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

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89/R/RA/1

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 - Osier.

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

Associate sponsors: P.B. Barraclough, J. Lacey, S.P. McGrath.

Design: A single replicate of 2 x 2 x 2 x 2 x 2 x 2 + 3 replicates of 2 x 6 + 20 extra plots.

Whole plot dimensions: 3.0 x 21.0.

Treatments: All combinations of:-

1. **SEEDRATE** Seed rates (sown on rows 17 cm apart):

 4 KG
 8 KG

2. **SOW DATE** Dates of sowing:

 17 AUG 17 August, 1988
 7 SEP 7 September

3. **N RATE** Amounts of N fertilizer (kg N), as 'Nitro-Chalk',
 applied on 16 Feb, 1989, and 28 Mar in addition
 to a basal application of 50 kg N as 'Nitram' to
 the seedbed:

 25+25
 50+100

4. **FUNGCIDE** Fungicides:

 NONE None
 SPRAYED Prochloraz at 0.50 kg in 220 l on 8 Nov, 1988, to
 SOW DATE 17 AUG plots only on 21 Mar, 1989 and to
 SOWDATE 7 SEP plots only on 12 Apr. Iprodione at
 0.50 kg in 220 l on 2 June

5. **GROWREG** Growth regulator:

 NONE None
 TRIAPEN Triapenthenol at 0.70 kg in 220 l on 21 Mar, 1989 to
 SOW DATE 17 AUG and on 12 Apr to SOW DATE 7 SEP

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6. **INSCTCDE** Insecticides:

NONE None

DE+MA+TR Deltamethrin at 62 g in 220 1 on 4 Oct, 1988 and
 11 Nov

 Malathion at 1.3 kg in 220 1 on 12 Apr, 1989

 Triazophos at 0.42 kg in 220 1 on 5 June

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

1. **SEEDRA N** Seed rate:

8 KG

16 KG

2. **N RATE N** Amounts of N fertilizer (kg N) as divided
 applications on 16 Feb and 28 Mar:

0+0

25+25

25+75

50+100

50+150

75+175

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

N RATE P Amounts of N fertilizer as divided applications on
 16 Feb and 28 Mar (kg N):

0+0

75+175

plus two replicates of three extra treatments (sown later, at 8 kg in rows 17 cm apart and given 50+100 kg N, growth regulator, insecticides and fungicides and oxamyl at 5 kg to the seedbed)

SULPHUR Rates of sulphur (kg S) as calcium sulphate, applied
 on 28 Mar, 1989:

0

25

50

plus two replicates of two extra treatments, sown at 8 kg in rows 17 cm apart and given 50+100 kg N and insecticides:

FUNG ALT Alternative fungicides 'HWG 1608' applied on three
 occasions:

H 17 AUG Sown on 17 August, 1988, fungicide on 8 Nov, 21 Mar,
 1989 and 2 June

H 7 SEP Sown on 7 September, 1988, fungicide on 8 Nov, 13 Apr,
 1989 and 2 June

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plus four extra plots, sown at 8 kg in rows 17 cm apart, given no nitrogen:

EXTRA NO	Sowing dates and agrochemicals:
17AUG TIF	Sown on 17 August, 1988 given growth regulator, insecticides and fungicides (triplicated)
7SEP O	Sown on 7 September, none

- NOTES:** (1) The alternative fungicide 'HWG 1608' (proposed common name terbuconazole) was applied at 250 g active ingredient in 220 l on the first occasion and 375 g a.i. in 220 l for the remainder.
- (2) Because of errors in spray application two plots were incorrectly treated. These were the combination of **SEEDRA N 8** with **N RATE N 25+25** and one of the plots of **EXTRA NO, 17AUG TIF**. These plots were not used in the analysis.

Basal applications: Manures: 'Nitram' at 140 kg. Weedkillers: TCA at 10 kg in 200 l. Metazachlor at 1.2 kg with fluazifop-p-butyl at 0.19 kg and a wetting agent ('Enhance' at 0.26 l) in 260 l. Desiccant: Diquat at 0.60 kg ion with a wetting agent ('Enhance' at 0.50 l) in 520 l.

Seed: Ariana, dressed gamma HCH, thiram and fenpropimorph.

Cultivations, etc.:- Heavy spring-tine cultivated, rotary cultivated: 9 Aug, 1988. Basal N applied, TCA applied: 16 Aug. Remaining weedkillers applied: 30 Sept. Desiccant with wetting agent applied: 12 July, 1989. Combine harvested **SOW DATE 17 AUG:** 18 July and **SOW DATE 7 SEP:** 20 July. Previous crops: W. wheat 1987, w. barley 1988.

NOTE: Observations were made during the season on diseases, pests, N in plants and soil, dry matter accumulation, leaf areas, light interception and lodging. Glucosinolate and oil contents of grain were measured.

GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SEEDRATE	4 KG	8 KG	Mean
SOW DATE			
17 AUG	3.41	3.41	3.41
7 SEP	3.19	3.28	3.23
Mean	3.30	3.34	3.32
N RATE	25+25	50+100	Mean
SOW DATE			
17 AUG	3.55	3.27	3.41
7 SEP	3.28	3.18	3.23
Mean	3.42	3.23	3.32

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

N RATE	25+25	50+100	Mean
SEEDRATE			
4 KG	3.38	3.22	3.30
8 KG	3.45	3.23	3.34
Mean	3.42	3.23	3.32
GROWREG	NONE	TRIAPEN	Mean
SOW DATE			
17 AUG	3.26	3.56	3.41
7 SEP	3.23	3.24	3.23
Mean	3.24	3.40	3.32
GROWREG	NONE	TRIAPEN	Mean
SEEDRATE			
4 KG	3.21	3.39	3.30
8 KG	3.28	3.41	3.34
Mean	3.24	3.40	3.32
GROWREG	NONE	TRIAPEN	Mean
N RATE			
25+25	3.33	3.50	3.42
50+100	3.16	3.30	3.23
Mean	3.24	3.40	3.32
INSCTCDE	NONE	DE+MA+TR	Mean
SOW DATE			
17 AUG	3.31	3.50	3.41
7 SEP	3.08	3.39	3.23
Mean	3.20	3.45	3.32
INSCTCDE	NONE	DE+MA+TR	Mean
SEEDRATE			
4 KG	3.21	3.39	3.30
8 KG	3.18	3.50	3.34
Mean	3.20	3.45	3.32
INSCTCDE	NONE	DE+MA+TR	Mean
N RATE			
25+25	3.28	3.55	3.42
50+100	3.11	3.34	3.23
Mean	3.20	3.45	3.32

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

INSCTCDE	NONE	DE+MA+TR	Mean
GROWREG			
NONE	3.21	3.28	3.24
TRIAPEN	3.18	3.61	3.40
Mean	3.20	3.45	3.32
FUNGCIDE	NONE	SPRAYED	Mean
SOW DATE			
17 AUG	3.26	3.56	3.41
7 SEP	3.22	3.25	3.23
Mean	3.24	3.40	3.32
FUNGCIDE	NONE	SPRAYED	Mean
SEEDRATE			
4 KG	3.23	3.37	3.30
8 KG	3.25	3.44	3.34
Mean	3.24	3.40	3.32
FUNGCIDE	NONE	SPRAYED	Mean
N RATE			
25+25	3.31	3.52	3.42
50+100	3.17	3.29	3.23
Mean	3.24	3.40	3.32
FUNGCIDE	NONE	SPRAYED	Mean
GROWREG			
NONE	3.17	3.32	3.24
TRIAPEN	3.31	3.49	3.40
Mean	3.24	3.40	3.32
FUNGCIDE	NONE	SPRAYED	Mean
INSCTCDE			
NONE	3.20	3.19	3.20
DE+MA+TR	3.28	3.61	3.45
Mean	3.24	3.40	3.32
SOW DATE	N RATE	25+25	50+100
	SEEDRATE		
17 AUG	4 KG	3.59	3.22
	8 KG	3.50	3.32
7 SEP	4 KG	3.17	3.22
	8 KG	3.40	3.15

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SOW DATE	GROWREG SEEDRATE	NONE	TRIAPEN
17 AUG	4 KG	3.23	3.58
	8 KG	3.29	3.53
7 SEP	4 KG	3.18	3.20
	8 KG	3.27	3.28

SOW DATE	GROWREG N RATE	NONE	TRIAPEN
17 AUG	50	3.46	3.63
	150	3.06	3.48
7 SEP	50	3.20	3.36
	150	3.25	3.12

SEEDRATE	GROWREG N RATE	NONE	TRIAPEN
4 KG	50	3.24	3.52
	150	3.18	3.27
8 KG	50	3.42	3.48
	150	3.14	3.33

SOW DATE	INSCTCDE SEEDRATE	NONE	DE+MA+TR
17 AUG	4 KG	3.35	3.47
	8 KG	3.28	3.54
7 SEP	4 KG	3.08	3.31
	8 KG	3.08	3.47

SOW DATE	INSCTCDE N RATE	NONE	DE+MA+TR
17 AUG	25+25	3.39	3.71
	50+100	3.24	3.30
7 SEP	25+25	3.18	3.39
	50+100	2.98	3.39

SEEDRATE	INSCTCDE N RATE	NONE	DE+MA+TR
4 KG	50	3.30	3.46
	150	3.12	3.32
8 KG	50	3.27	3.64
	150	3.10	3.37

SOW DATE	INSCTCDE GROWREG	NONE	DE+MA+TR
17 AUG	NONE	3.31	3.21
	TRIAPEN	3.32	3.80
7 SEP	NONE	3.11	3.34
	TRIAPEN	3.05	3.43

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

SEEDRATE	INSCTCDE	NONE	DE+MA+TR
4 KG	GROWREG		
	NONE	3.25	3.17
8 KG	TRIAPEN	3.18	3.61
	NONE	3.17	3.39
	TRIAPEN	3.19	3.62

N RATE	INSCTCDE	NONE	DE+MA+TR
50	GROWREG		
	NONE	3.29	3.37
150	TRIAPEN	3.28	3.72
	NONE	3.13	3.18
	TRIAPEN	3.09	3.50

SOW DATE	FUNGCIDE	NONE	SPRAYED
17 AUG	SEEDRATE		
	4 KG	3.21	3.61
7 SEP	8 KG	3.31	3.51
	4 KG	3.26	3.13
	8 KG	3.18	3.37

SOW DATE	FUNGCIDE	NONE	SPRAYED
17 AUG	N RATE		
	25+25	3.37	3.73
7 SEP	50+100	3.15	3.39
	25+25	3.25	3.31
	50+100	3.18	3.18

SEEDRATE	FUNGCIDE	NONE	SPRAYED
4 KG	N RATE		
	25+25	3.35	3.41
8 KG	50+100	3.12	3.32
	25+25	3.27	3.63
	50+100	3.22	3.25

SOW DATE	FUNGCIDE	NONE	SPRAYED
17 AUG	GROWREG		
	NONE	3.09	3.44
7 SEP	TRIAPEN	3.43	3.68
	NONE	3.25	3.21
	TRIAPEN	3.19	3.29

SEEDRATE	FUNGCIDE	NONE	SPRAYED
4 KG	GROWREG		
	NONE	3.20	3.21
8 KG	TRIAPEN	3.26	3.52
	NONE	3.13	3.43
	TRIAPEN	3.36	3.46

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

	FUNGCIDE	NONE	SPRAYED	
N RATE	GROWREG			
25+25	NONE	3.26	3.41	
	TRIAPEN	3.36	3.63	
50+100	NONE	3.08	3.23	
	TRIAPEN	3.26	3.34	
SOW DATE	FUNGCIDE	NONE	SPRAYED	
	INSCTCDE			
17 AUG	NONE	3.22	3.41	
	DE+MA+TR	3.30	3.71	
7 SEP	NONE	3.18	2.98	
	DE+MA+TR	3.26	3.52	
SEEDRATE	FUNGCIDE	NONE	SPRAYED	
	INSCTCDE			
4 KG	NONE	3.25	3.18	
	DE+MA+TR	3.22	3.56	
8 KG	NONE	3.15	3.21	
	DE+MA+TR	3.34	3.67	
N RATE	FUNGCIDE	NONE	SPRAYED	
	INSCTCDE			
25+25	NONE	3.24	3.33	
	DE+MA+TR	3.38	3.71	
50+100	NONE	3.16	3.06	
	DE+MA+TR	3.17	3.52	
GROWREG	FUNGCIDE	NONE	SPRAYED	
	INSCTCDE			
NONE	NONE	3.18	3.24	
	DE+MA+TR	3.16	3.40	
TRIAPEN	NONE	3.22	3.15	
	DE+MA+TR	3.40	3.83	
SEEDRA N	8 KG	16 KG	Mean	
N RATE N				
0+0	3.40	3.04	3.22	
25+25	3.24	3.21	3.23	
25+75	3.62	3.30	3.46	
50+100	3.10	3.17	3.14	
50+150	3.08	3.16	3.12	
75+175	3.18	3.20	3.19	
Mean	3.27	3.18	3.23	
N RATE P	0+0	75+175	Mean	
	3.22	3.14	3.18	
SULPHUR	0	25	50	Mean
	3.39	3.57	3.41	3.46
FUNG ALT	H 17 AUG	H 7 SEP	Mean	
	3.84	3.67	3.76	

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GRAIN (AT 90% DRY MATTER) TONNES/HECTARE

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

EXTRA NO	17AUG TIF	7SEP O	Mean
	4.22	3.44	3.96

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

(not including extra plots)

Margin of two factor tables 0.088

Two factor tables 0.124

Three factor tables 0.176

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

Stratum	d.f.	s.e.	cv%
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BLOCK.WP	19	0.351	10.6
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GRAIN MEAN DM% 85.4

PLOT AREA HARVESTED 0.00299