THE MORLEY FARM

A Report for Members of the Norfolk Agricultural Station

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ROTATION TRIALS

Phosphate and Potash Rotational Manuring 1963–1968

The lack of fertilisers during World War II left a legacy in the immediate post-war years of soils that were deficient in phosphate and potash, a position that was particularly serious on the lighter lands in Norfolk. Many farmers—the Station included—countered this by generous use of these fertilisers as soon as they became available, with the result that by the early sixties most of the soils at Sprowston were classified as having medium levels of potash and high levels of phosphate.

It was felt at this time that some savings could be made in fertiliser costs by a reduction in the levels of these nutrients but it was not known to what extent they could be reduced without affecting yields. Accordingly an experiment was designed to examine four levels of phosphate and potash over the whole of the normal six course rotation at Sprowston. The plots received in total over six years all combinations of nil, 5, 10 and 15 cwt per acre of 18% superphosphate and nil, 3½, 7 and 10½ cwt per acre of 60% muriate of potash These manures were applied directly to the pea, potato and sugar beet crops as seedbed dressings in a six course rotation of peas, potatoes, winter wheat, winter barley, sugar beet and spring barley. In order to eliminate climatic conditions as far as possible the trial was divided into six separate sections, so that all crops were under treatment in any one year. The levels of manures which each of the above crops received individually are shown in the table below.

	18% Superphosphate				60% Muriate of potash			
Peas	0	1	2	3	0	1	2	3
Potatoes	0	2½	5	7½	0	1½	3	4½
Winter wheat ..	—	—	—	—	—	—	—	—
Winter barley ..	—	—	—	—	—	—	—	—
Sugar beet	0	1½	3	4½	0	1	2	3
Spring barley ..	—	—	—	—	—	—	—	—
Six year total application ..	0	5	10	15	0	3½	7	10½

The cereal crops received no direct application of phosphate or potash but measured the residuals as the rotation progressed. All crops received nitrogen at the appropriate levels, but no farmyard manure was used on the potatoes and the sugar beet crop received no salt.

The experiment completed its first rotation in 1968. Six years' results are now available for peas, sugar beet and potatoes, but the residual responses if any in the cereal crops will not be available until after the 1970 harvest.

Bearing in mind the initially high levels of phosphate and potash in the soil, the high value cash crops have shown considerable responses even in the first rotation. Potatoes gave a consistent and increasing response up to the highest level of phosphate, an increase of 1.2 tons per acre of ware over the treatment where no phosphate was used. This crop also gave a response of 2.4 tons of ware to the medium level of potash, when compared to the nil treatment. Any further increase in potash level gave no corresponding increase in yield.

Vining peas, a crop where the requirements were likely to be less than those for potatoes, showed a need for an application of both phosphate and potash but only at the lowest levels. No increases were recorded where higher levels were used.

In the case of sugar beet, no consistent trend was recorded from increasing phosphate applications but this crop showed a large response to potash. Yields increased from 15.6 tons per acre of washed beet where no potash was given up to 17.3 tons per acre at the highest rate of application and sugar content also rose from 16.5 to 17.0%. When combined, these two results show a considerable increase in yield of sugar from the use of the high rate of potash, amounting to 7.4 cwt per acre. It must be emphasized however that these plots did not receive salt and some part of these increases must be directly attributable to this factor.

Treatment responses in the cereals have been relatively small so far. A slight increase in yield of winter wheat occurred where phosphate was applied to the preceding potato crop and the low level of potash also gave 1 cwt per acre more grain. A similar residual response was shown by the winter barley, which in this case was the second white straw crop in the rotation Spring barley as the first white straw crop after sugar beet has so far given no response to either fertiliser. These cereals have not yet completed their full six-year cycle as testing crops but it would seem unlikely that in the first rotation any large differences will occur.

So far the results show that even under conditions of high fertility the requirements of cash crops such as peas, potatoes and sugar beet need to be met with adequate direct manuring in the form of inorganic fertilisers. Even though there may appear to be adequate reserves of phosphate and potash in the soil, this is either not sufficient, or is not readily available to meet the maximum requirements of these crops. On the other hand, it would appear that the reserves are adequate in most cases for the needs of the succeeding cereal crops, and it is from these that savings in phosphate and potash usage may be made. From a farming point of view these results confirm the results from annual experiments where little response to phosphate and potash in cereals grown as a first white straw crop has been obtained. On the other hand, such crops respond spectacu-

larly to top-dressings of nitrogen—a factor not covered by the treatments included in this trial.

CEREAL TRIALS 1969

Use of CCC for Winter Cereals

The trial series evaluating the use of CCC on Cappelle-Desprez wheat at Morley completed its third year in 1969. This year the experiment was sited on a second successive wheat crop after potatoes, and treatments of 0, 40, 80 and 120 units nitrogen per acre were given as a spring top-dressing. When the first stem node was detected at the base of the shoot, half the plots, at each nitrogen level, were sprayed with CCC at the recommended rate of 1.5 lb a.i. per acre (3 pints *Cycocel*).

The optimum level of nitrogen for both the CCC treated and the untreated crop was 80 units. With this rate of nitrogen the untreated crop was badly lodged and yielded 34.7 cwt. Treatment with CCC reduced the length of straw by 8 inches and very little lodging occurred and the crop yielded 37.8 cwt thus giving an increase of 3.1 cwt grain over the untreated crop.

Three years of trials indicate that the use of CCC on winter wheat is likely to be of worthwhile benefit where there is a strong possibility that the crop would otherwise lodge.

The fourth and final year of the trials in which CCC was used on Maris Otter barley was completed in 1969. The results confirmed those obtained in earlier years, namely that the use of the material on winter barley at Morley is not justified.

Winter Wheat Variety and Nitrogen Manuring

In this trial relatively new varieties showing commercial promise are grown alongside Cappelle-Desprez and all receive three or four rates of nitrogen fertiliser in the spring. Cappelle-Desprez is used as a standard for comparison as this variety has performed consistently for several years and is well suited to the locality. The trial was sited at Morley for the first time in 1968/69 and was sown as the second successive cereal crop after potatoes. The rates of nitrogen used were 40, 60 and 80 units per acre.

Maris Ranger, Maris Widgeon and Joss Cambier were in trial for the second successive year, and two other varieties, West Deprez and Cama, were included for the first time. All six varieties are on the N.I.A.B. list of recommended varieties but the last two named are comparatively new additions. Cama was the highest yielding variety and averaged 37.9 cwt per acre, which was 2.5 cwt more than Cappelle-Desprez. Joss Cambier and Maris Ranger yielded better than Cappelle and averaged 37.0 and 36.2 cwt per acre respectively. The remaining two varieties yielded a little less than Cappelle-Desprez. The shorter stiff varieties Cama, Joss Cambier and Maris Ranger stood well and all gave top yields with the highest rate of nitrogen applied (80 units). The other three varieties suffered some lodging particularly at the highest rate of nitrogen and gave no worthwhile increase in yield in excess of 60 nitrogen units per acre.

Although the overall performance of West Desprez was a little disappointing it yielded well where 60 units nitrogen had been given but at the highest rate severe lodging affected yield.

Observations were made for susceptibility to some of the more common diseases and smutted ears were seen in Cappelle-Desprez, West Desprez and Maris Ranger, although the level of infection in Maris Ranger was very slight indeed. Both Cama and Joss Cambier were affected by mildew but infection was late and yield did not appear to have suffered much as a result of the infection. Although eyespot could have been expected all varieties appeared free from disease, and where lodging occurred, it was not attributable to this disease.

In 1967 and 1968 the performance of Joss Cambier had been disappointing but in 1969 this variety yielded well. In fact the performance of all varieties tested was as might have been expected from their relative classification on the N.I.A.B. recommended list.

Use of Anhydrous Ammonia for Cereals

Anhydrous ammonia as an alternative source of nitrogen for cereals has now been examined at the Station for four years. In the most recent trial it was compared with ammonium nitrate on a crop of Cappelle-Desprez winter wheat following peas. Unlike the two previous years the wheat was well brairded by the time the treatments were applied in early April. The yield differences between the treatments receiving the two forms of nitrogen were small and averaged 0.3 cwt in favour of the solid fertiliser. The response to nitrogen was good, 80 units resulting in the best mean yield of 44.1 cwt. It was noted, however, that where anhydrous ammonia had been applied the crop was slower to respond and this could have resulted in the small though consistently lower yield at each rate of nitrogen tested. In previous years, on crops less well established, the use of anhydrous ammonia had proved disappointing. The results over four years indicate that for winter wheat the stage of growth and time of application will affect results and in certain circumstances the slow release of nitrogen can be a disadvantage.

The trial comparing the two forms of nitrogen as seedbed dressings for spring barley confirmed the results of previous years. Although in 1969 the yield of barley receiving anhydrous ammonia was approximately 1 cwt less than that receiving ammonium nitrate, this again may be considered as a reflection of the season. Results over several years show anhydrous ammonia to be a suitable alternative to ammonium nitrate for use on the seedbed. The choice between the two materials will therefore depend largely on unit cost, cost of application and relative ease of handling.

Intensive Cereal Growing

Interest in continuous cereal cropping has waned a little over the past two years. This is no doubt due to the present economics of cereal production and an increasing awareness that the practice frequently gives rise to problems of disease and weeds. The long term trial on the

continuous growing of winter barley at Sprowston completed its sixth and final year in 1969 while that on spring wheat at Morley was cropped for the third season.

Maris Otter barley was sown in October at Sprowston and in addition to an autumn dressing of 2 cwt of a 10:10:20 mixture it received an application of four levels of nitrogen (21, 42, 63 and 84 units) in the spring. A comparison between a second successive crop through all stages of cropping to a sixth successive crop was possible and results show a similar pattern of yield to that experienced in previous years. Some lodging occurred throughout the trial and bird damage gave rise to some variability in yield data. The second barley crop averaged 32.7 cwt and the optimum level of spring nitrogen was 42 units when a yield of 33.9 cwt was recorded. The yield of barley declined with increasing years of cropping and the sixth crop averaged 26.6 cwt with a yield of 29.3 with 42 units of spring nitrogen.

The pattern of response to nitrogen was variable but there were again firm indications in the third to fifth year of cropping that the optimum spring nitrogen requirement rose at least to 63 units. Where only 21 units of nitrogen were applied in the spring, the difference in yield between the second and sixth successive crops was 9 cwt thus illustrating the importance of soil fertility and correct use of nitrogen. Although all the causes of decline in yield with succeeding crops have not been determined increasing competition of grass weeds and disease are partly responsible.

At Morley, Kolibri spring wheat was sown in early April and received nitrogen topdressing to bring the levels of nitrogen fertiliser to 40, 70, 100 and 130 units per acre. The trial enabled a comparison to be made between first, second and third successive crops after a two year break. While broad leaved weeds still proved troublesome, particularly where crop growth was poor, the problem of creeping thistle, which had been prevalent in 1968, was largely controlled. The first crop after the break yielded on average 32.9 cwt grain per acre, the optimum level of nitrogen for this crop being 100 units which resulted in a yield of 37.5 cwt. The second and third crops averaged 23.3 cwt and 21.2 cwt per acre respectively. The second crop gave a maximum yield of 27.9 cwt with 100 units N while the third crop gave a continuing response to 130 units of nitrogen when its maximum yield was 24.7 cwt. No lodging occurred in the trial and the response to the higher levels of nitrogen may be a reflection of the peculiarities of the season.

Patches of take-all and eyespot were apparent in the second and third crops and pathological examination confirmed that these diseases had increased considerably compared with the first crop after the break. Three years of successive spring wheat crops indicate that the loss in yield that has so far been recorded would rule out the practice, but the trial will continue to the fifth or sixth year in order to confirm results so far obtained and to determine the behaviour of the crop in relation to disease problems.

Winter *v.* Spring Barley and Nitrogen Manuring

A new trial was started in 1968 to reassess the comparative performances of winter and spring barley, using two modern varieties, Maris Otter and Sultan, at three drilling dates. Each variety was grown at three levels of nitrogen, 40, 60 and 80 units per acre.

The early sowing of Maris Otter was made on the 14th November but the two later drillings, where both varieties were to be used, were delayed due to wet soil conditions until the 10th March and 5th April respectively. Because of the lateness of the third drilling it was decided to replace Maris Otter by Zephyr.

The autumn drilled Maris Otter not only gave the highest yield —33.5 cwt with 80 units of nitrogen—but also came to the combine some four weeks before the remaining treatments. Delaying drilling of this variety until March, resulted in a loss of 1.1 cwt of grain at the 80 units level. March sown Sultan yielded very poorly, giving 2 cwt less than the winter variety drilled at the same time. The April drilling of Sultan was more successful, probably due to the much improved soil conditions at the time of the last drilling. Again 80 units of nitrogen proved to be optimum, and at this level Sultan yielded 30.9 cwt per acre, against 27.1 cwt from Zephyr.

The first year's results have shown clearly the advantages of winter barley in a year when very wet and cold conditions delayed the sowing and subsequent growth of spring varieties. Subsequent work of this type will probably indicate more clearly those conditions leading to the optimum development of spring varieties.

Spring Barley, Varietal Type and Nitrogen

The responses to nitrogen from a quality malting barley, a dual purpose variety, and a feeding barley were again compared in 1969, using Proctor, Sultan and Deba Abed respectively. In 1968, the first year of the trial, the poor yields showed only small responses to nitrogen and there were no significant interactions between varietal types and nitrogen. In 1969 yields were closer to normal but again there were no significant interactions between variety and nitrogen. The best yield was 36.3 cwt per acre and was obtained from Sultan at 40 units of nitrogen. At this level of nitrogen, Proctor also gave its highest yield, approximately 3.5 cwt below Sultan. The most economic return from Deba Abed was also at this level of top-dressing although its highest yield was at the 60 unit level.

Increasing the nitrogen application to 100 units of nitrogen per acre caused excessive lodging in Proctor and severe lodging in Sultan with corresponding marked reductions in grain weight. There was no lodging in the case of Deba Abed but there was some depression in yield above the 60 unit level.

Spring Barley, Variety and Nitrogen Manuring

For the sixth successive season, new spring barley varieties were examined at Sprowston with particular reference to their responses to differing levels of nitrogenous manures. The six varieties grown in 1968 were Zephyr, Julia, Vada, Sultan and Impala, with Proctor as

control, and each was grown at 42, 63 or 84 units of nitrogen per acre. The trial was drilled on land which followed a well manured sugar beet crop and in this season despite the loss of nitrogen from arable soils through leaching following an extremely wet autumn and winter, there was on average no response to nitrogen above the lowest level applied.

Individually, all varieties except Impala and Proctor gave their highest yields at the lowest rate of nitrogen. In the case of Proctor and Impala, 63 units per acre of nitrogen gave a marginally better yield than 42 units.

All varieties gave substantially better yields than Proctor at all levels of nitrogen. There was little to choose between Zephyr, Julia and Vada, all yielding 5 cwt per acre more than Proctor. Sultan gave 1.3 cwts per acre less than the three highest yielding varieties, but this variety nevertheless outyielded Proctor by an appreciable margin. Impala, having lost its resistance to mildew has not yielded well for the past four seasons and in this trial the same trend was shown. However, the variety gave on average a 2.5 cwt per acre increase above Proctor.

It would appear from these results and those of the last few seasons that Proctor is becoming outclassed as far as yield is concerned. But, if the newer varieties are to maintain their supremacy, their disease resistance or tolerance must be maintained and not lost as in the case of Impala.

Spring Barley, Mildew Control

It has been estimated that a severe attack of mildew can reduce the yield of spring barley by as much as 20% particularly if infection comes before the crop is heading. In order to determine the relative importance of mildew on spring barley and the effectiveness of fungicides for its control a trial series examining these factors was started in 1969.

Three fungicides likely to come on the market in the next year or two were used in the experiment, these were *Milstem* (ethirimol), *Calixin* (tridemorph) and *Benlate* (benomyl). The first named was applied as a seed dressing and the others given as a spray in late May at the time the crop was being sprayed for weed control. Since varieties vary in their susceptibility to mildew the materials were applied to three varieties, namely Proctor as a susceptible variety, Sultan as a variety with high inbred resistance, and Julia as being intermediate in susceptibility. The crop was a third successive cereal after sugar beet and was grown at two rates of nitrogen, 50 and 80 units per acre.

Milstem as a seed dressing presented some practical difficulties for at a rate of 1.25 lb product per acre it did not adhere to the seed well and reduced the 'flow' of the seed, a factor which had to be taken into account when setting the drill. *Benlate* is a wettable powder and was made up for use as a spray without difficulty and applied at the rate of 2.0 lb per acre. *Calixin* is a liquid and was applied at the rate of 0.54 pints per acre. Both sprays are compatible with a number of

herbicides and could have been applied when weed control measures were being taken.

Mildew infection in the crop was not high and in late May when the crop received the sprays only a few mildew lesions were found. Four weeks later—in late June—the highest level of 7% leaf area infection (3rd leaf from ear) was recorded on the untreated Proctor receiving 80 units of nitrogen and after a further two weeks this was found to have increased to 13% leaf area infection. In late June all treatments had held the level of infection to 1% or less, but by 10th July, whilst *Milstem* still held infection to 1% or below, where *Benlate* had been used, damage had increased to 7.5% on Proctor with 80 units nitrogen, and with *Calixin* the infection was 5.5%. Both Julia and Sultan were only slightly affected by mildew, the highest level recorded on Julia was 3% and on Sultan 1.5%.

Unfortunately the crop as a whole was badly lodged, Proctor appearing to be the weakest strawed variety and Julia the stiffest. Considerable plot variation occurred as a result of lodging but the overall effect of the fungicides was to increase yield. Individually *Milstem* had little effect on yield but *Benlate* and *Calixin* gave increases of 1.3 and 2.3 cwt per acre respectively. It would be unwise to view these yield differences as being entirely due to treaments applied. However, the results obtained indicate the seed dressing of *Milstem* to have greater persistence for control of mildew than the materials applied as sprays, but in the trial the benefit was not reflected in a yield advantage. The materials applied as single sprays are likely to give adequate control of mildew for the period of active plant growth provided infection does not occur early.

This work is to be continued and is being extended to winter wheat where *Benlate* is also to be used as a seed dressing and *Milstem* as a spray.

Spring Wheat Sowing Date, Seed Rate and Nitrogen

Yields obtained from Kolibri spring wheat during recent years indicate that this variety is superior to all others, and in some situations may be considered as an alternative to spring barley. A general shortage of seed of Kolibri precluded any appreciable acreage being sown at the Station in 1969 and the variety Rothwell Sprite was sown on two fields. The revival of interest in spring wheat has caused the choice of seed rate to be raised again since the newer varieties differ considerably in character from the older varieties. In 1969 a preliminary trial was laid down to examine the effect of seed rate on yield of Rothwell Sprite in relation to date of sowing and nitrogen manuring.

Difficult soil conditions in the spring prevented the preparation of ideal seedbeds and early sowing. Four seed rates of 144, 173, 198 and 230 lb per acre were used together with four rates of nitrogen —30, 60, 90 and 120 units per acre—at each of two sowings undertaken on 25th March and 14th April. The trial was sited on a field previously cropped with sugar beet. Following the wet winter and spring, response to nitrogen fertiliser was good and at both sowings

the use of 120 units gave the highest yield. At the first sowing, however, 90 units proved to be the optimum rate and resulted in a mean yield of 32.3 cwt compared with 27.6 cwt from the later sown plots which had received the optimum nitrogen dressing of 120 units. There was no indication of lodging even where 120 units maximum had been given, irrespective of seed rate or time of sowing.

The delay in sowing from late March to mid-April markedly reduced grain yield and a mean reduction of 7.9 cwt was recorded. Where nitrogen manuring was substantially below optimum the crop grew very poorly where it was late-sown and yielded 10 cwt less than the earlier sown crop receiving the same rate of nitrogen. Although there was some variability in the response to seed rate the March sown crop yielded equally well at all rates tested. However, where the crop was late sown the seed rate of 144 lb resulted in the yield being approximately 2.5 cwt less than that obtained from any other provided the optimum or near optimum rate of nitrogen fertiliser had been given. At the lowest rate of nitrogen there was an increase in yield of 1.5 to 2.1 cwt for each increment in seed rate. The results show that in 1969 a seed rate of 173 lb would have been adequate and could in some instances have been still further reduced. Plant and tiller counts taken in mid-July showed that percentage plant establishment at both sowing dates did not fall appreciably with increasing seed rate over the range of 144 lb to 198 lb per acre but above this, establishment appeared to fall more rapidly. Tillering capacity, however, was largely unaffected by seed rate or time of sowing. When ear bearing tillers are considered in relation to seed rate and yield it is apparent that ear size, grain weight and size may have been affected by the seed rate. An analysis of grain size is necessary to determine which of these factors was operative.

Since this is only the first year of the study, further work is to be undertaken before any firm recommendation can be made, it is therefore intended to pursue the investigation using the variety Kolibri in 1970.

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

Winter Wheat

Due to the large number of varieties in their first year of statutory testing, it was necessary to have two trials. The Main trial of eleven varieties and the Statutory Performance of twenty-seven varieties were drilled in late October on a good seedbed. Establishment and early growth were good and although severe frosts occurred during the winter, snow cover prevented any significant frost damage. Soil conditions were very wet throughout the winter and there was some waterlogging, particularly on the Main trial.

Diseases were less prevalent than in some recent years. Moderate levels of mildew were recorded on several varieties but on only one variety, in the Statutory trial, did infection exceed the 25% level. *Septoria* was more noticeable as a leaf infection than in previous years and reached the 25% level on several varieties, including Maris

Ranger. Loose smut was at a higher level than in 1969, but yellow rust was confined to a very low level on Hybrid 46 and Cappelle. A rare occurrence was the presence of brown rust on a number of varieties which, although late appearing, did reach a moderate level of infection on Cama. Lodging was absent on all varieties apart from a weak strawed one in the Statutory trial.

Wet weather in the second half of August delayed harvesting until early September, but there was no apparent shedding or sprouting. Yields nevertheless were low and the nitrogen levels applied (45 and 90 units) may have been too low in view of the excessive rainfall in late spring. In the Main trial Cappelle yielded 26 cwt per acre and Maris Ranger gave a similar yield. Cama was 7% above, while Maris Settler and Maris Beacon outyielded Cappelle by 14% and 16% respectively. Maris Nimrod, in its first year of Main trial, was over 20% above Cappelle, and performed well at most N.I.A.B. regional centres.

In the Statutory Performance trial Cappelle produced 35 cwt per acre, with Maris Widgeon 8% above this. Of the twenty-three varieties in their first or second year in trial, only two gave yields significantly above that of Cappelle.

Winter Barley

Sown in mid-November, the trial established well. Although severe frosts were recorded during the winter, snow cover afforded protection to all plots, with only slight frost damage on some varieties, which included Maris Otter. An observation plot of Proctor suffered more serious damage, with some plant mortality.

Growth was very slow in the spring, and despite a damp May, *Rhynchosporium* was late appearing. Infection built up rapidly on Maris Otter and reached a level of over 50%, but the disease was not serious on any other variety. Loose smut was serious on several varieties, but it was interesting to note that Malta suffered only a low infection. In previous seasons this variety had shown extreme susceptibility to loose smut, but this year the seed used was once-grown systemic fungicide treated seed. Mildew infection was heavy on several of the six-row varieties, with a level of over 75% on Leon and nearly as high on Senta.

Two of the four replicates of the trial were caged and netted as a precaution against bird damage. This was obviously worthwhile, for on the two unprotected replicates over half the plots were later seriously damaged and had to be abandoned for yield purposes. Lodging was not serious in any variety, and was confined to moderate lodging in Leon and moderate leaning in several other varieties.

Harvesting was completed under excellent weather conditions. Maris Otter yielded just over 19 cwt per acre and Senta gave 22 cwt. However, due to the high number of 'missing plots', the standard error of this trial was very high and none of these yield differences were significant.

Winter Oats

The trial of five varieties was drilled in mid-November. Emergence was very slow and establishment, although adequate, was not very good. Frost damage was slight to moderate and growth in early spring was very slow. There was an almost complete absence of disease, with negligible levels of mildew. Very little lodging occurred in the trial, apart from moderate lodging on the high nitrogen lodging strip on Padarn. The crop appeared poor right through the summer, but yields were very good. Peniarth produced nearly 36 cwt per acre, as did Maris Quest. Maris Osprey (AB 158/7) was 5% higher than Peniarth, and its yield on the two high nitrogen blocks (70 units N) was over 2 tons.

Spring Wheat

The trial was drilled on 25th March on a seedbed that although dry on the surface was very wet at no great depth. Establishment and early growth were good, but by early summer it became apparent that the levels of nitrogen applied (low N blocks 45 units, high N blocks 90 units) were inadequate. Mildew was present on all varieties with a maximum level of 50% on Rothwell Sprite and Koga II. 25% infection levels were recorded on Pompe, Janus, Troll, Kloka, Maris Ranger and Svenno. The only yellow rust recorded was a low infection on Kolibri and a moderate primary focus on Rothwell Sprite.

Kolibri was again the highest yielding variety in the trial but did not outclass other varieties to the same extent as in 1968. Its mean yield was 25 cwt to the acre, but the inadequate nitrogen levels were reflected in that, whereas the two low nitrogen plots meaned at 19 cwt per acre, the two high nitrogen plots averaged 31 cwt per acre.

All the Recommended varieties were in the trial, and the nearest in yield to Kolibri was Maris Ensign, 6% down. Rothwell Sprite was 14% below Kolibri, with Troll at a similar level. Maris Ranger, which was included as a spring sown variety, gave a yield similar to that of Rothwell Sprite. Of the varieties in their final year of testing, Sirius and Toro were the best yielders, 6% below Kolibri.

Spring Barley

Thirty-four varieties were in this trial including the four Recommended varieties Proctor, Zephyr, Deba Abed and Sultan. The trial was drilled on 9th April and establishment was excellent, with strong growth throughout the growing season. Mildew reached moderate levels of infection; Zephyr was the most heavily infected Recommended variety, with a level of over 25% and this level was approached on Berac and Imber. A level of just over 10% was recorded on Proctor, and Sultan, which in previous seasons had shown complete resistance, suffered a 5% infection. *Rhynchosporium* was generally at a low level, with a maximum of 10% on Deba Abed, and up to 5% levels on the other Recommended varieties and those in their final year of trials. Loose smut was again prevalent, with very heavy infections on some of the new varieties. Sultan suffered a heavy

infection, but Zephyr had a light infection only. A low infection occurred on Proctor, the first time for many years in which the disease has been seen on this variety.

With the absence of summer storms lodging was almost completely absent, despite the relatively strong straw growth, and only slight lodging occurred in Proctor. Harvesting was delayed by wet weather until early September, by which time all varieties were well past combine ripeness. Brackling became serious in all varieties, but no sprouting was seen and ear loss before cutting was only slight. Proctor gave a yield of 27 cwt per acre and Sultan outyielded this by 5% at 29 cwt. Zephyr was marginally below Proctor while Deba Abed was 8% below. The highest yielding of varieties in final year of trials was Felda, 6% above Proctor, with Berac 4% above. Gerkra and Midas were 4% below Proctor and Imber 6% below.

Spring Oats

This trial was drilled on 29th March. Establishment and early growth were satisfactory, but later growth was poor, with all varieties remaining relatively short in the straw. There was no lodging apart from on the very early Ayr Grenadier and a moderate amount of leaning in Manod and Maelor. Mildew remained at a low level, barely reaching 10% infection on Condor and Astor, while Mostyn maintained its complete resistance.

Harvesting was delayed by wet weather and was carried out between showers on 28th August. There was appreciable shedding of grain before harvest, possibly as a result of the unusually high straw stiffness, but varietal differences were not marked. Condor, with a yield of 28 cwt per acre, outyielded all other varieties in the trial. Bento was 5% below, and Astor was 8% below with a yield of 26 cwt. Mostyn and Rosenante produced similar yields to Astor.

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