |

| INSCTCDE       | NONE | DE+MA+TR | Mean |
|----------------|------|----------|------|
| <b>N DIVIS</b> |      |          |      |
| SINGLE         | 3.30 | 3.47     | 3.38 |
| DIVIDED        | 3.28 | 3.51     | 3.40 |
| Mean           | 3.29 | 3.49     | 3.39 |

| INSCTCDE       | NONE | DE+MA+TR | Mean |
|----------------|------|----------|------|
| <b>GROWREG</b> |      |          |      |
| NONE           | 3.21 | 3.24     | 3.23 |
| TRIAPEN        | 3.37 | 3.74     | 3.55 |
| Mean           | 3.29 | 3.49     | 3.39 |

| FUNGCIDE       | NONE | PR+IP | Mean |
|----------------|------|-------|------|
| <b>VARIETY</b> |      |       |      |
| ARIANA         | 2.84 | 3.51  | 3.17 |
| BIENVENU       | 3.20 | 4.01  | 3.61 |
| Mean           | 3.02 | 3.76  | 3.39 |

| FUNGCIDE        | NONE | PR+IP | Mean |
|-----------------|------|-------|------|
| <b>SOW DATE</b> |      |       |      |
| 19 AUG          | 3.08 | 3.68  | 3.38 |
| 10 SEP          | 2.96 | 3.83  | 3.40 |
| Mean            | 3.02 | 3.76  | 3.39 |

| FUNGCIDE      | NONE | PR+IP | Mean |
|---------------|------|-------|------|
| <b>N RATE</b> |      |       |      |
| 150           | 3.01 | 3.68  | 3.35 |
| 250           | 3.04 | 3.83  | 3.43 |
| Mean          | 3.02 | 3.76  | 3.39 |

| FUNGCIDE       | NONE | PR+IP | Mean |
|----------------|------|-------|------|
| <b>N DIVIS</b> |      |       |      |
| SINGLE         | 3.00 | 3.76  | 3.38 |
| DIVIDED        | 3.05 | 3.75  | 3.40 |
| Mean           | 3.02 | 3.76  | 3.39 |

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

\*\*\*\*\* Tables of means \*\*\*\*\*

|                   |       |         |      |
|-------------------|-------|---------|------|
| <b>FUNGCIDE</b>   | NONE  | PR+IP   | Mean |
| <b>GROWREG</b>    |       |         |      |
| NONE              | 2.84  | 3.61    | 3.23 |
| TRIAPEN           | 3.21  | 3.90    | 3.55 |
| Mean              | 3.02  | 3.76    | 3.39 |
| <b>FUNGCIDE</b>   | NONE  | PR+IP   | Mean |
| <b>INSCTCDE</b>   |       |         |      |
| NONE              | 3.00  | 3.59    | 3.29 |
| DE+MA+TR          | 3.05  | 3.93    | 3.49 |
| Mean              | 3.02  | 3.76    | 3.39 |
| <b>SEEDRA N</b>   | 8     | 16      | Mean |
| <b>N RATE N</b>   |       |         |      |
| 0+0               | 2.73  | 2.55    | 2.64 |
| 25+25             | 3.38  | 3.12    | 3.25 |
| 25+75             | 3.39  | 3.54    | 3.47 |
| 50+100            | 3.86  | 3.67    | 3.76 |
| 75+175            | 4.03  | 3.98    | 4.00 |
| 125+225           | 3.95  | 3.87    | 3.91 |
| Mean              | 3.56  | 3.45    | 3.51 |
| <b>N RATE P</b>   | 25+25 | 125+225 | Mean |
|                   | 3.18  | 4.05    | 3.62 |
| <b>TR IN OX</b>   | TR+OX | IN+OX   | Mean |
|                   | 4.79  | 3.91    | 4.35 |
| <b>GRAIN MEAN</b> | 3.47  |         |      |

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

\*\*\* Standard errors of differences of means \*\*\*

|   |          |          |          |          |
|---|----------|----------|----------|----------|
|   | VARIETY  | SOW DATE | N RATE   | N DIVIS  |
|   | 0.036    | 0.036    | 0.080    | 0.080    |
|   | GROWREG  | INSCTCDE | FUNGCIDE | VARIETY  |
|   | 0.080    | 0.080    | 0.080    | SOW DATE |
|   |          |          |          | 0.051    |
|   | VARIETY  | SOW DATE | VARIETY  | SOW DATE |
|   | N RATE   | N RATE   | N DIVIS  | N DIVIS  |
|   | 0.087    | 0.087    | 0.087    | 0.087    |
| Except when comparing means with the same level(s) of | VARIETY  |          | 0.113    |          |
|   | SOW DATE | 0.113    |          | 0.113    |
|   | N RATE   | VARIETY  | SOW DATE | N RATE   |
|   | N DIVIS  | GROWREG  | GROWREG  | GROWREG  |
|   | 0.113    | 0.087    | 0.087    | 0.113    |
| Except when comparing means with the same level(s) of | VARIETY  | 0.113    |          |          |
|   | SOW DATE |          | 0.113    |          |
|   | N RATE   |          |          | 0.087    |
|   | GROWREG  |          |          | 0.087    |
|   | N DIVIS  | VARIETY  | SOW DATE | N RATE   |
|   | GROWREG  | INSCTCDE | INSCTCDE | INSCTCDE |
|   | 0.113    | 0.087    | 0.087    | 0.113    |
| Except when comparing means with the same level(s) of | VARIETY  | 0.113    |          |          |
|   | SOW DATE |          | 0.113    |          |
|   | N DIVIS  | GROWREG  | VARIETY  | SOW DATE |
|   | INSCTCDE | INSCTCDE | FUNGCIDE | FUNGCIDE |
|   | 0.113    | 0.113    | 0.087    | 0.087    |
| Except when comparing means with the same level(s) of | VARIETY  |          | 0.113    |          |
|   | SOW DATE |          |          | 0.113    |
|   | N RATE   | N DIVIS  | GROWREG  | INSCTCDE |
|   | FUNGCIDE | FUNGCIDE | FUNGCIDE | FUNGCIDE |
|   | 0.113    | 0.113    | 0.113    | 0.113    |
| Except when comparing means with the same level(s) of | N RATE   |          |          |          |
|   | GROWREG  |          | 0.087    |          |
|   | FUNGCIDE |          | 0.087    |          |

\*\*\*\*\* Stratum standard errors and coefficients of variation \*\*\*\*\*

| Stratum        | d.f. | s.e.                | cv%     |
|----------------|------|---------------------|---------|
| BLOCK.WP       | 6    | 0.072               | 2.1     |
| BLOCK.WP.SP    | 26   | 0.318               | 9.4     |
| GRAND MEAN DM% | 78.4 | PLOT AREA HARVESTED | 0.00299 |