SPECIAL PAMPHLET No. 49

COMPOSTS AS A SOURCE OF HUMUS

Utilization of Farm and Garden Vegetable Waste, Peat and Muck

ON many farms and market gardens some materials which are generally neglected or allowed to go to waste might well be used as humus-forming materials.

Humus is formed by the decay of organic matter. In the breakdown or decomposition of raw organic matter, microscopic forms of life play an indispensible part. These micro-organisms—bacteria, fungi, etc.—derive their food and energy from the organic matter and, as a result of their activities, humus is formed and the plant food present in the organic matter is gradually made available.

Humus is one of the most important constituents of all soils and performs several functions. It improves the texture of soils by lightening heavy clays and binding light sands. It increases the moisture-holding capacity of all soils, thus tending to lessen the adverse effect of drought on crops. It is the natural storehouse of the soil's nitrogen, the most expensive plant food in commercial fertilizers, and it also contains appreciable quantities of other plant foods. These facts emphasize the importance of using as sources of humus those materials which are often neglected or allowed to go to waste.

Sources of humus of particular interest to gardeners are such materials as garden refuse, leaves and domestic garbage. While these may be applied directly to the soil where they will eventually rot, the rate of decomposition is often very slow and it is preferable to compost them. Night soil, soot and wood ashes may be added during the making of a compost heap. The waste materials may be composted either with or without manure as follows:

When manure is used, spread the raw materials on the ground to a depth of 1 or 1½ feet making the width 8 to 10 feet and the length in accordance with the amount of waste available. Cover this with 6 to 12 inches of manure and continue with alternate layers of the waste material and manure until the heap

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is 4 to 5 feet high. The heap should be compact and kept *moist* but not saturated. After standing for several weeks it may be turned by cutting slices from top to bottom with a sharp spade and re-piled to ensure a uniform product. After three to six months the compost should be in excellent condition for application to the soil.

If the quantity is small the refuse is best handled by piling it in a crate to keep it from spreading. On stock farms the waste materials may be incorporated directly with the farm manure.

The preparation and handling of a compost heap is not a difficult matter, but in order that the resulting compost may of good quality certain details must be closely attended to.

1. The waste materials should be kept compact and moist. In districts of low rainfall such as certain areas of the Prairie Provinces and British Columbia, it is very difficult to obtain satisfactory results unless a supply of water for moistening the heap is available.

2. To prevent contamination of the soil with weed seeds, ripened weeds should not be used in the heap, but should be burned and the ashes then added. If pulled green before the seeds are matured the weeds may be added safely.

3. Garden or crop refuse affected by diseases such as club-root of cabbage, turnips, etc., should not be added to the heap as this practice would undoubtedly spread disease. All diseased refuse should be burned and the ashes then mixed with the other materials.

4. Care should be taken not to add any soil which has been used in the greenhouse or frames unless it is certain that such soil is free from root disease germs, eelworms, etc.

5. Tramping to ensure compactness as each layer of refuse is added is desirable especially if it contains a large proportion of dry material such as leaves.

When composting the waste materials without manure, decomposition will be more rapid if some food is supplied for the bacteria which bring about the rotting. This food may be supplied by distributing through the heap a small quantity of nitrogenous fertilizer such as sulphate of ammonia, together with some ground limestone to reduce acidity, or the following mixture may be used.

	Lb.
Sulphate of ammonia	40
Superphosphate	40
Muriate of potash	10
Ground limestone	20

If more convenient, the ground limestone may be replaced by 40 pounds of unleached wood ashes.

This mixture should be used at the rate of from to 4 to 6 pounds per 100 pounds of waste material and distributed evenly through the heap.

Using the above method, straw was converted to artificial manure by the Division of Chemistry. About 7½ pounds of a fertilizer mixture was used for each 100 pounds of straw. Rotting commenced within a week of constructing the compost pile, as shown by a rapidly rising temperature, and at the end of

three months a considerable shrinkage of the pile had taken place. Examination of the material showed that the straw had darkened in colour, was well broken down and resembled coarse strawy manure. This artificial manure was compared with barnyard manure on potatoes, and practically the same yields were obtained. The analysis of the artificial product, compared with average barnyard manure, was as follows:

	Nitrogen	Phosphoric Acid	Potash
Artificial manure	0·37%	0·22%	0·10%
Barnyard manure	0·50%	0·25%	0·50%

Similar experiments were conducted recently by the Division of Field Husbandry, Experimental Farms Service. In this work, the waste products used were corn stover, corn stover mixed with pasture clippings, corn stover cut with the ensilage cutter, and sudan grass. Fifty pounds of ammonium sulphate, 40 pounds of superphosphate and 30 pounds of ground limestone were mixed with each ton of the material except where a mixture of uncut corn and pasture clippings was used. Water was added to keep the composts moist in all cases, except where corn stover cut with the ensilage cutter was used. At the end of eleven months the composts were examined and it was found that in every instance sufficient decomposition had taken place for the compost to be satisfactorily used as manure. Analyses of representative samples of compost were made and the results of analysis, calculated to a 75% moisture content, are given in the following table. For comparison, the analyses of fresh and rotted stable manures, containing about the same amount of water, are included:

Material used for compost	Pounds per ton			Approximate value of plant food constituents
	Nitrogen	Phosphoric Acid	Potash	
				$ cts.
1—Uncut corn stover	6·8	15·2	2·0	1 85
2—Uncut corn stover and pasture clippings (no fertilizer added)	8·7	5·8	2·3	1 50
3—Corn stover, cut with the ensilage cutter	7·1	15·7	2·2	1 90
4—Sudan grass	14·6	12·8	2·3	2 65
5—Fresh horse manure	13·2	4·4	11·6	2 40
6—Fresh cow manure	11·4	2·8	9·8	2 00
7—Well rotted manure	15·5	13·7	16·8	3 50

While there is considerable variation in the amounts of plant food in the several composts, the approximate values of these constituents compare fairly favourably with those of fresh horse and cow manure. It will be noted that the potash contents of composts 1, 2, 3 and 4 are much below that of stable manure. This might have been rectified by adding 10 to 15 pounds of muriate of potash to the fertilizer mixture used when preparing the compost heap. The low content of phosphoric acid in compost 2 was because no fertilizers were added, but even so the amount of this fertilizer constituent present in the finished compost was larger than that usually found in fresh stable manure. However, the addition of the fertilizer materials is desirable as it results in a better balanced manure.

Among the more commonly occurring, but often neglected, humus-forming materials are peat and muck. Deposits of these organic substances may be found on many farms. Fibrous peat, when dried by exposure to the air, is an excellent absorbent of liquids and may be used in the stable, especially in the gutter behind the animals, to absorb the liquid manure which is far richer in nitrogen and potash than the solid excrement. A further advantage of its use is that it tends to lessen the odour of the stable by absorbing the ammonia given off in the fermentation of the urine. Its use increases the bulk and, to some extent, the richness of the manure.

Peat and muck may be applied directly to the soil, but are slow to decompose when used in this way. Composting them, layer by layer, with manure hastens their rotting. Somewhat the same effect may be obtained, with a considerable saving of labour, by applying the peat or muck to the land with a manure-spreader, applying a light coat of manure on top, and ploughing down the two.

In considering the utilization of farm and garden wastes as discussed above, it should be kept in mind that, apart from the plant food content, the chief object is to convert the coarse vegetable material to a form in which it may be satisfactorily used as a source of humus.

In view of the fact that the supply of stable manure for market gardening is becoming less year by year, it is not only feasible, but very desirable, for market gardeners in particular, to make composts from their vegetable and other waste materials in order to provide organic matter much needed for the soil.

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