HOW THICK SHALL WE SEED CEREAL GRAINS?

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Some Interesting Results with Oats Secured at the Ontario Agricultural College, Showing the Effects of Thick and Thin Seeding on Yield, Lodging, Weight per Bushel and Resistance to Rust.

THE question of the amount of seed of the cereal grains to be sown for the best results has been discussed many times and in many places. Experiments have also been conducted with the object of securing information on this problem in different countries; and yet we have reached no unanimity in regard to the matter. We find, for instance, in Canada that the amount of oats that are sown per acre will vary from one to four bushels, and in Scotland the quantity frequently reaches six bushels of seed per acre. We find very strong advocates of using as small a quantity as one bushel of oats per acre, while others will argue as earnestly for the using of as high as six bushels or more per acre. The question then arises as to why there is such a difference in views of men who have had wide experience in the growing of grain upon their individual farms.

We are safe in coming to the conclusion that these variations are caused partly on account of knowledge, and partly on account of ignorance. It is undoubtedly true that the amount of seed per acre that would give the highest results under certain circumstances would not give the highest results under other conditions. There are many factors which exert an influence in determining the quanity of seed to use to give the best returns, each of these factors producing its own particular influence. The fertility of the soil, the state of cultivation, the moisture content of the soil, the variety of the crop, the method of seeding, the date of seeding, and many other factors, apparently exert their respective influence in regard to the amount of seed to be sown in order to secure the highest returns. If this be true it can readily be seen that we cannot come to a definite conclusion regarding the quantity of seed to use per acre of any class of our farm crops that would give the highest returns under all circumstances. It must be admitted that definite knowledge regarding the influence of some of the factors above referred to is very meagre. We believe as knowledge along these lines accumulates we shall be in a very much better position to know what is likely to give satisfactory results under the varying conditions in which a crop is to be grown. We believe, therefore, that any new and definite information obtainable which will throw additional light on this problem will be appreciated. I will present the preliminary results of an experiment which was started at the Ontario Agricultural College in 1909, and which has now been conducted in each of the past four years.

AN EXPERIMENT WITH STOOLING

Members of this Association who are present, will remember the discussion which has recently taken place in the United States in regard to seed selection as an influence in crop production, and also the discussion that took place in Canada regarding the stooling of oats in reference to the yield of grain per acre. To glean information, especially, on these two points, an experiment has been conducted in each of four years by using both large and small seed of heavy stooling, medium stooling, and light stooling varieties of oats, and by planting the seed of each variety in squares, one, two, three, four, six, eight and 12 inches apart. The seed was planted by hand and with very great care. Each plot was surrounded by oats of the same kind and planted in the same way. When the crops were ready to harvest the surrounding plants were removed so that the crops under experiment would not be influenced by the paths surrounding the plots. After the seed had germinated and the oat plants had appeared above the ground, notes were taken in regard to the stooling of the plants every 24 hours. Other notes in regard to height, amount of rust, strength of straw, etc., were taken at the proper time. Each plot was harvested with great care. The actual number of heads on each plot were counted. The weight of the total crop was determined, and after threshing was completed the amount of grain was subtracted from the entire crop, thus furnishing the combined weight of straw and chaff. The table published herewith gives the average results of 32 tests made by planting oats at seven different distances apart:.

In an experiment of this kind it is usually considered wise to extend the experiment into extreme conditions, hence in the thickest seeding the oat grains were planted one inch apart each way, which would require on the average a little over 12 bushels of seed per acre, and in the thinnest seeding the oat grains were planted one foot apart each way, which would require only about one-tenth of a bushel, or a little less than three pounds of seed per acre. Some of the intermediate seedings, however, approximate more closely the quantities of seed which are used in actual practice, as for instance, where the grains were planted two inches apart each way it required about three bushels of seed per acre, and where the seeds were planted three inches apart each way the amount of seed required would be about one and one-third bushels per acre. We expect to start another experiment in which several different thicknesses of seeding will be used, but the range will probably run from about one bushel to four bushels per acre.

THESE TESTS ARE ACCURATE GUIDES

The average results are worthy of very careful consideration. It is probably the first time that an experiment of this kind has been conducted in the manner here described. It should be remembered that each column represents the average of 32 distinct experiments. These experiments covered a period of four years which included an exceptionally dry season, and an exceptionally wet season. The yields of grain per acre are much lower than we usually obtain in the Experimental Grounds at Guelph. This is due to certain reasons, one reason being the unfavorable weather conditions of some of the years, and another reason being the fact that we conducted the experiment on land which would be unlikely to cause the straw to become badly lodged, especially in a wet season. Even though this precaution was taken the crop lodged considerably, especially in 1912, when the weather conditions were inducive to a very large yield of straw of a succulent character.

The fourth column from the left shows that the number of heads or stools of an oat plant can be regulated largely by the thickness of seeding. When the seeds were planted one inch apart each way there was only an average of one head a plant, and when the seeds were planted 12 inches apart each way there was an average of 11 heads a plant. The number of heads a plant increased according to the increase in the distance between the plants.

THINNER SEEDING INCREASES HEADING

In the fifth column we have the comparative number of heads from equal areas of land. Where the seeds were planted one inch apart there were 144 times as many plants as on the same area of land where the seeds were planted 12 inches apart, and only about 11 times as many heads. It will, therefore, be seen that while the number of heads per acre decreases with the thinness of the seeding, that decrease is not nearly as great as the decrease in the number of seeds planted.

According to the results obtained in column six, the highest average crop was produced by the plants which were planted in the six inch squares. These plants were about five inches taller than those that were planted in the inch squares, and about one and one-half inches taller than those which were planted in the 12 inch squares. It seems apparent that where the plants were a foot apart each way the stooling was so abundant that the energy of the plant was expended in the production of stools to the sacrifice of the height to a limited extent. The results shown in the sixth column correspond, to a certain extent, with those in column five. It will be seen that the plants which lodged the most were those which were also the tallest, and were produced from the seeds which were planted six inches apart. It is interesting to notice that the very thickest seeding produced a crop which was lodged less than any of the other seedings. These results seem somewhat different from the popular conception that it is necessary to sow oats comparatively thin so as to reduce the percentage of the lodging of the grain.

Thickness of Seeding Oats—Average Results for Four Years of Experimenting at the O. A. C.

Inches between plants.	Seed per acre, Lbs.	Bus.	Heads per plant.	Per cent of heads per acre.	Height (ins.).	Per cent lodged.	Per cent rust.	Days to mature.	Pounds per bus.	Yield per acre Straw (tons)	Grain (bus.)
1	414.4	12.34	1.0	100	28.4	5.5	11.5	91	25.0	1.75	30.60
2	104.0	3.06	1.1	51	27.5	11.9	15.0	93	31.4	1.58	34.95
3	46.1	1.36	1.3	17	32.6	12.8	17.8	94	33.2	1.52	41.73
4	26.0	.76	2.0	13	33.1	29.9	20.9	95	31.5	1.79	38.99
6	11.6	.34	4.7	12	35.3	35.8	25.4	97	29.6	1.49	37.42
8	6.5	.19	6.5	11	34.9	34.7	27.7	99	26.4	1.20	31.77
12	2.9	.09	11.2	9	34.9	30.1	33.2	100	23.9	1.03	21.93

MOST RUST ON THIN SEEDLINGS

The average results of the per cent. of rust shown in column number eight, is also very interesting as they show a gradual increase in the amount of rust on the straw of the oats from the thickest to the thinnest seedings. The plants from the thin seeding had about three times as much rust as those from the thick seeding. The amount of rust on the plants, which were four inches apart, was about average of that of the thinnest and the thickest seedings.

The average number of days from the time that the grain was planted until the plants were matured are presented in column nine. It will be seen that there is a difference of nine days from the time that the thickly seeded plants matured until the thinly seeded plants had ripened. The increase in the stage of maturity corresponds exactly with the increase in the distance between the plants. The farther the plants were apart the later they were in ripening. It will, therefore, be observed that as the amount of seed oats

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