



## HAWAII COOPERATIVE EXTENSION SERVICE

College of Tropical Agriculture and Human Resources

University of Hawaii

GENERAL HOME GARDEN SERIES No. 9

### SEWAGE SLUDGE

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Sewage sludge is the solid material removed from sewage during the sewage treatment process. It contains plant nutrients, organic matter, and microorganisms and, when properly used, is a satisfactory fertilizer material.

#### Types of Sewage Sludge

Five types of sludge are produced as follows: (1) raw, (2) digested, (3) activated, (4) digested activated, and (5) chemically precipitated. The types most often used as fertilizers are the digested sludge and the activated sludge.

#### Digested Sludge

The digested sludge is generally produced from a mixture of primary and secondary treatment solids that are stabilized by a 14- to 55-day heated anaerobic digestion process.

The digested sludge contains 1.5 to 2.2 percent nitrogen (N), 0.48 to 0.88 percent phosphorus, (1.1–2.0 percent available phosphoric acid ( $P_2O_5$ )), and 0.17 to 0.91 percent potassium (0.2–1.1 percent water-soluble potash ( $K_2O$ )). In addition, the digested sludge contains many of the micronutrients. In areas where industrial wastes are added to the domestic sewage, the digested sludge may be lower in nitrogen, phosphorus, calcium, and magnesium and often higher in heavy metals such as nickel, lead, and chromium. These latter materials may cause harmful residues in food crops if sewage sludge is used as a fertilizer source for these crops.

The digested sludge may be air-dried or heat-dried. The air-dried material may contain 10 percent or more moisture and the heat-dried product less than 5 percent.

The digested sludge may not be in acceptable physical condition for application to the soil. The digested sludge should be passed through a shredder or grinder to produce a material easier to handle and to incorporate into the soil. This material may still

contain viable weed seeds, especially tomato seeds. Digested sludge generally has little offensive odor, although if heavy applications are applied to the surface of the soil and then wetted, a noticeable odor may be detected. Digested sludge is believed to be free of disease-causing organisms.

Digested sludge is generally available in the vicinity of sewage disposal plants. It is of lower fertilizer value than the activated form, and for this reason little of it is commercially available for fertilizer purposes.

#### Activated Sludge

This type of sludge is produced by inoculating the sewage with special microorganisms and aerating it for several hours. The sludge is filtered off, with or without the aid of coagulants, dried in rotary kilns, and then ground and screened. This process results in a material that is in excellent physical condition for application to the soil. The activated sludge is free of odor and does not attract flies or other vermin. It contains 5 to 7 percent nitrogen, 0.88 to 2.20 percent phosphorus (2 to 5 percent  $P_2O_5$ ), 0 to 1.66 percent potassium (0 to 2 percent  $K_2O$ ), significant amounts of micronutrients such as zinc, copper, manganese, molybdenum, and boron. Most of the commercially available sewage sludges are of the activated type.

#### Use of Sewage Sludge

Sewage sludge is primarily a source of nitrogen and may be used where this plant nutrient is needed. It is a poor source of phosphorus and potassium and should be supplemented with sources of these nutrients for plant needs. The nitrogen is of the slow-release type, so that it may be applied at any stage of plant growth with little danger of "burning" the plants. Most sewage sludge is used for application to turf, but may be used with other crops. It may also be added to mixed fertilizers to improve their physical condition and to reduce the danger of burning when the fertilizer is applied.

### **How to Apply Sludge**

Add sewage sludge to the soil at the time of preparation and thoroughly mix it with the soil. For most grasses, apply the sludge at the rate of 50 to 55 pounds per 1000 square feet of soil area. After the plants are established, fertilize them as often as needed to maintain the desired green color of the lawn. Apply sludge as a top dressing at the rate of 35 to 50 pounds per 1000 square feet. At higher elevations, conversion of the nitrogen contained in the sludge may be slowed up, thereby decreasing its effectiveness as a fertilizer material.

Digested sludge may contain soluble salts. Therefore, the material should be tested and, if salts are present, care should be taken in using the material, to prevent damage to seeds or plants. Avoid application rates above 25 to 30 pounds per 1000 square feet, especially on sandy soils.

### **Summary**

When properly used, either the activated or the digested form of sewage sludge is a satisfactory fertilizer material. Its slow rate of availability greatly reduces the danger of burning plants, and its use as a fertilizer is an effective means of disposing of waste material.

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**NOTE:** The use of trade names is for the convenience of readers only and does not constitute an endorsement of these products by the University of Hawaii, the College of Tropical Agriculture and Human Resources, the Hawaii Cooperative Extension Service, and their employees.

Reprinted June, 1980—2M