

GERMINATION OF "NEW SEASON'S" ALGERIAN OATS.

E. O. C. HYDE, Seed-testing Station, Palmerston North.

GENERALLY farmers are aware that the sowing of "new season's" oats in the autumn is attended by the risk of poor germination. This danger is often avoided by sowing at a heavy rate, or by using "old season's" seed. Nevertheless, the difficulty of judging the suitability of seed for autumn sowing not infrequently results in considerable loss. The trouble arises from the fact that the oat grain generally requires several months for its complete after-ripening.

It is characteristic of the seeds of many plants that they are incapable of germinating when newly ripened, or can be brought to germinate promptly only by the application of some special stimulus. During storage changes take place which render these "dormant" seeds capable of prompt germination. In this connection we speak of the process of "after-ripening," although the nature of the changes involved is still largely a matter of conjecture.

The oat-grain for some weeks or months after harvesting is in a "dormant" state, and only gradually, with the progress of after-ripening, acquires its full germinating-capacity. Dormant oats germinate, however, if they are first placed for about six days under moist conditions at a temperature within a few degrees of freezing-point. Thereafter they will continue to grow in a normal manner at higher temperatures. Under warm conditions (20° to 30° C.) dormant oats germinate completely only after the lapse of months. Furthermore, after a period of several days under these warm, moist conditions the seed loses its capacity to respond to the stimulus of low temperatures. Fully after-ripened oats, on the other hand, germinate within a wide range of temperature, from near freezing-point to as high as 30° C., the optimum temperature being about 20° C.

As regards germination, the behaviour of newly harvested oats is the same in the field as in the laboratory at temperatures comparable with the soil temperatures. There are ample grounds for the belief that soil temperature is generally the limiting factor in determining the rate of germination of dormant or partially dormant oats in the field.

The temperature of the soil, near the surface, varies widely at all seasons, but in the fine weather which prevails during the autumn months it frequently rises (in tilled ground) to over 30° C., while the minimum night temperature may be as high as 20° C. A comparison of the germination of a number of samples of partially dormant oats in the field and in the laboratory showed that during the autumn-months there is close agreement between the percentage germination in the field and the percentage in the laboratory with temperature fluctuating daily between 20° C. and 30° c. The Seed-testing Station has now adopted the practice of making two tests of each sample of oats received during the summer and autumn. In one test the grain is pre-chilled, whereby all dormant seeds are induced to germinate. From this test we learn

the proportion of living seeds, and the probable future germinating-capacity in the field when after-ripening is completed or when the prevailing soil temperature is low. The second test is made with the temperature at 30° C. during the day and at 20° C. at night. This test gives the approximate rate of germination which can be expected in the field if the seed is sown immediately.

In this way the difficulties attending the selection of seed can be overcome. There remain, however, problems relating to the supply of seed.

The time occupied by after-ripening varies from crop to crop, and the average duration of the process varies from season to season. Although it was known that after-ripening proceeds slowly after a cool and rainy summer, it has been impossible to foretell when any crop of oats would become suitable for use as seed.

Several investigators have observed that oats, like other cereals, can be "artificially after-ripened" by prolonged kiln-drying. Some preliminary studies have been made at the Seed-testing Station with a view to exploring the possibilities of hastening after-ripening in the grain-store.

Experiments designed to show the separate effects of temperature and moisture content were productive of the following information: The reduction of the moisture content has no immediate effect on the germinating-capacity. Both moisture content and temperature influence the rate of after-ripening, but temperature is the more potent factor. After-ripening is greatly delayed by storage at low temperatures, and is hastened by storage at relatively high temperatures. When stored at 30° C. samples of oats having a wide range of moisture content were all completely after-ripened within twenty-four days. By maintaining the storage temperature at about 30° C. it appears to be possible, at little cost, to have oats ready for sowing within four weeks after threshing from the stook. Prolonged storage at this temperature is injurious to the vitality of the grain, unless the moisture content is low. However, oats with a moisture content as high as 17.6 per cent. showed a decline in germinating-capacity only after storage for two months at 30° C.

The necessity for forcing the after-ripening of oats may seldom arise. It may more frequently be of assistance to grain-merchants to be able to foretell when a given lot of oats will become available for use as seed. Probably when more experience has been gained it will be possible to accomplish this. By determining the germinating-capacity and the moisture content of a sample of the grain, and also the prevailing temperature of the store, it probably will be possible to make some estimation of the time required for the completion of after-ripening.

DISCUSSION.

Mr. *Cockayne*: With regard to "new season's" oats for autumn sowing, I take it that merchants may get within a few days a report based on prechilling and indicating whether the oats are suitable for sowing. With regard to oats not of good germination at temperatures of 20° to 30°, provided it is possible to do so, merchants holding supplies of these oats will tend to keep them for future use rather than make immediate deliveries of them. One feels that would be a very useful service.