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Soil and Plant Water Studies on Wheat Summary of Results 1969/70

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D. Tennant.

SOIL AND PLANT WATER STUDIES ON WHEAT

SUMMARY OF RESULTS 1969/70

A. LOCATION

Trials were carried out within a radius of 5 miles of Tammin on the properties of Messrs P. York and B. Nottage. Sites represented deep sand, sandy loam, sand/clay and grey clay soil types.

B. EXPERIMENTAL

(a) Effect of soil type on root distribution and moisture use.

Moisture profiles were obtained throughout the year on each of these sites. Standard fertilizer applications gave average crops for the area. Data was obtained at weekly or fortnightly intervals.

Root samples were obtained at 2 inch intervals down the profile at each time of sampling. Root lengths and weights were determined for these.

Comments on results

1. Moisture penetrated to around 3 to 4 feet in the sand and sandy loam and 24 and 10 inches in the sand/clay and grey clay respectively.

2. Root penetration to depth was greatest in the deep loam (60 inches) than in the deep sand (50 inches), sand/clay (24 inches) and grey clay (10 inches).

3. Lack of moisture caused the crop to fail on the grey clay. Failure occurred mid to late August. The sand/clay crop was patchy. Observations made on adjacent areas suggest crop failure to be associated with proximity of clay to the soil surface. Moisture penetration as governing root penetration is affected here. Both the sandy loam and sand sites grew to maturity.

4. Two stages of root proliferation and extension were observed.

(i) Rapid root extension and proliferation on a per plant basis commenced between 4 and 6 weeks after seeding (16th June). Root distribution was however restricted to the surface foot of soil. As an example, root length/plant on the sand site increased slowly to 50 cms by the 3rd of July, more rapidly to 400 cms by the 22nd July and then very rapidly to 2000 cms by the 8th August.

(ii) Rapid root penetration to depth commenced in mid August. Maximum depths of penetration being achieved by mid to late September. For the sand therefore, roots penetrated from 12 to 18 inches to 48 inches over a period of 4 to 5 weeks.

5. Wilting was observed for all sites by mid August. At later stages, rapid root penetration into moist soil apparently contended with the dry conditions of the sand and sandy loam sites. Recovery with the sand/clay was incomplete and as previously implied variable with location. There was no recovery with the grey clay.

6. The following points arise when comparing the sand and loam sites:

(i) Root lengths/unit volume of soil in the surface foot of soil were greater with the sand than loam.

(ii) Depth of root penetration was more consistent with the loam than sand.

(iii) In both soils, depths of maximum moisture extraction at each time of sampling after mid-August were associated with greater root length/unit volume of soil. Apparent decreases in root length at intermediate levels were evident for the loam in particular.

(b) P32 tracer technique for evaluating depth of root penetration

From the experience of the previous season's work, the techniques of P32 injection was modified to 36 injections spaced 2 inches apart at 1, 2, 3, 4 and 5 foot depths from the soil surface.

Data derived re root penetration was similar to that obtained from core samples. The injection technique was found to be better suited to situations where root penetration was not associated with extensive root proliferation. This 'replication' requirement showed up in the sand site where root proliferation at the 4-5 foot depths was only slight.

The P32 data has proved useful in indicating location of root activity throughout the season. Data has been collected which suggests specific times at which P32 uptake from each depth of injection ceases with subsequent retranslocation within the plant. Further investigations relating root activity with moisture availability are envisaged.

All P32 work is carried out in collaboration with Mr A.E. Oakley, P.R.D.

(c) Effect of amount and time of irrigation on plant performance.

Irrigations amounting to ½, 1, 2 and 4 inches of water were applied at 6 times in the season at two weekly intervals from July 30th. Controls with no additional water and ½ to 1½ inches of water at each time of irrigation were included.

Samples obtained from the sand and loam sites are now being processed. Responses were not evident in the field. High evaporative demand during application would have played a part. Data relating to tillers/plant, heads/tiller, head weight, grain/head, 1000 grain weight and yield/acre will become available.