CHLOROPHYLL-TYPE COMPOUNDS IN SOIL
III. THEIR SIGNIFICANCE IN ARABLE SOILS
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INTRODUCTION

Chlorophyll-type compounds in soil come mainly from fresh plant material and from faeces of grazing animals. They decompose in soil at rates that depend on the history of the material, on the activity of the plant tissue enzymes, and on soil conditions, particularly those affecting the microflora. Consequently, their amounts in arable soils should differ according to their properties and recent histories. The ability of soils to supply nitrogen to plants is often associated with recent additions of plant materials which cannot be readily identified, soils containing plant residues that may release nitrogen are not readily distinguished from those without such residues.

The work described in this paper was done to find whether chlorophyll-type compounds in arable soils might be used to indicate the content of undecomposed plant material and, whether this was relative to their ability to supply nitrogen to crops.

ANALYTICAL METHODS

The methods to measure chlorophyll-type compounds were as already described; 25 g of each soil were extracted with 75 ml of 90 per cent aqueous acetone. Absorption readings were made on extracts in 4-cm glass cells at 665 m\(\mu\) (used as the absorption peak); background absorption was allowed for by subtracting the mean of the readings at 630 and 750 m\(\mu\).

Absorption readings for the 24 soils in the second experiment were examined to find how well the analytical methods developed earlier measured

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chlorophyll-type compounds. Readings were taken on extracts of the 24 soils from 350 to 760 m\(\mu\) at 10-m\(\mu\) intervals with an additional reading at 665 m\(\mu\). Absorption by extracts from 3 soils was greater at 660 m\(\mu\) than at 665 m\(\mu\) and from one soil, greater at 670 m\(\mu\); however, the reading at 665 m\(\mu\) was used as the peak.

The minimum absorption reading preceding 665 m\(\mu\) was always at 630 m\(\mu\). The mean of the readings at 630 and 750 m\(\mu\) would not correctly represent the background absorption at 665 m\(\mu\) if it decreased linearly over this range. Background absorption values close to 665 m\(\mu\) were therefore calculated from readings at 630 and 740 m\(\mu\), assuming absorption decreased linearly; the chlorophyll units (CU) calculated using these values were correlated \((r = 0.99)\) with those using the means of the absorption readings at 630 and 750 m\(\mu\). Consequently, the mean of the readings at 630 and 750 m\(\mu\) was considered an adequate measure of background absorption.

**EXPERIMENTAL AND RESULTS**

*Quantities of chlorophyll-type compounds found in field-rotations*

Soil samples were taken 0–9 inches deep from the Ley–Arable rotation experiments on Highfield and Fosters Field at Rothamsted and on Stackyard Field at Woburn; samples were taken from a rotation that included a ley and an arable rotation.

The ley–arable rotation consists of three years of grazed grass–clover ley followed by three arable crops. The leys are ploughed in autumn. Soil samples were taken in May, 1962, from plots in the three stages of arable cropping at 0–1, 1–2 and 2–3 years after ley.

The arable rotation consists of a one-year grass–clover ley cut for hay, followed at Rothamsted by 5 arable crops and at Woburn by 4 arable crops. The plots were sampled the year before 1 year-ley was to be grown. Soil samples were taken in May, 1962 from sub-plots given farmyard manure (FYM) at 12–15 tons per acre once in the course of each of the rotations (1 year before sampling at Rothamsted and 3 years before at Woburn) and from sub-plots not given FYM.

**TABLE 1**

<table>
<thead>
<tr>
<th>Location</th>
<th>Field</th>
<th>Ley–arable</th>
<th>Continuous arable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Years from ploughing the ley</td>
<td>With FYM</td>
</tr>
<tr>
<td>Rothamsted</td>
<td>Highfield</td>
<td>6.4</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>Fosters</td>
<td>5.6</td>
<td>7.0</td>
</tr>
<tr>
<td>Woburn</td>
<td>Stackyard</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.0</td>
<td></td>
</tr>
</tbody>
</table>

Quantity of chlorophyll-type compounds in some plots of field experiments testing different crop sequences, expressed as CU/100 g soil.