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INOCULATION FOR THE GROWTH OF LEGUMES

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The numerous enquiries recently received from all parts of Canada upon this subject point to the desirability of making some announcement respecting the work that has been done, and is now being carried on, at the Experimental Farm, Ottawa, to obtain data as to the practical value of inoculation with cultures for increasing the growth of clover, Alfalfa and other legumes. Further, since many of our correspondents are making requests for samples of inoculating material, it seems advisable to state our present position as to any supposed necessity for a general distribution of cultures of the nitrogen-fixing bacteria.

For several years we carried on experiments, both in pots and in the field, with cultures prepared in Germany and known as Nitragin, the results appearing in the Reports of the Experimental Farms for 1897, 1898 and 1899. It was shown that in certain instances the cultures had distinctly favoured the growth of the legume, but their action was more or less uncertain and we concluded that there was not sufficient evidence to justify us in recommending this preparation for general use. These cultures (there being at that time 17 in all upon the market) were found particularly susceptible to light and heat, and under the best conditions of preservation their vitality could only be guaranteed for six weeks from the date of preparation. It was felt, therefore, that the matter was still in the experimental stage—that further investigation and more satisfactory results would be necessary before it could be considered one of practical utility.

THE NEW CULTURE.

The re-awakened interest in inoculation is undoubtedly due to the wide publicity given to the new cultures of Dr. George T. Moore, of the Bureau of Plant Industry, Department of Agriculture, Washington, D.C., U.S.A., illustrated articles setting forth the claims of this culture and the results obtained from its use having appeared in several of the popular American magazines and a large number of newspapers. It is

claimed for these cultures that by reason of special modifications in the method employed in their preparation that they are more potent and much less susceptible to unfavourable conditions than the German Nitragin.

Last spring we were kindly supplied by the authorities at Washington with samples of these new cultures for Red Clover and Alfalfa. Experiments with these preparations were carried on in pots, using sterilized soil of a light sandy character, the instructions issued with the cultures being carefully followed. While it is true that nodules were found on many of the plants growing in the inoculated pots, these nodules were few and of small size and no general increase in the weight of the crop was to be observed as a result of the use of the cultures. Further, as a few nodules developed on plants in two of the control (uninoculated) pots we were unable to decide if the cultures had been effective or not. It is certainly to be regretted that the results this past year have not been more satisfactory, but at present, from our own experience, we cannot report very favourably. It is possible that the sterilization to some extent injuriously affected the soil, for the growth was not luxuriant on either the inoculated or untreated pots. Further trials will be made during the coming season on a larger scale, and the results made known in due course.

INOCULATION WITH SOIL.

The attention of farmers may be drawn to the fact that effective inoculation for Clover and Alfalfa may be obtained by the use of a certain amount of the soil from fields growing good crops of these plants, and which we may feel sure contain an abundance of the bacteria. This method has proved most successful. Such soil is not difficult to obtain in any of the provinces save, perhaps, Manitoba and the North-West Territories. Directions for using these bacteria-containing soils may be briefly given as follows:—The soil containing the bacteria is mixed with a larger quantity of soil and this broadcasted over the area to be sown with the Clover or Alfalfa, as the case may be. The field is at once thoroughly harrowed. This may be known as soil inoculation. Another method is to place the bacteria-holding soil in a vessel, such as a pail, and pour on water. Stir and allow to settle. After standing a little time, decant the supernatant soil extract and thoroughly moisten therewith the seed of the legume. The seed should be sown as soon as it has sufficiently dried. In connection with inoculation for Alfalfa it is of importance to note that Professor Cyril G. Hopkins, of the Illinois Experiment Station, has conclusively shown that soil growing Sweet Clover (*Melilotus Alba*) may be effectively used for the inoculation of Alfalfa.

THE PREVALENCE OF NITROGEN-FIXING BACTERIA IN THE SOIL.

For many years past, as is well known, particular attention has been paid by us to the system of soil enrichment by the growth of legumes and to the various means that could be taken to obtain a vigorous growth of the crop. In this connection we may say that our experience and observations have shown that the necessity of inoculation is not so great as was at one time thought. We are led to believe that the existence of the bacteria that serve to fix the nitrogen in the legume is by no means restricted to small or isolated areas. We have found—at all events, in Ontario and the Eastern provinces—that failures in the past to obtain a good catch of clover have been due rather to deficiency of moisture, an unsuitable mechanical condition of the soil, poverty in humus, or

insufficient drainage, than to the absence of nitrogen-assimilating germs. The killing out of clover may, we think, in the majority of cases be attributed to the severity of the winter or water lying upon the soil in spring. The general—though probably not universal—presence of root nodules on the clover in Ontario and the East leads us to believe that special means for inoculation have not been necessary save, perhaps, in exceptional instances in the aforementioned provinces. It is due to these facts, we consider, that there has been no general demand for inoculating material.

In a recent tour through the larger agricultural districts of British Columbia the writer found these organisms present upon every root of clover examined, and especial care was taken to obtain information upon this matter in all the agricultural districts visited. The same stands true alike for the irrigated soils of the dry belt (Nicola and Okanagan valleys), as well as for the lower Fraser and the coast soils and those of Vancouver Island. The luxuriant crop of clover observable in British Columbia almost everywhere this year convinced me that inoculation was not generally necessary in that province.

THE BENEFIT IS ONLY TO BE OBTAINED THROUGH THE LEGUMES.

It would seem from certain of the enquiries lately received that there is an impression abroad that the benefit to be derived from the nitrogen-fixing bacteria can be obtained directly from inoculation of the soil, *i.e.*, without the agency of a clover or other legume crop. This is, of course, erroneous, for these beneficial bacteria are only of assistance to the legumes. It is only through the growth of the clover (or other legume) and the subsequent decay in the soil of its roots (or whole plant) that the soil is enriched in humus and nitrogen. It is obvious that where clover bearing nodules on its roots grows luxuriantly, inoculation is unnecessary.



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