1987

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In 1987, ten field trials were conducted on soils selected to represent a range in productivity and a range in the level of soil acidity. At each trial site, species and cultivars varying in their tolerance to aluminium (hence to soil acidity) were grown. During the growing season, four measurements were estimated,

(i) Plant densities - approximately 5 weeks after seeding
(ii) Early vegetative yield - approximately 8 to 10 weeks after seeding
(iii) Anthesis vegetative yield - approximately 3 months after seeding
(iv) Grain yield at maturity

Yields obtained at each time of sampling were expressed as a percentage of triticale yield to give a 'relative productivity' measurement.

The relationship between the relative productivities of the different genotypes and soil characteristics (such as pH and Al in each of the seven depths sampled) were examined, initially to determine whether there is a close relationship between soil properties and crop growth and secondly if there is a strong relationship, what critical levels are the best indicator of relative productivity.

Soil Solution Extraction

Soil samples were collected from seven depths from the ten trial sites in 1987. Six profiles were sampled and the soil from each of the seven depths were bulked and then frozen until analysis.

The field capacity of the soils studied was estimated to be 12%.In order to extract the soil solution for chemical analysis, a subsample of soil was removed from the freezer, wet up to 12% and left at room temperature for 16 hours. At this stage soil was placed in centrifuge tubes, and spun at 2000 rpm for 20 minutes. The resulting extractant was then filtered through a 0.45uM millipore filter and then analysed for pH and cations such as Al, Ca, Mg, and Na.

General Observations

(i) Plant densities

In each of the 10 trial sites, the variety IW/610 failed to establish as well as the other varieties of wheat grown. Consequently the density of this variety was significantly ($p<0.05$) down at all sites. The exact reason for this is not known as germination percentages obtained in the seed testing laboratory suggested there was no difference in the number of viable seedlings expected in any of the varieties grown. (Table 1).

Table 1 Germination percentage, Abnormal seedlings and Dead seed in Wheat varieties grown in 1987 trials

Variety	Normal	Abnormal	Dead
Millewa	94	5	1
Aroona	86	5	9
Gutha	88	9	3
Bodallin	80	8	12
IW/610	89	5	6

(ii) Early Vegetative Yield

Due to the wide geographical location of the 10 trial sites, time of seeding varied considerably (25/5/87 to 15/6/87). This fact and the prevailing weather conditions at the different sites resulted in extremely variable biomass production from site to site. Because of this variation, the productivity as a result of soil chemistry at each site could not be accurately assessed. Consequently there appeared to be little or no relationship between the relative productivities of the varieties grown and the soil chemical measurements made.

(iii) Anthesis Vegetative Yield

By anthesis, the differences between genotypes observed in biomass production were very pronounced and hopefully due mostly to the soil conditions at each site.

Consequently relationships between soil measurements and relative productivities were much better than those noted with the initial yield estimation.

Although no definite 'critical' value could be derived from this year's data, results obtained are very encouraging and indicate additional work may be profitable in determining an accurate soil test.

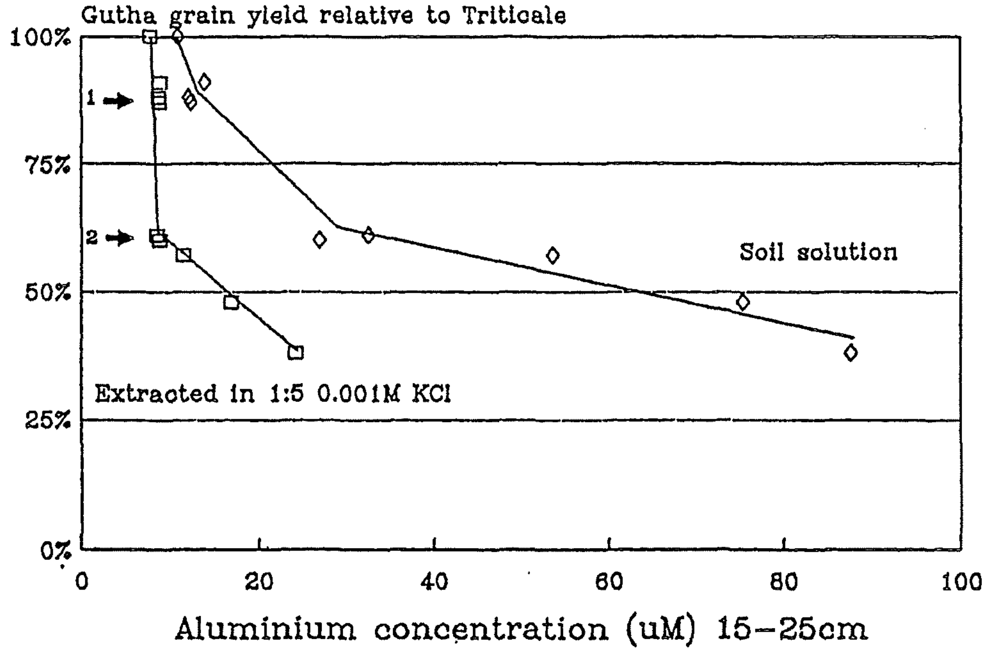
(iv) Grain yield

The relative grain yield of several wheat varieties is well related to some soil measurements.

The best observed relationship was between the relative yield of Gutha (compared to Tyalla triticale) versus the concentration of aluminium in the soil solution extracted from the 15 to 25 cm layer. (Figure 1).

From Fig. 1 it can be noted that the soil solution Al is a far better indicator of yield depression than Al extracted in 1:5 0.001M KCl. Soil solution extraction is an extremely time consuming tedious task and therefore further work is required in order to develop a quick extraction technique that is better related to soil solution aluminium.

Figure 1. Two measures of subsoil aluminium as indicators of the severity of subsoil acidity (gauged by comparing the yield of acid sensitive Gutha wheat to the tolerant Tyalla triticale).



Soil Solution Al vs 0.001M KCl Extractable Al

Measuring aluminium in surface soil samples can result in a number of problems, due mainly to the presence of organic matter which readily complexes with the aluminium present in the soil. Methods used are unable to distinguish between these Al complexes and as a consequence Al values are often extremely elevated and totally inaccurate.

The relationship between soil solution Al and 0.001M KCl extractable Al throughout the whole soil profile is rather poor. If however, the top 15 cm (0 - 5, 5 - 10, and 10 - 15 cm samples, where essentially all the organic matter is in these soil profiles) is excluded an extremely good relationship is observed (Figure 2). The equation of the plotted line is:

$$Al_{ss} = -26.878 + 5.010\ Al_{KCl} \ \ldots\ldots\ (r^2 = 0.934)$$

General Comments

87ME77 - One of the better sites in terms of prooductivity. This site was sown at two times, initially 4 reps were sown but as it was very dry the remaining 8 reps were sown after additional rain. This split seeding did not seem to adversely affect the trial

87ME78 - A poor site, towards the middle of the range of the ten sites sown. The very high basal N and P fertilizer applied