ROTHAMSTED RESEARCH

Report for 1958

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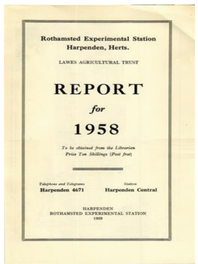
Rothamsted Experimental Station
Harpenden, Herts.

REPORT
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Woburn Experimental Station

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WOBURN EXPERIMENTAL STATION

C. A. THOROLD

The programme of field experiments was completed, despite difficult conditions for harvest and the increase in short-term cereal experiments to 366 plots from fewer than two hundred previously.

In common with the rest of England, the June rainfall was excessive, and all months from April to October had less than average sunshine. An important agricultural feature, not shown in the table, was the high humidity in August; the mean value of observations at 9.00 (G.M.T.) was 85·8 per cent relative humidity, in contrast with the 10-year average value of 77·4 per cent relative humidity. There were a few rainless days towards the end of the month, which permitted combine-harvesting of barley on 26–27 August. The percentage moisture in the grain ranged between 16 and 20 per cent. After a short spell of unsettled weather, the combine-harvesting of barley was completed on 1 September. Subsequently, weather was unsettled, and combine-harvesting was not resumed until 9 October, when the spring wheat experiments were cut. The moisture percentage of the grain was then about 30 per cent.

TABLE 1

Monthly mean temperatures (means of maximum and minimum), total rainfall and daily means of bright sunshine for months of April to October 1958, with departures from long-period means in brackets

Month	Mean temperature, °F.		Rainfall, inches		Bright sunshine (daily mean), hours	
April	44·9	(−1·5)	1·06	(−0·44)	4·43	(−0·48)
May...	52·7	(+0·7)	2·00	(+0·06)	5·98	(−0·06)
June	57·3	(−0·2)	5·32	(+3·36)	4·61	(−2·00)
July	60·5	(−0·9)	2·09	(−0·14)	5·82	(−0·22)
August	60·4	(−0·3)	2·25	(−0·06)	4·37	(−1·49)
September	58·9	(+2·2)	2·73	(+0·42)	4·32	(−0·31)
October	50·9	(+1·4)	2·07	(−0·60)	2·95	(−0·44)

FIELD EXPERIMENTS

Permanent wheat and barley

These areas were again sown in the autumn of 1957, when both winter wheat (Squareheads Master) and winter barley (Pioneer) were drilled in both areas. Subsequently, spring wheat (Peko) and spring barley (Plumage Archer) were drilled in March 1958. Both autumn and spring sowings germinated so unevenly that it seemed unlikely that useful comparisons between plot yields could be made, and both wheat and barley areas were ploughed in May 1958. An attempt is now being made to resume the experiments in which both wheat and barley are to be grown in both areas. Strips of

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winter wheat (Squareheads Master) were drilled across the permanent wheat and continuous barley areas in December 1958, although the land was too wet to provide a satisfactory seedbed. The remainder of these areas will be drilled with barley in the spring of 1959.

Green-manuring experiment

The mean of early potato yields was 10 tons/acre, which exceeds the means in each of the preceding 4 years. Alternate halves of the experiment area have now had early potatoes since 1954, when this experiment was revised.

The fallow plots of the original scheme remain fallow between each main crop in the revised scheme. In 1958 the mean yield of early potatoes on such " continuous fallow " plots was 9½ tons/acre, as compared with a mean yield of 10¾ tons when potatoes followed trefoil undersown in the preceding crop of barley. The comparable benefit from undersown ryegrass was smaller, the mean yield of early potatoes being 10 tons/acre. Potatoes after continuous fallow yielded ¼ ton/acre less than potatoes after a short fallow after barley; this benefit is attributable to the residues of green manures grown after the previous crop of potatoes.

Attention has been drawn to a general result from this experiment, indicating the importance of the length of time during which organic materials are in the soil before a crop uses them (*Rep. Rothamst. exp. Sta. for 1954,* p. 168). In the revised scheme introduced in 1954 half the plots of each group carrying ryegrass or trefoil after early potatoes are ploughed in autumn and the remainder ploughed in the spring before the barley seedbed is prepared. In 1958 the mean yield of barley, when the preceding green manure crop was ploughed in the spring, was 30·9 cwt./acre, in contrast to 22·8 cwt. when the green manure was ploughed in the autumn.

The 1958 season favoured the green manures grown for testing in 1959. The abundant herbage made it difficult to dry the barley sheaves from some plots undersown with trefoil and ryegrass. In some plots that received only the basal seedbed application of " Nitro-Chalk " (0·23 cwt. N/acre), the undersown trefoil outgrew the barley; this was not accompanied by lodging, which, however, was serious in most of the plots that received additional nitrogen (totalling 0·46 cwt. N/acre).

Six-course rotation experiment

In contrast with the large yield of early potatoes in the Green-manuring experiment, yields of maincrop potatoes were small; for example, in the six-course rotation experiment mean yield was 6·5 tons/acre. The early outbreak of blight (*Phytophthora infestans*) which spread rapidly was responsible. All the experimental potatoes, including the early potatoes, were sprayed with a copper fungicide on 14 July; maincrop potatoes were again sprayed on 29 July and 16 August.

Barley (Herta) and rye (King II) lodged, but the Yeoman wheat stood well, and gave mean grain yields of 20·6 cwt./acre and of straw 28·4 cwt./acre, which have not been exceeded in this experiment since 1948. It is noteworthy that such yields can be attained in the twenty-ninth year of cropping with mineral fertilizers only.

Ley and arable rotations experiment

Future results from this experiment will be somewhat vitiated by the incidence of lucerne-stem eelworm (*Ditylenchus dipsaci*). Two lucerne plots found to be infected in 1957, were ploughed on 29 April 1957 as a safety precaution, instead of lasting into their third year of cropping. J. J. Hesling and D. J. Hooper, Nematology Department, found that the other two third-year lucerne plots were heavily infested in August 1958 and that three of the four second-year lucerne plots (sown April 1957) were affected. The four second-year plots will be ploughed prematurely and remain fallow in 1959, to try to prevent the eelworms developing further. Neither eelworms nor eelworm damage were found in the first-year lucerne (sown April 1958). Fumigated seed was used for the first time in 1958 and will be used for the plots to be sown in 1959. However, plots sown with fumigated seed may still become infested later, and another legume may have to be substituted for lucerne. Sainfoin is, therefore, to be tried on a site adjacent to the experimental area.

Market-garden experiment

Since 1956, early potatoes have replaced cabbages, which previously followed globe beet. The mean yield of early potatoes in 1958 was 7 tons/acre, near to the average of 8 tons in 1956 and 5 tons in 1957. Responses to organic manures are good; in 1958 the mean yields were 8½ tons/acre, with sewage or sewage compost at 20 tons/acre, whereas without organic manure, they were below 5 tons/acre.

The mean yield of saleable bulbs of globe beet in 1958 was 7·9 tons/acre, compared with 8·4 tons/acre in 1957. The percentage of bolted plants in 1958 was 3·78, compared with 0·08 in 1957. However, the extent to which plants bolted depended on the manuring. Without either organic manure or inorganic nitrogen, there was no bolting. The largest percentage of bolted plants (8·4 per cent) came from sewage sludge at 20 tons/acre plus dressings of " Nitro-Chalk ", equivalent to 0·3 cwt. nitrogen/acre. This recently noticed effect is of interest because sewage sludge also produced much bolting in 1950 (*Rep. Rothamst. exp. Sta. for 1950*, p. 129) when the total bolting was more than in 1958.

Irrigation experiment

There were few opportunities for the annual crops in this experiment (spring wheat, spring beans and sugar beet) to benefit from irrigation in 1958. The wheat was watered twice in May, and once in July, each time getting the equivalent of ½ inch of rain. The mean yields of wheat, as cwt. grain/acre, were 24·2 with irrigation and 25·9 without. The spring beans planted 25 March received only two waterings, each of ½ inch in May. Nevertheless, the plants made excessive extension growth over a prolonged period. Many pods shattered and shed beans before combine-harvesting on 15 October.

Some sugar-beet plots received the equivalent of ½ inch of rain in May. There was no irrigation in June, but two applications in July totalled $1\frac{1}{4}$ inches. The mean yields of roots per acre were about 14 tons, both with and without irrigation. Sugar percentages also varied only between 16·3 and 16·5 per cent, and the general mean was 45·4 cwt. sugar/acre.

The first application of water to plots in the area of permanent Cocksfoot grass was on 2 May, when the equivalent of $\frac{3}{4}$ inch of rain was given. Table 2 shows the weights of grass at each cutting and the amounts of nitrogen removed, calculated from nitrogen determinations made on samples taken at each cutting.

TABLE 2

Weights of dry grass (G) and of nitrogen (N) removed (cwt./acre) at each cutting, with and without irrigation, and at different rates of nitrogen application, in 1958

Date of cut	Without irrigation 0·3 cwt.		Without irrigation 0·6 cwt.		With irrigation 0·3 cwt.		With irrigation 0·6 cwt.	
	G	N	G	N	G	N	G	N
14 May ...	7·7	0·3	8·4	0·4	9·3	0·3	10·9	0·4
3 June ...	7·9	0·3	10·5	0·5	8·7	0·4	11·1	0·5
24 June ...	13·4	0·4	20·3	0·8	13·4	0·4	14·6	0·6
15 July ...	10·8	0·3	11·5	0·4	10·2	0·3	10·5	0·4
6 Aug. ...	8·6	0·3	8·6	0·4	10·9	0·4	12·6	0·5
5 Sept. ...	15·6	0·5	20·5	0·8	15·7	0·5	18·8	0·7
8 Oct. ...	6·1	0·3	5·2	0·2	5·5	0·2	4·4	0·2
14 Nov. ...	3·0	0·1	2·6	0·1	2·4	0·1	2·1	0·1
Total ...	73·1	2·5	87·6	3·6	76·1	2·6	85·0	3·4

There were eight nitrogen applications, at 0·3- and at 0·6-cwt. levels, respectively, totalling 2·4 and 4·8 cwt. nitrogen/acre.

Irrigation amounted to 2·0 inches in May, 0·5 inches in June, 1·25 inches in July and 0·5 inches in August (total 4·25 inches).

Although the total yield for all cuts with irrigation differs from that without irrigation by less than 1 cwt./acre when the two nitrogen levels are combined, there were indications of benefit from irrigation in the first two cuts (14 May and 3 June). Subsequently, yields at each cut with and without irrigation were similar.

Amounts of nitrogen removed in the grass reflect the levels of "Nitro-Chalk" applied, but total amounts were unaffected by irrigation.

Short-period experiments with wheat and barley

Combine-drilling of nitrogen. Two experiments, with Herta barley and Peko wheat respectively, were done to observe the effects of combine-drilling the seed with different compound fertilizers, containing nitrogen at three different levels (0·22, 0·54 and 0·72 cwt. N/acre) in comparison with similar dressings of nitrogen applied as sulphate of ammonia, broadcast on the seedbed after drilling. All plots received the same amount of potash and phosphate, combine-drilled.

The barley lodged at the two higher levels of nitrogen, both when combine-drilled and when broadcast. There was little lodging at the lowest level of nitrogen and with no nitrogen. In contrast to

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the barley, the wheat stood well at all three levels of nitrogen, when combine-drilled and when broadcast.

Glume blotch (*Septoria nodorum*) attacked the wheat in this experiment, and incidence was more severe in plots which received most nitrogen.

With barley, combine-drilling at all rates was equal to, or better than, broadcasting, but with spring wheat combine-drilling depressed yield. A similar depression occurred with barley at Woburn in 1957, and because of these inconsistencies, the experiments will be repeated in 1959.

Time and quantity of nitrogen. Two experiments, with Herta barley and Peko wheat respectively, were designed to compare three levels of nitrogen (0·3, 0·6 and 0·9 cwt. N/acre, as " Nitro-Chalk "), given as one application (in seedbed; as an early top-dressing; as a late top-dressing or as two applications (seedbed and early; seedbed and late; early and late top-dressings), or as three applications (seedbed, early and late top-dressings).

Barley lodged even at the lowest level of nitrogen, and at the highest level all plots were badly laid. The amount of lodging was more related to total quantity of nitrogen applied than to time of application. The wheat stood well even at the highest level of " Nitro-Chalk " application (0·9 cwt. N/acre). With spring wheat, the single seedbed dressing was at least as good as other methods of application. With barley, early top-dressing seemed somewhat more effective than seedbed application. (See above, p. 164.)

Comparisons of spring wheat and barley varieties at two levels of nitrogen. The following varieties were compared at 0·4, and at 0·8 cwt. N/acre:

Wheat: Atle, Atson, Koga II, Miana, Peko, Progress, Svenno.
Barley: Domen, Herta, Ingrid, Plumage Archer, Procter, Rika.
(See above, pp. 181–182.)

Jerusalem artichoke

Trials have continued at Woburn since 1954 on the so-called " Topine " strain of Jerusalem artichoke, which is reputed to be especially luxuriant. Both tops and roots might be profitably used as fodder for stock. Topine, like artichoke, is normally planted in April. As the tops are liable to be damaged by frost, it seems desirable to cut them in October, or possibly earlier, when required for fodder, but it is not known whether the yield of roots is adversely

TABLE 3

Weight of Topine and of Jerusalem artichoke tops, cut in October 1958

	Fresh weight, tons/acre	Percentage dry matter	Dry weight, tons/acre
Topine	20·2	22·1	4·8
Artichoke	10·6	21·1	2·2

affected by removing the tops while green. An area of about 0·1 acre was therefore planted with Topine and ordinary artichoke in alternating rows on 28 April 1958. The rows were 2 feet apart, and the plants were spaced at 1·3 feet apart in the rows. The tops in

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one-half of the area were cut by hand and weighed on 30 October 1958. The other tops will not be cut until all roots in the whole area are lifted and weighed about February 1959.

Table 3 shows that the Topine tops weighed twice as much as tops from ordinary artichoke, but yields of roots will not be known till 1959. (Mann and Barnes.)

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