THE SPROWSTON FARM

A Report for Members of the Norfolk Agricultural Station

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Note This is a progress report for Station Members and its contents are **Confidential**

THE FARMING

The summer of 1958 was the third wettest we have recorded in the last 35 years at Sprowston and like most summers of above average rainfall it produced good root and less satisfactory cereal yields at Sprowston. Barleys averaged only 8 sacks per acre (44 acres) and wheat 15 sacks per acre. The beet crop proved the best we have ever grown—17 tons washed beet per acre—and potatoes 10 tons per acre, averaging all varieties. King Edwards were very disappointing at 7½ tons ware, but whites yielded up to 16½ tons per acre.

The yarded cattle will not weigh as heavily this year, which may also be a summer legacy from the wet, rather lower quality of the grass.

We are continuing our interest in hormone implantation of fattening cattle and have three groups under trial, viz. untreated, implanted with hexoestrol, and implanted with natural hormone.

Virus Yellows in Sugar Beet

In the last issue of The Sprowston Farm we gave the results of a spraying experiment for controlling virus yellows in beet. The Sprowston experiment was one of several carried out at various places in the country, under the direction of our national authority on the subject, Dr. R. Hull. In 1958 four centres, other than Sprowston, were in the Eastern Counties: three were in Norfolk, where the increases in yield from one early spraying were 1.5, 1.0 and nil tons per acre respectively, and the proportions of plants infected with virus yellows on the unsprayed plots at the end of September were 66%, 17% and 19% respectively. The Sprowston experiment showed a 67% infection and a yield increase of 4.1 tons per acre from one spraying, at a yield which was over 2 tons per acre higher than any other Norfolk centre.

Dr. Hull writing in "Agriculture," May, 1958, about twenty 1957 experiments says "that an early spray gave an average increase of 1¼ tons per acre and increased the sugar content by 0.3%." Increases from a second later spraying were much less, on average ¼ ton per acre and 0.1% sugar.

The important spraying is obviously the first one. Dr. Hull says in a private communication that "it pays to spray whenever the infection would build up to 20% if uncontrolled by the end of August." The British Sugar Corporation records do in fact show that in Norfolk crops often build up to 20% of virus yellows infected plants in the final crop. But as the earlier the infection occurs the more likely is damage to accrue, it is very important to recognise the time and extent of the aphid invasion of the crop. As a rough guide Dr. Hull says that "spraying should be considered whenever there is an average of at least one green aphid per two plants." However there is no close relationship between number of green aphids in a particular field and yield increases from spraying, but if a farmer knows from past experience that his crops are usually yellow by, say, the 20th August in most years, it is reasonable to expect an economic response from spraying when on average he finds one green aphid per two beet plants.

The tonnage he will save by spraying depends on the potential yield of his crops as well as on the incidence of yellows. The past wet, sunless and it is to be hoped, exceptional year was one in which aphid infestation did occur: but in such years the development of yellows may be late, and the time of spraying may possibly be deferred until a safer forecast of the development can be made. There are many unknown factors influencing the build up for every field: sowing date, aspect, surroundings, adjacent sources of infection, even soil type have to be studied in trying to forecast the extent of aphid attacks on sugar beet and it is therefore very difficult to give any recommendation which will cover all contingencies.

Perhaps the best guide is the farmers' past experience and the alarm warning given by Dr. Hull's rough guide of at least one aphid per two beet plants, remembering that the first spraying is likely to be remunerative in any field where the above holds.

After all, one spraying (including application) will not cost 30s. per acre this year, and the odds are heavily in favour of the value of tonnage saved overwhelmingly meeting the cost of spraying.

NITROGEN FOR BEET

Since the introduction of the crop to this country the use of nitrogen for sugar beet has been a constant topic of discussion. Some of the earliest investigations at Sprowston were directed at this problem and our experience can be briefly summarised thus. If the beet receives muck, about 6-8 cwt. of a compound containing 10% nitrogen is adequate, or 8-10 cwt. in the absence of muck. The optimum of course varies from season to season but generally speaking if these quantities are exceeded, the yield of roots is not increased although top weight is and there is a danger that sugar content and particularly juice purity will be reduced. If the total

quantity of nitrogen given lies within the above range, however, there is no difference in the effect on root yield, sugar percentage and purity between putting all the dressing on the seedbed and dividing it between seedbed and top dressing provided that the beet are top dressed immediately after singling.

More recent experiments both on a light soil in North Norfolk and on better land in the East of the county have confirmed the earlier work although the results show clearly that the response to nitrogen varies according to the season.

In 1951, for example, after a very wet winter there was a profitable return from no less than 7½ cwt. of sulphate of ammonia —equivalent in nitrogen to 15 cwt. of a 10% N compound. Similar conditions prevailed in 1958 and although we had no series of nitrogen rates comparable with the experimental treatments in 1951, there was one trial in which top dressing after singling with 2 cwt. of a fertiliser containing 15% N increased yield by 1½ tons per acre. The seedbed nitrogen was equivalent to 10 cwt. of a 9% N compound, so the total dressing was considerably higher than the optimum quoted above; it is true that it was accompanied by a drop in sugar content of ½% but even so the final yield of sugar was 1 cwt. per acre better on the top dressed crop.

By contrast the pattern of response in a dry season is very different. In 1952, for example, on light land at Heacham the maximum economic dressing was not more than 6 cwt. of a 10% N compound. Moreover as compared with the wet season of 1951 the higher rates of nitrogen in 1952 had a much more serious adverse effect on juice purity because the general standard of purity was so low.

1957 was another season of poor response to nitrogen. In that year a number of experiments were conducted throughout the country by the British Sugar Corporation in conjunction with Rothamsted and the results of these trials demonstrated the same lack of response to nitrogen as had been found in 1952, the optimum being around 6 cwt. of a 10% N compound.

The weather is one factor that governs nitrogen response; another is the relation between nitrogen and potash in the nutrition of the beet plant. Experimental work has clearly shown that as is the case with many other crops the best results from using nitrogen can only be expected if ample potash is also given. However in Norfolk where a high proportion of farmers apply kainit in the autumn as well as a high potash compound on the seedbed, there is little danger that shortage of potash will be a factor restricting crop response to nitrogen.

FERTILISER PLACEMENT FOR SUGAR BEET

Experiments carried out by Rothamsted a few years ago indicated that although fertiliser placed 2 inches to the side and just below the level of the seed stimulated the early growth of the crop compared with the same rate broadcast, there was no improvement in final yield.

The reason why beet, in contrast with many other crops, fails to respond to fertiliser placement may be that the crop occupies the ground for several months during which time its extensive rooting system enables the plant ultimately to reach and make use of all fertiliser applied, even if this is broadcast and therefore dispersed widely through the soil.

During recent years however development in commercial placement equipment has progressed and the view is quite widely held that some further investigation in placing fertiliser is justified because even if this practice does not lead to any yield increases or savings in fertiliser there are certain other advantages to recommend it.

Firstly, the use of a placement drill enables a small saving in the cost of fertiliser application and, more important, avoids one set of wheelings on the seedbed, which can be very deep where a fully loaded wide distributor is used. Again, if the quicker initial growth found in the original experiments brings the early drilled beet to the hoe a few days earlier, this is in itself a very worthwhile gain from placement.

It is alsc true that in many areas soil reserves of phosphate have been built up since the last war to such a level that it may be a sound policy to reduce the quantity given to sugar beet. Where the phosphate status of the soil is high a possible method of adding plant nutrients in the correct balance for beet could be to plough in kainit during the autumn and follow on the seedbed with a relatively small dressing of complete fertiliser which could be placed; any additional nitrogen required could then be applied as a top dressing possibly in conjunction with inter row cultivation and certainly not later than singling.

Trials by the N.A.A.S. in Norfolk over the last few years have in general disclosed no adverse effects on yield from placement drilling; indeed in some cases there has been a benefit of over 1 ton per acre compared with broadcast fertiliser.

Last year the Station obtained two experimental seeder units capable of delivering known quantities of fertiliser very accurately, and these were used for a trial in which two rates of fertiliser, 6 or 10 cwts. of a 9:6:15 compound were compared either broadcast or placed. The whole area received a basal dressing of potash equivalent to 5 cwt. of kainit, and nitrogen top dressing treatments were included which are discussed elsewhere.

The results of one experiment in the first year did not suggest any gain from placement and the response to fertiliser was not entirely consistent with previous work here. The experiment is being repeated and it is hoped that a clearer picture of the relationship between fertiliser use and method of placement will emerge as the investigation continues.

POTATO TRIALS

Time of Planting and Chitting

Most of the evidence about the value of sprouting or chitting main crop seed potatoes is based on trials in Scotland and Ireland and relatively little experimental work has been done under the very different climatic conditions of the Eastern Counties. This was the reason for starting an investigation on this subject in 1958 and because at Sprowston we should expect the time of planting to influence the gain from sprouting, the intention was to compare sprouted and unsprouted seed planted at three dates, the middle one being as close to the optimum as possible and the other two being about three weeks earlier or later than the optimum, which previous experimental work at Sprowston has shown to be about the first week in April. Favourable weather enabled the first planting to be made on the 19th March and this was followed by a mid-season planting on 8th April and a late planting on 28th April. The chitted seed produced aerial growth much more rapidly than the unchitted and by the 14th May the mean percentages of plants which had emerged were as follows :—

Seed treatment	Early	Middle	Late Planting
Seed Chitted	13.3	41.7	3.0
Seed Not Chitted	0.3	0	0

The crop grew well during its early life and no late frost occurred so that the plants which emerged first suffered no severe check. In 1957 a frost on the 8th May cut down the tops of some of the farm crop planted with chitted seed but did not affect those planted with unsprouted seed because the tops had not emerged; if there had also been late frosts in 1958 the advantage of chitting, particularly at the middle time of planting, might not have been so evident as it was in this season.

Sample tubers dug in the third week in July (and displayed on the Open Days) showed that bulking had taken place in the order that might have been expected from the emergence figures given above. In particular the late planted chitted seed had bulked much better than unchitted seed planted at that time. The high incidence of blight attack in 1958 in spite of protective

spraying made it necessary to destroy the haulm early in August so that the latter part of the growing season was curtailed. The trial was harvested in mid-October and riddled in late November; the results are set out below :—

YIELDS IN TONS PER ACRE

Treatment	Ware (over 1¼")	Seed and Chats	Seed and Chats as % of total
Planted Early 19.3.58 ...	8.7	1.2	12.1
Planted Mid 8.4.58 ...	10.0	1.4	12.0
Planted Late 28.4.58 ...	8.1	1.5	15.5
Sig. difference	1.0	0.2	(1.2)
Seed Chitted	9.7	1.3	12.1
Seed Not Chitted	8.2	1.4	14.2
Sig. difference	1.0	n.s.	n.s.

The effect of time of planting agrees with previous trial results at Sprowston; these trials have shown that the optimum date of planting falls in the first week in April and that planting earlier or later than this date generally causes a decrease in the yield of ware potatoes. The yield of seed and chats tended to increase with later planting and they made up a significantly greater proportion of the total yield following late planting. A similar increase in the proportion of seed and chats was obtained from the crop planted with unchitted seed tubers. The effect of chitting the seed on the yield of ware was the same at all dates of planting and it was, on the average, an extra 1.5 tons per acre in favour of chitted seed. This figure must be treated with caution since it is the result of a single trial, but if it is confirmed by further experimental work the increase in yield obtained by chitting the seed has, in one year of high potato prices, paid for the capital outlay involved in converting an existing farm building into a chitting house. (See the Sprowston Farm Vol. 1, No. 8 p. 65, March 1957).

Seed Treatment and Fertiliser Placement

An introduction to this investigation will be found in Vol. 1 No. 10 p. 91 of the Sprowston Farm (March 1958) when the first year's results were reported. In 1958 the experiment was repeated with the same treatments, in which a comparison of sprouted and unsprouted seed was combined with the testing of three methods of fertiliser application; broadcasting on the flat immediately before planting, placing fertiliser in two sidebands and placing fertiliser in three bands, two at the side and one below and in contact with the setts.

The trial was planted on 8th April and by the 13th May 50% of the sprouted seed had emerged but no foliage was visible on the plots planted with unchitted setts. In 1958 the emergence of the chitted seed was ten days earlier than the unchitted compared with an advantage of only two days in 1957. Subsequent growth was rapid on all plots but during the first week after emergence the colour and size of the tops was a little better after three band compared with two band placement of the fertiliser. The tops were burnt off in early August and the trial was harvested in mid-October. The results were as follows :—

Yields of Ware (over 1½") and Seed and Chats (in brackets)

TONS PER ACRE

Fertiliser	Seed Chitted	Seed Not Chitted	Fertiliser Means
Broadcast	9.6 (0.8)	7.1 (1.1)	8.4 (1.0)
Placed in 2 bands	10.6 (1.3)	8.2 (1.2)	9.4 (1.3)
Placed in 3 bands	10.3 (1.4)	8.1 (1.3)	9.2 (1.4)
Seed Treatment Means ...	10.2 (1.2)	7.8 (1.2)	
Sig. difference	0.7 (n.s.)		n.s. (0.1)

Sig. difference for comparison within the table 1.3 (0.2)

It will be seen that in 1958 the advantage in favour of sprouting the seed tubers was a little over two tons per acre of ware potatoes. This agrees reasonably well with the results of the time of planting trial reported above but contrasts with the results in 1957 when a similar trial showed no increase in yield due to seed sprouting. In neither year was there any evidence visible in the tops of the scorching which might have been expected when sprouted seed was planted in contact with a third of the fertiliser, but in both years conditions at planting time were moist and this is known to reduce the risk of damage from scorch.

On the average of the 1957 and 1958 trials the placement of fertiliser has given 0.8 tons per acre more ware than the same quantity of fertiliser broadcast on the seedbed but in neither year was the increase sufficient to reach statistical significance. In 1958 placement did produce more seed size tubers than broadcasting and three spout placement gave significantly more seed than two spout placement. In both years three spout placement with chitted seed has produced a lower yield of ware than two spout placement but in the case of unsprouted seed the yields from either method of placement were about the same. There is therefore some indication that placing fertiliser in contact with sprouted seed may cause some damage but since the effect was not large

enough to reach statistical significance in either year this conclusion must await confirmation when the work is repeated in future years.

Control of Spread of Virus by Spraying

A progress report on this experiment appeared in the Sprowston Farm Vol. 1 No. 8 p. 68 (March 1957) and the 50th Annual Report p. 13 (September 1958). Briefly the object of the investigation, which was undertaken in co-operation with Rothamsted Experimental Station, was to find whether stocks of potato seed could be grown on for several years without undue increase in virus infection if the aphids which were responsible for the spread of virus disease in the crop could be controlled by spraying with DDT. In 1955 five acres were planted with Stock seed King Edward and during the growing season this area received experimental treatment with DDT sprays as follows (a) control, unsprayed (b) sprayed on six occasions (c) sprayed on 2nd and 4th occasions (d) sprayed on 2nd occasion and (e) sprayed on 4th occasion. At harvest seed was saved from each treatment to plant up similar plots in 1956 which received the same spraying treatment as had been given the year before. This was repeated in 1957 and 1958 but in 1958 the incidence of virus disease in these infected stocks had reached such a level that the experiment was concluded and yields at harvest on the various treatments were recorded. In each year of the trial the incidence of virus infection was assessed and these results are set out below :—

PERCENTAGE OF PLANTS IN SAMPLE COUNTS INFECTED WITH LEAF ROLL (L.R.) OR RUGOSE MOSAIC (R.M.)

Treatment	1956		1957		1958	
	L.R.	R.M.	L.R.	R.M.	L.R.	R.M.
(a) Unsprayed	0.3	0.3	2.1	0.1	12.4	4.8
(b) 6 sprays	0.2	0.2	0.7	0.0	1.5	5.3
(c) 2nd and 4th sprays only ...	0.4	0.1	0.1	0.3	3.9	9.8
(d) 2nd spray only	0.1	0.0	1.9	0.0	12.4	4.2
(e) 4th spray only	0.1	0.4	0.8	0.9	6.5	19.1

The six sprays and the two applied on the 2nd and 4th occasions significantly reduced the spread of leaf roll but spraying had little effect on the considerable early spread of rugose mosaic in 1957, an effect which was observed at other centres where similar trials were in progress. For some reason the proportion of plants infected with rugose mosaic in the first year was higher in treatment (e) than in the other treatments and this disparity became more pronounced in 1957 and 1958. Any control

of virus build up was due entirely to the effects of spraying but if rogueing had been carried out each year as well, the life of the stocks would probably have been prolonged.

The spraying treatments had little effect on yield but the high incidence of leaf roll and rugose mosaic present in the produce from treatment (e) reduced yield by about 1 ton per acre. The general level of yield was lower than in comparable trials grown in the same field in 1958 and it is likely that tractor wheel damage was partly responsible for this because in addition to the six DDT sprayer wheelings (which were common to all plots in the trial) there were five applications of copper spray against blight. In spite of this drawback (which might be eliminated by aerial spraying) work at a number of centres during the last seven years has shown that the life of potato stocks can be prolonged by appropriate spraying treatments.

It is hoped to continue this line of investigation and in particular to test whether yields from sprayed stocks maintained on the farm are equal to those from imported seed.

N.I.A.B. CROP VARIETY TESTING SCHEME

Brussels Sprouts Trials

In 1951-2 the N.I.A.B. started testing small numbers of new strains of brussels sprouts from the Plant Breeding Station, Glasnevin, Eire. This programme was expanded during the following two seasons and included a trial at Sprowston in 1954-5 and subsequent years.

Comparisons throughout have been with the established variety Cambridge Special, the object of the trials being to assess the value of these new strains and other commercial varieties for the production of relatively small high quality sprouts suitable for the quick-freezing trade.

Cambridge Special is an early-maturing variety with a satisfactory yield but it suffers from a number of defects which can seriously reduce sprout quality. Its stems are short and do not lodge readily but sprouts borne close to the soil level are often damaged by slugs or contaminated with soil splashed by rain. The sprouts although of the desirable tight spherical shape are often close packed on the stem. This makes picking more difficult and the retention of moisture in the crevices often leads to rotting of the outer leaves of the sprouts. The resistance of the variety to frost and its genetic uniformity could also be improved.

The most successful of the new Irish breeders' stocks was 46/52 now named Irish Glacier. It is a vigorous uniform variety with bold deep green foliage. The stems are longer and stouter than Cambridge Special and normally strong and upright but

liable to lodging if, as in 1958, growth is excessive. Its sprouts are dark in colour and round, better spaced on the stem than Cambridge Special and they detach readily leaving very little stalk.

Yield of marketable produce and the proportion of first quality sprouts in each size grade has been slightly below that of Cambridge Special in most years but in all cases the yields from the later picks have been higher and both foliage and sprouts are markedly less susceptible to frost damage than the Cambridge variety.

When seed is commercially available Irish Glacier should prove a useful complementary variety to Cambridge Special.

Three commercial varieties, Freezer (Harrison), Canner (Clucas), and De Rosny (Clause) were included in the trial in 1956-7.

Freezer is generally similar to Irish Glacier in time of maturity, yield and proportion of first quality sprouts. Its stems are of intermediate length and more susceptible to lodging than Cambridge Special. Sprouts are of attractive shape, easily detached and little affected by frost.

Canner yielded poorly for two seasons and has been discontinued in trials. Its sprouts were largely of inferior quality.

At Sprowston de Rosny has produced high gross yields but the sprouts are typically of elongated shape less suitable for freezing and packing.

Potato Variety Trials

In 1957 and 1958 the new Irish maincrop varieties Ulster Beacon, Ulster Tarn and Ulster Torch were compared in trial at Spowston with the Recommended maincrop varieties Majestic, Arran Viking and Ulster Supreme.

In the first of the two trial years all varieties yielded better than Majestic. Arran Viking was the best with 3 tons per acre more ware over the 2 in. riddle than the older variety, followed by Ulster Beacon and Torch yielding 2 tons per acre and Ulster Supreme and Tarn 1 ton per acre more than Majestic.

It was interesting to note that Arran Viking also showed a much lower proportion of seed sized tubers than the other varieties, especially Ulster Tarn and Torch which produced a higher proportion than average of smaller tubers.

In 1958 Majestic yielded relatively better than the new introductions with the exception of Ulster Torch which maintained the high yield level shown in the preceding year at Sprowston and at all other centres.

Of the new varieties, all late-maturing, white fleshed and white skinned, Ulster Torch has attracted the most attention because there was a real hope that this variety had some resistance to blight. In fact in the first years of testing at Sprowston and elsewhere its foliage showed virtually complete resistance but unfortunately this broke down in many trials during last season. Although the foliage shows resistance the tubers, which tend to be rather irregular in shape, appear more susceptible to infection than those of the other varieties in trial. At Sprowston its vigour of establishment from unsprouted seed was particularly noteworthy. Preliminary tests indicate that as regards keeping and cooking quality Ulster Torch is in the same class as Ulster Supreme.

Ulster Beacon and Ulster Tarn differ in habit of foliage but produce tubers of similar type and shape; despite extreme blight susceptibility, Ulster Beacon gave the higher yield of ware in both Sprowston trials. Little information on quality of these varieties is available at present.

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