1970

Soil and plant water studies on wheat - Summary 1970 Results

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SUMMARY 1970 RESULTS

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SOIL AND PLANT WATER STUDIES ON WHEAT.

A. Early Root Growth in Wheat.

Earlier work by May et. al.(1965, 1967) emphasised the importance of early conditions of development to later root growth and plant performance. As suggested by these authors, it was initially required that patterns of root growth be established as a pre-requisite to analysing response data.

Trial 1:

Effect of time of sowing on early root growth.

Root growth was studies over a period of six weeks from seeding for wheat cv: Gamenya following five times of sowing. Sowings were done at two or three weekly intervals commencing May 14th, 1970. The trial was located at the Medina Research Station on a Medina sand soil type.

Data collected at two, three or four day intervals related to numbers and lengths of the primary, secondary and tertiary components of the seminal and nodal root systems.

Results:

(1) Surprisingly, daily soil temperatures taken at 2", 6" and 10" depths from the surface tended to similarity following each sowing.

(2) Patterns of root component initiation were almost identical following each time of sowing. There was at the most only a three to four day relative delay in initiation of nodal primary roots with all sowings later than the first. The appearance of secondary and tertiary seminals followed by primary and secondary nodals occurred around 10, 22, 26 and 36 days after sowing respectively.

(3) The phasic increases in root number and length associated with progressive root component initiation was quite distinct and possibly more defined for length than those described by May et. al. (1965, 1967) for barley cv. piroline.

(4) Numbers and lengths of secondary and tertiary seminals which were greatest with the first sowing tended to decrease to the third sowing. The later sowings showed some recovery.

(5) Notwithstanding some loss of root material at later times of sampling, consistent patterns of root development were demonstrated using field grown material.

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Trial 2:

Effect of levels of N, P and K application on early root growth.

Minus, half, standard and twofold N, P and K solutions were used in an attempt to demonstrate nutrient effects. The solutions gave concentration effects of N, P and K with only slight variation in sulphate ions. The standard solution in ppm. comprised 224 N; 31P; 156 K; 48 Mg; 80 ca; and 16 OS.

Single plants of Gamenya were grown in 2½" X 2" X 10" polypots filled with quartz sand. Day/night temperatures of 22°/17°C were used.

Data collected over two or three day intervals to 23 days after sowing were identical to those obtained for the time of sowing trial.

Results:

(1) Root numbers were least with all minus levels of nutrient. Minus k which showed no further increase after day ten did not initiate tertiary seminal or nodal roots. Plant growth with -k ceased at day ten. Subsequent development of opaque white areas on -k leaves was followed by plant death.

(2) To six to ten days, root lengths were greater with minus levels of N in particular and to a lesser extent P.

(3) Greater numbers of secondary and tertiary roots at later harvests contributed to the total root lengths of the half, one and two levels being greater than those of the minus levels. Lengths per secondary and tertiary seminal root tended to remain longer for the -N throughout the trial and to a lesser extent for the - P.

(4) Two fold N at the later harvests tended to have a greater number of secondary and tertiary seminals than the ½ and 1N levels. Overall root lengths were shorter for the 2N plants.

(5) Half K, 1 K and 2K levels showed little difference amongst themselves in root numbers. Lengths tended to be less with the 2K plants.

(6) Both numbers and lengths of root components were significantly greater with the ½ P level. Also significantly, the 2P level was retarded below both 2N and 2K levels which were slightly below standard levels.

(7) Again the pattern of root production was consistent. Secondary and tertiary seminals and primary and secondary nodals appear around 6,12, 12-13 and 19 days after seeding.

B. Effect of Soil Type on Root Distribution and Moisture Use of Wheat.

Trials were carried out within a radius of five 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.

Moisture profile and root distribution data were obtained throughout the growing season. Fertilizer application comprised 120 lbs/acre Urea. Seeding rate - 50 lbs/acre gamenya.

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Results:

(1) The rainfall data are shown listed in Table 1. June to October rainfall of 7.33 inches compared favourably with 3.77 inches for 1969. Notably, July August rainfall was below average and very similar to that of 1969. Cyclonic rain in February and good April, May rains saw moisture penetration beyond six feet in the sand and to 4-5 feet in the sandy loam. Unexpectedly, moisture penetrated to only twelve inches in the grey clay. More favourable July-August rainfall was apparently required to either maintain adequate moisture levels in the top foot of soil or to facilitate penetration to depth.

(2) As with 1969, the grey clay crop failed to mature. Early growth was good but with exhaustion of moisture in mid August all plants died.

(3) Root penetration was maximised at 54 - 66 inches in both the sand and the loam. Penetration in grey clay and sand/clay followed moisture penetration.

(4) The stages of early rapid root proliferation and extension followed by rapid penetration to depth was also evident in 1970. Significantly, two week earlier seeding in 1970 was followed by two week earlier penetration to depth than in 1969. The consistent patterns of root penetration with time of sowing and the constancy of temperature conditions described for the Medina trial are probably relevant.

(5) As with 1969, an inspection of moisture profiles shows relationships with root distribution. High September rainfall modified patterns of depletion for the surface twelve inches.

(6) Yield data from small samples are listed in Table 2.

TABLE 1. Summary of Rainfall data for Tammin.

	1969	1970	1931-60 Average.
January	-	2	35
February	22	488	46
March	73	6	59
April	118	132	87
May	100	146	177
June	184	282	220
July	87	90	236
August	56	67	171
September	48	202	90
October	2	92	80
November	36	6	38
December	1	28	40
	7.27 inch.	15.41 inch.	12.79 inches

TABLE 2. Yield data 1969, 1970 (bus/acre)

	1969	1970
Sand	11.8	23.9
Sandy Loam	16.7	26,7
Sand/clay	7.3	16.2
grey clay	-	-

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5th March, 1971.