

**Reprinted from the Maryland Florist
No. 23, August, 1955**

IS MANURE DANGEROUS?

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Upon seeing the after effects of half a dozen cases of the improper use of manure this past year the answer to the above question is definitely "Yes". We saw a bench of chrysanthemums and snapdragons which were a total loss due to dwarfing and loss of plants. In another place the grower analyzed the situation correctly and saved half of the crop by leaching the soil heavily. We also saw injury to potted chrysanthemums and to hydrangeas. In all cases cited there was an association of the use of manure with high soluble salts or specific toxic substances which in turn caused injury to the plant. It is true that other things contributed such as improper watering, and improper sterilizing, and composting. Perhaps

manure need not be dangerous to use but certainly it can be dangerous even in experienced hands.

In addition to the presence of excessive soluble salts or toxic materials there are other ways in which manure can be dangerous. Manures not properly composted and leached may give off volatile materials (usually ammonia which can readily be smelled) which injure plants in the confined atmosphere of the greenhouse. The breakdown of the manure produces available nitrogen and whenever accelerated by a warm temperature may cause a soft succulent growth of the plant which cannot be controlled once the manure is present.

Experiments at Cornell have led to the idea that the most serious results of the use of manure were from the poor aeration resulting from the bacterial activity associated with the breakdown of manure. The bacteria use the soil oxygen and give off carbon dioxide thus competing with the plant roots. Furthermore, the reduced oxygen in the soil will result in the chemical change of various elements in the soil which then become poisonous to plants in their "reduced" state. The most common substances produced might be nitrites, ammonia and marsh gas. (Andreasen, Richard C. in New York State Flower Growers Bul. 74, 1951). These effects of manure in the soil are most common under conditions of high soil moisture such as are obtained by the constant level system of watering. In order to keep bacterial activity at a minimum the use of a mixture of clay with peat (which decomposes slowly) and a soil pH of 5.0 (acid soil also reduces the activity of bacteria) is recommended for roses. (N.Y. Flower Growers Bul. 102, 1954).

Add to this the fact that the variable breakdown of manure and the resulting variable release of fertilizer elements make the job of soil testing more difficult and the results less reliable.

The Use of Manure

Within the memory of most florists (and still to some extent today) manure was the most common fertilizer material used. It was thought of as the stuff that made good flowers. As it became more difficult to obtain and chemical fertilizers became more common and their use understood, manure and other organic materials ceased to be important sources of fertilizer material. The role of manure became that of the "best soil conditioner" and florists who were fortunately situated bragged of their source of manure or that they produced their own from a herd of beef cattle. Now we find that the position of manure as a soil conditioner is being challenged from many sources aside from its natural scarcity in this machine age.

What is taking its place? The answer is artificial manure (composted straw, or other organic matter) sod crops, peats, both domestic and imported and the new synthetic soil conditioners such as Krilium and Aerotil.

What are some of the reasons for this decline in the use of Manure? Several are listed below:

1. Manures are variable and are unpredictable just as much as they are variable. Depending on the filler material used as bedding and litter, they will vary tremendously in their desirability. Some kinds as poultry manure are

rarely if ever safe for direct use in the greenhouse. Material accumulating for months in feeding pens will vary greatly from that cleaned daily in dairy barns. Many times, certain chemicals are used to disinfest the stable or animals or the manure and these chemicals may be harmful to plants.

2. To be safe for greenhouse use it must be composted, leached and stored so that it no longer retains much of its original fertilizer value.

3. Because of its rapid decomposition it benefits soil structure greatly but likewise does not last long in the soil to retain this benefit.

4. It breaks down more rapidly in hot weather and makes the job of soil testing and setting up a fertilizer program more difficult. It contributes to soluble salt problems after sterilizing and due to increased number of microorganisms competing for oxygen in the soil air may accentuate soil aeration problems.

5. Manures when unsterilized, usually carry weed seeds and often disease organisms which attack the crop plants. This however, may also be true of many peats and other forms of organic matter.

Manure is, we feel, best used as a soil conditioner mixed with the soil or as a soil mulch and not considered as a fertilizer. When used it should be rotted so as to be easily mixed with the soil. It should be stacked or composted during the rotting period in a well drained place out in the weather where it will stay wet and a certain amount of leaching take place. Manure is still used to a large extent by the florist industry but there is an ever increasing trend towards the use of other materials.

Substitutes for Manure

In field preparation of soil there have been some very satisfactory programs of soil building worked out through the use of green manure and sod crops.

A few years ago the use of corncobs (ground or whole) was quite an innovation as a substitute for manure in mulching of roses. This proved very satisfactory and the leaching of sugars from the corncobs was one of the reported reasons for the increased friability and structure of the soil presumably due to the increased number of microorganisms. Ground corncobs have also been used very extensively in soil mixtures by some florists. Hay and straw are suitable for soil mulching and after having been composted are suitable for mixing with the soil. Corncobs, hay, straw, and similar material decomposed fairly rapidly and as such have much in common with manure in increasing the population of microorganisms and also aiding soil aggregation. They do, unlike manure, deplete the soil nitrogen in the process and have often been used for this purpose when the nitrogen in the soil is too high.

Peats, formed from the accumulation of the dead plant material under conditions where decomposition is only partial, offer the most satisfactory substitute for manure for many purposes in the greenhouse. Domestic peats, formed to a large extent from reeds and sedges are satisfactory for many purposes. Many are fine and powder like in texture. They may vary

considerably in moisture content and acidity. When purchased locally and in bulk they may prove economical for many purposes. Reed and sedge peats are not as satisfactory as is "peat moss" for acidifying soil or using as a soil substitute for such crops as azaleas.

"Peat moss" is the term used to designate the partially decomposed sphagnum from northern

partially decomposed sphagnum from northern bogs and although some is available from this continent a good share of the material sold is imported from Europe. It is usually packed dry in bales and has considerably more fiber and structure than reed and sedge peats. It is fairly uniform, quite acid and typically contains no weed seeds although the possibility that disease organisms may be present should not be overlooked.

Peat moss has been used successfully as a mulch or a soil conditioner for all of the common crops, is excellent as a soil substitute for certain acid crops as azaleas, gardenias and hydrangeas (even poinsettias) and is used in the propagation for many cuttings. It decomposes slowly, thereby neither adding or taking away appreciable amounts of nitrogen from the soil and does not greatly increase the population of microorganisms. Because of its granular character and relative resistance to decomposition it improves the structure and aeration of soils more effectively and over a longer period of time than some of the other materials.

The determining factor in the use of peat moss in the greenhouse is its relative cost. Where it is obtained reasonably it is coming more and more into use in the greenhouse.

The synthetic soil conditioners, of which Krilium is probably the best known trade name, have not come into widespread use in the greenhouse. The great interest which accompanied their introduction has declined considerably. They still have value as soil conditioners but the price is high for the benefits received. Generally, experimental results have shown no increases in production over the use of adequate amounts of some organic materials used in the soil. Where peat or manure more costly or harder to get than they generally are today then there might be more of a place for the synthetic materials.