ROTHAMSTED RESEARCH

Report for 1953

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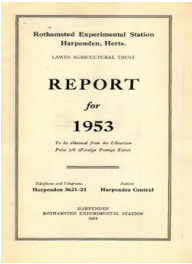

Woburn Experimental Station

H. H. Mann

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WOBURN EXPERIMENTAL STATION

H. H. MANN

SEASON

With a rainfall far (3·4 inches) below the average, but no drought during the growing season of all spring-sown crops, and with a cool summer up to the end of July, the agricultural year on the light sandy soil at Woburn in 1953 has been a good one, while the autumn has been almost consistently favourable for the harvesting of the excellent crops that have been grown. The only exception to this has been the rather poor growth of the grain crops sown in the autumn of 1952, which apparently suffered as a result of the dry weather in February and March 1953. The meteorological records from October 1952 to the end of 1953 are shown below.

Meteorological Records for 1952–53

Month	Rainfall: Total fall, inches	Rainfall: No. of rainy days	Bright sunshine, hours	Temperature, ° F.: Max.	Temperature, ° F.: Min.	Temperature, ° F.: 1 ft. in ground	Temperature, ° F.: Grass min.
1952							
October	2·96	18	98·7	53·5	41·0	46·8	36·9
November	3·24	16	65·4	43·7	32·7	39·9	30·0
December	2·06	19	68·3	41·8	30·0	35·8	27·7
1953							
January	1·16	13	32·8	41·7	32·5	36·9	29·5
February	1·62	11	68·5	44·3	32·2	37·8	29·2
March	0·62	7	126·2	50·9	31·5	41·0	26·7
April	2·34	13	158·3	53·4	37·2	46·0	32·0
May	1·64	11	204·3	63·2	45·4	55·6	39·9
June	1·92	15	110·3	64·1	48·9	58·9	46·1
July	2·97	20	190·4	68·0	51·9	61·9	48·0
August	3·11	11	223·2	70·0	52·2	62·5	47·4
September	1·41	11	169·9	65·1	48·2	57·8	42·7
October	2·13	13	68·4	55·8	42·3	61·1	37·4
November	1·31	10	55·2	30·9	42·0	46·1	37·3
December	0·58	13	32·2	47·9	39·9	45·0	36·4
Total or mean for 1953	20·81	150	1,439·7	56·3	42·0	50·9	37·7

FIELD EXPERIMENTS

The field experiments at Woburn are now conducted under the direction of the Field Plots Committee at Rothamsted, and that committee will report separately on them. There are, however, a few points in connection with them which may be recorded here.

Continuous barley

In the past two annual reports certain aspects of recent crops of barley which have been grown on this area have been discussed. The yield on all the plots has been declining for many years, even

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with heavy nitrogenous manuring, and when the land became infested with wild oats it became necessary to fallow it for four years in order to get rid of this weed. Even then, though the wild oats had been eliminated, the area was so foul with spurrey that it was impossible to ripen the barley crop of 1951. As the crop of spring barley had become so poor, it was suggested that it 1952 half of each plot should be placed under winter barley, which grew so well in that year (see Report for 1952, p. 152) that it was supposed that the superior capacity of winter barley for smothering weeds and its greater root range might be the reason for its greater success. To test this, the areas which grew winter barley and spring barley in 1952 were reversed, with the result that the winter barley yielded no better than the spring barley. It is in fact clear that the better results with winter barley in 1952 were due neither to the reduced weed growth nor to the greater root range of the crop. This has led to an examination of the soil acidity, and it appears that in nearly all the plots, one half is more acid than the other, and the more acid half has in all cases given the poorer crop, whether of winter or spring barley.

It is, in fact, the difference in acidity which seems to be the primary cause of the apparent superiority of the winter barley reported last year. It is well known that barley is the most sensitive of the common cereals to soil acidity, and we have found in pot experiments that a critical acidity for this crop lies between a pH value of 4·8 and 5·0. The exact point where pathological symptoms appear seems to depend on the amount of organic matter and of soluble phosphate in the soil. The effect of acidity on barley, and the precise conditions under which it becomes injurious, have been studied in a long series of experiments at Woburn, an account of which is now being prepared for publication. In any case, there seems to be a tendency for land which is growing barley to become steadily more acid, whatever the nature of the manuring. Thus, in the continuous barley experiment at Woburn, where the original soil had a pH value of 6·1, the values at intervals of years have been found to be as follows :

	pH values			
Treatment to 1927	1888	1898	1927	1953
No manure	5·9	5·4	5·5	5·2
Nitrate of soda	6·0	5·9	5·9	5·5
Nitrate of soda and minerals ..	6·2	5·7	5·8	5·3
Farmyard manure..	6·1	—	5·8	5·3

Crop injury by industrial fumes

On 26th June, there appeared a blighted appearance on many of the crops at Woburn just after a serious and unusual fog. The damage was first noticed on barley, but on examination it was found on many plants, including wheat, oats and lucerne, and these showed brown patches on the leaves or other exposed parts of the plants. It soon appeared that this was not merely a feature of the crops on the experimental station, but also occurred on many other plants in the neighbourhood, including fruit-trees and especially young conifers in nurseries. This effect has been put down, locally, to effluvia from local brickworks retained near the ground owing to

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the foggy conditions. Though this is as yet quite unproved, it has raised the question of the general results of factory emanations on vegetation in their neighbourhood. It is only in exceptional cases that damage such as occurred this year is sufficiently obvious, but it is more than possible that the yield of various crops may be affected long before any visible sign of damage would be noticed. We have not been able to follow up this question, but it is clearly important if occasional visible damage can occur, as in 1953, in an almost completely rural area.

Effect of irrigation on grass and clover

The irrigation experiment at Woburn started in 1951, under the general supervision of Dr. Penman, has afforded us the chance to estimate, on the grass ley plots in the experiment, the effect of watering on the proportion of grass and clover in the cut grass during the six or seven cuttings during the season. The results of 1953 are particularly interesting, as there was no period of drought, and the growth of the sward was continuous right through the season, even without the application of extra water. Under these conditions the effect of additional water still tended, as last year, to give more clover in the grass ley, though the difference was small. At the period when the growth of grass was at its height, the water caused the proportion of clover to go down very markedly, but at other times the proportion was always a little higher on the more heavily watered plots, except just at the end of the season. The actual figures for the seven cuttings on the plots receiving the most water are shown below :

Percentage of Clover in Cut Grass

	13th May	5th June	3rd July	4th Aug.	24th Aug.	16th Sept.	29th Oct.	Mean season
I. Low nitrogenous manuring								
No watering ..	42	40	25	29	27	29	19	30
Maximum watering	48	44	13	40	40	30	14	33
II. High nitrogenous manuring								
No watering ..	18	20	12	13	6	16	7	13
Maximum watering	28	27	11	17	25	17	7	19

In a year such as 1953 when the actual yield is not affected by watering, it is noteworthy that there was no appreciable difference between the sugar content of highly watered sugar beet and that which received no water. This agrees closely with what was found in the very different season of 1952.

New Crops

Maize

For the past fifteen years maize has been grown experimentally at Woburn with the object of obtaining grain types that could be economically grown in England. At first the attempt proved futile, for the only kinds of maize which would ripen in this country gave too small a yield per acre, and the more productive varieties

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could not be relied upon to ripen. With the advent of hybrid corn, the situation changed, and some of the early hybrids developed in the northern United States of America have now for five or six years given economic yields of grain that can be relied upon to ripen, provided the site faces south and has a reasonably warm soil. Some of the American hybrids have now been acclimatized in Europe, particularly in Holland, and the seed of these has been further improved there.

The year 1953 has been very much a test year for these hybrids, for the early part of the season was so cold that little growth was made up to the middle of July, and at one time it appeared as if they would fail as commercial crops. When the weather became more normal in the latter part of July, the hybrids improved very much, and by the beginning of October it was possible to reap some of them with a satisfactory yield. For instance, a Dutch variety gave 31 cwt./acre of dry corn, harvested in November, while some of the others did almost equally well. It is clear that we have now types of maize which can ripen in this part of England even in an unfavourable year and give an economic yield. But the following points must be attended to if success is to be achieved. First, the seed must not be sown before the beginning of May; second, the land must be well manured with nitrogenous manures, which are best applied soon after the seed has germinated; and third, there must be some provision for drying the maize after it has been harvested, as otherwise it will go mouldy.

Fodder crops for semi-acid soils

(1) *Sweet lupins.* We have continued testing sweet lupins as a fodder crop in 1953. The previous two years were wet, and good yields had been obtained with Weiko, a variety developed in Germany. This was again tested, in the very different season of 1953, along with two other varieties, Neven and Pflug—the last being a white variety from South Africa. All were sown at the beginning of May, and all flourished, giving record yields of fodder on 7th September. The figures were as follows :

Variety	Yield of green fodder per acre, tons	Percentage dry matter	Dry matter per acre, tons	Percentage inedible
Weiko ..	27·8	12·4	3·45	25
Neven ..	24·1	12·6	3·04	42
Pflug ..	21·8	12·5	2·70	16

These yields are very high when it is considered that the growth had been made in four months, and on suitable soils sweet lupins should now take their place as a most valuable fodder crop. The dry matter of the fodder contained about 3 per cent of nitrogen, so that these lupins must be considered as a highly nitrogenous fodder material. The seed of sweet lupins has been used largely as a constituent of concentrated feeding-stuffs, but the yield of seed here has not yet been satisfactorily determined.

(2) *Serradella.* This is the fourth successive year in which we have obtained excellent yields of this very suitable fodder. Sown at the beginning of May, it gave on 24th August over 20 tons of

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green fodder per acre containing 12·7 per cent dry matter, equal to 3·09 tons of hay. This follows yields of 2·14, 1·33 and 2·84 tons of hay equivalent per acre in the previous three years. It is only necessary to arrange for a supply of seed for this crop to become a very valuable addition to our fodder resources in the early autumn, on semi-acid light soils.

(3) *Birdsfoot trefoil.* This is supposed to be a fodder suitable for our class of land, and one which will flourish where conditions are too poor to give a normal growth of clover. It is a perennial, and gives a very large yield of fodder in the second year. When sown at the beginning of May, it shows little growth till after the end of July, but it can be cut for fodder at the end of September, giving a large yield. This year, the second year's crop was taken, and the following yields have been obtained with the narrow-leafed and the broad-leafed varieties :

Variety	Wt. green fodder per acre, tons	Percentage dry matter	Wt. hay equivalent per acre, tons
Narrow-leafed			
First year ..	12·5	—	2·8
Second year ..	20·5	21·5	5·19
Broad-leafed			
First year ..	?	?	?
Second year ..	16·5	21·4	4·16

The small area has now been left for a third year, to see whether it will continue to give yields of the same order.

Clover Sickness

There is little to add to what was said on this subject last year. The whole study has been completed so far as we are likely to go at present, and we are now able, with some certainty, to give a general explanation of the phenomenon. We have still not been able to isolate the toxic material in the soil which causes the clover failure; it is certainly not soluble in water, alcohol or neutral salts like potassium chloride solution. But it seems clear that this toxic material is sensitive to heat, that its influence can be reduced by the addition of certain forms of colloid matter, and that it gradually, though only very gradually, disappears if clover or a similar crop is not grown on the soil.

Laboratory Work

Work in the pot culture station and in the laboratory has again been restricted in 1953 by the demands of the irrigation experiments, and has hence been almost entirely concerned with what was necessary for the field experiments. Most of this work falls on Mr. Barnes and his staff, and they have been fully employed in these directions during the last year.

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