

**FROM AGRICULTURAL GAZETTE OF N. S.
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NO. 625; SEED WHEAT: AN
INVESTIGATION AND DISCUSSION OF THE
RELATIVE VALUE AS SEED OF LARGE
PLUMP AND SMALL SHRIVELLED GRAINS**

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N. A. COBB

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Seed Wheat:

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AN INVESTIGATION AND DISCUSSION OF THE RELATIVE VALUE AS SEED OF LARGE PLUMP AND SMALL SHRIVELLED GRAINS.*

BY N. A. COBB.

Introduction.

ALL the remedies we devise for the alleviation of crop diseases are but so many acknowledgments of the existence of disease.

Our greatest hope is for the production of disease-resistant varieties. These will be resistant through certain constitutional characteristics.

Next in importance to such constitutional characteristics is the maintenance throughout the life of the plant of vigorous growth. This involves health and strength from the very start. The seed must be good, and the seedling strong, if the best results are to be secured.

Manifestly one of the main elements in the production of a strong seedling is a strong sound seed. In all annual crops, such as wheat, this question of strong sound seed is an ever recurring one, and one that requires careful attention. Nevertheless, it is frequently neglected. It is so much neglected that I am of the opinion that the losses caused by the diseases from which such crops suffer would be very materially lessened if we could bring the average of our seed up to the point actually found profitable by, say, the best fourth of our farmers.

The following pages present the results of an inquiry into the state of our seed wheat, with the object of defining the extent to which it is practicable to add to the vitality of our wheat crops through more careful attention to the seed.

The quality of our seed wheat is looked at here only in the light of a single test, namely, the relative amount of small and

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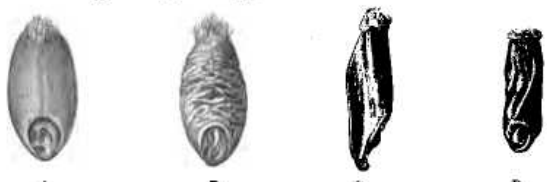


Fig. 1.—Four grains of wheat showing varying condition—A, plump; B, slightly shrivelled; C, shrivelled; D, much shrivelled; enlarged four diameters.

shrivelled seed and useless or deleterious matter to be found in the sample tested. Needless to say a better test would have given more

* This investigation was suggested by the Interstate Wheat-rust Conference. Two related investigations are reported in the published proceedings of the Conference. The present report differs from previous ones in being the result of several years' field work on an extended scale, with the object of arriving at average figures that might be made the basis of definite rules for practice.

valuable results. The test applied has the merit of having a proved relation* to the amount of the resulting crop, as well as that of being easily applied.

I cannot help feeling that a number of people will, at first glance, regard any effort to prove the lower value of small grains as seed to be rather in the nature of an effort to kill a dead horse. Still I find it impossible to disclaim the necessity of harping on this subject so long as there exist among us advocates of the use of such seed, and, above all, so long as it can be shown that our practice is as far below what it ought to be as it is at present.

So long as it can be shown in the manner here adopted that the bulk of our wheat growers are using seed of a quality no higher than that disclosed by these examinations, there will exist the disagreeable necessity on the part of our leading lights to keep on pointing out the

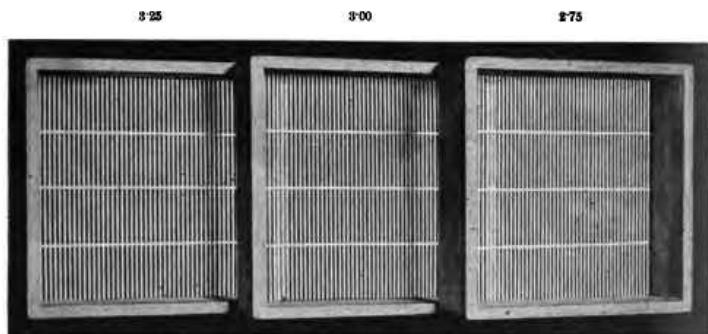


Fig. 2.—Three sieves with meshes of three different widths, from 3.25 millimetres to 2.75 millimetres; shown about one-tenth natural size.

fact. It seems to me that our agricultural officers of all kinds, and especially the teachers in the agricultural schools, should keep the facts of the case prominently before growers and intending growers.

This can be done at the schools and colleges through passages in lectures, and even more forcibly by ocular demonstration year by year through the growth side by side of plants derived from small, medium-sized, and large seed. Object lessons of this kind have an exceedingly high value if used in the right way—far higher than is generally realised. Both students and visitors will, from such continuous annual demonstrations, be more strongly impressed than through almost any other means.

For several years demonstration plots of this nature were grown at the Wagga Farm, and they were inspected, first and last, by thousands of people. Side by side were to be seen rows of plants grown from large, medium-sized, and small grains. In each season these were to be seen growing on varying soil, and exemplified in the most diverse

* The proof is presented in the second part of this report.

varieties of wheat. They were indeed eloquent and convincing, though silent, arguments against the use of anything but large and plump seed.

To this day growers of a conservative type have not ceased to tell me that these little demonstration plots were the means of opening their eyes to the fact that the extra number of seeds in a bushel of pinched wheat was not all that had to be taken into consideration in connection with the comparison of large and small grain for seed purposes, and that further trials have convinced them of the advisability of using the large grains for seed.

This is not to be wondered at, for no one could fail to see, if he examined the demonstration plots with care, that the plants from large and plump seed were not only larger but healthier and more resistant

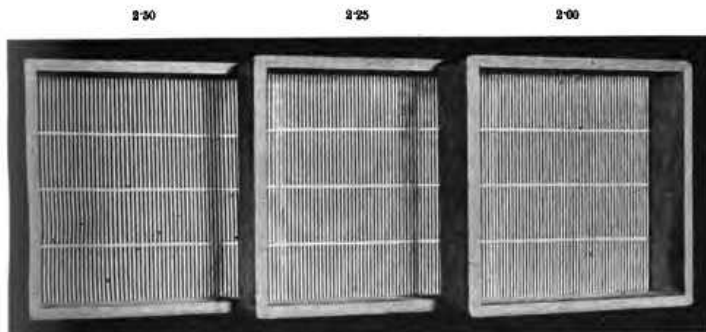


Fig. 3.—Three sieves of varying mesh from 250 millimetres to 200 millimetres; shown about one-tenth natural size.

Figures 2 and 3 show the kind of sieves used in testing the quality of seed-wheat for this report. The sieves are made from "half-round" brass wire, placed with the flat side down. They were specially made with accuracy.

to all adverse conditions. They suffered less from disease if disease appeared, and they more readily surmounted the difficulties placed in their way by bad patches of soil or by scanty rainfall.

Rev. E. E. Hale, consoling with one too sensitive about unfavourable comments in the public prints, remarked that of all the people who saw the print not half would see the item in question; and of those who saw it, half would not read it; and of the half that read it, half would not understand it; and of the half that understood it, half would forget; and that under such a haphazard process the ones that remembered probably would not amount to much any way.

It is some such thought as this that leads me to emphasise the advisability of demonstration plots at our colleges and farms and wherever else we can present them. I fear that experts are terribly prone to over-estimate the number of people that read their lucubrations, and if these be sifted according to Dr. Hale's keen-witted method it will be seen that our printed teachings stand in need of all the reinforcement possible.

I.—Our Seed Wheat.

The differences in yield arising from the use of seeds of different sizes,* and the consequent gain to farmers through the proper grading of seed wheat so as to secure for seed only that which is best, led to a desire to ascertain the precise quality of the seed wheat being used in this State. Accordingly arrangements were made for collecting samples in various parts of the State at sowing time, the samples to be as far as possible the ones actually being sown.

The task of collecting these samples was entrusted to Mr. E. D. Butler, and it was carried out carefully and systematically—several hundred samples being collected, to each of which was attached a statement showing the locality in which it was being sown, by whom it was being sown, and the name of the variety. Each sample consisted of about five pounds of grain, though in some cases there was somewhat less, and in a few cases more.

These samples were graded in the same manner as the samples that were used as the basis of the article entitled "The Grading of Wheat," published in the *Agricultural Gazette*, Vol. VIII, p. 855, that is to say the December number, 1897. The same sieves were again used, and the sizes of the grain were the same as then secured, and similar illustrations were again prepared as the result of these siftings. It is, therefore, sufficient to allude to the methods then used; and to reproduce here some of the illustrations prepared in explanation of that article. See Figs. 2, 3, and 4 to 10. I was careful to use as far as possible the same methods as before, in particular because it was from similar gradings that various sized seeds were obtained for the experiments made to ascertain precisely what are the relative yields from large and small seed growing under similar conditions for a series of years; experiments whose results are presented in the second part of this article.



Fig. 4. Fig. 5. Fig. 6. Fig. 7. Fig. 8. Fig. 9. Fig. 10.

Figures showing the actual size of the grains belonging to each grade yielded by the sieves shown in Figures 2 and 3. The proper grade numbers are placed above each illustration.

An attempt is made in the above illustrations to show the sizes of the grains that result from the grading done with the sieves shown in Figures 2 and 3, but these illustrations are somewhat deceptive because of the nature of the wheat grain. If the reader will examine a shrivelled grain, such as is figured at C, D, Fig. 1, he will at once remark the fact that its outline is large in proportion to its actual weight. This is owing to the shape and structure of the wheat grain, a shape that prevents it from being so placed with reference to the observer that its contour will adequately represent the loss of substance due to shrivelling. The actual differences in size are also obscured by the assemblage of the grains. If the reader will bear these facts in mind in looking at the above seven illustrations, he will derive a more correct impression. Grains of these seven sizes are also shown in Figs. 14, 20, 21 and 22. The actual variation in the size of the grains derived from a single ear of wheat is well and accurately illustrated in the woodcut, Fig. 11, which was prepared with great care to illustrate this point.

Of course the sizes of the meshes here used in the sieving are purely arbitrary, but they are the result of considerable study of the question of the range of variation in the grain of wheat, and, in the absence of any recognised standard, have served the purpose of the present and other investigations.

Method of Examination.

After the samples collected by Mr. Butler were graded, the weight of each of the seven resulting grades was taken, and, with a calculating machine, reduced to its percentage of the whole sample from which it was taken. Each sample, therefore, gave a result like the following:—

$\frac{\%}{3.25}$	$\frac{\%}{3.00}$	$\frac{\%}{2.75}$	$\frac{\%}{2.50}$	$\frac{\%}{2.25}$	$\frac{\%}{2.00}$	$\frac{\%}{1}$	Mixture.	Contamination.
1.1	7.6	29.7	23.4	35.6	5.5	5.9	Slightly mixed	Oats and white-heads.

* See the second part of this report.

by which is meant that 1.1 % of the sample was composed of grains of the size shown in Fig. 4, 7.6 % of the sample was composed of grains of the size shown in Fig. 5, and so on down through the seven grades. Thus, the series of seven figures gives a kind of picture of the sample. Looking at the first of the seven figures, we can see at once what proportion of the grains are large; looking at the other end of the series, we can see at once what proportion of the grains are small.

The sample on being compared with first-class samples of the same variety could be classed as good, bad, or medium; and it is needless to say that this classification was the main object of the examination. The results enable us to pass judgment with some certainty on the quality of the seed being used, and to discuss on a sounder basis than heretofore the question whether we are using seed as good as we ought to use, and, if not, what amount of money farmers could afford to expend in grading with a certainty of increasing the profits of wheat-growing.

In 1898, at the instance of the Hon. Sydney Smith, the then Minister for Agriculture in this State, the late Mr. Thompson collected data as to the proportion of the various varieties of wheat in actual use in the State. The record of his results, which appears in the Annual Report of this Department for 1899, shows that the varieties then in favour were as follows, and in the following order:—First, Steinwedel, Purple Straw, and Allora Spring; second, White Lammas and Australian Talavera.

Mr. Thompson had unequalled opportunities for collecting this information, travelling, as he was, among the farmers in all parts of the State as lecturer on agricultural subjects, and the information should be very reliable.

It is interesting to note that the samples gathered for the purposes of the present inquiry give as the favourite varieties the following, and in the following order:—Purple Straw, 52%; White Lammas, 27%; Steinwedel, 14%; Red Wheat, 3%; Golden Drop, 2%; Blount's Lambrigg, 1%; Velvet, 1%.

From this it will be seen that, at the time of collecting these samples, 93% of the wheat being sown consisted of Purple Straw, Lammas, and Steinwedel, with a large preponderance of Purple Straw.

Now the farmers must use these varieties either because they prefer them or because they can get no others, unless, indeed, they give the matter no thought, and simply sow whatever comes handy. I think we may unhesitatingly dismiss this latter contingency from the discussion, as experience shows that farmers have decided opinions, and are no more likely than others to neglect to think about the means they employ to make a living.

Of the remaining two alternatives, namely, whether they use these varieties because they prefer them, or because they can get no others, it seems to me we must choose the former. Other sorts are available, and at prices within the reach of all. If a farmer does not use some other variety, it is not because he cannot get it, nor because he cannot afford it. This seems to me the inevitable conclusion.

It seems equally clear that the farmers must prefer these varieties because they consider them to be the most profitable ones to grow.



Fig. 11.—An ear of Defiance wheat, with the grains arranged as extracted from one side of the ear.



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SEED

WHEAT

.. BY ..

N. A. COBB.

*Published by Authority of the
GOVERNMENT OF THE STATE OF NEW SOUTH WALES.*



SYDNEY, 1903.



SAMPLES of New South Wales Seed Wheat, Graded to show Quality,
 1897-8—continued.

Locality.	Variety.	Remarks.	%					Ballings	
			8-25	5-00	2-75	2-50	2-25		2-00
Murrumbarrh	P. St.		64	18.4	54.0	30.9	6.3	1.7	2.1
"	R. Tu.		9.5	40.7	29.2	16.3	2.1	5	1.1
"	N. Rd.	Mixed	1.6	7.9	10.0	44.5	27.5	3.6	4.6
"	"	Mixed	1.6	7.9	10.0	44.5	27.5	3.6	4.6
Young	P. St.	Mixed Oats	13.9	47.1	24.2	11.9	2.4	2	3
"	"	Mixed Oats	16.3	33.8	28.0	12.9	2.3	2	3
"	"	Mixed Oats	14.0	41.7	29.5	12.7	1.7	3	3
"	"	Mixed Oats	17.0	41.2	27.0	12.2	1.7	3	4
"	Strw	Mixed Oats	7.0	22.1	30.4	28.4	8.4	1.8	1.5
Bowling	Wh. L.	Mixed Oats	15.2	23.7	25.5	23.4	7.7	2.7	5.0
"	P. St.	Mixed Oats	3.3	17.5	24.7	35.1	13.6	4.3	2.1
Hilabo	Wh. L.	Mixed Oats	1.4	6.9	19.4	49.3	30.7	1.7	..
Yass	"	Mixed Oats	20.0	37.2	28.6	12.0	1.9	2	2
Grabben Gullen	"	Mixed Oats	7.4	29.4	34.6	23.3	3.0	6	1.3
Yass	Wh. L.	Mixed Oats	40.8	47.2	10.8	1.5	..	..	..
"	R. L.	Mixed Oats	6.5	13.1	25.1	33.4	14.0	2.5	5
"	Rd. L.	Mixed Oats	11.4	30.0	37.5	19.7	1.3	1	1
Harden	Strw	Mixed Oats	9.5	29.9	37.1	22.9	5.8	1.6	3.2
Near Cowra	"	Mixed Oats	3.5	10.9	22.3	39.7	15.7	5.2	2.4
Cowra	Strw	Mixed Oats	2.5	21.4	24.2	32.0	12.6	3.3	3.7
"	"	Mixed Oats	2.6	12.4	30.3	34.3	15.8	2.6	2.1
"	"	Mixed Oats	5.1	17.2	26.3	31.6	15.3	3.2	3
West Vile	Wh. L.	Mixed Oats	4.2	10.4	24.5	50.0	9.3	3	3
Back Creek	Y. Tu.	Mixed Oats	8	9.8	21.3	39.4	23.6	4.3	9
Moroniga Creek	"	Mixed Oats	1.9	5.6	14.9	44.5	25.7	3.8	4.2
Cowra	P. St.	Mixed Oats	8	6.9	16.3	44.2	25.5	3.3	9
"	"	Mixed Oats	2	3.9	11.2	39.7	37.0	5.7	3.2
Molong	"	Mixed Oats	1.8	14.1	19.4	37.6	20.5	5.2	3
Canowindra	Wh. W.	Mixed Oats	2.2	3.7	17.0	30.3	30.5	9.3	2.2
"	P. St.	Mixed Oats	3.0	10.4	30.6	35.3	11.6	1.6	7
"	"	Mixed Oats	3.1	24.9	31.7	24.5	8.9	1.3	3.4
Blayney	Wh. L.	Mixed Oats	15.9	44.3	30.0	10.3	1.9	3	3
Barry	"	Mixed Oats	4.2	11.7	25.7	35.5	13.6	3.6	1.5
Blayney	P. St.	Mixed Oats	17.1	43.5	23.6	10.3	1.4	1	7
Avondale	Wh. L.	Mixed Oats	4.9	14.4	23.3	19.7	32.3	2.6	1.7
Near Orange	"	Mixed Oats	9.1	43.0	32.7	7.3	1.9	2.6	2.1
Forest Reefs	Wh. H.	Mixed Oats	13.9	32.1	23.3	7.1	2.3	3	1
Raglan	"	Mixed Oats	3	9.9	16.8	42.4	24.9	3.6	3.6
"	"	Mixed Oats	4	9.6	18.7	43.7	25.6	4.1	2.6
"	Wh. L.	Mixed Oats	3.3	14.9	31.5	30.3	16.6	2.4	1.0
Perth	"	Mixed Oats	4.3	14.3	20.3	36.1	18.3	3.9	1.8
White Rock	"	Mixed Oats	24.1	52.4	22.8	1.0	1	1	1
"	"	Mixed Oats	5.0	13.3	20.6	33.9	16.6	4.4	1.9
Broula	P. St.	Mixed Oats	1.6	14.6	27.3	41.5	12.6	1.9	3
White Rock	Wh. L.	Mixed Oats	5.4	15.4	21.3	33.4	20.3	2.7	1.5
George's Plains	Wh. T.	Mixed Oats	7.9	33.3	39.5	31.2	4.3	1.2	1.6
Millthorpe	Ill. L.	Mixed Oats	3.9	12.9	26.6	40.2	12.1	2.9	1.3
W. Orange	"	Mixed Oats	10.2	32.2	24.6	16.5	6.4	1.6	2.6
Shaw	"	Mixed Oats	1.8	8.1	14.3	33.4	27.7	9.9	3.7
Near Orange	Strw	Mixed Oats	11.5	18.3	27.4	33.3	6.7	1.2	1.2
Millthorpe	P. Fr.	Mixed Oats	31.5	43.2	16.7	8.9	3	1.1	7
Spring Hill	P. St.	Mixed Oats	12.1	49.7	23.6	8.3	1.7	1.2	1.9
"	Wh. H.	Mixed Oats	10.0	49.7	24.0	5.3	1.5	2.0	1.1
Near Orange	P. St.	Mixed Oats	17.3	39.0	20.2	10.7	3.4	2.4	7.1
Burrows River	Wh. T.	Mixed Oats	2.4	14.2	23.3	44.2	8.4	7	3
Wattamondarra	P. St.	Mixed Oats	1.3	4.4	19.3	37.5	22.7	3.3	2.7
Neville	"	Mixed Oats	20.7	37.7	21.3	13.2	3.3	1.3	2.0
Evans Plains	Wh. L.	Mixed Oats	6.1	15.1	23.6	34.1	15.6	3.1	1.3
Brewongle	"	Mixed Oats	6.3	14.7	19.3	28.1	17.2	2.5	1.6
Barwang	"	Mixed Oats	9.4	7.7	12.3	33.4	22.1	1.7	9
Kialla	Tul.	Mixed Oats	3.6	12.3	43.3	21.9	4.7	9	5
Garangula	Wh. W.	Mixed Oats	2.9	9.4	31.4	44.5	8.0	1.4	2.4
Evans Plains	Wh. L.	Mixed Oats	4.7	16.4	20.6	32.2	18.1	3.6	1.4
Locknow	"	Mixed Oats	13.4	41.7	24.5	13.0	3.5	1.2	2.5
Jerrawa	R. Wh.	Mixed Oats	1.4	3.4	17.3	32.0	39.4	6.2	1.5
Demondrille	Strw	Mixed Oats	5.9	40.5	24.3	19.3	7.5	1.7	7
Wattamondarra	"	Mixed Oats	2.3	16.7	27.9	31.7	13.4	4.7	2.3
Currawang	P. St.	Mixed Oats	4.7	21.3	30.3	27.2	6.2	3	1.0
Jerr	"	Mixed Oats	13.7	32.3	40.3	12.3	4	..	..
"	Wh. L.	Mixed Oats	21.3	43.7	33.9	1.2	..	..	..
"	Rd. L.	Mixed Oats	11.4	26.9	46.1	15.4	1	..	..
Adelong Crossing	Wh. L.	Mixed Oats	6.1	29.2	35.7	24.7	3.7	2	4
"	P. St.	Mixed Oats	8.9	28.9	35.7	19.3	7.4	1.1	3
South Gundagai	Wh. T.	Mixed Oats	8	7.4	21.7	49.7	19.3	1.2	3
Near Gundagai	"	Mixed Oats	7.5	20.2	25.0	27.5	16.9	2.4	7