Deep sowing of wheat: the effect on root systems

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Grateful acknowledgment is made to Mr. L. Price for assistance with the field work and to Miss P. Thomson for the statistical analysis of results. This project was financed by a grant from the Wheat Research Committee of Western Australia.
DEEP SOWING OF WHEAT

- The Effect on Root Systems

By S. C. CHAMBERS, M.Sc., Plant Pathologist

In deeply sown wheat crops, the main root system does not originate from the seed, but develops from the under-ground part of the stem approximately 1 to 1 1/2 inches below the soil surface.

Deep sowing appears to be an important cause of poor emergence in wheat and care should be taken to seed at the recommended depth of 1 to 1 1/2 inches. Nevertheless some growers in drought liable areas, persist in sowing at 2 to 3 inches in the belief that it will encourage a deep root system.

Field observations in deeply sown crops indicate that although some roots arise from the seed, the main system originates from the stem an inch or so below the soil surface.

However, to obtain more precise information, the following experimental work was undertaken.

EXPERIMENTAL

Plump well-graded seed of the wheat variety Gabo was sown by hand at depths of 1, 2, 3 and 4 inches in small plots at South Perth on July 5, 1962.

The experimental design was a simple randomised plot system which included six replications of the four sowing depths. Each plot contained 100 seeds sown in 10 rows of 10 with a space interval of 2 inches between seeds.

The root systems were examined eight weeks after seeding to determine the depths of origin.

RESULTS

Emergence was markedly reduced in the deeply sown plots and only 60 plants could be examined as the maximum standard number for each plot. An analysis of the depths at which the main root systems originated, in relation to depths of seeding is contained in Table 1.

<table>
<thead>
<tr>
<th>Depth of planting (in inches)</th>
<th>Origin of main (secondary) root system (inches below soil surface)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.77</td>
</tr>
<tr>
<td>2</td>
<td>0.92</td>
</tr>
<tr>
<td>3</td>
<td>1.27</td>
</tr>
<tr>
<td>4</td>
<td>1.48</td>
</tr>
</tbody>
</table>

Differences for significance P = 0.05 0.06
P = 0.01 0.12

DISCUSSION

The root system of the wheat plant may be differentiated into two parts, that is the primary and secondary root systems. There are five (sometimes six) primary roots which arise from the seed soon after
The primary root system consists of five roots. The single central root develops first and is followed by two pairs of lateral roots on germination (Fig. 1). The secondary roots develop subsequently from the underground part of the stem to form the bulk of the root system (Fig. 2).

From the results it is evident that deep sowing only caused a slight increase in the depth of origin of the secondary roots (Fig 3). However, whereas these roots originated ¼ inch above seed sown in 1 inch, the distance was increased to 2½ inches by sowing seed 4 inches deep.

Thus it will be seen that deep sowing causes unnecessary elongation of the stem between the seed and the secondary roots. As a result, the food reserves of the grain are taxed severely and the seedling may even fail to emerge. In this experiment sowing at 4 inches reduced emergence by almost 40 per cent.

It is apparent there is little value in sowing crops deep to produce a deep root system. This is further emphasised by field observations of secondary roots developing within an inch of the surface in older plants, irrespective of planting depth.

Fig. 2.—Primary roots (1) arise from the seed and the main secondary system (2) develops about 1 to 1½ inches below the surface. Secondary roots may subsequently grow from the first node above the ground (3).
In many cases, later secondary roots even arise from the first node or joint above the surface (Fig. 2).

REFERENCE

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Grateful acknowledgment is made to Mr. L. Price for assistance with the field work and to Miss P. Thomson for the statistical analysis of results.

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