

to be varied to bring about the most healthy growth of turf and correspondingly the greatest freedom from disease.

The disease problem is not necessarily connected with the vigor of the growth of turf or of other crops. There are some diseases which can attack a crop more successfully that is growing luxuriantly than if it is more or less stunted; but a large number of the milder diseases, and especially the milder root parasites, are dependent to a very large degree for their opportunity to injure these plants on a sub-normal condition of the plant itself, and this can be brought about by unwise use of fertilizers or unbalanced fertilizers, as well as by drought, or drowning from too much rain or too heavy watering.

So we find a need for the closest possible cooperation in these difficult and unknown problems. Even the farmer in the long run is going to benefit from the very close cooperation that has existed, and that I hope will continue to develop, between the United States Golf Association and the Bureau of Plant Industry. If, through the keen interest in turf production and turf maintenance, these researches will give us a similar knowledge of grass management as we are now securing of tobacco management, then these same ideas can be applied on pasture lands, lawns, and other parts of the farm and home-stand, no less than on the golf courses.

I want to add one word of caution, however. Because work is done scientifically, it does not mean necessarily that it is going to be done rapidly. I think much excellent work is spoiled by a desperate attempt to reach conclusions too suddenly and before the problems are thoroughly understood. In urging more attention to research problems, I wish to appeal to all of you not to be insistent on immediate application of results, and especially do not feel that the work is useless if such application of results shows that the work was not sufficiently understood and that parts of it may have to be done over again.

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### Colloidal Phosphate as a Fertilizer

From time to time the Green Section receives inquiries as to the merits of colloidal phosphate as a grass food. One of the most common phosphatic fertilizers is superphosphate, previously widely known as acid phosphate. As far as we have been able to ascertain, there appears to be no difference between grasses and farm crops in their utilization of different forms of phosphate. The evidence available however indicates that grass requires relatively less phosphate than do many of the farm crops but shows no special preference for any certain form of phosphate from which to obtain its supply. A rather complete estimate of the value of colloidal phosphate as a fertilizer has been published by the Massachusetts Fertilizer Control, in its 56th report, in Bulletin 51 of the Massachusetts Agricultural Experiment Station, Amherst, which appeared under date of November, 1929. Its report on colloidal phosphate is quoted below. In this report we wish to call special attention to the difference in cost of colloidal phosphate as compared with superphosphate. This difference is even more striking when one takes into account the relative percentages of phosphoric acid contained in these two forms of phosphorus, and its relative availability. In discussing colloidal phosphate the report says:

"This product was temporarily registered in Massachusetts as 'Florida phosphate with colloidal clay.' Later, through mechanical separation of the product supplemented by a chemical analysis of the various separated portions, both made at this institution, it was determined that the material was largely of a colloidal nature (having diameter of particles from .005 to .0001 mm.). Registration has since been completed under the name 'colloidal phosphate.'

"This product is a low-analysis natural Florida phosphate known to the industry as 'pond phosphate,' a by-product in mining Florida rock phosphate. In the recovery of this Florida rock phosphate, water is used. The soft, finely divided phosphate, with more or less clay and silt, is washed into ponds or basins, the finer material separating more abundantly at points farthest from the washer. When the water evaporates, the very finely divided deposit remains, and this is the source of the product under discussion.

"The material is not sufficiently rich in phosphoric acid and, moreover, contains too much iron and alumina to warrant its use in the manufacture of superphosphate. Its use as a fertilizer is therefore restricted at present to direct application to the soil. The product is in no sense a complete fertilizer as it contains no nitrogen or soluble potash, but furnishes phosphoric acid in the form of tricalcium, iron, and alumina phosphate, forms considered unavailable according to official methods of analysis.

"With reference to its purchase as a source of phosphoric acid, without consideration of the claims of the producers as to merits based on its colloidal nature or any unique feature of its chemical composition, it might be compared to superphosphate. The more common grade of superphosphate sold in Massachusetts contains 16 per cent available phosphoric acid of which from 9 to 11 per cent is in water soluble form. This product cost on the average during 1929, \$20 a ton, delivered, thus making the unit cost of available phosphoric acid from this source \$1.25, which is at the rate of 6¼ cents a pound. The colloidal phosphate is guaranteed 22 per cent total phosphoric acid, no claim being made for either water soluble or available phosphoric acid. The ton price quoted for the product is \$55 f. o. b. Boston, thus making the unit cost for *total* phosphoric acid \$2.50, which is at the rate of 12½ cents a pound, or more than double the cost from superphosphate.

"This station has made two analyses of the colloidal phosphate, with results as follows:

	"Total phosphoric acid
"Sample received from Natural Products Corporation..	20.40
"Sample received from Market Garden Field Station...	21.18

"The product was registered under a guarantee of 22 per cent total phosphoric acid, no claim being made for water soluble or available phosphoric acid, nitrogen, or potash. Our analyses, therefore, did not include these determinations. The variations noted in the composition of the two samples as compared with the guarantee are not surprising, as such a product is likely to vary in composition, and it would hardly be an economical proposition to attempt its standardization."