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80/W/PH/1 *Phaseolus Rhizobium* Inoculation Study

Rothamsted Research

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80/W/PH/1

PHASEOLUS

RHIZOBIUM INOCULATION STUDY

Object: To study the effects of *Rhizobium phaseoli* inoculation and nitrogen fertiliser on the yields and nitrogen uptakes of two varieties of *Phaseolus vulgaris* - Gt. Hill III.

Sponsor: J.M. Day.

Design: 4 randomised blocks of 4 plots split into 5 plus 2 extra plots.

Whole plot dimensions: 1.83 x 22.9.

Treatments: All combinations of:-

Whole plots

- | | |
|-------------|---|
| 1. VARIETY | Varieties: |
| SEAFARER | Seafarer, harvested as grain |
| CASCADE | Cascade, harvested as green pods |
| 2. INOCULUM | Inoculum: |
| NONE | None |
| RHIZOB | <i>Rhizobium phaseoli</i> - a mixture of strains, R3644, R3622 and 963A |

Sub plots

- | | |
|--------|--|
| 3. N | Nitrogen fertiliser (kg N) as 'Nitro-Chalk': |
| 0 | None |
| 30 | 30 to seedbed |
| 60 | 60 to seedbed |
| 120 | 120 to seedbed |
| 120+60 | 120 to seedbed plus 60 at flowering |

plus two extra plots:

EXTRA

- | | |
|----------|--|
| SEAF ISN | Seafarer, inoculated <i>R. phaseoli</i> and given slow release N |
| CASC ISN | Cascade, inoculated <i>R. phaseoli</i> and given slow release N |

- NOTES (1) The slow release N was a mixture of glucose and ammonium sulphate labelled with ¹⁵N in the ratio 10:1 and applied at 1 kg N.
- (2) In each block there was one plot divided into sub plots for crops (maize, fenugreek and soya bean) and nitrogen fertiliser applied at the same rates given to *Phaseolus*, to assess N uptake by non-nodulating crops during the season. Yields from these crops are not presented.
- (3) One of the blocks was abandoned because of many grass weeds.
- (4) Yields were not recorded for VARIETY CASCADE and EXTRA SEAF ISN.

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Basal applications:- Manures: Magnesian limestone at 7.5 t. (0:14:28) at 340 kg. Weedkillers: Carbetamide (as 'Carbetamex' at 3.1 kg) in 280 l. Bentazone (as 'Basagran' at 2.9 l) with spray additive (as 'Actipron' at 2.0 l) in 280 l.

Seed: Sown at 250,000 seeds per hectare.

Cultivations, etc.:-

Magnesian limestone applied: 29 Sept, 1979. Ploughed: 20 Oct. Spring-tine cultivated, field beans sown: 23-24 Oct. 'Carbetamex' applied: 2 Nov. Field beans failed, ploughed in: 12 Feb, 1980. Heavy spring-tine cultivated, PK applied, rotary cultivated: 11 Apr. Slow release nitrogen treatment applied: 29 Apr. Spring-tine cultivated, seed sown: 19 May. 'Nitro-Chalk' applied: 23 May and 18 July. 'Basagran' with 'Actipron' applied to Phaseolus only: 3 July. Harvested by hand: 17 Sept. Previous crops: Potatoes 1978, w. wheat 1979.

NOTES: Plant samples were taken at weekly intervals for measurements of dry weight, nitrogen uptake and nitrogenase content.

GRAIN TONNES/HECTARE

***** TABLES OF MEANS *****

	N	0	30	60	120	120+60	MEAN
INOCULUM							
NONE		0.72	0.99	1.13	1.59	1.69	1.22
RHIZOB		1.48	1.65	1.96	1.91	1.90	1.78
MEAN		1.10	1.32	1.54	1.75	1.80	1.50

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	N	INOCULUM*
		N
SED	0.106	0.150

* WITHIN THE SAME LEVEL OF INOCULUM ONLY

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
BLOCK.WP.SP	16	0.184	12.3
PLOT AREA HARVESTED	0.00167		