THE MORLEY FARM

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CEREAL FOLIAR DISEASES

Winter Wheat. Yellow Rust

The past season will long be remembered for the severity of yellow rust encountered on some fields of winter wheat. The variety Joss Cambier, widely grown in 1972, proved to be particularly susceptible to one of the races of the disease and in many instances the yield from this variety was much reduced. In an attempt to halt the spread of the disease many growers resorted to an intensive spraying programme, a practice not previously used on which little prior information was available either concerning the effect on the disease or on resultant crop yield.

Experience at the Station in 1972 confirmed the opinion that early sown Joss Cambier was very susceptible particularly in situations where the crop came as a second successive wheat crop. One such field on the Station provided an ideal site for evaluating the role of chemicals in the control of the disease. Yellow rust was observed in the crop in early May and by the end of the month about 5% of the leaf area of the two top leaves was infected with the fungus. During June there was a further rapid spread which was favoured by cool damp weather and before the end of the month over 60% of the surface area of the flag leaf of the untreated crop was affected and leaf senescence had commenced. By the middle of July a high proportion of ears were affected and flag leaf area lost because of yellow rust exceeded 77%.

The chemicals tested in a fully replicated trial were sulphur (in an oil formulation), *Calixin* and the chemicals triforine and BAS 3170F which in summer 1972 were not commercially available. In addition a tank mix of a reduced rate of BAS 3170F and *Calixin* was included in the trial. All chemicals were applied on each of two dates, 17 May and 1 June, both as a single and as a repeated application. Additional plots were also included to test the efficiency of *Antracol* at a rate below that subsequently recommended, *Calixin* plus a dithiocarbamate, and a systemic fungicide being developed by Hoechst Chemicals.

Sulphur was of very little value in preventing the development of yellow rust and subsequent crop yield was little different from that of the untreated crop. *Calixin* and to a lesser extent triforine and *Antracol* markedly reduced the activity of rust present at the time of spraying and development of the disease was arrested for 10-14 days.

The best performance from a single spray of these chemicals was given by *Calixin* applied on 1 June just prior to ear emergence and the yield was increased from 23.6 cwt on the untreated crop to 26.8 cwt per acre. The double application of *Calixin* proved much more effective in restricting the development of the disease and resulted in a yield increase of 6.4 cwt per acre.

The two chemicals BAS 3170F and that being developed by Hoechst showed considerably greater persistency. A single spray of the former on 1 June was effective for about four weeks after application giving a yield benefit similar to that given by the double spray of *Calixin*. When an application on 17 May was repeated on 1 June the leaf remained almost free of yellow rust at the end of June but there was some infection on the ears. At this point and again later in July additional sprays of the chemical were applied in an attempt to keep ear infection to a minimum. These repeated applications failed to keep the ears free of infection but the yield achieved was 35.3 cwt – almost a 50% increase over the untreated crop. The tank mix of *Calixin* and BAS 3170F gave similar results to that given by BAS 3170F on its own. The crop as a whole was only slightly infected by powdery mildew and for this reason the addition of *Calixin* failed to give any additional benefit.

The results of this trial clearly demonstrate the substantial loss in yield that can result from a severe attack of yellow rust. Losses can be minimised by foliar sprays and of those tested and commercially available in 1972 *Calixin* was the best. From the supplementary plots it appeared that the addition of a dithiocarbamate may have improved the control of the disease. From chemicals currently available (1972) a programme of repeated spraying was the most successful, the frequency being dependent on the severity of the attack. Where this practice is adopted the second spray is likely to be required some 2 weeks after the first application. If a single application only is planned this is best delayed until the top two leaves are showing signs of infection at a level not exceeding 5% of the leaf area.

Chemicals superior to those commercially available in 1972 are likely to be on the market before long and for materials such as BAS 3170F the results suggest that the application of the second spray may be delayed for a period of three to four weeks after the first and a single application may be adequate where reinfection is slow to build up or where initial infection is late.

Chemical control of yellow rust in wheat can only be viewed as a preventative measure to be used when a crop succumbs to the disease and for this reason the growing of very susceptible varieties is inadvisable. Since varieties differ in their degree of susceptibility to a number of individual races of rust, a range of resistant or moderately resistant varieties on a farm is preferable to a single one as this will reduce the risk of heavy yield loss.

Following the heavy attack on the 1972 crop, sources of inoculum for 1973 are widespread and these present a very real threat, particularly if we have a second mild winter. Farmers are

advised to keep a frequent check on their wheats for the early appearance of the disease. This precaution is particularly important where known susceptible varieties are being grown. The variety Maris Ranger was reported to be infected by a race of yellow rust in 1972 and while the level of infection was generally low its susceptibility to the disease should be borne in mind when crops are inspected.

Work at the Station in 1973 will include the continuation of the 1972 work on yellow rust and some attention will also be given to *Septoria* since this disease was troublesome in parts of North Norfolk this last year.

Spring Barley. Mildew control — time of spraying

The programme of work started in 1970 was continued in 1972 and since results were similar to those of previous years this particular trial series is now considered complete. The incidence of mildew varies considerably from year to year and from one field to another a fact that was particularly apparent in 1972. Winter barley acts as a source of mildew inoculum for the spring sown crop. In early May the level of mildew was particularly high on fields close to infected fields of winter barley and by the middle of the month the disease on the basal leaves of plants infected was sporulating freely. Strong winds delayed the application of foliar sprays to trial plots until 19 May and shortly afterwards the advent of cool damp weather restricted the spread of mildew and crops grew away strongly. Mildew was dormant until mid to late June when a further increase in disease level occurred and early applied sprays were largely ineffective against this late attack.

Mildew sprays of *Calixin*, wettable sulphur and sulphur in oil were applied to Proctor barley in the spray timing trial as single sprays on 19 May, 1 June and 13 June at growth stages 5, 7 and 8 respectively. Half the plots sprayed on 19 May received a second spray treatment on 13 June. The control of mildew given by *Calixin* was very good and persisted for three to four weeks. At the time of applying the first spray the level of infection was past that when spraying would normally have been recommended but for the reason stated previously spraying was delayed. On 19 May the third leaf from the top was showing about 40% leaf area infection. The control given by both forms of sulphur was less satisfactory and the persistence of control was poorer than that given by *Calixin*.

The untreated crop yielded on average 31.0 cwt and there was an increase of 2.8 cwt following the treatment of the crop with *Calixin* on 19 May. For the first time in three years a further spray on 13 June gave an additional yield increase slightly in excess of 1.0 cwt. The single application of *Calixin* on 1 June and on 13 June increased yield by 0.6 and 0.7 cwt respectively compared with the mean of the untreated plots. In no instance did the use of sulphur as a single or double spray give increases in yield in excess of 2.0 cwt. On average the oil "formulation" was slightly superior to the wettable powder without the addition of oil.

The trial series has demonstrated that worthwhile increases in crop yield can be obtained following the use of *Calixin* and that the chemical should be applied when mildew is beginning to build up on the lower leaves of the plant. Sulphur has proved useful during periods of dry weather but has lacked the persistency given by systemic fungicides and yield results were not as good. In areas where spring barley is subject to early attacks of mildew the use of a seed dressing as an alternative to foliar treatment should be considered for use on susceptible varieties. Where reliance is placed on foliar treatment the use of a systemic fungicide is advisable and evidence from trials at the Station suggests that this is best applied before mildew spreads to the upper leaves of the plant. In most instances a single spray treatment will suffice and only in the case of late infection following early spraying will a second spray treatment be justified.

Spring Barley. Mildew Control and Brown Rust

Recent years have seen an increase in the level of brown rust *(Puccinia hordeii)* on winter and spring barley. In 1971 the yield of susceptible varieties of spring barley was greatly reduced by a build up of brown rust during July. The severity of infection is influenced by weather and warm dry conditions favour rapid spread. The disease is thus often encountered late in the season and it is generally believed that crop yields are not seriously affected. However an early attack on leaves and awns can result in inferior grain size and marked reduction in yield.

Fungicides are currently being developed which are effective against many types of rust and two trials were undertaken at the Station in 1972 in an attempt to assess the importance of brown rust in relation to mildew and to determine the possible value of chemical treatment.

The variety Proctor is recognised as being relatively susceptible to brown rust as well as to mildew and was therefore selected for test in both trials. Julia is less susceptible to both diseases and this variety was included in one trial only. In order to evaluate the chemicals for brown rust control on a mildew free as well as a mildew infected crop half of the plots sown to Proctor were seed dressed with *Milstem*. The chemicals BAS 3170F and triforine were applied as foliar sprays in mid-June when the crop was at growth stage 10 and when brown rust was first seen on the 3rd expanded leaf from the top.

Milstem gave a satisfactory control of mildew and increased the yield of the crop to 39.9 cwt compared with 35.5 cwt from the untreated crop which suffered heavy mildew infection in late May and early June.

The incidence of brown rust remained very low until mid-July when some increase of infection occurred. However compared to levels observed in 1971 incidence of the disease was low.

Triforine proved more effective than BAS 3170F in reducing mildew infection but compared to the control given by *Milstem* the result was disappointing. *Milstem* had no effect on brown rust

level while the control given by BAS 3170F was very good being also superior to that given by triforine.

The use of BAS 3170F increased the yield of Proctor by 2.4 cwt in the absence of *Milstem* seed dressing and by 3.1 cwt where *Milstem* had been used. The yield increases given by triforine were about half those given by BAS 3170F.

In a second trial BAS 3170F and *Calixin* were applied to Proctor and Julia in mid-May or in mid-June. The earlier application of BAS 3170F alone increased the yield of Proctor from 35.9 cwt to 39.4 cwt and of Julia from 43.0 to 43.7 cwt. In mid-May, Julia was free of brown rust and Proctor only slightly infected. Mildew infection however was high, particularly on Proctor, and the use of *Calixin* alone increased yield of Proctor by 4.0 cwt and Julia by 3.5 cwt. Delaying the use of *Calixin* until mid-June resulted in poorer yield increases but applying BAS 3170F at that time, when brown rust lesions were apparent on the 3rd leaf, particularly on Proctor, resulted in a yield increase of 3.9 cwt from Proctor and 3.2 cwt from Julia. The early use of *Calixin* followed by the June spray of BAS 3170F gave the best yield increases equivalent to 6.6 cwt of Proctor and 5.0 cwt Julia. In addition to the good control of mildew achieved in the trials by the use of *Milstem* as a seed dressing or *Calixin* as a foliar spray the interesting feature of the results was the satisfactory control of brown rust achieved by the use of BAS 3170F when applied in mid-June. The incidence of brown rust was not heavy and it is perhaps surprising that a mean yield increase of a little over 3.0 cwt was achieved by the use of BAS 3170F on Proctor at that time. This result suggests that the incidence of brown rust can be of considerable importance in determining the final yield of barley. It is also possible that some other factor as yet undetermined is affected by the use of the new fungicide BAS 3170F and that this results in some yield benefit.

The use of fungicides to control cereal mildew in situations where the disease is likely to be prevalent and where non immune varieties are grown is now widely accepted as being economically justified. However the wider use of chemicals for control of other diseases requires further study. Because the cash income per acre from cereals is low compared with that from roots, excessive expenditure on sprays and seed dressings can lead to an uneconomic return. The cost of cereal spraying or the damage caused by tractor wheels must also be added to the cost of the fungicide. In spite of this the results from the 1972 work justifies its continuation for a further year.

CEREAL HUSBANDRY TRIALS

Time of applying nitrogen to winter cereals.

Work in progress on the rate and time of applying nitrogen to winter barley and winter wheat has illustrated the effect that nitrogen has on grain quality. It is now well established that the use of high rates of nitrogen reduces grain size and increases the nitrogen content of the grain. Delaying the date of application of nitrogen

fertilisers may not have a marked effect on yield but when applied late in the spring protein content is increased. This can be advantageous in the case of wheat or barley for feeding, but is deleterious when a malting sample is required.

The correct timing of nitrogen top-dressings for maximum yield is to some extent dependent on weather and results suggest that after a wet winter an early spring (March/April) application is advisable. In the same way, a late application may be rendered ineffective if it is followed by a period of prolonged drought.

In the trial on Maris Otter winter barley at Morley in 1972 the application of fertiliser in mid-April resulted in a higher yield than those obtained from the same weight of fertilisers applied either in mid-February or mid-March. The advantage from the April application was of the order of 2 cwt on a 40 cwt per acre crop, in spite of a somewhat smaller grain size.

At Sprowston after peas where Joss Cambier, West Desprez and Maris Widgeon winter wheats were grown, 60, 80 and 100 units of nitrogen were applied either in early April or in mid-May or split equally between the two dates. Except on Maris Widgeon 60 units of nitrogen was optimum for both the early or late applications. Maris Widgeon gave a better response to the May application of nitrogen and 100 units was optimum. Splitting the dressing resulted in a small increase in yield but this was insufficient to justify the additional work involved. While early application tends to lead to weaker straw, on most mineral soils some nitrogen is required early to encourage spring growth. With the exception of highly fertile areas, it is generally best to complete all nitrogen top-dressings by late April after which date, a late spring drought may result in only partial utilisation.

Examination of the wheat for flour and milling quality showed little consistent difference between samples due to time of applying nitrogen although the later application resulted in some instances in slightly higher protein values and a general increase in gluten.

Placement of Fertiliser for Spring Barley

The trial comparing broadcasting with combine drilling of fertiliser for spring barley was undertaken for a second year. The fertiliser treatments compared two complete mixtures (20:10:10 and 20:15:15) at both 2 and 3 cwt per acre with almost comparable amounts of nitrogen applied as Nitro-Chalk. The broadcast fertiliser was applied at the time of sowing, and the combine drilled material was applied between alternate pairs of rows. The variety of barley was Julia and the crop followed sugar beet. There was a good response to nitrogen fertiliser and on average the use of 60 units of nitrogen compared to 40 units increased the yield by 2.0 cwt per acre. Placement of the Nitro-Chalk failed to give any improvement in yield compared with broadcasting. The addition of phosphate and potash to 40 units of nitrogen did not improve yield but where 60 units nitrogen were applied there was some evidence of improved yield due to the additional 30 units of phosphate and potash where

the fertiliser was either broadcast or placed by the drill. The placement of compound fertiliser showed no yield advantage over the broadcast treatment, in fact crop yield following the broadcast application of the fertiliser tended to be better.

Benefits from the placement of phosphate and potash are only likely to be measured on soils deficient in these elements. On better soils the adequate manuring of root crops will leave sufficient phosphate and potash for the following cereal crop. The soil on which the trial was sited had adequate reserves of phosphate but tended to be a little low in potash.

Intensive Spring Wheat

This trial has now completed five years and the 1972 harvest afforded a comparison between crops grown successively for one to five years after potatoes. The first crop after the break required 70 units of nitrogen to give an optimum yield of 37.4 cwt. The second and third successive crops gave yields of 29.9 cwt and 27.1 cwt respectively with the same amount of nitrogen which was also the optimum rate for these crops.

The fourth crop required 100 units of nitrogen for an optimum yield of 29.2 cwt while in the fifth successive crop the use of 130 units nitrogen maintained yield at 29.1 cwt.

Data from plant samples analysed for take-all and eyespot are not yet available but in previous years the yield decline in the second and third successive crops has been associated with a build up of take-all. The slight yield recovery in the fourth and fifth successive crops may be indicative of the phenomenon of take-all decline which has been observed by other workers in similar systems of cropping.

Examination of the grain samples showed clearly that the percentage tail corn increased to a maximum in the third successive crop and thereafter declined. To date, yields from successive crops of spring wheat have tended to be low and the practice is not one to be encouraged. The site has remained free of serious wild oat or couch grass infestation but broad leaved weeds were abundant in 1972 and the choice of a suitable single herbicide for all weeds became difficult.

Where long runs of cereals are part of the farm system the use of successive crops of spring barley or possibly winter wheat appear, from work elsewhere, to be preferable to continuous spring wheat.

Cultivations for Spring Barley after Late Lifted Sugar Beet.

The sandy loams and sandy clay loams of much of central Norfolk and Suffolk exhibit weak soil structure. They slake readily and are also easily overcompacted. If compaction is present anaerobic conditions are readily formed during periods of wet weather. Conversely under dry conditions compaction gives a high soil strength which may act as a barrier to root growth.

Slaking of the soil can be caused by water alone or by mechanical forces together with water. This is the case when soil is subjected

to the passage of farm machinery when very wet (above its plastic limit). A typical example is the puddling, smearing and compaction caused by lifting sugar beet under wet conditions which frequently occur late in the season. Sugar beet tops are an additional problem since if ploughed in under these conditions anaerobic breakdown may result which gives the soil a characteristic sour smell. It is known that such anaerobic breakdown produces toxins which restrict the rooting of subsequent crops.

An experiment was carried out in 1971 to test the value of various systems of cultivations in overcoming some of these problems for spring barley. The cultivation systems examined are summarised in the table of yield results. Treatment 4 was the control consisting

Yield Spring Barley at 85% d.m. (cwt per acre)

Primary cultivation treatment	Seedbed cultivations			Mean
	Nil	Minimal	Traditional	
1. Chisel plough winter + conventional plough spring.	47.4	47.3	47.1	47.3
2. Chisel plough winter	46.3	47.1	46.1	46.5
3. Chisel plough frosty	46.1	47.2	45.8	46.4
4. Conventional plough winter	46.2	45.9	44.9	45.7
5. Conventional plough spring	46.8	47.2	46.1	46.7
Mean	46.6	46.9	46.0	

of conventional ploughing in the winter. In treatments 1, 2 and 3 one pass of a chisel plough was given in the winter to break up wheel ruts, remove any surface ponding and also to partially incorporate the sugar beet tops into the cultivated soil. This might reduce the risk of anaerobic breakdown which could result from complete burial in the soil resulting from conventional ploughing. Treatment 3 was carried out under frosty conditions to overcome the wheelslip problems that might occur under treatments 1 and 2.

The 5th treatment was to give no cultivation in the winter and allow the sugar beet tops to partially breakdown on the soil surface before ploughing under drier conditions in the spring. The natural weathering actions of alternate freezing and thawing and wetting and drying were therefore allowed to act on the soil surface and help correct the damage to the soil caused by harvesting under wet soil conditions.

Following these five primary cultivation treatments a need was recognised for differing amounts of work to prepare a seedbed. Three degrees of intensity of seedbed preparation were therefore tested ranging from nil, one pass of a springtine cultivator (minimal) or three passes of the springtine cultivator (traditional).

Yields were high with only small differences between any of the

cultivation systems. However, the results do show that conventional ploughing in the winter was no better than one pass of a chisel plough. Following conventional ploughing yields tended to decline as the number of passes of a springtine cultivator to prepare the seedbed was increased. However after chisel ploughing one pass of the springtine cultivator to prepare the seedbed proved beneficial.

The results of this experiment suggest that the effort put into cultivations can be reduced with an obvious cost saving. These economies can be large especially if yields are not reduced. However, experiments concerning soil management are greatly influenced by season and further work is necessary to obtain results under a wider range of conditions.

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

Winter Wheat

The Main trial of 16 varieties was drilled in late October under good conditions with good subsequent establishment. Strong autumn growth was made and slight frost damage was recorded on all varieties, but recovery was rapid.

Much less mildew was recorded than in previous seasons, with no more than 20% on Cama and Joss Cambier. Yellow rust first appeared in May and with cool moist weather it increased quickly. Joss Cambier suffered the most, with an infection level of 10-25%, with patches of 50%. This however, was much less than on a nearby field crop of this variety which had been drilled one month earlier. Cama suffered a level of 5-10%, and although light infections were recorded on several other varieties, including Cappelle-Desprez, these were too low to affect yields. Loose smut was more prevalent than in recent years, with heavy levels on Cappelle-Desprez, West Desprez and Maris Ranger.

With the cool conditions experienced throughout much of the growing season, maturity was late, the straw in particular being very slow to ripen. This was also true of the other cereals, and was common in other parts of the country. Harvesting conditions were very easy, however, and the trial was harvested on 29 August with grain moisture levels around 15%. Yields were lower than in 1971, and this was probably a reflection of the low sunshine recorded in July. The two controls Cappelle-Desprez and Maris Ranger gave almost identical yields of just over 37 cwt. Maris Nimrod gave the highest yield of 44 cwt, 19% above the control mean, and Maris Templar and Maris Huntsman were slightly lower than Nimrod with 43 and 42 cwt respectively. The high quality variety Maris Freeman, in its first year of Main trials, was fourth in ranking order but well below the three high yielding varieties. Its yield of 39 cwt was 3% above the control mean. Atou and Val, each in their third year of testing gave yields similar to the controls. West Desprez was 1 cwt under the controls, and Joss Cambier with a yield of 34 cwt was 10% below the control mean, and a large proportion of this was composed of shrivelled grain.

Winter Barley

This trial was drilled in late October, with subsequent good establishment. Maris Otter suffered moderate frost damage but made good recovery, while damage was negligible in all the other varieties.

Mildew was the most important disease in the crop, with up to 50% on Senta and 25% on Maris Otter, Cossack (previously Alpha), Hoppel and Malta. Brown rust was present at a low level from March onwards but did not increase to a high level until just before the foliage was dying off. Despite the wet weather of May and June *Rhynchosporium* was not a problem, with no more than 10% on Maris Otter and lower levels on Malta and Engelen 2300. The French two-row Cossack was again completely free.

Maturity was later than normal, the harvest date being 7 August, under ideal conditions. Good yields were obtained, the two controls Maris Otter and Senta each producing approximately 39 cwt with Senta slightly the higher. Mirra gave a similar yield and Astrix was 7% above the control mean. Engelen 2300, a new two-row type of German origin produced the highest yield of 43 cwt, 11% above the controls, while Cossack was 3% above.

Winter Oats

The trial included the 5 Recommended varieties and one new variety in its first year of testing. After drilling in early October, all varieties emerged well and made strong growth, all becoming rather winter proud. Slight to moderate frost damage was recorded on all plots but there was no plant mortality.

Mildew first appeared in May and increased rapidly to over 50% on Maris Quest and Padarn. Heavy rain at the end of July caused considerable lodging in some plots, particularly at the high N (80 units) level. Padarn was the worst affected with nearly 100% lodging while Pendrwm also lodged badly in places.

At harvest Peniarth produced 39 cwt and the other control Maris Quest gave 41.5 cwt, Pendrwm was the only variety to exceed the latter and then by only a small amount.

Spring Wheat

The trial was drilled in mid-March on a good seedbed, and although establishment was good, early growth was slow in the cool weather of April and May. Mildew levels were generally low, with around 20% on Kleiber, Kolibri and Rothwell Sprite and a little higher on Troll. Yellow rust levels were higher and more varieties affected than in the winter wheat trial. This was probably due to the spring wheat being adjacent to a severely infected field of Joss Cambier. Maris Halberd was the worst affected, with a 25% overall level and patches in some plots of up to 75%. Infections nearly as high were recorded on Sappo and Tilly, and Cardinal suffered a 10-25% level. No variety was completely free of yellow rust, but only low levels were recorded on Maris Dove, Rothwell Sprite and Sirius.

As with the winter wheat the grain ripened before the straw, and harvesting took place on 5 September. Once again Maris Dove was top yielder, its yield of 44 cwt being over 25% above the mean of the two controls. Rothwell Sprite was the better of the controls with a yield of 36 cwt which was 6% above Kolibri at 34 cwt. Sirius produced 37 cwt and Sappo, despite the heavy yellow rust attack gave exactly 2 tons and Maris Butler was marginally higher. The yields of Cardinal, Maris Halberd and Tilly were all seriously affected by the level of yellow rust, all three being well below the control mean.

Spring Barley

Three trials were grown. The Statutory trial was composed of new varieties at an early stage of testing and the Main trial included new varieties at a more advanced stage and all those on the Recommended list. The fungicide trial compared eight varieties with and without a systemic mildew fungicide seed dressing.

All three trials were drilled in mid-March. Establishment was good but growth during late April and early May was poor, probably due to the low temperatures at that time. Mildew appeared in mid-May and increased quickly at first, but the wet weather of late May and early June did not encourage further development, and infection levels were lower than those of the previous season.

In the Main trial the heaviest mildew infection was just under 50% on Proctor with slightly lower levels on Sultan and Zephyr. Julia suffered more mildew relative to other varieties than in the past with a level of 20%. Very low levels occurred on Vada and Lofa Abed. Low levels were also recorded on Mazurka, Tern and Wing, all three of which possess the same source of race specific resistance and in the past have remained completely free of mildew. Loose smut was more prevalent than in 1971, with a heavy infection on Berac. *Rhynchosporium* was unusually prevalent, with all varieties showing at least slight symptoms. Moderate levels were recorded on Deba Abed, Tern, Maris Mink and Universe, the latter variety suffering up to 25%. Traces of brown rust were present for much of the growing season, mostly on the lower leaves. A short period of warm weather in early July brought about a very rapid increase, and infection reached a high level on the top two leaves of Midas, Proctor and Sultan, but as all varieties were approaching maturity it was too late to affect yields seriously.

The heavy rain at the end of July caused lodging in some varieties. Proctor was badly lodged at the high N (90 units) level, while moderate lodging occurred in Lofa Abed and Vada. Strong winds just before the crop was ready for harvest caused widespread ear loss. Although all varieties were affected to some extent, it was most noticeable in Imber and Mazurka.

Harvesting was carried out in August under perfect conditions, with moisture levels under 14%. Proctor produced 33 cwt, and the other control Zephyr was 6% higher with just under 35 cwt.

The highest yield in the trial came from Lofa Abed, nearly 43 cwt and 26% above the control mean. Vada, Julia, Tern and

Wing were also above the 40 cwt. level, and all around 20% above the control mean. Berac, Mazurka, Maris Mink and Universe were just below the 40 cwt mark, and at least 16% above the controls. Midas was 1.3 cwt above Proctor, and the only variety yielding below Proctor was Sultan.

In the fungicide treatment trial mildew levels were high on the untreated plots of several of the eight varieties. Golden Promise suffered the heaviest level of 70% while the level on Proctor and Zephyr was just under 50%. Much lower levels of around 10% occurred on Julia and Midas, only 5% was recorded on Vada, and Mazurka remained virtually free. Varying levels of brown rust occurred on all varieties but infection occurred too late in the growing season to seriously affect yields. In the treated plots mildew was below 1% in all varieties and the top four leaves remained free of the disease.

All varieties gave a response to fungicide treatment, the greatest being + 8 cwt for Golden Promise and the smallest of + 1 cwt in Mazurka. As in the previous season Vada and Julia gave greater response to fungicide treatment that would have been expected from the low mildew levels on them. The ranking order of the varieties was only slightly changed by the fungicide treatment.

Spring Oats

After a mid-March drilling establishment was good. It was not possible to apply herbicide however, due to the high winds and adjacent root and herbage crops, and the crop suffered by competition from weeds.

Mildew reached very high levels, with 75% or more on Astor, Condor, Selma and Leanda and approaching 50% on Mostyn and Nelson. Moderate levels also occurred on Maris Tabard and Maris Titan, varieties which at one time showed complete resistance. Heavy rain a few weeks before harvest caused widespread lodging, particularly on the high N blocks (80 units) where Astor, Condor and Mostyn were badly lodged. Maris Titan was only slightly affected.

Harvesting was carried out under good conditions at the end of August, when moisture levels were as low as 9% in some cases. The control varieties Astor and Condor gave respective yields of 32 and 33 cwt. Maris Oberon (AJ. 13/111), Maris Tabard (AJB. 4/51/B1) and Maris Titan all produced similar yields of around 45 cwt and 40% above the control mean. These 3 varieties were well ahead of all others, the closest to them being Mostyn with a yield of 40.5 cwt and 25% above the control mean. It was interesting to note that the mean of the yield of all varieties at the N_2 level (80 units) was 8% below the mean of the N_1 (40 units).

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