1978

Predictive test for take-all; Effect of nitrogen fertalizers on wheat rhizosphere micro-organisms.

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EXPERIMENTAL SUMMARY, 1978

A. Predictive test for take-all.

B. Effect of nitrogen fertilizers on wheat rhizophere micro-organisms.

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(Preliminary reports of experiments conducted with Dr. G.C. Mac Nish, mainly in his experimental plots, in co-operation with other officers of the Department of Agriculture.)

CONTENTS

1. Sampling techniques : Variation within paddock

Location : B. Eyres, Kulin

Aim : To study the variation in MPN of TAF and disease potential of soil within a paddock. This investigation should also indicate whether it is possible to bulk soil from a paddock for assessment without any significant loss of accuracy.

Treatments and methods

The paddock had a take-all affected wheat crop in 1976. Nine samples were collected at 100 m intervals along a transect across the paddock. In addition 3 sub-samples were taken from a bulk sample consisting of a mixture of the 9 soils.

Results

Treatment	MPN/250 g soil		S.I.	C.I.
	Total	Effective		
Transect mean of samples 1 to 9	9.05	1.94	9.90	10.27
Means of 3 sub-samples from bulk	6.08	1.68	8.44	11.87

Based on log transformation of the 9 sample transect data, and of the bulked samples it appears that 3 sub-samples from the bulk sample will adequately estimate the mean of the transect MPN.

Comment

In this situation it is possible to bulk the soil from the paddock for the assessment without losing much accuracy.

3. Storage of Sampled Soil

Location : Newdegate Research Station - 76LG25

Aim : To study the effect of storage of soil on the MPN of TAF and the disease potential of soil.

Treatments and methods

Soil sampled from the buffer plot of 76LG25 which had a wheat crop in 1977 was sampled in April 1978, mixed, air dried and stored in bags. The soil was assayed 3, 13 and 43 days after sampling.

Results

(Means of 3 reps)

Treatment	MPN/250 g soil		S.I.	C.I.
	Total	Effective		
Day 3	4.72	0.98	4.43	23.44
Day 13	2.90	0.70	4.35	24.09
Day 43	6.34	0.42	9.17	11.37
L.S.D.	N.S.	N.S.	**	N.S.

Comments

Storage had no significant effect on the MPN of the pathogen or the C.I. but the suppressiveness appears to have increased with storage. This experiment will be repeated.

5a. Cleaning Crop

Location : Newdegate Research Station

Aim : To study the effect of oats on the MPN of TAF and disease potential of soil.

Treatments and methods

Soil from 76LG25 buffer plot sown to wheat and soil from a plot next to it (77LG20) sown to oats (in 1977) were used for this study. Three replicate samples were taken from each of the treatments.

Results

(Means of 3 reps)

	MPN/250 g soil		S.I.	C.I.
	Total	Effective		
After wheat	917.33	55.73	7.80	12.80
After oats	67.73	6.08	20.74	5.81
L.S.D.	**	N.S.	N.S.	**

Comments

These results confirm a similar study made in 1977 with soils from Yealering. It is noteworthy that although the oat crop caused a reduction of propagule numbers it did not eliminate the pathogen from the soil.

Oat also significantly reduced the conduciveness of the soil. Large variability in the data is the cause for the lack of significance for the high suppressiveness of the oat soil.

6a. Grass Control

Location : C. Parson, Fitzgerald - 77JE4

Aim : To study the effect of grass control and spray fallow on propagule numbers of TAF and the disease potential of the soil.

Treatments and methods

Samplings of soil from 1977 pasture (treatment 1) and "Surflan" (treatment 4) treated plots were made in May 1978. Six replicate plots for each treatment were sampled for this study.

Results

(Means of 6 samples)

Treatment	MPN/250 g of soil		S.I.	C.I.
	Total	Effective		
After pasture	99.46	10.00	10.77	9.37
After Surflan	40.13	2.52	10.02	10.86
L.S.D.	*	*	N.S.	N.S.

Comments

The grass control by Surflan evidently reduced the propagule numbers although it did not affect the disease potential of the soil.

7. Effect of nitrogen sources on wheat rhizosphere micro-organisms, with special reference to antagonists to take-all fungus

Location : Newdegate Research Station - 76LG25

Aim : To study the effect of nitrogen sources on wheat rhizosphere micro-organisms, with special reference to antagonists to the take-all fungus.

Treatment and methods

Plants were sampled from (1) Nil, (2) $(NH_4)_2 SO_4$ and (5) $Na NO_3$ treatments of 76LG25 (see Expt. 4 for treatment details) on September 21, 1978 and October 24, 1978 (anthesis). There were 4 replicate plots for each treatment. Microbiological assessment of the rhizosphere and "residue" (i.e. root-surface and cortical colonizers) of seminal roots were made for the following:-

1. The total bacterial, actinomycete, fungal and fluorescent Pseudomonad numbers.
2. Numbers of general bacterial antagonists to TAF.
3. Number of fluorescent Pseudomonad antagonists to TAF.
4. Number of non-fluorescent Pseudomonad antagonists to TAF.

Results

Excepting the results presented below, all treatment differences encountered in the rest of the analyses were not significant.

Table 1: FUNGI (INCLUDING YEASTS) IN RHIZOSPHERE PER mg OF DRY ROOT x 10^3

	Sept 21	Oct 24
1. Nil	4.8 A	0.420 A
2. $(NH_4)_2 SO_4$ D	4.9 AB	0.803 B
5. $NaNO_3$ TD	7.9 B	0.735 B
L.S.D.	*	*

Table 5 : ANTAGONISTIC BACTERIA IN RESIDUE %

	Sept 21	Oct 24
1. Nil	3.0 AB	2.9
2. $(NH_4)_2$ SO_4	0 A	0
5. $NaNO_3$	7.0 B	0.9
L.S.D.	*	N.S.

Although the treatment differences were not significant Table 6 is presented for comparison with Smiley's (1978) results.

Table 6a : ANTAGONISTIC FLUORESCENT PSEUDOMONADS IN RHIZOSPHERE %

	Sept 21	Oct 24
1. Nil	14.2	27.9
2. $(NH_4)_2$ SO_4	20.7	1.5
5. $NaNO_3$	19.9	4.4
L.S.D.	N.S.	N.S.

Table 6b : ANTAGONISTIC FLUORESCENT PSEUDOMONADS IN RESIDUE %

Sept 21	Oct 24
32.3	29.5
25.3	7.7
23.9	11.9
N.S.	N.S.

Comments

We failed to repeat the effect Smiley (1978) showed with ammonium sulphate in fluorescent Pseudomonads. Smiley however use fewer isolates and no statistical treatment of his data from his pot trials.

Nitrogen appears to promote the growth of fungi in the rhizosphere. In the residue, ammonium sulphate appears to stimulate the activity of actinomycetes. Ammonium sulphate however reduced the numbers of Pseudomonads in rhizosphere and residue and those of antagonistic bacteria in the residue.

BACTERIA AND ACTINOMYCETES IN RHIZOSPHERE
PER g OF RHIZOSPHERE SOIL x 10^8

	Aug 1	Sept 5	Oct 10
1. Nil	2.419 B	7.3	-
6. Fe SO_4	2.615 B	4.9	-
7. $(NH_4)_2$ SO_4	1.494 A	4.7	-
9. Na NO_3	3.485 C	5.9	-
L.S.D.	*	N.S.	-

ANTAGONISTIC PSEUDOMONADS IN RESIDUE
PER mg OF DRY ROOT x 10^3

	Aug 1	Sept 5	Oct 10
1. Nil	-	3.06 AB	1.6
6. Fe SO_4	-	3.03 AB	0.5
7. $(NH_4)_2$ SO_4	-	11.65 B	1.6
9 Na NO_3	-	1.24 A	1.9
L.S.D.	-	*	N.S.

Comments

It is possible that lowering of pH by iron sulphate and ammonium sulphate and the raising of it by sodium nitrate produced the increase of fungal activity in the acidic situation, while raising of pH resulted in the increase in bacterial activity.

Ammonium sulphate's effect on antagonists to TAF could be important although the effect was significant only at one sampling time. In general the results of this experiment like that on 76LG25 are disappointing.