FERSI STENCY IN CRESTED DOGSTAIL.

Though crested dogstail is of great value under certain conditions of farm management and on particular types of soil, it is one of the Cinderella grasses as far as research and improvement, go. The two main countries supplying the British market i.e. New Zealand and Ireland, appear very indifferent as to the quality of the seed exported, At the present time the price factor undoubtedly operates strongly, but even when prices were good no effort was made at improvement. It has been neglected by selectionists for several reasons,

1. Its relatively small bulk,

2. Its capacity to maintain itself in suitable pastures by reseeding.

3. It is not considered as a. valuable species by European workers and is not widely sown on the continent. (Holland used to cater for the English Market but their seeds not now advertised).

4. Even the crop for seed production purposes is regarded as only of minor importance, In this respect New Zealand has now only one district for seed growing (Southland) whilst Ireland has reduced her districts to two.

At Aberystwyth, a preliminary attempt at selection was made in 1919-21, to determine if any benefit to the species could be brought about by selecting indigenous strains, These were grown. against commercial lines and compared with them, but in the trials the commercial plants proved more bulky than the indigenous ones and the investigation was dropped. Apart from this no other attempt has been made at improvement, Ireland is not particularly interested in its improvement, in fact Irish growers are reducing their area for four reasons,

1. They have difficulty in disposing of the straw at a profit. It used to be made into straw hats which are now demodé. Hampshire has ceased to produce it for this reason alone.

2. Bad harvesting weather with a consequent lowering of vitality of the seed,

3. The inability of such seed which is often discoloured to favourably compete with the brighter New Zealand samples,

4. The competition from dogstail seed cleaned from white clover crops.

Dogstail comes in for its strongest criticism at seeding time when the flower heads appear, whilst the remainder of the year any credit that ought to go to it is, (owing to a resemblance of dogstail leaves to those of ryegrass) often given to ryegrass. It is safe to say, taking into account what is to follow, that if these seed heads were not persistent there would be very little dogstail remaining in our pastures. It is to the exceptional power of re-establishment even under most adverse seed bed conditions and the power to produce viable seeds that enables dogstail to persist in the pastures in the way it does, It is doubtful if any other grass used for permanent pasture work has this feature so well marked although ryegrass has decided capabilities in this direction, Judging from the results which follow it can safely be said that persistency in crested dogstail is solely dependent upon its power to produce seeds, This is a weakness which it is desired to eliminate.

'What *i.s* required is a plant which will persist through its own vigour and one which will maintain that vigour for many years. This desire is legitimate if only to reduce the unproductiveness of this grass during the middle and late summer seasons, At present where reseeding is general the established plants weaken in January and either die during the dry weather or recover slowly in autumn with the advent of the rains, The casualties are replaced by seedlings which generally compete strongly for establishment on the available ground but seldom form a close turf. There is thus a. lag in production between the flowering season, and the full establishment of the seedlings in late autumn and this coincides with a. critical season in stock feeding. If this could be eliminated it would add considerably to the value of dogstail as a species suitable for serious'inclusion in all seeds mixtures. At the present time there is doubt in the, minds of several grassland authorities in England as to the advisability of including this species in mixtures for the better class land, If dogstail will lend itself to improvement there is no doubt that it will be able to reinstate itself in the opinions of these men,

PERSISTENCY TRIALS.

In order to get more information on persistency and at the same time test out the relative values of the different commercial iin'es in New Zealand on a persistency basis, 320 1/500th. acre plots were laid down at the College in 1929 and 30. The origin of the samples was -

Southland	225
Sandon	52
Misc. Comm.	9
Experimental	31
Kentish	3
	320 plots.

With the exception of the two Kentish samples (one duplicated) the whole of the seed was of New Zealand origin, The samples represented the full range of commercial seed available in New Zealand. Some were from stripped seed while others were from commercially blended lots . Each plot was divided into three and each third or subplot given a different treatment to see if persistency was affected by it, One series of subplots was mown weekly throughout the year with a lawn mower to simulate close grazing, A second series was mown every third week to approximate rotational grazing while the third series was mown weekiy but closed up for hay in October and mown late December when the majority of the plants were in full flower . Under such treatment no seeding could take place,

Persistency was determined by making counts and the subplots were counted separately to determine the effect of treatment on the relative persistency. Five random counts were made on each subplot a.nd the area thus covered was $1\frac{1}{4}$ sq. feet or approximately 1/25 of the total area.

The trial covered two areas - one spring sown (1929) and the other autumn *sown* 1930. Results have been worked out separately for these two areas so it may be advisable to deal with them separately although the treatment was the same for both,

AREA 5 . Sown spring 1929 . This area consisted entirely of commercial lines. The first counts were made. from 10th.-16th. December when the seediings were. rather less than 2" high and three subsequent counts were made on many of the plots,'

Disregarding 'fcr the moment the different treatment and origin, the number of live plants has fallen' away consistently between 1929 and 1932. Some idea of this can be got by the following figures representing the average number of surviving plants on all plots counted on the' different dates.

TABLE I.

All Plots sown at the rate of 20 lbs. seed per acre in September 1929.

	Date of Counts,	Av. no, of surviving plants per 1¼ sq. ft.	No, of months after sowing,
1	December 1929.	193.5	3
2	March 1931	82.7	18
3	December 1931	1801	27
4	May 1932	1.4	32

Some plots have maintained their numbers better than others but nevertheless a rapid mortality rate has been evident throughout. In none of the plots was there an,y indication of an outstanding line, which clearly showed the unsuitability of New Zealand commercial seed as a basis for improvement by mass selection.,

Thi s -area yielded an interesting comparison between Southland and Sandon seed&three of the counts have been treated statistically, These figures also indicate the effect the different mowing treatments have had on persistency,

TABLE II,

Acomparison between Southland and Sandon seed showing the effect of the different treatments on persistency,

COUNTS MADE MARCH 1931 (18 Months After Sowing Down).

AREA.	Treatment. WEEKLY MOWING	THREE WEEKLY MOWING.	HAY	No. of Plots,
Southland	102.38 ±3.53	36.20 ±2.38	25.07+ 1.96	42
Sandon	89.27 ±5.18	25.48 ±2.41	23.36± 2.01	33

Though the figures are definitely in favour of Southland yet only the three--weekly mown plots can be regarded as being significantly better,

The difference between them cannot be attributed to a better germination capacity of'the Southland seed for this has been determined from the official germination figures, The average for the whole of' the Southland samples was 94.66± .32% and for the Sandon 92.64 ± .94%; the figures are not significant.

It would appear that Southland seed is beginning to exhibit a slight superiority in persistency eighteen months after sowing, where seeding is not permitted.

During the succeeding nine months the mortality rate was very high as shown by Table 3.

TABLE 3.

A comparison between Southland and Sandon samples showing, the effect of the different treatments on persistency,

COUNTS MADE DECEMBER 193'1 (27 MONTHS AFTER SWING) .

Area, 5	TREATMENT weekly mowing.	3 weekly mowing .	Hay.	No, of Plots .
Southland	21.39 ± 10.74	12.82 ± 0.49	4.15 ± 0.41	128
Sandon	15.60 + 1.23	10.15 ± 0.89	2.60 ± 0.53	33

Thus at the end of 27 months the average number of plants per $1\frac{1}{4}$ square feet over the whole of the area had decreased from 193.5 to **18.1** giving a survival rate of one in 10.7. By May 1932 32 months after sowing there, were only 1 .4 plants in an equal area giving a survival rate of 1 in 139. The figures show. that Southland seed is still maintaining the greater number of plants though the difference between them and the Sandon counts is barely significant.

During the winter of 1932 the survivors were collected and planted out as single plants, but the dry summer of 1932-3 was too much for practically the whole of these and by the winter of **1933** there remained less than 200 plants from one third of an acre. (6 $\frac{2}{3}$ lbs. **seed)** .

AREA 8. Owing to the greater diversity of Sample origin in this area by inclusion of experimental samples and the possibility of duplicating some plots, the results are of greater interest.

Counts were not made to determine soil germination but this was equally as good if not better than, on Area 5. This area contained 152 plots of which 98 were Southland,, 16 Sandon 35 experimental and 3 of Kentish origin, Of these, duplication was possible on 20 Southland, 8 experimental, 6 Sandon and 1 Kentish lots,

The experimental samples were selections made from roadsides and permanent pastures and were included to determine if they exhibited a more marked degree of persistency than the commercial seed. The first count was made in January 1932 with the following results.

TABLE 4,

COUNTS MADE JANUARY 1932 (20 MONTHS AFTER SOWING DOWN) .

Area 8.	Treatment. Weekly mowing .	Three weekly mowing.1	Hay.	No, of Plots,
Southland	24.66 + 0.61	30.03 ± 0.87	19.43 ± 0.73	98
Sandon	10.68 ± 0.29	21.87 + 0.11	7.62 ± 0.67	19
rimental	25.39 ± 1.03	33.68 ± 1.62	22.50 ± 1.91	33
'Kentish	59.6	61.3	32.0	3

As in Area 5 the Southland seed showed a superiority over the Sandon and in this case the differences' were decidedly significant. The rate of decline in the number of survivors was more rapid than in Area 5. The experimental plots were very close to the Southland in the number of surviving plant A second close count was commenced in October 1932 when the average figures for the different lots divided according to origin were as follow :

TABLE 5.

Area 8. weekly mowing. 3 weekly mowing. Hay. No. of Plots.

Counted Oct. 1932 (29 months after sowing down).	South-land	4.20	6.12		98
	Sandon	2.70	3.45		19
Counted Feb. 1933 33 mths. after sowing down).	Experimental	1.9	3.3	2.3	31
	Kentish	8.3	5.0	2.3	3

The results of these two counts are not strictly comparable as there is a high mortality rate evident during the summer period and the figures are definitely favourable to Southland and Sandon.

Here again the Southland have done better than the Sandon. The result obtained from the two Kentish samples suggests a possible improvement from that source. The experimental samples on the whole were disappointing,

During the autumn of 1933 the few survivors were searched for and transplanted out as single plants as it was thought that the progeny from selections of these would be better and longer lived plants than could be got from the mass selection of even the best commercial or' experimental lines, A check was kept of the number of plants so obtained on representative and contiguous plots and the results are instructive,

TABLE 6.

Area 8. Origin. Description, Av. no, of surviving plants per plot, No, of Plots,

Southland	No duplicates	26.5	9
Sandon	do	3.5	12
Kentish	One duplicated sample	74.5	2
Experimental	One duplicated sample -best, plot	155.5	2
do	Average of the remainder of the plots counted, No duplicates.	24.9	10.

The majority of the experimental selections were considerably better than Sandom commercial but were no better than the Southland Commercial. The Kentish seed was comparatively very satisfactory and was only eclipsed by one experimental sample,

To sum up, the present position is as follows :

The dogstail position in New Zealand is very unsatisfactory. All the New Zealand commercial seed has been tried and of' the two districts which supplied it, Southland produced the better article, There are no outstanding lines which can be immediately used as a basis of improvement, This lack of outstanding samples or regional strains on which to concentrate makes mass selection impossible and the slower path by individual selection has to be traversed.

Irish seed is not likely to show any improvement, as New Zealand seed, owing to its brighter colour is frequently sown down for the production of the seed crop in Ireland. Kentish old pasture seed offers some hope for improvement by selection, but so far the number Of samples tested has been insufficient to give reliable conclusions, Through the courtesy of Mr. Wm. Davis several Kentish samples are now awaiting trial.

Dogstail is by nature short lived, but an early improvement in the matter of persistency is being sought by selecting the best plants from the -survivors of these plots, grouping them according to growth form and increasing the amount of seed., It is considered that a. more rational method of seed production will be required in order to maintain any improvement that is brought about.,

The greatest yield from this plants comes in the first harvest season, after which there is a rapid falling away tin production due both to the high mortality rate and also to the loss of vigour of many of the survivors. It would appear from these trials that there is a small but varying proportion of good plants present in most samples but this is extremely low and it is from these plants alone that improvement can be sought, .