

UNIVERSITY COLLEGE OF WALES,
ABERYSTWYTH.

NEW VARIETIES AND STRAINS
FROM THE
WELSH PLANT BREEDING STATION.

**No. 1. Pure Lines of Hen
Gymro Wheat.**

Selections made by
T. J. JENKIN, M.Sc.,

With a Preface
by
Professor R. G. STAPLEDON, M.A.

PRICE ONE SHILLING.

Prefatory Note.

The Welsh Plant Breeding Station was founded in 1919 as the result of the generosity of Sir Laurence Philipps, Bart. It is affiliated to the Agricultural Department of the University College of Wales, and receives grants from the Development Fund and from the Empire Marketing Board through the Ministry of Agriculture, and is also assisted by the generosity of persons individually interested in the work in progress.

The work conducted at a Research Station is of more than local importance—the researches at Aberystwyth are, however, chiefly dedicated to regions of relatively low fertility and of high rainfall. Consequently, as the work proceeds, Wales will undoubtedly derive a giant's share of benefit.

The time is now approaching when the new varieties and strains bred at the Station will be available for large scale trial, and it will be the results obtained from such trials that will decide what particular varieties and strains will be worked up with a view to making them generally available to the farming community.

It will be the policy of the Station to issue a leaflet describing the work which has led up to the production of the various strains which it is desired to thoroughly test in those districts where it is to be supposed they are likely to prove of the greatest value. It is perhaps fitting that the first batch that has reached this stage takes the form of a number of selected pure lines made by Mr. Jenkin, the senior member of the research staff of the Station, on that well-known and essentially Welsh wheat, Hen Gymro. The next lot of material will probably be a new hybrid oat—a "white winter", which appears to be exceptionally winter hardy and to have decidedly better standing capacity than ordinary Grey Winter, resulting from the researches of Mr. E. T. Jones; contemporaneous with this material there will be a number of highly promising pure line selections of both Ceirch-du-bach and Ceirch Llwyd, made by Mr. Martin G. Jones, which will be rendered available for large scale trial in all those districts where these oats are popular.

Grasses and clovers, the most important of which are normally cross pollinated, are more difficult to deal with than are the cereals, while when the Station started work on grasses and clovers there was very little knowledge available as to how best to approach the matter. Nevertheless it will not now be long before strains of cocksfoot, bred by the Director, will become available for large scale

trials, while strains of rye-grasses, timothy and red fescue, due to the researches of Mr. Jenkin, will follow soon afterwards. The farming community will have to be rather more patient in respect of the clovers—Captain Williams's work being perhaps the most difficult of all.

To return to Hen Gymro wheat, with which this leaflet is primarily concerned, it is the intention of the Station to retain from year to year pure stocks of the five strains which have given the best results over a considerable period of years. It is of the utmost importance, however, that the Director should have some idea of the demand that is likely to be made on these strains. The policy would be to supply such seed as is available at ordinary current "seed-corn" rates to any farmer, wholesaler or retailer, or to Co-operative Societies who might wish to acquire a supply for trial. It will then be for the farmers themselves or the traders to grow on their own supplies of seed to meet whatever demand may be created for the pedigree strains. Every endeavour should of course be made to keep the strains pure, but if the degree of purity appears to be falling off as the years advance, arrangements can be made for a member of the staff of the Station to inspect the standing crops and report when, if necessary, fresh and pure supplies (in small quantities) of the strain in question can be provided by the Station.

The first necessity is for the Station to know whether there is a real demand for these strains, and it is proposed therefore to circulate this leaflet widely amongst both farmers and dealers, so that a fairly accurate estimate can be formed of the amount of seed required for sowing *in the autumn of 1930*—that is to say, the amount of seed the Station will have to grow in 1929 from the stocks that will be available from the sowings made this (1928) autumn.

It is obvious that the Station cannot guarantee supplies, but it is only fair to ask that those making application for seed will guarantee to take it if it is available. Such stocks as are available will be issued in strict rotation to the applicants, but in order to get the tests conducted over the widest possible area, if supplies are short it may not be possible to give the full quota to those asking for the largest parcels.

Farmers and others are reminded that the Station is trying to help them out of the difficult situation in which they now find themselves, and the issue of these strains of Hen Gymro is the first tangible result. The farmers on their part should therefore be enthusiastic in giving these strains a fair and thorough trial. The strains may or may not achieve everything that is hoped from them, but if they are well and thoroughly tried, this fact alone will be an encouragement to the members of the staff of the Station,

as it will show that Welsh farmers are appreciative of their efforts, and intend to give them all possible support.

It is realized, of course, that Hen Gymro has a restricted range of usefulness, and it is largely on that account that the Station is willing to sell stock seed at ordinary seed-corn rates, but this action must not be regarded as a precedent which will be necessarily followed in connection with the release of strains or varieties of other species which will have entailed an altogether greater expense to the Station than have the pure lines of Hen Gymro, and which will have an altogether wider range of usefulness.

It is to be noted that in the present case, precisely the same offer has been made to all the trade interests as to the farmers themselves, and in broad outline such will be the avowed policy of the Station in relation to the more important and more valuable productions that it will be possible comparatively soon to release.

R. G. STAPLEDON.

*Agricultural Buildings,
Alexandra Road,
Aberystwyth.*

1928.

“HEN GYMRO” WHEAT

BY

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Welsh Plant Breeding Station, Aberystwyth.

Two small lots of “Hen Gymro” wheat from different sources were grown at the Welsh Plant Breeding Station in 1920. As they came into ear, it was discovered that while in the great majority of the plants the ears were beardless and smooth-glumed, in a certain proportion they were bearded and/or rough-glumed. As the lots ripened, it was further found that whether bearded or not and whether smooth or rough-glumed, the glume colour might again be either red or white.*

Other lots of “Hen Gymro” were obtained later and these agreed with the previous lots in containing a mixture of different ear types, but in all cases there was a heavy preponderance of beardless, smooth-glumed, red-glumed ears. They all further agreed in that the grain was red in all types, but the grain varied considerably both in size and appearance, although on the average it was distinctly smaller and more flinty than such types as Standard Red. Apart from rare ears, which were of the squarehead type, and which might be regarded as impurities, the ears of whatever type agreed in being relatively long and lax. There was a considerable difference in actual density, but no typical “Hen Gymro” ears were squarehead in type. Some measurements made by Carter† gave an average density of 5.65 for typical “Hen Gymro” ears and 4.84 for squarehead types rarely found amongst Hen Gymro.

Another relatively constant characteristic of Hen Gymro is the type of straw produced. This is typically tough but long and slender, so that on good land and under adverse weather conditions the crop may become badly lodged.

Despite this obvious drawback, the variety has persisted, and many farmers still insist that over a period of years it gives more

* In later work it was found that the straw might be either red or yellow, but straw colour does not as a rule develop sufficiently well at Aberystwyth to make an absolute classification possible. It has, therefore, not been ascertained whether red or yellow straw may be found in association with all possible combinations of ear characters.

† Carter, P. W. Thesis presented in 1923 for Honours Degree of the University of Wales. (Unpublished).

satisfactory results than the modern squarehead types. As far as I am aware, the validity of this contention has not been put to the test, and it is doubtful whether yield tests alone would adequately meet the case, since "more satisfactory results" may not be synonymous with "higher grain yields."

It must be borne in mind that Hen Gymro, at least in comparatively recent years, has been grown not for commercial purposes but to provide home-grown household bread, and, more or less incidentally, wheat straw for thatching purposes. This means that whether a wheat gives satisfactory results or not depends largely upon the quality of the bread and of the wheat straw produced, and there is little doubt that Hen Gymro wheat, at least under the adverse Welsh conditions, generally produces a higher quality grain than most of the more modern varieties, while its long and tough straw is ideal for thatching purposes.

It is also conceivable that the actual yield results are better, since the variety has been grown more often than not on non-typical wheat land. Moreover, in all instances, it consists of a mixture of types—a fact which over a period of years probably tends to a slightly increased yield. In addition, a certain amount of natural crossing occurs in the variety,* and this also in all probability has a slight effect upon yield.

With the increase in the number of Dutch barns, the demand for the Hen Gymro type of straw has diminished, but it is still important that the small areas for the production of household wheat should be maintained, and, if possible, increased. It might be suggested that such a type as Yeoman would be more suitable for this purpose than Hen Gymro, owing to its stiffer straw, but Yeoman is inferior to Hen Gymro in tillering capacity and would, therefore, probably be rather less reliable.

In view of the possibility that its very heterogeneity may be a contributing factor to its success, it would appear somewhat doubtful whether any attempt at the production of Hen Gymro pure lines would be ultimately successful. At the same time, *a priori*, the fact that the variety consists of such a number of diverse morphological types suggests the existence also of a great diversity in yielding capacity and in other characteristics.

In the autumn of 1920, a total of 209 single ears were selected, including representatives of all eight possible ear type combinations, together with some which appeared intermediate in awn development and/or colour of glumes. The proportions were roughly as follows :—

* Jenkin, T. J. Natural Crossing in Wheat. Welsh Journ. Agric., Vol. I, 1925, pp. 104—110.

Beardless red smooth	..	..	..	=	44
„ „ rough..	..	..	..	=	20
„ white smooth	..	..	..	=	36
„ „ rough	..	..	..	=	24
Bearded red smooth	..	..	..	=	29
„ ^{ed} „ rough ..	..	..	..	=	16
Beardless white smooth	..	..	..	=	24
„ „ rough	..	..	..	=	4
Intermediate types ..	..	..	..	=	12
					—
					209
					—

The proportions do not exactly represent the composition of the original material except in a very rough way. For instance, there was a considerably higher proportion of beardless red smooth than of beardless white smooth in the original material than is shown in the selections, and there was throughout a tendency to increase the proportion of each type in the selections as the proportion in the original material became lower.

Further selections from the original material were made in the autumn of 1921, a total of fifty-six ears of various types now being selected, bringing up the total number of selections to 265.

Each ear selection was first studied by the ear-to-row method, and it was found that a relatively large number of ear-rows consisted of mixed types, showing that natural crossing had taken place at some previous date.* All these rows were rejected, as also, owing to lack of promise, were many other lots.

The progeny of the first batch of selections were grown in single rod-rows in 1921-22, and further rejections were made.

YIELD RESULTS.

In 1922-23, the first yield trials were obtained (C. 92). By this time the original selections (on two years' study) had been reduced to 41 lots† (including two selections from Red Lammas), while the second selection (on one year's study) had also been reduced to 41 lots. Each lot of the original selections was replicated five times in rod-row beds of three rows each, while sufficient seed for only two replications was available in the case of the other lots. Seventy similar beds of a check lot, Standard Red, were arranged throughout the area for comparison.

* Jenkin, *loc. cit.*

† This rapid reduction in numbers can only be justified by the fact that the time and labour involved with very large numbers were prohibitive.

Only the middle row of each bed was used for the comparative results, but when these were averaged up the relative yields were as follows :—

Standard Red	.. .. .	= 100
Average for all Hen Gymro lots	.. ..	= 101
Average for the best 20 Hen Gymro lots	..	= 111
Average for the poorest 21 Hen Gymro lots		= 91

For this comparison, only those lots replicated five times were taken into consideration.

These results indicated that although on the average there was practically no difference between the Standard Red and the Hen Gymro lots, there was a strong suggestion that at least some of the Hen Gymro selections were superior to Standard Red under the conditions of the experiment.

Selection for the next yield trials was made mainly on yield, but to some extent also upon type and quality of grain. Into the new experiment, 45 lots were brought, and the beds were now extended to five rod-rows each, the two outer rows to be discarded at harvest. Each lot was replicated four times except in a very few cases where the amount of seed available only allowed for three replications. Thirty-three similar check beds of home-grown Standard Red were included as the basis for comparison.

This season proved to be favourable to Standard Red. Some of the Hen Gymro lots became more or less lodged quite a month before they were ripe, and by harvest time most of them were rather badly laid, while Standard Red remained standing. Yet the average yields for Standard Red (33 plots) and Hen Gymro (172 plots) were as 100.0 is to 100.5. The difference is, of course, quite negligible, but the surprising fact is that Standard Red did not outyield Hen Gymro.

There was much variation amongst Hen Gymro lots, and for the next season's trial 1924-25 (C. 124) the lots were reduced to twenty-nine. The beds were similar to those of the previous year, and each lot was replicated four times, while the check lot, Standard Red, was represented by 32 beds.

This season was much more favourable to Hen Gymro than the preceding, and none of the lots became badly lodged. Yet on the average Hen Gymro was very disappointing in yield, the relative figures for Standard Red and Hen Gymro being as 100 is to 91, with only four lots of Hen Gymro giving higher yields than Standard Red.

For the next trial, season 1925-26 (C. 153) the number of Hen Gymro lots was reduced to fourteen, and these were replicated five times in beds similar to those of the two preceding years. The number of Standard Red beds now included was twenty-five.

The ground in this trial was probably the nearest approach to typical wheat land on the farm, and all lots did very well up to a certain point, when stormy weather caused the Hen Gymro lots to become badly lodged, while Standard Red again stood up relatively very well. It was, therefore, not surprising to find that in comparison with the standard variety the Hen Gymro lots on the average yielded very poorly, the relative figures now being as 100 is to 79. In this season, even the best Hen Gymro selection yielded 11 per cent. less than Standard Red.

As a result of this experiment, one Hen Gymro lot was again discarded, while five others were only represented in the new 1926-27 experiment (C. 175) by one bed each. The remaining eight were replicated five times and Standard Red was represented by twenty beds. For this experiment, the soil was decidedly lighter and in poorer condition, but with continued wet weather, some of the Hen Gymro beds again became rather badly lodged. Ripening conditions in this season, 1927, were also very poor, and this, together with the poorer soil conditions probably accounted for the fact that Hen Gymro now outyielded Standard Red by 28 per cent.

Bringing these yield results together we find that the relative figures for Standard Red and the average for Hen Gymro (diminishing in numbers from year to year) were as follows :—

	<i>Standard Red.</i>	<i>Hen Gymro.</i>
1922—23	.. 100	101
1923—24	.. 100	100+
1924—25	.. 100	91
1925—26	.. 100	79
1926—27	.. 100	128
	—	—
Total	.. 500	499+
	—	—

Thus, in spite of continued selection in Hen Gymro, there is no definite indication of an improvement unless we ignore the two seasons 1924—25 and 1925—26, the one decidedly favourable to Standard Red and the other decidedly unfavourable to Hen Gymro. In any case, on the average of the five seasons, there was no difference between the two varieties. This, however, only holds good for the average of the Hen Gymro lots, some of which, as shown below, outyielded Standard Red by a fair margin.

At the end of season 1927 the Hen Gymro lots were reduced to five, and these were each given four 1/100th acre plots in the new experiment, C. 198, while Standard Red was represented by four similar plots.

Soil conditions in this experiment were not uniform. From a lightish type at the top of a slope it gradually passed into a fairly heavy soil at its base. The plots, which were long and narrow, were arranged lengthwise along the slope in such a way that as far as possible the soil variation was covered by plot distribution. The results obtained are interesting, and the relative figures for Standard Red and the Hen Gymro lots are shown below :—

			<i>Standard Red.</i>	<i>Hen Gymro.</i>
Replication	(a) lightest soil	.. ..	100	147
	(b) intermediate	.. ..	100	129
	(c) .. ..	.. ..	100	116
	(d) heaviest soil	.. ..	100	109

Thus there is a fairly definite indication that on the lighter soil Hen Gymro showed to much greater advantage than on the heavier soil. In fact, however, Standard Red gave consistently improved results from the lighter to the heavier soil, the relative figures for Standard Red and Hen Gymro (each at 100 on the lighter soil) being :—

				<i>Standard Red.</i>	<i>Hen Gymro.</i>
Replication	(a)	.. ..	..	100	100
	(b)	.. ..	..	120	105
	(c)	.. ..	..	136	106
	(d)	.. ..	..	153	113

Thus, while in each replication series Hen Gymro outyielded Standard Red, it was far more successful on the lighter than on the heavier soil, and was less capable of taking advantage of the improved conditions of the heavier soil.

It is interesting now to review the yield performance of these five selected Hen Gymro lots over the period covered by the experiments. For this purpose it is sufficient to tabulate the average results for 1923 to 1927 and to add separately the results for 1928 :—

		<i>Standard</i>	<i>Hen Gymro.</i>				
		<i>Red.</i>	No. 274	No. 326	No. 480	No. 484	No. 490
1923—27	..	100	110	102	111	114	106
1928	..	100	117	114	124	131	128

On the whole, the 1928 results agree rather well with the average of the previous years, but they appear to favour line No. 490 rather unduly. Line No. 484 has shown a consistently high yielding capacity in spite of the fact, as shown below, that the grain in this line is very small, while the straw is less stiff than in No. 274 and much less so than in Standard Red.

GRAIN DEVELOPMENT.

In no case have I found a white-grained type of Hen Gymro; but in size and appearance of grain there is a very considerable amount of variation. As a rule, the grain is small and flinty, and bread-making tests with the mixed type gave very good results.

Even at its maximum development, the grain is apparently distinctly smaller than in Standard Red, although in certain seasons some of the selected lines have given samples of a greater grain weight per 1000 than this variety.

Of the seasons under review, 1925 appears to have been the most favourable for grain development, and in this season, Standard Red gave a particularly heavy grain sample while that of each of the five Hen Gymro lines was heavier than in any subsequent season. It may still be doubted, however, whether actual maximum development was in any case reached, but the figures obtained probably indicate fairly accurately the type of grain to be expected and its approximately maximum development in relation to that of Standard Red.

In the table given below, the actual weight per 1000 grains (in gm.) is shown for 1925 and the relative weights for each of the succeeding three seasons compared with 1925, that is to say, the relative figure for 1925 in each case standing at 100 :—

	<i>Standard</i>		<i>Hen Gymro.</i>				
	<i>Red.</i>	No. 274	No. 326	No. 480	No. 484	No. 490	
1925	..	54.56	45.16	43.20	50.96	37.26	46.10
1926	..	79	83	89	79	77	75
1927	..	71	91	90	82	94	88
1928	..	68	87	91	77	88	84

It seems possible from these figures that Standard Red more closely approached its maximum in 1925 than did the Hen Gymro lines, but this is not very probable as in that season the Hen Gymro lines stood very well.

In 1926 most of the Hen Gymro lines became very badly lodged long before harvest, line No. 274 standing best of all, while Standard Red became only very slightly lodged. Yet only two of the five Hen Gymro lines showed a greater deterioration in grain weight than the standard variety, while one of them, No. 326, in spite of lodging, showed far less deterioration.

The continuous rain of 1927 caused some lodging in Hen Gymro, but none in Standard Red. Yet the selected lines of the former gave a much higher yield than the latter, while at the same time they gave

a far finer grain sample. In fact, the Standard Red sample in this season was extremely poor as compared with Hen Gymro.

The next season, 1928, appeared to be much more favourable to grain development, but actually Standard Red and also all the Hen Gymro lines except one gave a lighter sample even than in 1927. The difference as compared with the peak season, 1925, is, however, very much more marked in the case of Standard Red than in the Hen Gymro lines, so that the latter approached much more nearly their maximum development.

The reaction to soil conditions appears to be at least partly responsible for difference in grain weight. The 1928 results are interesting in this connection. Below, the figures for the different replications are shown, but unfortunately in three cases the grain for two replications was mixed :---

				<i>Standard</i>		<i>Hen Gymro.</i>			
				<i>Red.</i>	No. 274.	No. 326	No. 480	No. 484	No. 490
Replication	(a)	Lightest soil	..	33.67	36.78	38.81	36.29	32.11	37.15
"	(b)	Intermediate	..	36.49	39.01		40.59		
"	(c)	"	..	37.59	40.44	40.25	39.84	33.71	40.56
"	(d)	Heaviest soil	..	41.52	41.04		40.15		
Average	..	..	..	37.32	39.32	39.53	39.22	32.94	38.86
Relative yields	..	..	..	100	117	114	124	131	128

In all three cases where independent results for each replication were obtained, the 1000 grain weight was distinctly lower in the "a" series than in the others, while in two cases there was a gradual increase from the lightest to the heaviest soil. Exactly the same thing is suggested in the other lots.

A comparison of grain weight with yield, however, shows no definite correlation, so that it is obvious that when different strains are compared, grain weight alone is no definite index to yield.

What the figures do show is that under conditions unfavourable to grain development in Standard Red, in spite of a lower potentiality, some Hen Gymro strains may produce a bigger grain than this variety, but this is not a necessary or essential factor in determining relative yield.

GENERAL SUMMARY AND CONCLUSIONS.

"Hen Gymro" wheat as obtained from various growers was found to consist of several distinct morphological types within which, as judged by yield and other results, there were yet different physiological types. In addition, there were also plants which were heterozygous for one or more factors, indicating that in this variety natural crossing is not uncommon.

In the course of seven years 265 original selections were reduced to five, continued selection being made on yield, resistance to lodging, and, to some extent, quality of grain. Standard Red was the check variety used for comparison.

On the average over five years, Standard Red and "Hen Gymro" selections (in dwindling numbers) gave all but identical yield results, but over the same period the five "Hen Gymro" selections ultimately retained showed an average excess over Standard Red of from 2 to 14 per cent.

The chief defect of "Hen Gymro" is undoubtedly weakness of straw, and, while the five lines now retained differ somewhat in this respect, none of them is as stiff-strawed as Standard Red. This means that where the soil conditions are good and stormy weather intervenes before and during ripening, "Hen Gymro" is liable to become badly lodged. This happened in one of the seasons under review, and in this season "Hen Gymro" fell distinctly behind Standard Red in yield. In another season, however, even though Hen Gymro became somewhat lodged, the conditions were so adverse to Standard Red that its yield was very poor as compared with Hen Gymro.

In 1925 the conditions for grain development were particularly good, and the results showed that at their maximum development the grain of Hen Gymro lines is distinctly smaller than that of Standard Red, and in the case of line 484 it is very small.

Under adverse ripening conditions, however, grain development suffers far less as a rule in Hen Gymro than in Standard Red, and a combination of relatively poor soil and poor ripening conditions may even cause the grain of some "Hen Gymro" lines to be actually bigger than that of Standard Red. In fact, in most years, Standard Red has yielded, under Aberystwyth conditions, a very poor grain sample, while the grain of Hen Gymro, though small, has been much better in quality.

On the whole, therefore, over a number of seasons, taking both yield and quality into consideration, "Hen Gymro" has undoubtedly proved to be superior to Standard Red, under the conditions prevailing at the Welsh Plant Breeding Station, in spite of its weakness of straw, and the results are therefore in accord with the claims of the growers of this variety.

It should be clearly understood, however, that "Hen Gymro" is less well suited to land in good wheat growing condition than to land of relatively poor quality. But it has the great advantage for average conditions in Wales that it is capable of ripening a relatively good grain sample under very poor ripening conditions, and should, therefore, maintain its popularity where small areas are grown for household purposes.

The five "Hen Gymro" selections now retained have the following characteristics :—

Hen Gymro 274 (Plate 1) : Beardless ; glumes white or pale red, hairy. Straw long but relatively stiff. On the average has outyielded Standard Red by 10 per cent. Grain small as compared with Standard Red at its best, but medium sized for Hen Gymro. Ripens well under adverse conditions. Later in ripening than other Hen Gymro lines and distinctly later than Standard Red.

Hen Gymro 326 (Plate 2) : Beardless : glumes red, smooth. Straw relatively short and rather weak. On the average has outyielded Standard Red by 2 per cent. Grain rather smaller than line 274 but in spite of weak straw is capable of ripening a relatively good grain sample under very adverse conditions. Too weak-strawed for very good conditions, but does well on lighter and poor soils. Relatively early ripening.

Hen Gymro 480 (Plate 3) : Beardless ; glumes white, smooth. Straw short, weaker than in 274 but stronger than in 326. Grain smaller than Standard Red but relatively large for Hen Gymro. Gives a much better grain sample than Standard Red under adverse ripening conditions, but is not the best Hen Gymro line in this respect. Has outyielded Standard Red on the average by 11 per cent. Rather late ; suits lighter soils than those on which Standard Red is at its best.

Hen Gymro 484 (Plate 4) : Beardless ; glumes white, smooth. Straw slightly long and rather weak. Has outyielded Standard Red by 14 per cent. on the average, and is the heaviest yielding Hen Gymro line. Grain very small but ripens very well under adverse conditions. Suits the lighter soils. Rather early.

Hen Gymro 490 (Plate 5) : Beardless ; glumes red, smooth. Straw rather long and rather weak. Has outyielded Standard Red by 6 per cent. Grain smaller than Standard Red but rather large for Hen Gymro. Unless very badly lodged, ripens a much better grain sample than Standard Red under adverse conditions. Suits the lighter soils. Rather early.

Standard Red (Plate 6) : This illustration is given to show the difference in the type of ear produced.

It is obviously impossible without further trial under as widely different conditions as possible to state the exact conditions for which each of the five selected lines is most suitable, but from present results it would appear that lines 274 and 480 are the most reliable where the growth of the crop is expected to be strong ; lines 326 and 484 are better suited for the poorer conditions, and line 490 is of a somewhat intermediate type.



Plate 1. Hen Gymro, Line 274.

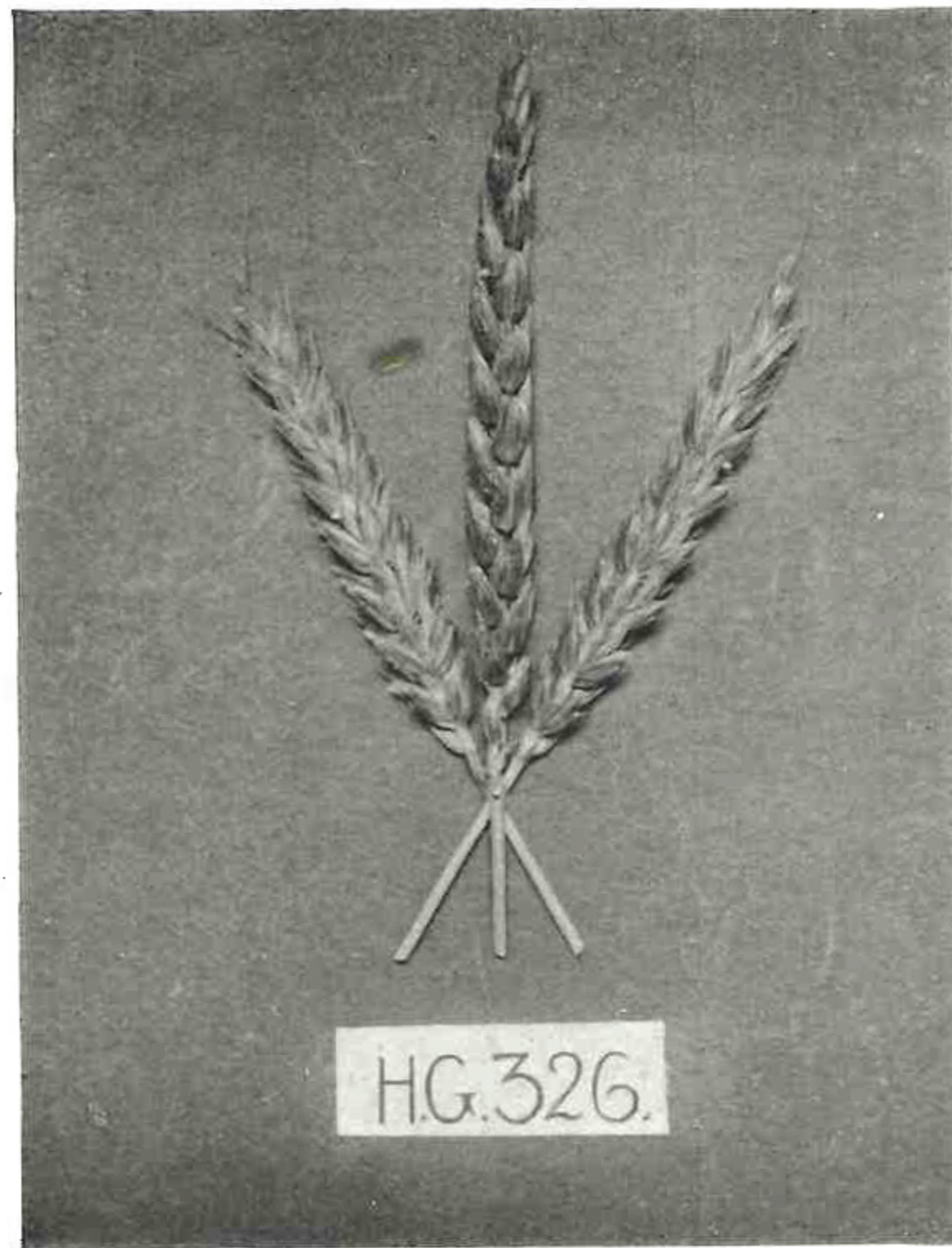


Plate 2. Hen Gymro, Line 326.



Plate 3. Hen Gymro, Line 480.

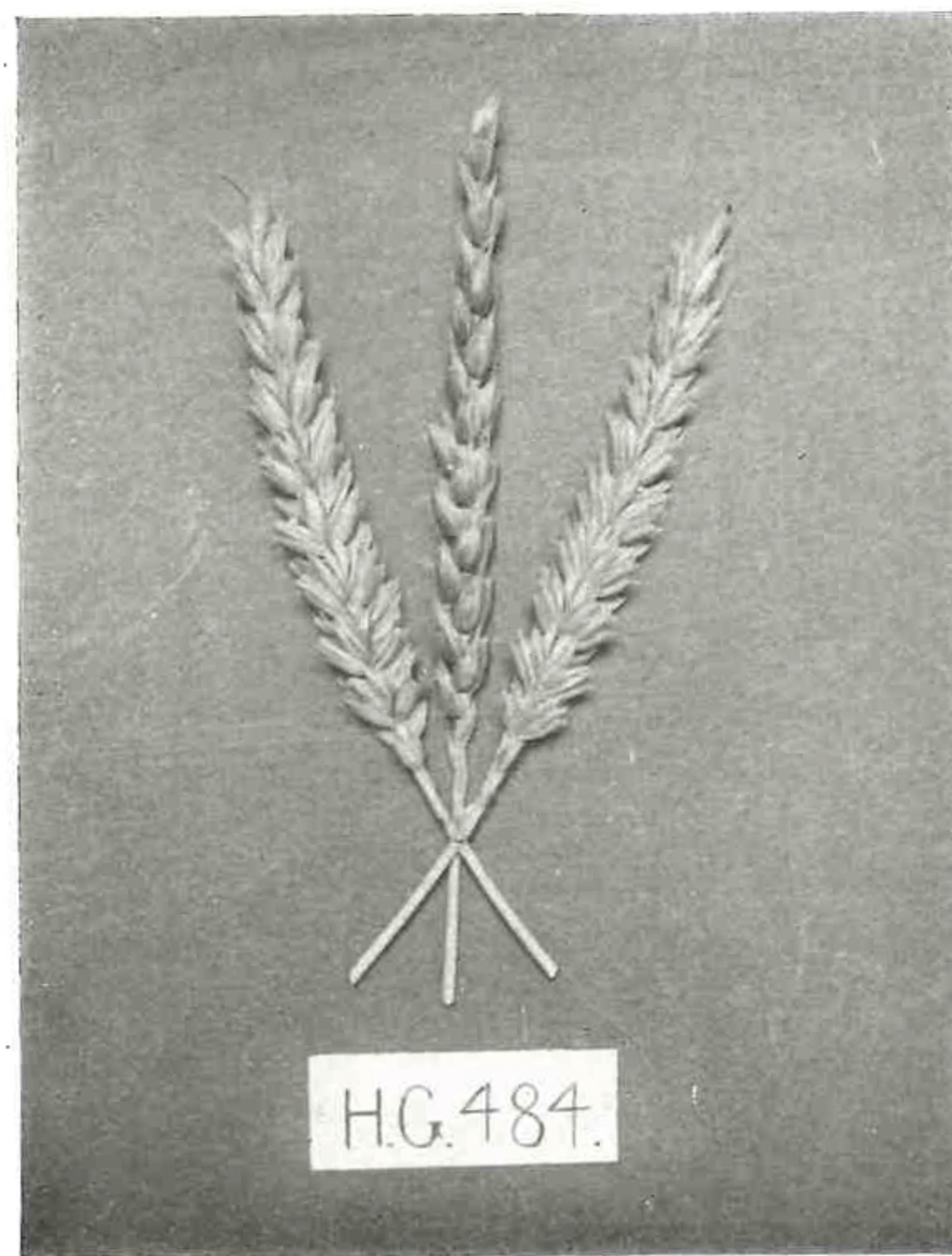


Plate 4. Hen Gymro, Line 484.



Plate 5. Hen Gymro, Line 490.

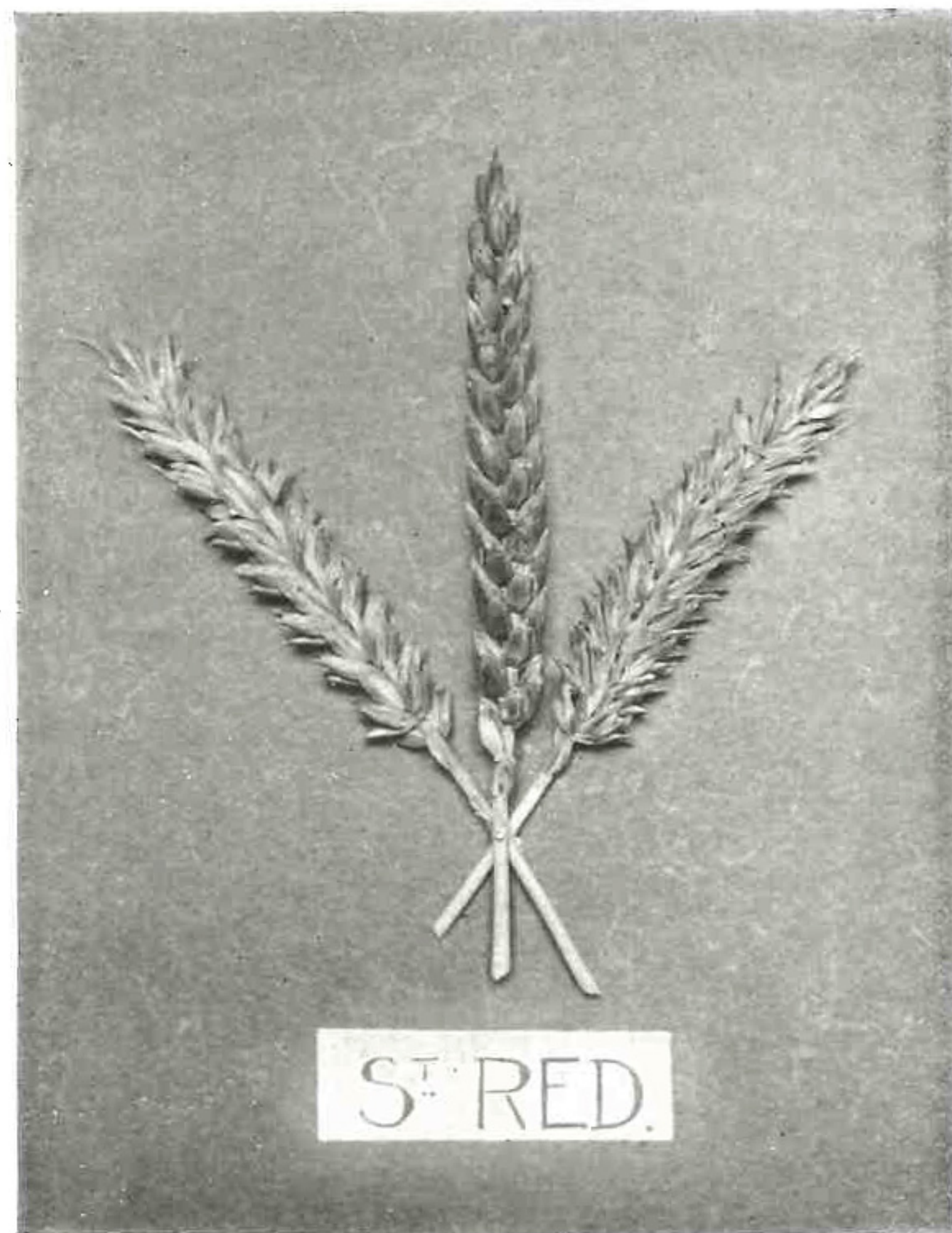


Plate 6. Standard Red.