

How to Kill Weed Seeds in Compost

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[First of Two Installments. To be Concluded in June GOLFDOM]

COMPOST free of viable weed seeds is very desirable. Good clean compost is needed for the topdressing of fine turf areas and for use in other places where the weed situation causes concern. The problem of the most efficient and economical method for the destruction of weed in soil or compost is an important factor.

Previous methods of soil sterilization by the use of steam and electricity to generate heat sufficient to kill weed seeds; and by chloropicrin have been employed at the Rhode Island Agricultural Experiment Station with varying degrees of success. Preliminary tests in 1934 with nitrogenous fertilizers indicated their possible use as weed seed eradicating agents. As a consequence four different sets of experiments were conducted over a period of seven years to determine the weed seed killing power of certain nitrogenous fertilizers mixed with the compost.

Experiments undertaken and the purposes of the tests were as follows:

1. Field test in a compost pile from 1935 to 1938, to determine whether nitrogenous fertilizers would destroy seed of weeds, grass and clover when mixed with compost or soil in a pile under field conditions.
1. Greenhouse tests in open-top cardboard containers during 1939-40, and in 1942, to determine:
 - (a) The necessary amounts of nitrogenous material to be mixed with compost to destroy weed, grass and clover seed in a relatively short time where temperature and moisture conditions were fairly uniform; and (b) Tests in wooden bins in the compost shed during 1942, designed to increase the volume of material treated and to approach more practical working conditions; and also to determine how turf would respond when topdressed with the different compost-fertilizer mixtures.

In a search through scientific publications, no reference was found to a method of killing weed seed in compost by the use of nitrogenous fertilizers. However, Welton and Carroll reported, "under conditions

other than a compost pile, as on lawn areas—among the various materials used at the Ohio Station, Cyanamid was the most effective topdressing agent.—Applications made at the rate of 20 lbs. per 1000 sq. ft. and worked into the surface soil gave fairly satisfactory control of many of the more common lawn weeds. For plantains and many of the annuals like foxtail and crabgrass, however, 40 lbs. per 1000 sq. ft. did not give complete control, although most of the weed seeds were killed." These workers also treated a portion of a compost pile with chloropicrin at the rate of 25 oz. per cu. yd. They state, "In this test the seeds of lamb's quarters were highly resistant to chloropicrin; so were those of orache and white clover." In fact they recorded 54 plants of white clover in untreated compost whereas there were 66 in the treated compost.

Materials, Methods and Results

Field Test:—In November 1935 eight treatments were employed in duplicate, using the following materials and number of pounds of nitrogen on the cubic yard basis: Milorganite 5 and 15, cottonseed meal 15, Cyanamid 1 and 5, ammonium sulfate 15, all mixed with compost made of 3 parts soil and 1 part sand; ammonium sulphate 15 with 2 parts soil, 1 sand, 1 manure; and ammonium sulfate 15 with 2 parts soil, 1 sand, 1 granulated Swedish Peat. To the ammonium sulfate treatments an equal number of pounds of ground limestone were added to help neutralize the acidity from the ammonium sulfate. The 16 lots of compost were mixed separately with measured amounts of the fertilizer materials. Likewise, 16 batches, each made up of 1 pint of weed seed and Rhode Island bent grass seed obtained as screenings from a grass seed cleaning process were mixed with 2 shovelful of compost and placed in containers made of window screen. Sixteen two-bushel burlap bags were filled 1/3 full of the compost-fertilizer mixture. The batches of the seed and compost mixture were placed on top of this and the bags were then filled to 2/3 full with more of the compost-fertilizer mixture and buried

Table I—Compost Treatment, Materials and Rates of Application, Temperatures Obtained, and Results of Test as Shown by Amount of Weeds Produced from Treated Compost. Greenhouse Test No. 1, 1939-1940.

Materials	Nitrogen per cu. yd. pounds	Fertilizer per cu. yd. pounds	Av. maximum temp. °F.	Number of weeds in flats ^a			
				May 25	May 29	June 3	June 24
Milorganite	5.0	83	105	0	0	0	0
“	10.0	166	115	0	0	0	0
“	15.0	249	130	0	0	0	0
Agrinite	5.0	58	90	0	0	0	0
“	10.0	116	95	0	0	0	0
“	15.0	174	105	0	0	0	0
Cyanamid	0.55	2.5	75	43	72	135	141
“	1.10	5.0	75	0	0	0	0
“	5.0	22.0	75	0	0	0	0
Amonium sulfate	16.0	75 ^b	75	0	0	0	0
Check	0	0	75	105	137	190	195

a. Compost placed in flats May 15. b. An equal number of pounds of ground limestone were added to the sulfate of ammonia to help neutralize acidity from ammonium sulfate.

throughout a compost pile at regular intervals. The compost pile had been built recently of 2 parts loam, 1 part cow manure, 1 part clean sharp sand, and measured 20 by 20 feet square and was 5 feet high.

On the basis that good compost pile management would necessitate the construction of the pile a few years in advance of use, it was left undisturbed until August, 1938. Samples were obtained from the variously treated composts and placed in flats in the greenhouse where conditions were made favorable for the germination of the viable seeds. Notes on numbers and kinds of weeds and grasses were taken every 3 weeks.

The use of Milorganite at the rate of 15 lbs. N. per cu. yd. gave complete kill of all weed and grass seed but the 5 lb. rate in this test had no noticeable effect. Cottonseed meal and Cyanamid were very effective at the rates used. Ammonium sulfate at 15 lbs. N. in this test had but little effect on the kill of weed and grass and no significant differences were obtained between composts made up with peat moss, or with manure, or of only soil and sand. The total weed count per flat where manure was used was 160, with peat 117 and with soil and sand 131.

Greenhouse Test No. 1:—The fertilizers used in this treatment of compost were Milorganite, Agrinite, Cyanamid, and ammonium sulfate.

The compost was a mixture of 2 parts loam, 1 part manure, 1 part sand, screened

through quarter-inch wire mesh. The fertilizers were weighed out and mixed thoroughly with the compost. Three grams of weed seed, 2 grams of clover seed, and 1 gram of Rhode Island bent seed were thoroughly incorporated with the mixture. The mixture was placed in open-top containers about 1 ft. square made of heavy cardboard coated with wax and designed for packing gallon containers of ice cream. The bottom and top 2 inches were not mixed with the seed but consisted of the fertilizer-loam mixture. The containers were placed side by side on a propagating bench and covered with moist newspapers and burlap bags to help prevent evaporation and radiation. The average temperature in the greenhouse was about 75° F. Daily temperature readings were taken of the various treatments. Milorganite at the rate of 15 lbs. N. per cu. yd. caused the greatest rise in temperature, developing heat to 130° F., an increase of 55° which remained for a period of approximately 30 hours. Agrinite developed a temperature of 105° F. After a period of 2 weeks, the contents of the containers with the exception of the bottom and top 2 inches were put in flats and watered. The 4 nitrogenous fertilizers used in this test appeared to be of considerable value for the purpose of killing weed seed in compost. The results of the treatments are shown in Table I.

This article on killing weed seeds in compost will be continued next month.