ROTHAMSTED RESEARCH

Report for 1930

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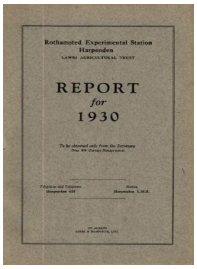

Composition of the Crops

Rothamsted Research

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mustard ploughed into the soil, decompose with formation of nitrate, which is rapidly washed out, especially from the tares, leaving only little for the wheat, and in consequence it starves for want of nitrogen.

THE COMPOSITION OF CROPS

Dr. Bishop's work on the composition of barley grain, carried out under the Institute of Brewing scheme, shows that the composition and amounts of the various proteins in the grain depend only on the total amount of nitrogen present, and not at all on how it got there—whether as the result of manuring, of soil properties, or weather conditions. The simplest connection is shown by hordein; all varieties of two rowed barleys so far examined contain the same amount of hordein for any given total weight of nitrogen per grain; for a nitrogen percentage N in the dry matter the weight of hordein in the dry matter of 1,000 grains of barley is: $0.089+0.422\ N+0.0727\ N^2$ grams.

The other nitrogen compounds, the salt soluble compounds and the glutelin differ in their proportions according to the variety. In the fully mature grain these proportions depend only on the total nitrogen content and the variety; they are independent of soil, season and manuring.

Dr. Bishop further shows how from a knowledge of the percentage of nitrogen in the barley grain, and of the thousand corn weight, it is possible to calculate the amount of malt extract obtainable after malting, a figure of great importance to maltsters. He has constructed a slide rule which shows this figure at a glance, and thus furnishes information which hitherto could be obtained only after a long, difficult and expensive analysis. Another simple calculation shows also from the barley figures the diastatic power to be expected in the malt cured at any given temperature; the closeness of agreement between the values expected and those found can be used as a measure of the efficiency of the malting process. The equations are for Plumage-Archer barleys:—

(1) For extract, E:
$E=110.1-11.2N+0.18G.$

(2) For diastatic power, D.P.:
$D.P.=29N+0.4\ G-21.$

(3) For permanently soluble nitrogen:
$P.S.N.=0.33\ N.$

Where

N is the total nitrogen percentage on dry barley.

G the dry weight in grams of 1,000 grains.

The D.P. is given for a "kilning temperature" of 180°F.*

* For full accounts of this work see:

Proteins—

Journ. Inst. Brewing, Vol. 34, p. 101, 1928.
" " " Vol. 35, p. 316 and 323, 1929.
" " " Vol. 36, p. 336, 1930.

Prediction Methods—

Extract. Ibid. Vol. 36, p. 421, 1930.

The papers relating to permanently soluble nitrogen and diastatic power are in preparation.

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These results are proving of great importance to maltsters and brewers. English brewers require a barley containing about 1.3 to 1.4 per cent of nitrogen; this seems to represent good normal barley in our conditions.

A survey is in hand of the malting barley production in Britain, showing the yields and qualities that can be expected in different parts of the country, and the comparison of quality of British and foreign barleys.

THE PLANT IN DISEASE. INSECT PESTS AND THEIR CONTROL. INSECTICIDES

Pyrethrum flowers contain substances highly poisonous to certain insects and quite harmless to plants and animals. Since pyrethrum is easily grown in this country there is the possibility that its cultivation may prove of considerable commercial interest. Dr. Tattersfield and his colleagues have studied the active principles; they find that the maximum yield is obtained when the flowers are fully opened, *i.e.*, when the disc florets are opening; they should be harvested at this stage and not later, otherwise there is risk that the achenes, which contain most of the poison, may be lost. Flowers differ considerably in their pyrethrin content, however, the range has been from 0.4 to 2.0 per cent. A method has been worked out for determining the quantity in a single flower head, and this can be used in plant breeding experiments to try and raise a strain of plants of high toxic value.

THE INSECT PESTS

In agriculture as distinct from horticulture a direct attack on the insect by sprays and other methods is not always possible, and for the insect pests of ordinary farms it is necessary to rely on some other means.

The natural control of insect pests is by their parasites, and this is being studied by Dr. Imms and Dr. Barnes. The Frit fly of oats is usually parasitised to the extent of about 30 to 35 per cent, the range during the past four seasons has been 27 to 37 per cent; parasitism becoming heavier as the season advances. There has been no severe attack during this period.

Willow midges during the last three years have also been well parasitised, the range being from 51 to 64 per cent, but foxtail midges have been more variable; there was 38 per cent parasitism in 1928, only 3 per cent in 1929, and 19 per cent in 1930; it is not yet known why the parasites did so badly in 1929.

Immune Varieties. The simplest way of dealing with the Willow midges, however, is to grow varieties of willow immune to its attacks. Unfortunately the most desirable commercial species, *Salix triandra*, is susceptible, as are all its varieties. On the other hand, *S. purpurea*, *S. alba* var. *vitellina* and *S. viminalis*, and their varieties, also the cross *S. viminalis* x *S. purpurea*, are immune. It should not be impossible to cross *S. triandra* with one of these immune varieties, and so finally obtain a new variety, immune to the midge, but with the commercial value of the old *triandra*.

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