Extension Circular 348
March, 1940

APPLICATION OF SUPERPHOSPHATE

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Corvallis

Cooperative Extension Work in Agriculture and Home Economics
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Oregon State College and United States Department of Agriculture, Cooperating
Printed and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914

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The increased use of treble phosphate under the AAA program has led to many questions regarding the application of this material. We do not have much information comparing different methods of application under Oregon conditions. A few fundamentals on the use of phosphate fertilizer may be helpful in developing local recommendations as to its use.

Treble phosphate and other phosphate fertilizers are manufactured from rock phosphate which contains phosphorus in the form of tricalcium phosphate and a certain amount of impurities. The rock is treated with sulphuric acid forming a mixture of monocalcium phosphate (the available form of phosphate) and calcium sulphate (gypsum). This material is the ordinary superphosphate of commerce. In the manufacture of treble phosphate the calcium sulphate is eliminated making possible the higher concentration of available phosphorus.

The term available as applied to phosphate fertilizers is only a comparative term. When phosphates are applied to the soil, certain reactions may occur that make the material either temporarily or permanently unavailable. On certain acid soils it is probable that iron and aluminum phosphates are formed which may become permanently unavailable. On alkaline soils with an excess of lime, tricalcium phosphate is again formed. This material may become available in time through the action of organic compounds in the soil. To say that neither of these reactions would occur on a strictly neutral soil would be risky, since some difficulty is involved in determining when soil is strictly neutral. One or the other of the above reactions goes on to a certain degree even in a neutral soil.

Experimental evidence in all parts of the United States points to the fact that phosphate fertilizers do not penetrate far into the soil even though there is ample rainfall or irrigation water. This may be due to the reactions outlined above or to physical properties of the phosphate and soil. The bulk of the application of the top dressing of soluble phosphate probably remains within the surface inch of soil until such time as it can be taken to a greater depth through the growth of roots.

These two fundamental properties of phosphate fertilizer should be remembered in developing recommendations for use. Top dressings should be made at a time when the plant can take up the readily available material before it has an opportunity to revert to a less available form. This means an application when the plant roots are active. Since the material does not leach downward to any great extent, it should be applied at a time when the surface of the soil can be kept moist, permitting root growth up to the surface. If the phosphate will not go to the roots, permit the roots to go to the phosphate. This means early applications even on irrigated land since it is necessary that the roots be active up to the very surface of the soil. As the days become longer and the weather warmer it is increasingly difficult to keep this surface moist for any length of time. From the practical standpoint this means that top dressings in western Oregon should be made during

the last half of February. Applications in eastern Oregon should be made just as soon as growth starts in the spring, providing ample moisture is available to moisten the surface of the soil. In some areas it may be possible that the surface will be dry after growth starts and water is not available from irrigation districts until some later date. Under such conditions applications probably should be delayed until water is available. This would not be true if the soil is moist from natural precipitation.

Applications made to new seedings should be withheld until just previous to seeding time. Broadcast applications should be only lightly covered. Thorough mixing with the soil increases the chances of at least temporary loss through reversion. Applications made far ahead of seeding likewise increase the chance of loss since the phosphate is in contact with the soil a longer period of time before being absorbed by the plant. Applications made with fertilizer attachments on drills have distinct advantages in that the material is placed within easy access of the roots and there is a minimum of mixing with the soil.

These same principles will apply to any soluble phosphate material including complete fertilizers, the ammonium phosphates and the various super phosphates.

If applications can be made in combination with barnyard manure, the possibility of loss from reversion (a term applying to the formation of these insoluble compounds) is decreased to some degree. More effective use of phosphate materials can be made in this manner. However, manure should not be depended upon to hold the phosphate in available form over any great length of time.

Many applications of treble phosphate made in the past have been applied entirely too late because of the exceptionally dry season. Many persons have the impression that the results of last year's applications, which were apparently unused, should show on this year's crop if the soil was deficient in phosphate. It is quite probable that much of this material was entirely lost because of reversion to some unavailable form. Oftentimes a carry-over effect is noted for a period of several years after the application of phosphate. It is probable that this carry-over effect is due to the carry-over of organic material in the soil which had utilized phosphorus in its growth rather than to any carry-over of unused available material. Such carry-over would, of course, be most pronounced on perennial legumes and grasses.

Ordinarily rates of application recommended for treble phosphate are 100 to 125 pounds per acre. Actually this recommendation is nothing more than a wild guess. It should be ample to supply the phosphorus needs of most crops. On the other hand, we have no way of knowing how much of the material is temporarily or permanently lost. Lighter broadcast applications are not recommended without trial in the field because of the increased chance of loss. There is plenty of evidence that lighter applications can be used safely when the material is applied with a fertilizer attachment, because of the decreased contact with the soil. It would be wise if each farmer would vary the rate both up and down on small portions of the land phosphated. This is the only way that definite information as to the correct rate of application can be developed for each farm.

In regions where sulphur or land plaster are generally used, the application of these sulphur bearing materials should not be discontinued because of an application of treble phosphate. There are conditions where an application of the sulphur bearing material may be necessary in order to secure full benefit from the phosphate application.

These properties of phosphate materials, which make them difficult to use, have one distinct advantage. There is little or no danger of the phosphate being washed or leached away from the soil unless the run-off is serious enough to cause actual erosion. It is a mistake to delay application because of the theory of heavy rains. With ammonium phosphates, however, a substantial part of the nitrogen may be lost through heavy run-off or leaching.

Much difficulty has been encountered all over the state in applying treble phosphate. Spreading equipment satisfactory for other materials often will not handle the treble phosphate satisfactorily. The machines ordinarily used for spreading land plaster or sulphur have not generally proved satisfactory. Of these machines those with the auger type agitator appear to be most successful. Most of these machines will apply the material at the rate of 200 pounds per acre or more, but with a rate of 100 pounds per acre the holes are closed to a point where distribution is uneven and there is a tendency for the material to pack around the agitator. There are instances where the machines have been seriously damaged.

These land plaster sowers will generally work satisfactorily where land plaster is to be applied in addition to phosphate. If the two materials are mixed together the rate of application will be great enough so that it will flow through most machines. A few farmers have overcome the difficulty encountered with these machines by stopping up every other hole. This permits opening the remaining holes wide enough so that the material will feed through. No difficulty has been experienced with granulated superphosphate.

The more expensive spreaders made especially for commercial fertilizers have generally proved satisfactory.

Many farmers have used grain drills successfully for spreading this material. Most drills will work satisfactorily. However, there are reasons that would justify the recommendation, "any farmer using a drill for spreading phosphate should borrow his neighbor's drill". The material causes a rapid corrosion of all wearing parts. Furthermore, there is a definite risk at all times that the material may jam in the feed, even while the drill is in operation. This may cause serious breakage. If a drill is to be used, it is advisable to carry an extra sack or two of the material on the drill, filling the box to a depth of two or three inches of it in the drill at any one time. This will greatly reduce the risk of jamming. Corrosion should not be serious if the drill is thoroughly washed out with water after use. It would be advisable to wash every night if the drill is to be used for more than one day. When the job is completed the drill should be thoroughly washed, permitted to dry, then all parts subject to corrosion should be treated with some light oil.

One further thought on the use of spreading machinery. The machine may work perfectly for a day or two, then absolutely refuse to work, or it spreads in a most unsatisfactory manner. This can often be legitimately blamed on the weather man. Treble phosphate is not highly hygroscopic, yet it will absorb a small amount of moisture. This small amount is often enough to cause serious jamming in a machine that, a day or two before in conditions of lower humidity, was operating perfectly.

In western Oregon the conditions may be such that at the time of application only hand spreading is possible. No particular comment here except that this is a nasty job. On the other hand it is amply justified over waiting until the ground is dry enough to permit the operation of machinery.

We are badly in need of a reasonably priced machine to handle treble phosphate and other fertilizer materials. Some newer machines are being tried this year. Any information on the operation of these machines will be greatly appreciated.