ROTHAMSTED RESEARCH

Report for 1927-28

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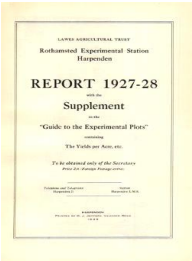

Winter-sown Oats and Wheat

Rothamsted Research

Rothamsted Research (1928) *Winter-sown Oats and Wheat ;* Report For 1927-28, pp 30 - 32 **- DOI: https://doi.org/10.23637/ERADOC-1-85**

ammonia to raise the percentage of nitrogen; at Woburn, in 1928, the percentages of nitrogen in the grain were :—

Effect of Sulphate of Ammonia. Superphosphate and Sulphate of Potash.		Effect of Sulphate of Potash. Superphosphate and Sulphate of Ammonia.		Sulphate of Ammonia and Sulphate of Potash. No Superphosphate.
+Sulphate of Ammonia.	No Sulphate of Ammonia.	+Sulphate of Potash.	No Sulphate of Potash.	
1.372	1.310	1.372	1.398	1.346

The nitrogen content of the barley, more than any other single factor, determines its malting value. It is closely connected with the amount of " extract " and with the diastatic power of the malt, the extract varying inversely and the diastatic power directly with the nitrogen : it has also more subtle effects.

The investigations by Mr. Bishop on the nitrogen compounds of the barley grain have reached an interesting stage. The proportions of hordein, glutelin, and salt-soluble compounds are all connected with the percentage of nitrogen in the grain : for different samples of the same variety (Plumage-Archer) the glutelin increases proportionately to the nitrogen, the hordein increases more rapidly, and the salt-soluble compounds less rapidly than the nitrogen. The relationships are the same, whether the variation results from changes in soil, season or manuring; it appears, therefore, that the ratio glutelin/nitrogen may be a varietal constant of considerable interest to the breeder of barley for quality, and this is being determined for some of the new barleys grown by the National Institute of Agricultural Botany : the barleys are also being malted by the experts of the Institute of Brewing.

The large number of analyses of British-grown barleys made in recent years at Rothamsted has shown that the grinding barleys are richer in protein than is usually supposed. The figure quoted in the standard British tables is 8.6 per cent. of protein, corresponding to 1.38 per cent. of nitrogen; our results show that the figures have been, for barleys which buyers would not take for malting :—

	Valuation 45/- and less	Valuation below 40/-
1922	1.72 ...	1.76
1923	1.73 ...	1.95
1925	1.86 ...	2.16
1926	1.58 ...	1.65
Mean	1.72 ...	1.88
Protein on conventional basis ...	10.8% ...	11.8 %

The results show that less protein concentrates, such as decorticated cotton seed cake or meal, or decorticated ground nut cake, than is usually recommended, need be mixed with barley meal for feeding to farm animals.

Winter-Sown Oats and Wheat.

The experiments have given further information as to the effect of time of application of the sulphate of ammonia, and we are now able to sketch out the following as the probable

https://doi.org/10.23637/ERADOC-1-85

facts. In its relation to nitrogen supply, the life of a cereal plant has two well-marked periods: the first, in which roots and tillers are formed but no heads; the second, in which heads develop on the tillers, but no more new tillers are formed. For autumn-sown cereals, the first stage is so long drawn out that it can be sub-divided into a first period, starting at the time of germination and continuing all through the winter, when root formation is the chief process, and a second period when tillering proceeds actively; at Rothamsted, this is mainly in the spring, about March, or early April. Roots, tillers and heads are all increased by nitrogen supply. The heads, however, are increased in number only, and not in size or number of grains: there is even a small tendency for the number of fertile grains to decrease.

Applied during the time of tillering (which at Rothamsted is about the month of March) the nitrogenous fertiliser increases the number of tillers.

Applied after tillering has ceased, it can still increase the amount of grain, and also the amount of straw, though not as much as if it had gone on early enough to increase the tillers also. The earlier application has therefore at first sight the advantage. It suffers, however, in that some of the nitrogen may be washed out by rain, leaving insufficient for the crop unless an excess has been added. In practice, the ordinary dressing of 1 cwt. sulphate of ammonia per acre is best applied late, as it gives more grain and but little less straw than if applied early, while the larger dressing of 2 cwt. sulphate of ammonia is best applied early, as it then gives considerably more straw and somewhat more grain than if applied late. The averages of all results for the four years 1925-28 have been :—

Increases over No Nitrogen.

	Grain.				Straw.			
	Single.		Double.		Single.		Double.	
Sulphate of Ammonia.	Early	Late	Early	Late	Early	Late	Early	Late
Oats (2 years)	5.8	8.1	9.4	10.8	7.1	6.6	14.0	8.7
Wheat (3 years)... ...	1.9	4.3	5.3	2.8	3.8	4.6	7.5	4 3
Mean of all Tests with Sulphate of Ammonia and Muriate of Ammonia ...	3.5	6.0	6.7	5.1	5.1	4.8	10.8	4.6

Muriate of ammonia gives substantially the same results as sulphate of ammonia. The details are as follows :—

	No Nitrogen	Grain, Bushels per Acre.							
		Sulphate of Ammonia.				Muriate of Ammonia.			
		Single dose.		Double dose.		Single dose.		Double dose.	
		Early.	Late.	Early.	Late.	Early.	Late.	Early.	Late.
Oats, 1925	49.6	59.4	64.2	66.4	69.3	61.6	—	62.3	—
Oats, 1926	75.4	77.2	77.0	77.4	77.3	78.8	82.4	77.6	78.4
Wheat, 1926	27.0	24.5	32.8	30.8	32.1	35.4	34.4	37.0	29.5
Wheat, 1927	44.2	49.5	44.0	51.0	49.9	44.0	49.3	50.1	48.9
Wheat, 1928	43.3	44.4	50.6	—	—	48.5	48.1	—	—

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	No Nitrogen	Straw, Cwt. per Acre.							
		Sulphate of Ammonia.				Muriate of Ammonia.			
		Single dose.		Double dose.		Single dose.		Double dose.	
		Early.	Late.	Early.	Late.	Early.	Late.	Early.	Late.
Oats, 1925	23.5	31.8	30.8	36.7	34.6	31.8	—	37.4	—
Oats, 1926	44.1	50.0	50.0	58.9	50.3	52.6	48.6	58.2	47.2
Wheat, 1926	41.3	43.7	44.9	46.2	46.7	46.4	44.8	50.3	43.1
Wheat, 1927	45.8	51.4	48.6	55.8	48.9	48.4	50.0	55.3	49.1
Wheat, 1928	29.2	32.5	36.7	—	—	33.3	33.7	—	—

Cereal mixtures for green feed, hay or silage, and therefore grown for leaf rather than grain, should receive their nitrogenous dressing during tillering time.

Nitrogen in wheat grain. An experiment was made in 1928 in conjunction with the Research Association of British Flour Millers to ascertain how far the nitrogen content of wheat can be altered by variations in time of application of nitrogenous fertiliser. No significant effect was produced by manuring, although there were differences between the varieties: Yeoman II and Square Head's Master both contained more nitrogen in the grain than Swedish Iron or Million III. The percentage of nitrogen in the dry grain was:—

Different Varieties.		*Different Times of Applying Nitrogenous Fertiliser.*	
Yeoman II	1.700	No nitrogenous fertiliser	1.646
Square Head's Master	1.698	Early top dressing ...	1.642
Million III	1.565	Late top dressing ...	1.639
Swedish Iron	1.539	Early and late top dressings	1.657

Grassland.

Grass presents special problems because it is not a single crop but a mixture, the members of which are competing with one another. Further, the value of grass is not sufficiently expressed by its weight: it depends not only on the kind of plant but on the way the plant grows, whether leafy or stemmy. Two qualities are important to the farmer: palatability and feeding value. Palatability is tested in the Woburn experiments in Broadmead, where grass is treated with lime, basic slag, superphosphate, potassium salts on separate unfenced plots, all of which are then grazed by animals free to wander where they will. They congregate on the most palatable herbage and leave the rest: they choose always the plots treated with lime and phosphate. Feeding value is tested at Rothamsted; the plots are fenced in and the animals are given no option as to where they shall go: they are weighed each fortnight. The results again show the value of phosphate, especially the basic slag of high solubility: within certain limits they show that a 2 per cent. solution of citric acid is a useful agent for estimating agricultural value, though others are being tested with promising results. The experiments have emphasised the importance of skilful and close grazing in the management of grassland; this is even more important than manuring and, indeed, some of the records show that a properly manured pasture badly grazed may be worse than one left unmanured.

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