ROTHAMSTED RESEARCH

Report for 1960

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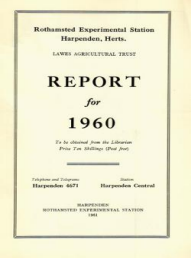

Report on a Series of Field Experiments Testing Winter V. Spring Field Beans

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Report on a Series of Field Experiments Testing Winter *v.* Spring Field Beans

by J. R. Moffatt

Winter beans at Rothamsted and Woburn have always been a rather hazardous crop because of risk from damage by birds during the autumn and winter, and because of their susceptibility to frost and to chocolate spot disease (*Botrytis* spp.). Spring beans, though potentially lower-yielding, are far less liable to damage from these causes, but they are more susceptible to attack by bean aphids (*Aphis fabae*), which, in a bad year, can ruin a crop. Systemic insecticides can control this pest and make the crop more reliable.

A series of experiments was started at Rothamsted and Woburn in 1956 in conjunction with the National Institute of Agricultural Botany, to compare the yield of the two types of beans over a period of years and to test the effect of spraying against bean aphids (*Aphis fabae*). The experiments also tested two levels of fertilisers. The Woburn experiments were on heavy land.

In each year there were three blocks of four whole plots each; the plots were split into three for broadcast treatments of phosphate and potash and pairs of whole plots were sprayed. The varieties were tested on whole plots with the PK treatments partially confounded. The levels of phosphate were none; 0·5; 1·0 cwt. P_2O_5/acre as superphosphate, and of potash none; 1·0; 2·0 cwt. K_2O/acre as muriate of potash. " Metasystox " was the insecticide applied in 40–80 gallons of water per acre. The same strain of winter beans, S.Q. Giant, was used throughout the series at a seed rate of 275–300 lb./acre. The spring variety Albyn Tick was drilled each year except 1959; the seed rate was 200 lb./acre except in 1957, when 150 lb./acre was used. In 1959 the variety was Granton, sown at 275 lb./acre because it has larger seed than Albyn Tick. The seed was drilled in rows 22 inches apart and planted as deeply as possible; the depth of drilling varied between 2 and 4 inches according to the condition of the ground. All plots were harvested by combine-harvester, and yields are corrected to 85% dry matter.

Table 1

Grain: cwt./acre—Rothamsted

Year	Winter No Spray	Winter Sprayed	Winter Diff.	Spring No Spray	Spring Sprayed	Spring Diff.
1956	17·9	19·0	+1·1	16·1	17·8	+1·7
1957	32·4	34·3	+1·9	7·6	18·7	+11·1
1958	12·8	10·6	−2·2	14·4	14·5	+0·1
1959	26·6	28·8	+2·2	13·9	18·8	+4·9
1960	34·3	—	—	20·5	23·7	+3·2
Mean of 4 years						
1956–59 ...	22·4	23·2	+0·8	13·0	17·4	+4·4

Full agricultural details of these experiments, and yields, are given each year in Results of Field Experiments.

At Rothamsted the unsprayed winter beans outyielded both the unsprayed and sprayed spring variety in 4 out of the 5 years.

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In the other year, 1958, which had an exceptionally wet summer, chocolate spot disease (*Botrytis* spp.) appeared early in the winter crop and spread rapidly. Both sowings grew tall, and the passage of the sprayer through the winter crop did appreciable damage; this crop also lodged badly. In 1960, a wet year with a medium aphid infestation, the winter beans grew tall and were not sprayed because the crop would have been damaged.

In the three years when winter beans were sprayed without damaging them much, yield was increased slightly (1·7 cwt./acre).

TABLE 2

Grain: cwt./acre—Woburn

Year	Winter 0	Winter Sprayed	Winter Diff.	Spring 0	Spring Sprayed	Spring Diff.
1956	—	—	—	15·4	17·9	+2·5
1957	16·9	23·3	+6·4	8·0	8·7	+0·7
1959	27·4	30·0	+2·6	23·3	17·8	−5·5
Mean of 2 years 1957–59 ...	22·2	26·6	+4·4	15·6	13·2	−2·4

In all 5 years the spring beans benefited from spraying, the increased yield ranging from 11·1 cwt./acre in a year of severe aphis infestation to 0·1 in a year of light infestation.

The Woburn results are less consistent, although the general trends are similar. In 3 of the 5 years the experiment had to be wholly or partially abandoned because birds so severely damaged the winter-sown crop, despite deep drilling and the use of explosive bird-scarers; the damage happened over many weeks.

The unsprayed winter beans yielded more than the sprayed or unsprayed spring beans in both years, and the increase from spraying the winter variety was more (4·4 cwt./acre) than at Rothamsted.

TABLE 3

Grain: cwt./acre—Rothamsted

Mean of 4 years 1956–1959

	P_2O_5 (cwt./acre)			K_2O (cwt./acre)			
	0	0·5	1·0	0	1·0	2·0	Mean
Winter	22·6	23·0	22·7	21·5	23·5	23·4	22·8
Spring	15·6	15·2	14·8	15·2	16·0	14·6	15·3
Mean ...	19·1	19·1	18·8	18·4	19·8	19·0	19·0

The mean yield of the spring variety is 2·4 cwt./acre lower on the sprayed plots than the unsprayed, partly because an early and heavy infestation of bean aphids in 1957 severely damaged the spring crop before it was sprayed in early June. The less-susceptible winter crop, however, benefited appreciably from spraying at this time. In 1959, with few aphids and a lush spring crop, the damage caused by the passage of the sprayer exceeded the benefit from the spray. In 1957 the spring beans also suffered severely from drought and weed competition in ground too hard to hoe.

In none of the four years, 1956–59, was there any significant response at Rothamsted to phosphate. Winter and spring crops

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responded in 1956 and 1957 to the lower level of potash, the winter crop responding more than the spring; there was no further increase from the higher level of potash.

Because broadcast phosphate gave no response it was omitted from the 1960 experiment and a single level of potash (0·74 cwt. K_2O/acre) placed near the seed was tested, but it gave no significant response. It increased the winter-bean yield from 34·1 to 34·6 cwt./acre and the spring bean from 21·7 to 22·5 cwt./acre.

At Woburn the only significant increase to phosphate (3·5 cwt./acre) was on a rather variable site with the winter beans in 1959. On all other occasions phosphate tended to lower yields. The lower level of potash always gave an economic return, and in 1959 the higher level gave a further increase in yield.

TABLE 4

Grain: cwt./acre—Woburn

Mean of 2 years 1957 and 1959

	P_2O_5 (cwt./acre)			K_2O (cwt./acre)			
	0	0·5	1·0	0	1·0	2·0	Mean
Winter	24·3	26·6	22·3	22·2	25·2	25·8	24·4
Spring	15·8	13·8	13·8	13·1	14·8	15·4	14·4
Mean ...	20·0	20·2	18·0	17·6	20·0	20·6	19·4

In 1956, when the winter beans failed, the yield of the spring-sown crop was decreased by increasing amounts of phosphate but greatly increased by potash. The means of the three spring experiments are:

TABLE 5

Grain: cwt./acre—Woburn

Mean of 3 years 1956, 1957 and 1959

	P_2O_5 (cwt./acre)			K_2O (cwt./acre)		
	0	0·5	1·0	0	1·0	2·0
Spring	16·5	14·7	14·3	12·9	15·3	17·3

The main conclusions from these experiments are:

1. The yield of unsprayed winter beans is consistently higher than spring beans, sprayed or unsprayed, except when chocolate spot disease (*Botrytis* spp.) is severe or birds damage the crop.
2. In areas where bird damage is common, spring beans are the more reliable crop.
3. In most years satisfactory crops of winter beans can be obtained without spraying, but spraying increases yields in years when aphid attack is severe.
4. The spraying of spring beans is nearly always beneficial, providing it is done in time and the crop is not too damaged by the machine.
5. Neither winter nor spring varieties respond to broadcast phosphate, but both respond to broadcast potash fertilisers.

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