Miscellaneous Fertilizers

By H. L. Westover

In the November, 1926, issue of THE BULLETIN, commercial fertilizers were discussed in some detail, consideration being given largely to products that are most commonly used to increase plant growth. There are many materials that at one time or another have been used as fertilizers and concerning the value of which inquiries are frequently received. It is the intention to discuss rather briefly in this article some of these products.

In an effort to reduce losses to a minimum it is the policy of most manufacturing concerns to utilize all by-products that can be economically prepared and marketed. In this connection fertilizers have come in for their share of attention and by-products from woolen factories, packing houses, oil mills, etc., that are of little further value for other purposes, are often utilized as fertilizers. These by-products vary in composition, some carrying a high percentage of plant food elements while others are very low in such constituents. However, the total amount of plant food alone should not be taken as a criterion of the value of the product for fertilizing purposes since it may be and often is in a form that is not available to the plant. For this reason it is not safe to purchase these unknown or unusual fertilizers except upon guarantee of available plant food regardless of the total amount. For convenience the fertilizers discussed in this article have been placed in three groups as follows: Nitrogenous fertilizers, phosphatic fertilizers and potassic fertilizers.

Nitrogenous Fertilizers

Dried Meat or Meal.—Dried meat or meat meal consists of materials produced in the process of rendering dead animals, meat refuse, and waste products from the manufacture of meat extracts. In the rendering process, hoofs, bones, meat, etc., are placed in tanks and subjected to steam pressure for the purpose of securing the fat. The residue is then dried and ground and sold as meat meal. When relatively pure meat meal contains 13.0 to 14.0 percent nitrogen and varying amounts of phosphoric acid depending upon the quantity of bone associated with the meat. Meat meal compares favorably with dried blood as a fertilizer. At one time it was of considerable importance but is seldom heard of now.

Leather.—Leather in the form of scraps is a waste product of various industries. The nitrogen content of leather meal prepared by the steaming or roasting process ranges from 7.0 to 9.0 percent and the phosphoric acid content from 0.5 to 1.0 percent. Decomposition takes place so slowly that it is of little value as fertilizer and is

not worth the cost of transporting any distance. It is sometimes used as an adulterant of dried blood. Leather meal can be changed into a more available form by treating with sulphuric acid, but the cost is usually prohibitive.

Horn and Hoof Meal.—Horn and hoof meal are by-products of slaughter houses that are sometimes steamed, dried, and finely ground to prepare them for use as fertilizers. They contain 10.0 to 15.0 percent nitrogen and about 2.0 percent phosphoric acid. The plant food elements are so slowly available that the material is of little value as a fertilizer.

Hair, Bristles and Feathers.—Hair, bristles and feathers contain about 15.0 percent nitrogen, but decompose so slowly that they are of little value as a plant food. Tannery hair contains more or less foreign matter and water which lessens the nitrogen content. In such hair the percent of nitrogen ranges from 5.5 to 8.0 percent. Hair and bristles have been used to adulterate the more readily available nitrogenous materials such as dried blood or tankage.

Clean feathers contain about 15.0 percent nitrogen but sweepings from feather warehouses contain only about 6.5 percent, indicating the presence of much foreign matter.

Wool Waste.—Wool waste consists of by-products of such industries as carpet making or manufacture of woolen cloth, etc., which may be utilized in the manufacture of commercial fertilizers. It is sometimes available in large quantities and at low cost. Pure wool contains about 15.0 percent nitrogen, but wool waste is usually mixed with more or less cotton and because of this the nitrogen content may vary from 0.5 percent to 7.0 percent. The nitrogen in the waste is extremely slow in its action in the soil though it may be made directly useful as an absorbent of other wastes, such as liquid manure, and as an ingredient of compost. Use of these materials untreated is only desirable when they may be obtained at very low cost. When dissolved with acid or steamed the nitrogen is made more available though the cost of such treatment is usually prohibitive.

Shoddy and Felt Refuse.—Shoddy formerly referred to short fragments of wool rejected in woolen industries. Now the name is often applied to both silk and wool wastes. It usually contains from 4.0 to 12.0 percent nitrogen averaging 6.5 percent. Felt is about the same general character as shoddy. These materials decompose so slowly in the soil that they are of little use in growing turf grasses.

Soybean Meal.—During recent years there has been an enormous increase in the production of soybeans in the United States. The beans are utilized in considerable quantities by oil mills. After the oil has been extracted the soybean cake is ground into meal, which is utilized largely as cattle feed, though to some extent as a fertilizer. The plant food elements in soybean meal rank a little higher than cottonseed meal, containing about 7.0 percent nitrogen, 1.5 percent phosphoric acid, and 1.8 percent potash.

In experiments on turf grasses soybean meal has given very good results and is seemingly equal to cottonseed meal for this purpose. Whenever soybean meal can be purchased at a lower price than cottonseed meal there is no reason why it should not be used. Much of the time, however, the demand for these materials as a cattle feed increases the price to such an extent that they can not be economically used as fertilizers.

Cocoa By-products.—Until a few years ago the only cocoa by-product in the United States having a sufficiently low market value to be available to the fertilizer manufacturer was the shells with such waste material as cocoa dust and sweepings. Due to the enormous demand for cocoa butter, two additional by-products, cocoa pressed cake and solvent extracted cocoa, are now available. The latter is the residue after the fat has been extracted from the pressed cake. The shells contain about 2.5 percent nitrogen, about 0.75 percent phosphoric acid and approximately 2.5 percent potash. The average pressed cake contains nearly 4.0 percent nitrogen, about 1.5 percent phosphoric acid, and a little less than 2.0 percent potash. Solvent extracted or defatted cocoa has a little less than 4.5 percent nitrogen, about 1.8 percent phosphoric acid and a little over 2.0 percent potash. The ground cocoa cake is said to be satisfactorily used as a filler and conditioner in mixed fertilizers and a part of the defatted by-product is used for the same purpose. As the latter by-product is nearly fat free it contains a somewhat greater percentage of plant food and therefore has a higher value as a fertilizer than the average unextracted cocoa. The quality or solubility of the nitrogen of the solvent extracted residue is a little lower than that of cocoa cake. While the experience with these cocoa by-products as a fertilizer on turf grasses is very limited it would seem that they should give about the same results as other organic fertilizers of similar availability and composition.

Sewage Sludge.—In a few cases near some of the smaller towns where land adapted to irrigation is readily available untreated sewage is profitably utilized in raising crops. In the case of large cities, however, this system of sewage disposal and utilization is entirely out of the question. In recent years great progress has been made in handling sewage and there is now available a product known as "sewage sludge," which is obtained by chemical treatment of raw sewage. This product is so low in fertilizing constituents that it is seldom worth handling. As a result of later studies in sewage disposal what is known as "activated sludge" which has given a very good account of itself as a plant food, is now being produced. "Activated sludge," however, may vary in composition, depending somewhat upon the amount of coarse vegetable matter that is incorporated with the fine precipitated material. Some of the best activated sludges have 5.5 percent nitrogen, 2.5 percent phosphoric acid, and a little less than 0.5 percent potash. Milorganite is the name applied to an activated sludge that is being manufactured by the Sewerage Commission of the City of Milwaukee.

Garbage Tankage.—This material is obtained by drying city garbage which consists of mixed animal and vegetable refuse. As a rule, the grease is first extracted after which the residue is dried. Its composition varies greatly. It may contain 2.5 to 3.0 percent nitrogen, 1.5 to 3.0 percent phosphoric acid, and 0.7 to 1.5 percent potash. It is regarded as a low grade of plant food, and since its composition and availability vary, should be purchased only on guarantee of analysis.

Soot.—The deposits formed in boiler flues and chimneys when wood and soft coal are burned consist chiefly of fine particles of carbon deposited on the chimneys during the imperfect processes of combustion. The carbon condenses gasses and sometimes becomes rich

in ammonia which it has absorbed from the gaseous products of combustion. The nitrogen content may range from 0.5 percent to 6.0 percent, the average being 3.2 percent. It also carries a small amount of potash and phosphoric acid. Soot improves the physical condition of heavy soils and on account of its dark color is supposed to absorb heat, thus forcing crops and increasing bacterial activity. Its value is as much due to its physical effect on the soil as to its fertilizing constituents.

Spent Hops.—Spent hops consist of the residue from the brewing industry. Ordinarily they contain only a trace of potash, a small amount of phosphoric acid, and about 5.5 percent nitrogen. They are reported to have been satisfactorily used in making compost for putting greens. Applications of spent hops to heavy soils are said to have worked very satisfactorily in rendering them more friable. Because of their fibrous nature, spent hops decompose rather slowly.

Spent Tea Leaves.—Spent tea leaves may contain a little less than 2.0 percent nitrogen, 0.5 percent phosphoric acid, and a little more than 1.0 percent potash. It is probable that they would be of some value for the humus they supply but their use is not justified unless they can be purchased at a very low cost.

Phosphatic Fertilizers

Bone Tankage.—Bone tankage is made from the residue after boiling cattle heads, feet, clippings, cartilage, and other refuse animal matter. It consists almost entirely of bone with small amounts of meat. The nitrogen content varies from 4.0 to 12.0 percent and phosphoric acid from 7.0 to 20.0 percent. The agricultural value is modified to a considerable extent by the degree of fineness. The bone in tankage has the same agricultural value as steamed bone of the same degree of fineness.

Bone Black.—This material also known as animal charcoal and bone charcoal is a product manufactured from bone which finds its chief use in sugar refineries. It is made by heating carefully selected bone in airtight vessels. The fat, nitrogen and water are removed leaving a phosphate of lime and carbon. It is then ground into a granular condition and becomes bone black. When used repeatedly in sugar refineries it becomes useless for the purpose and is sold as a fertilizer for direct use or to be made into a superphosphate known as dissolved bone black. Good bone black may contain 32.0 to 36.0 percent phosphoric acid. It decays slowly in the soil and at the present time is not used to any extent directly as a manure.

Bone Ash.—As the name implies, bone ash is made simply by burning bones in the open air. The nitrogen is of course wholly lost. The remaining portions contain 30.0 to 35.0 percent phosphoric acid. It was formerly imported from Argentina but is now practically out of the market.

Potassic Fertilizers

Tobacco Waste.—Tobacco waste appears in three forms, stems, stalks and dust. Stalks include the above-ground portions of the plants exclusive of the leaves. The stems include leaf stalks and ribs that make up the skeleton of the leaf together with such portions of the leaf as are rendered useless during handling. Tobacco dust consists of fine particles that result from handling, together with more or less dirt. Tobacco waste is rich in potash and contains some nitro-

gen. The nitrogen in the stems varies from 2.0 to 3.0 percent; in the stalks from 3.0 to 4.0 percent; and in the dust from 2.0 to 2.5 percent. Phosphoric acid is usually present in small amounts running between 0.5 and 1.0 percent. Potash occurs in the stems in amounts ranging from 5.0 to 10.0 percent, and in the stalks in amounts ranging from 4.0 to 5.0 percent. Tobacco waste is sometimes burned and the ashes used as a fertilizer. Such ashes are rich in potash but the nitrogen is lost. When ground fine tobacco waste is a valuable source of nitrogen where immediate availability is not required.

A few golf courses have reported good results from the use of tobacco waste as a fertilizer. Unless it can be purchased at a reasonable figure its use is not advocated. The nitrogen is of course beneficial to turf grasses but ordinarily the potash is not required, at least in such amounts, and furthermore, it may have a tendency to increase the weed problem.

Seaweed.—Seaweed is highly regarded in the Coast States as a source of potash for certain cultivated crops. The different kinds vary in fertilizing constituents. Some are relatively high in nitrogen and others in potash. It has been said that one load of manure is equal to two and a half loads of fresh seaweed or one and three-fourths loads that have lain in a pile for a month. Seaweed may be used to advantage in the compost pile when it can be obtained for the cost of carting provided the distance is not too great. Decomposition may be hastened by mixing with some manure and ammonium sulfate.

Velvet Bent at the Mountain Ridge Country Club, West Orange, N. J.

By A. D. Burton, Greenkeeper

A few years ago the Mountain Ridge Country Club decided to build nine new holes and remodel the old ones. At that time bent seed was not obtainable so the greens were sown with a mixture and with the idea in mind of getting bent into them later.

The architect had a nursery prepared, and as the old fairways and rough had a lot of velvet bent in them, sod was taken from these and planted in the nursery in rows about four feet apart. We had a hard time in selecting our stock on account of the men being unfamiliar with grasses, and as much of the selection for the nursery could not be supervised all kinds of grasses such as redtop, red fescue, and rough-stalked meadow grass were planted with the bent.

At that time I was working for the architect but when we finished construction I was retained by the club as Greenkeeper so the care of the nursery came under my charge.

I had a new plot of ground prepared for which additional selections were made. These stolons were planted and covered as advised by THE BULLETIN and that fall we had about 8,500 feet of nursery planted to all kinds of velvet bent. Later many of the coarser varieties were weeded out and the plot kept mowed down to nearly putting green length. This turf was fertilized with ammonium sulfate in May, June and July, and was a nice piece of turf.

That fall we planted 13,000 feet more which grew well with the exception of that planted late in the season. For this planting the selection of bent to be used was made entirely by myself.