THE PRESENT STATE OF OUR KNOWLEDGE CONCERNING LOW GERMINATION IN PERENNIAL RYEGRASS SEED.

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The importance of the yearly crop of certified perennial ryegrass seed will, I am sure, be appreciated by all who have watched the developments in grassland farming in New Zealand during the last decade. It is greatly to be desired that an abundant supply of this seed should be maintained. Such a supply is essential for the continued improvement of our pastures. Also, there are opportunities for expanding the export trade in this class of seed, but it is possible to take advantage of these opportunities only when the seed is plentiful and the price moderate.

It is, therefore, regrettable that in some districts which are well equipped for the production of small seeds the quality of the certified perennial ryegrass seed, from the standpoint of germination, is often disappointingly low. The Southland and Manawatu districts are particularly subject to this trouble, and to farmers in these districts the production of certified perennial ryegrass seed is a hazardous business. In consequence of the low germinating capacity of many seed crops the total quantity of good seed available is much reduced. Furthermore there is reason to believe that farmers in those districts most affected have been deterred from increasing the areas they have under true perennial ryegrass.

The trouble is encountered in some degree every season, but it appeared with exceptional severity this year and was unusually widespread. Of 48 crops of certificd perennial ryegrass seed harvested in the Manawatu district, 21 had a germinating capacity below 50 per cent. Twenty-five out of 54 crops harvested in Canterbury were in a like condition, and also seven out of eight crops in Southland.

On the other hand it may be mentioned that of 137 samples from Hawke's Bay only one showed a germinating capacity below 50 per cent, and of 28 samples from Central Otago none were of such low quality.-

An investigation of the causes of low germination in perennial ryegrass seed was commenced about 7 years ago at the Seed Testing Station of the Department of Agriculture, At first attention was concentrated upon the stage of maturity at the time of cutting, the methods employed in harvesting,, and the weather conditions prevailing at that time. Experiments carried out at Marton experimental area demonstrated that the time of cutting, within wide limits, had no significant effect on the germination of the seed. Also, from general observations, it was apparent that only extremely unfavourable conditions at the time of harvesting produced material loss of germinating capacity. It was concluded that the principle cause of the trouble would have to be sought elsewhere.

In the year 1931, while examining a sample of seed of low germination from the Carterhope estate, it was observed that some of the seeds were covered by the spores of a fungus. These spores were of a chcrecteristic form and were produced in a peculiar manner and consequently the diseased condition was found

easy to recognise. The germination of this sample was 12%. Of 100 seeds taken at random from the sample 84 obviously harboured the fungus, and when tested these seeds were all found to be incapable of germination. Of the remaining 16 seeds cn which the fungus could *not* be detected by a superficial examination, 11 germinated.

A similar examination was then made of a large range of samples showing low germination including samples from different districts and from the crops of the previous two seasons. It was found that in, almost all these samples the fungus was present on a proportion of seeds. Furthermore the infected seeds were invariably found to be dead.; and in almost all the samples examined the infected seeds accounted very largely for the low germination. The circumstances were such as to suggest that the fungus was parasitic upon the seed,, but there was, of course, the possibility that it was merely a saprophyte living upon the dead tissues of seed already killed by some ether agency. In the past few seasons our efforts have been directed towards discovering the identity and life history of the fungus , and determining whether or not it is the cause of death in the seeds upon which-it is found; and finally we have endeavoured to turn to practical account- the information we have already gained.

In presenting an account of what we know of this fungus found upon ryegrass seeds I regret that it is necessary to make a very poor beginning by admitting that we are still ignorant of its identity and its relationship to other similar organisms.

The officers of the Plant Diseases Division of the Plant Research Bureau, to whom., I wish to state, we are deeply indebted for assistance, sent a culture of the fungus to the Imperial Mycological Institute at Kew. A report received from that source stated: "A name has not been found yet for the isolation from perennial ryegrass seed. *The genus* is *in* doubt. The cylindric conidia with rounded ends seen to be born laterally on the hyphae in clusters suggesting the form-genus Pullularia. It nay be possible to say something more about it later," -No further report has yet been received.

It is awkward to talk of a thing wifhout a name and we have frequently applied the name Pullularia to the ryegrass seed fungus; but I wish to sake it clear that the name is' used with reservations. We have, as it were, a foundling to which we give a nickname pending the discovery of its relatives and the carrying out of a proper christening. But although we have **not** solved the problem of its identity 'we have learned much about its behaviour in the field and we have accumulated evidence which leads us to the conclusion that the organism is strongly parasitic.

For the benefit of any who nay be quite unacquainted with the structure of *an* organism of this type it may be as well to explain that the body of the fungus is comprised of slender tubular branches or hyphae. A minute examination of sections of diseased seeds shows that some hyphae invade the inner tissues of the seed, penetrating the cells of 'the endosperm from which we presume the parasite obtains much of its nourishment. Meanwhi le other hyphae grow out upon the surface of the seed forming a thin but apparently almost continuous covering. From these hyphae on the surface of the seed great numbers of short perpendicular outgrowths arise from the tips of each of which conidiospores are cut off in series. At first these remain attached end to end in rows, but as new ones are formed below the outer *ones* break'free. These conidiospores are produced in vast numbers and the whole mass of then is imbedded in a sticky fluid which we presume to be secreted by the hyphae covering the seed. This secretion dissolves rapidly in water and it is apparent that rain-water or dew provide the medium for the dis-persal Of the conidiospores. The precise manner in which. the parasite brings about

the death of the seed has not been determined. The tissues of the seed do not appear to be greatly disorganised, but the parasite obviously draws heavily on the substance of the seed. The developnent of the embryo and the endosperm are prematurely arrested and the seed is rendered incapable of germination.

Field and laboratory observations make it almost impossible to escape the conviction that the fungus is parasitic but we have also experimental evidence which supports this view. Last year at the Seed Testing Station a number of ryegrass plants grown in pots were treated in the following manner. Groups of three o r four heads from each plant were taken shortly after flowering was completed *and* dipped in'a suspension of spores obtained by shaking a few diseased seeds in water. The heads were then kept in a close atmosphere for 24 hours and subsequently enclosed in cellophane bags. Other heads were treated similarly but only distilled water was used when dipping these heads. Where the suspension of spores was applied about 50% of the seeds became infected while in the heads treated with distilled water only no disease was detected. The germinating capacity of steds from the innoculated heads was 54% while that of the control lots was 96%. This experiment was reseated three times with substantially the same results on each occasion.

Two other observations of interest nay be mentioned in connection with these experiments. Firstly, the symptons of infection, i.e., the production of conidiogpores upon the surface of the seed first became apparent on the 7th or 8th day after innoculation. Secondly it was found to be possible for seeds to become infected up to the time when they were at their maximum size and still green. Whether infection is possible later than this is not yet known.

During the past four seasons we have, as far as limi ted opportunities permitted, made observations upon the appearance of the disease in the field. We believe that there can be distinguished a primary infection and a secondary infection.

Diseased seeds representing the primary infection are first detected about a week after the date on which flowering commences. They are small and flat but from them conidiospores are produced in great abundance. These diseased seeds can be detected in the seed head by superficial examination owing to their amber colour and somewhat translucent appearance. When fresh, young seed herds are viewed over a diaphanoscope the diseased seeds representing the primary infection are quite conspicuous.

The appearance of the disease has been watched closely in the Manawatu district during the last two seasons. In several instances it has been observed that Perennial ryegrass in adjoining areas showed great differences in the *extent* of the primary infection. In one such example a field of Pedigree perennial ryegrass was examined carefully without the slightest evidence of the disease being found, while the scattered seed heads of ryegrass in an adjacent grazed paddock were heavily attacked. It is worthy of note that in the following year the disease was yresent in abundance in the pedigree crop.

As I have already stated thc symptons of infection, i.e., the production of spores in a sticky secretion *on* the surface of the seed first appear about a week after flowering. In our experinents we found that this was roughly the time required for the symptoms to appear after the application of spores. Hence it is probable that the @nary infection is introduced at f lowering time. This view is further supported by the observed distribution of the infected seeds in the seed heads. Frequently the infected seeds in two or more adjacent spikelets are so placed that it is almost certain that the flowers from which these seeds arose were

open on the same day, This suggests perhaps that the agency causing, the primary infeotion is wind-borne, However, the form in which the parasite survives the winter and the manner in which it is introduced to the *new* crop are at present quite unknown and these. problems call most *urgently* for investigation,

Almost always the spores upon seeds representing the primary infection become washed away before the crop is harvested and the shrunken remainder of' the grain is so light that 'it is removed by the air blast in the dressing of the seed. Consequently. these seeds are not directly responsible for the low germination of the machine dressed sample. They do, however, form the source of the secondary infection in which seeds at a more advanced stage of development are attacked, and it is these latter seeds which, being more nearly of normal size and weight, remain in the machine dressed sample and. reduce the germinating capaci ty.

It is a matter of common observation that the true perennial ryegrass is much more susceptible to the disease than is the false perennial, while Italian ryegrass, although not immune, is more resistant still,

The difference between the true perennial ryegrass and the false perennial ryegrass in respect of resistance to the disease was well illustrated in the results of an experiment carried out several years ago at Winton, under the direction of Mr. A.W. Hudson, then Crop Experimentalist of the Fields Division of the Department of Agriculture. In the experiment 24 plots of *true* perennial ryegrass of Hawke's Bay origin 'were sown *clown,* and adjacent to these were another 24 plots of Southland false perennial ryegrass, The seed from *the* latter plots showed an average germination of 90%, and the lowest individual result for any plot was 86%. On the other hand the plots of true perennial ryegrass yielded seed with an average germination of 24%. The highest result for any individual plot waa 47% and the lowest 15%.

Observations over a period of more than ten years have made it clear that poor germinating capacity in the perennial ryegrass seed crop is associated with humid conditions during the period when the seed is developing, It is in those districts where moist conditions often prevail at that period that the trouble assumes its. greatest proportions, Rain water and dew provide the medium for the dispersal of the conidiospores and thus wet weather favours the rapid spreadof the disease, Purthemore these same conditions delay. the ripening of the seed and in this way also favour the more extensive spread of the disease by lengthening the period during which the seed is susceptible to attack,

As yet we are unable to suggest any means by which the disease might be brought under control, It is, however, too early to despair. Only when the full life history of the parasite is known shall we be able to judge of the possibilities in that direction.

The possibility of selecting or breeding a strain of true perennial ryegrass having a relatively high resistance to the disease has already received attention from the Grasslands Division of the Plant Research Bureau. A great obstacle in this work is the lack of an efficient method of testing for resistance. The only method available as yet is that of sowing plots in districts where the disease appears with the greatest regularity and severity. This method is costly and slow and there are many factors which militate against its reliability. There *ban* be no assurance that all parts of the experimental area will be equally subject to attack, so that it is very necessary to have all tests replicated. Then again, the different strains are not always at the same stage of development. Consequently some may be at their most susceptible stage when climatic or other conditions are favourable for infection while others

at the same tine are at a stage of development when they are less susceptible.

It is not unreasonable to hope that the present methods will yield useful results but it would be a very great aid in this work of selecting or breeding resistant strains to have some r-leans of submitting all plants under test to the same liability to infection. This may. yet be found possible by means of artificial inoculation.

There, is also the possibility that the physiological basis of resistance in the Italian *and* false perennial ryegrasses could be discovered and the procedure of selection and breeding thus greatly facilitated. To illustrate my meaning I wi ll draw attention to the fact that in Italian ryegrass the time between flowering and the ripening of the seed-is shorter than is the case with perennial ryegrass. It may well' be that such a simple property as this contributes largely to the' comparative freedom fron infection of the Italian ryegrass . If this property were shown to be the main basis of resistance the task of breeding a resistant perennial ryegrass would resolve itself into one of incorporating this attribute of quick development and ripening of the seed into a strain of pure perennial ryegrass, You must understand, of course, that this is only a hypothetical example used to illustrate the possibilities of this method of approach to the problem.

A peculiar feature of the disease 'is the difficulty *en*countered in detecting its presence in the field, Even where the parasite is present in such abundance that nine seeds out of every ten have been killed, it is unlikely that its existence in the crop would be suspected by the grower. The plants nay appearperfectly healthy for it seems that the s.eeds alone are attacked, 'Nor will a superficial examination of' the seed heads give any indication of the extent to which the ravages of the disease have laid waste' the crop. The seed nay be harvested and when machine dressed there nay be produced a sample with which by all the old fashioned criteria of quality in seeds it is impossible to find fault. The seed *may* be of good weight and colour, dry and free from any mustiness; and yet that seed nay be almost worthless on account of low germination resulting from extensive infection with the fungal parasite.

Thus the grower in the past has generally had no notion of the quality of his seed crop until it was harvested and a sample tested for germination. But it is now possible to examine a crop before it is harvested and so learn something of the prospective quality of the seed. If on such an examination it is found that say 80% or 90% of the seeds are parasi tised the grower can be assured that his crop is nct worth cutting. A farmer who is forewarned in this way may be able to make a tolerable crop of hay , or, if whi te clover is abundant in the field he nay in some circumstances be able to get a crop of white clover seed by cutting later, At all *events* he can avoid the losses involved in harvesting and machine dressing ryegrass seed that has a very low germinating capacity. We are confident that the informati on that can be gained f rom a careful, examination of the standing ryegrass seed crop would often be of value to the grower and in some circumstances the information might also be of interest to the seed merchants.

The procedure in making an exnnination of the standing crop is simple but it must be carried out with thoroughness if the results are to be reliable,

The first operati on is to collect the seed heads in the field. A few heads should be taken from each of many scattered points to ensure that a representative sample is obtained. The sheaf should be packed in such a way that it will not rapidly dry out, and the examination should be carried out as soon as

possible after the sample is collected. If the sheaf is bulky it is satisfactory merely to wrap it closely in several layers of paper.

In the laboratory the sample is further reduced by taking a few spikelets from scattered positions on each seed head. Thus a working sample is obtained, each seed in which is then examined under a dissecting microscope.. The glumes are pulled away and the grain examined for the symptoms of infection and the observations recorded and promptly reported.

When examined in this way the infected seeds can be distinguished by the presence of the sticky fluid carrying the conidiospores. If the seed has become dry the secretion bearing the spores may be solid. It is then of a waxy consistency, clear or pale pink in colour. Often rain or dew will. have washed away the spores and then infection is betrayed by the dull rusty red colour of the grain and its opaqueness which makes it appear dark when viewed over a diaphanoscope.

It will be realised that in such an examination the presence of the parasite is detected only when it has reached an advanced stage of development. It is almost certain that improvement in the technique is possible in the direction of detecting infection at an earlier stage.

During the period when the seeds are developing the disease spreads more or less rapidly, depending largely upon the weather conditions prevailing. Several examinations of *one* area of ryegrass at intervals of seven to ten days yielded the following results which I give *in* terms of percentage of parasitised seed: 10, 28, 44, 56. The last figure was obtained at the time the seed was being harvested. The germinating capacity of the crop was 37%.

The later the examination is made the more reliable will the determined rate of infection be as a basis for estimating the prospective quality of the crop. On the other hand a farmer who has it in mind to make hay if the prospects for the seed crop are not vavourable will be anxious to have a report as early as possible. In some cases it might be advisable to make several examinations at intervals.

The interpretation of the results of an examination of a standing seed crop requires the exercise of some judgment and. it is here that the wide experience of the agricultural instructors should be of great value.

It must be understood that the percentage of infection reported is based upon the number of seeds in which the parasite has reached an advanced stage of development at the time the examination was made, for the incipient stages of infection pass undetected. A distinction should be made between the smaller and the larger diseased seeds representing the primary and the secondary infections respectively. As has already been stated the former are very light and are easily removed in the machine dressing, and it is the latter which reduce the germination of the dressed seed. It must also be borne in mind that subsequent to the examination the disease may spread and the deterioration of, the crop be advanced to a further stage, The extent of this further deterioration will presumably depend upon the amount of infection at the time of the examination, upon the weather conditions prevailing subsequently to the examination and upon the time elapsing before the ripening of the seed.

It will be seen that the examination of standing crops as a service to seed growers has its limitations. Nevertheless we incline to the opinion that such a service would be of considerable

use and we are desirous of obtaining the views of all others who are interested.

There still remains much concerning the disease of which we are Ignorant, but I think we have reached a stage where any further research may be planned more intelligently and with better prospects of success than has formerly been possible. I shall enumerate the points upon which I think any future efforts should be concentrated.

1. The discovery of the complete life history of the organism, in particular, the form *in* which the fungus passes the winter *and the* manner in which it becomes introduced into the new crop in the following season, Until these matters are elucidated the possibilities of bringing the disease under control cannot be fully known.

2. There should be undertaken a minute study of the manner in which the-secondary infection takes place and of the development of the parasite. It is reasonable to expect that this work would make possible the diagnosis of infection at an earlier stage than is practicable at present. The value of examinations of standing crops could be greatly enhanced if the methods of detecting infection were improved in this way.

3. To aid the work of selecting end breeding resistant strains an' effort should be made to devise a more efficient means of testing the material for resistance to the disease. This might be achieved by determining the physiological basis of resistance or by developing a technique based upon artificial innoculation.

In conclusion, I wish to' acknowledge the assistance which we, have received from many directions. I hope we shall continue to enjoy the advantages of this assistance in any further work on these problems which we are able to undertake.

DISCUSSION ON TWO PRECEDING PAPERS.

Mr. J.B. Waters, Dunedin:

I would like to express my appreciation of Mr. Foy's paper.

The trade deals with a living organism, and we are therefore vi tally concerned with all, phases through, which seed passes from the plant to the finished seed product, and back again to the plant. Everything .in this life cycle, (strain, quality, vitality) is of absorbing interest, not only to the producer and consumer , but also to the trade.

I agree with Mr. Foy that' specialization is becoming more and more necessary, and that the speculator is being gradually eliminated and his place is being taken, or at any rate, should be **taken',** by the seedsman who can bring special knowledge to bear on his subject, and for that purpose information in regard to all matters of interest to the seed trade is essential. In order to attain this, it is imperative that there should be co-operation between the technician of the Department of Agriculture, or in the Plant Research Station, the grower and the seedsman. I take it that this is one of the main aims of the Department in New Zealand, and that they are seeking to promote this co-operation, not by means of disciplinary and coercive measures, but by the free exchange of knowledge between the various groups interested in seed production and marketing. Mr. Foy' s compa ri son be tween this method, and that adopted in Australia is of very considerable interest, and will, I think, be news to the tnajority of those present . I certainly agree that Mr. Foy's criticism of the difference in regulations as between State and State in Australia and the Federal Government is most opportune, and one can understand the difficulty which it brings about in regard to the trade aspect, and while it is satisfactory to know that New Zealand exporters can now obtain a preliminary clearance in New Zealand, it is not at all reassuring to learn that such a decision is only advisory, and may be reversed on the other side. I t certainly would be a great improvement from our point of view if the Federal Government could control the Whole of the conditions under which seed entry is permitted in Australia instead of allowing each State to enact its own regulations.

As regards the outlook for trade with Australia, it would appear that now that they have established a Certified Seed system in their own country, the trade conditions with Australia will be governed more and more by the price factor, and that when New Zealand has a surplus crop in a good season and can quote favourable prices, no doubt Aus t ralia may be able to relieve us of that surplus.

In this connection, I would like to read an extract from a letter received from Mr. Brunning (Melbourne), recently:-

"New Zealand Seed Markets.
Yes, the Dominion appears to have suffered very much from adverse weather conditions this year, and in view of the fact that so little seed will be available for export tnis season it is very fortunate that we have h a d record crops of Perennial Ryegrass and Cocksfoot here in Victoria. The Certification Scheme in connection with Perennial Ryegrass hcs worked excellently this year, and we have sold many hundreds of bags of high class t rue perennial s t rain M/D. Seed, which has obviated the necessity of purchasing in New Zealand. The Certification Scheme is not yet in force in connection with Victorian Cocksfoot, but will be in full working order for the 1938 crop. The Victorian strain of Cscksfoot is the true leafy perennial type,, and in this

respect is in every way equal to the very best Akaroa strain, with the additional advantage that so far as purity and germination are concerned, it is immeasurably superior to your very finest "Mother" seed. You are not likely to be importing any Cocksfoot for Dunedin, but if you would like to try out a few bags of Victorian Government certified Perennial Ryegrass when ordering any other lines, we would be glad to take your order."

"It seems to us that the Kyneton strain should be best suited for Southland, and most parts of Otago, but for Central Otago the special Pickford strain of Clunes Perennial Ryegrass should be 'especially well adapted. We enclose leaflet on this wonderful type, which has given such excellent results here."

From this it would appear' that our export trade, not only with the Northern Hemisphere, but also with Australia must be governed more and mare by price factors which again are subject to climatic conditions.

Mr. Foy's 'remarks in regard to seed testing are most interesting especially in regard to their bearing on the question of quality. ' In this respect the Mew Zealand trade has always co-operated heartily with the Department from whose staff we have received the very greatest assistance, and any suggestions which have been furnished have been quite cordially received. The aims of the Department and of the trade being identical in regard to raising the standard of the various classes of seed in which we deal as high as possible. In this connection, the particulars which Mr. Foy has kindly given in respect to seed testing and especially to the ultra-violet ray test and. the picric acid test is of very great interest. In fact, the seed trade relies on Departmental testing to such a great extent that the delay this season in procuring seed testing results in reasonable time caused the greatest confusion, and I am very glad that we have recently received an assurance through Mr. Tennent that this trouble is not likely to occur again. It merely shows to what an extent the trade now relies on the services of the Departmental Testing Stations.

As regards export business, British buyers are much interested in White Clover tested by the Picric Acid Test, and it is to be hoped that under these conditions an increasing export trade will be worked up in -this variety.

Mr. Foy's observations in regard to the usefulness of the bushel weight test are exceedingly interesting, and without going into the matter in detail I fully agree that apart from the evaluation of seed on the weight of 1,000 seeds (which is not practicable) the bushel measure is an important factor in determining quality, provided always that all other things art equal.

In view of the highly technical knowledge which is now required in regard to the production and marketing of Ryegrass Seed, I suggest that Certified Seed at least should be bought and sold by the pound instead of by the bushel. It is to my mind absurd to think that me supply the dominant line in a seed mixture at per bushel weight, whereas all the other constituents are sold at per pound, especially when you realise that Certified Ryegrass requires from first to last a very much greater expenditure of skill, and technical knowledge than many of the smaller seeds which form the balance of the mixture. Such a practice would enable the trade to pay a higher price to the grower and make a profit more commensurate with the efficiency and knowledge which is required of the modern seedsman.

Mr. R.D. Wimmo, Dunedin.

What is the reason for the Department refusing to test and certify the imported seed from Australia by the ultra-violet

Test? It was proposed to the Testing Station that a sample of imported Australian certified seed should be examined for a certificate under a certified class.

Mr. N.R. Foy, Palmerston North:

The position is that the N.Z. certification is established to apply only to N.Z. grown seed. The fact that imported seed may -be equal or superior to our own has no bearing on the matter, It is one of departmental policy, - that N. Z. certified seed be N. Z. grown.

Mr. Gorman, Palmerston North.

We have ample sviden'ce that the Australian samples are quite inferior to the N. Z. certified strains. They may be much alike the first 12 months, but after that they show inferiority'

The Chairman:

Same statement is being made from time to time in regard to N.Z. certified seed in Great Britain. It brings up the question of whether certain characteristics may be only certain dharscteristics in the country where they are developed.

I would like to pass one or two remarks on the last paper, which was presented by Mr. Hyde, and to congratulate him most heartily, on the careful, work he is doing.

One does feel, with regard to the lack of germination of certified rye or true perennial rye::, that certain work along lines, apart from the investigation of the parasite itself, is absolutely essential. For instance;-, one of the first things that ought to be thoroughly and correctly determined is whether the best strains of local Southland rye are subjected to the same degree of infestation of this parasite as is certified seed. By Southland rye, I mean those ryes which the Southland farmer claims are better for Southland conditions than cc-rtified rye.

It is currently stated that a line of good Southland rye gave a germination of 86%, and that with an adjacen t line of certified seed the germination was only about 20% or 30, . If it is true that the good lines of natural Southland seed do show a real resistance to this parasite., it does seem a reasonable thing to do some isolation of the best of those Southland ryes, and use those ryes for definite Southland purposes until one can find means and methods of avoiding the destruction of certified seed in a wet season. Whenever a Southland perennial rye is claimed not to be infested like a certified rye, one feels p r e t t y well certain that that seed does not represent seed of truly permanent rye, but is one or other of the poorer types of Southland rye. There have not been any proper observations made on the actual origin of the so-called Southland ryes, which are producing high germination during a season when the majority of certified rye is heavily infested with the parasite. That is one line of work that should be carried out to thoroughly determine the point.

One feels that probably a final solution of the difficulty will have to come about through proper breeding in which resistance characteristics are transferred by the plant breeder to the type in which you require to develop resistance. You have not got any resistance at all, Mr. Gorman, in ordinary certified lines?

Mr. Gorman, Palmerston North.

No. We are well on the way to testing that point. At Winton we have made some 300 trials - 150 are of certified

origin, others are impor ted, English and old pasture Southland lines. They have all been seeded this year and are at present being tested in the seed laboratory. Fifty samples have been tested and the tendency is that the certified perennial is of lower germination.

The Chairman:

The points disoussed should be finalised pretty soon. Even there, slight differences at time of flowering of lines might make some difference.