RESEARCH RESULTS FOR NURSERYMEN

Utilization of Processed Garbage as a Mulch for Ornamentals 1967-70

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INTRODUCTION

This research had as a broad objective the determination of means of conservation and utilization of the resources contained in garbage compost.

The compost was produced from garbage after most of the metals, rags, and large items of refuse were removed by hand or mechanical means. The remaining material was ground in a hammer mill sprayed with sewage, and composted in windrows.

The compost was obtained from the Municipal Compost Plant of the City of Mobile, Alabama. The material was a coarse ground compost containing large quantities of plastic.

Compost as a Mulch for Ornamentals

The use of compost as a mulch is of interest since the large quantities of material available could be readily used in park and highway plantings. Homeowners use of compost mulches would probably be limited by the appearance and odor of the mulch.

Most processed garbage composts have a dark brown color. Some contain considerable amounts of film and rigid plastic which detracts from the mulch's appearance. Glass is ground to a size that does not present a problem in appearance or handling. The texture may be granular or fibrous depending on the stage of decomposition. Compost which contains sewage has an odor even when well composted. Odor problems with sewage-free compost varies with the raw materials used, the composting method and, the length of time the material is composted

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Mulching Perennials: Garden Chrysanthemums

Hardy or garden chrysanthemums (Chrysanthemum morifolium Ramat.) were used to test compost as a mulch for the growth of a perennial. On June 21, rooted cuttings of 19 cultivars of garden chrysanthemums were potted in 8 cm peat pots containing equal parts of soil, peat and perlite amended with 160 g superphosphate per bu. Plants were grown in the greenhouse until July 18, when they were transplanted outside into beds at a spacing of 38 cm x 46 cm. Plants were fertilized in the greenhouse each week by watering with a solution containing 1.9 g of 20-20-20 fertilizer per liter of water. Fertilization in the beds consister of 146 g. of 8-8-8 fertilizer 1 m^2 prior to planting and monthly applications thereafter at the same rate. All plants were pinched three times to increase flower number and growth habit. Pinching was done on June 28, July 18, and August 15.

Each bed contained one cultivar and was divided into three sections with 10 cm aluminum lawn edging. A 2.5 cm mulch was applied to each section using the various mulches. Three mulch treatments used were compost, sawdust, and pine straw. Comparisons were made on each cultivar in each mulch regarding flowering date, height, and spread of plants.

The growth of plants was excellent under all mulch treatments. Leaf and flower color were comparable. No large differences were noted in flowering date, height, and spread of the plants when grown in the three mulches. Compost, sawdust, and pine straw mulches produced plants with mean heights of 41.5 cm, 41.3 cm, and 39.8 cm, respectively. The spread of the plants were similar irrespective of mulch treatment. Compost appeared to be as satisfactory as sawdust or pine straw when used for mulching chrysanthemums.

Mulching Annuals: Petunias

Fifty-four petunia (Petunia hybrida Vilm) cultivars were planted in a mulching study on annuals. The petunias were produced in the greenhouse by sowing seed in February and transplanting in March to peat pots containing equal parts of soil, peat, and perlite amended with 160 g dolomite and 60 g superphosphate per bu. Plants were fertilized in the greenhouse each week by watering with a solution containing 1.9 g of 20-20-20 fertilizer per liter of water. Plants were planted in beds on April 16.

Fertilization consisted of 146 g of 8-8-8 fertilizer per 1 m^2 of surface incorporated prior to planting and 146 g of 12-6-6 fertilizer per 1 m^2 of bed. Each plot was divided into three sections with 10 cm aluminum lawn edging. The mulch treatments consisted of compost, sawdust, and pine straw applied to the section in each plot. Approximately 5 cm of mulching material was applied on May 2.

No apparent differences were observed among mulches in the growth and flowering of the petunias with any of the mulches. Leaf and flower color was comparable in all mulch treatments.

Mulching Woody Ornamentals on the Highway

The establishment, maintenance, and care of plants on highways has become a problem because of the increased use of plants on the highway for esthetic and safety reasons. Mulches can assist in this problem by conserving moisture, reducing weeds, preventing wide fluctuations in soil temperature, and influencing soil nutrition.

An experiment comparing compost with no mulch, pecan hulls, pine straw, turffiber, and sawdust was established on two roadside locations. Ilex cornuta 'Burford', 25 to 30 cm, and Forsythia intermedia, 50 to 90 cm branched, were used as test plants. The soil at each site was cultivated

to a depth of 15 cm prior to planting of potted Ilex and Forsythia. The mulches were removed the second year and reapplied with the exception of turffiber. Plants were watered immediately after planting and during extreme dry spells. Fertilization consisted of a yearly application of 15 g of dry 8-8-8 fertilizer sprinkled over the drip line of each plant. Soil moisture and temperature readings were taken May through August. Moisture readings were made with gypsum blocks, located in the center of each mulch treatment at a depth of 15 cm. A telethermometer was used to read the soil temperature as measured by thermister probes located in the center of each mulch plot.

Soil samples were taken from the plots during June of the first year to determine the influence of the mulches on soil nutrition. Soil samples were analyzed for pH, phosphorus, potassium, calcium, and magnesium.

Differences were observed in erosion of the various mulches on the slope which was quite steep, approximately 40 to 60 degrees. Turffiber mulches were washed or completely blown away before the end of the first year and were not replaced. Saw dust mulches washed considerably, with large gullies developing in the mulch. Pecan hulls were quite resistant to erosion, however small pieces of shell did wash. To minimize erosion, pecan hulls should be coarse and not ground. Pecan hulls often caked into lumps which were undesirable in appearance and may have impeded water penetration. Compost mulches exhibited little if any erosion. Rigid and film plastic became more prominent in the compost mulch, however, most of the film plastic was blown away. The removal of the film plastic may have contributed to the maintenance of the compost mulch's loose appearance, however, the well-decomposed nature and composition of the compost was probably responsible. Compost mulches would probably be excellent for wash areas on the highway.

Compared to no mulch, soil moisture was greater under all mulched sites, Table 1. Soil mulched with pecan hulls had the highest mean per cent moisture. Lower moisture was observed where pine straw, processed garbage, sawdust, and turffiber were used. The slope site had a higher mean moisture reading than the flat site. The proximity of water near the slope and differences in soil type might explain these moisture differences.

Mulching had no effect on the mean soil temperature, Table 2.

Compost mulches raised the pH of the soil almost an entire unit above some of the other mulch treatments, Table 3. In comparison to compost, the other mulches did not influence soil pH.

Compost mulches increased the amount of phosphorus, potassium, calcium, and magnesium in the soil, Table 4, Soil phosphorus was reduced by the sawdust mulches. Soil potassium was reduced by the sawdust, turffiber, and pinestraw mulches.

Compost as a Herbicide Mulch

Compost and sawdust were compared as mulches with and without dichlobenil (2,6-dichlorobenzonitrite) herbicide incorporation on nursery liner production.

Potted liners were planted at the Horticultural farm during July, 1968 in soil bins which contained 125 sq. ft. per bin. The soil in each bin was prepared by adding 6 cu. ft. of peat moss, 5 lb. of 8-8-8 fertilizer and 8.5 lb. of dolomitic limestone prior to rototilling. Test plants included Buxus harlandi, Rhododendron obtusum japonicum 'Rose Banner', Juniperus chinensis 'Pfitzer', Viburnum burkwoodi, Ilex cornuta 'Matthew Yates', Juniperus conferta and Thuja pyramidalis. Treatments are given in Table 5. Herbicide was mixed with mulches in a cement mixer prior to application. A second application of herbicide at the previous rate was broadcast and raked in the plots in July of 1969. Prior to the second application, all weeds were removed by hand.

Table 1. Influence of Various Mulches on Per Cent Available Moisture in the Soil at Two Highway Sites 1/

Mulch	Site 2/		
	Flat	Slope	Mean
	Pct.	Pct.	Pct.
None	57.4	61.9	59.7
Turffiber	58.5	63.8	61.5
Pecan hulls	62.6	72.2	67.4
Pinestraw	59.6	65.5	62.6
Sawdust	54.4	68.2	61.9
Compost	60.8	63.9	61.9

1/ Means for readings taken weekly from July 7, 1969 to January 12, 1970.
2/ Flat and slope sites were located on the north and south sides of I-85, respectively in Opelika, Alabama.

Table 2. Influence of Various Mulches on Soil Temperature at Two Highway Sites 1/

Mulch	Site		
	Flat	Slope	Mean
	F°	F°	F°
Check	66.7	68.0	67.4
Turffiber	66.6	68.0	67.3
Pecan hulls	67.5	68.1	67.8
Pinestraw	67.1	67.5	67.3
Sawdust	67.4	69.1	68.3
Compost	67.3	67.7	67.6

1/ Means for weekly reading taken July 7, 1969 to January 12, 1970. Flat and slope sites were located on the north and south sides of I-85 respecitvely in Opelika, Alabama.

Table 3. Influence of Various Mulches on the Soil pH at Two Highway Sites

Mulch	Site 1/		
	Flat	Slope	Mean
None	5.8	6.3	6.1
Turffiber	5.7	6.2	6.0
Pecan hulls	5.6	6.2	5.9
Pinestraw	5.8	6.3	6.1
Sawdust	5.6	6.2	5.9
Compost	6.6	6.9	6.8

1/ Flat and slope sites were located on the north and south sides of I-85 respectively, in Opelika, Alabama.

Table 4. Influence of Various Mulches on Phosphorus, Potassium, Calcium, and Magnesium in the Soil at Two Highway Sites.

Mulch	P			K			Ca			Mg		
	Slope	Flat	Mean	Slope	Flat	Mean	Slope	Flat	Mean	Slope	Flat	Mean
	Lb./A	Lb./A	Lb./A	Lb./A	Lb./A	Lb./A	Lb./A	Lb./A	Lb./A	Lb./A	Lb/A	Lb./A
None	21.4	27.8	24.6	101.1	130.0	115.6	882.0	905.0	893.5	105.8	120.0	112.9
Turffiber	20.1	26.8	23.5	189.5	116.5	103.0	901.0	959.0	930.0	105.0	120.0	112.5
Pecan hulls	22.1	26.4	24.3	208.8	214.3	211.6	851.0	883.0	867.0	111.0	120.0	115.5
Pinestraw	21.5	27.0	24.3	85.4	104.9	95.2	899.0	955.0	927.0	111.8	120.0	115.9
Sawdust	15.9	24.1	20.0	88.5	121.9	105.2	951.0	1011.0	986.5	102.0	120.0	111.0
Compost	31.5	33.8	32.7	230.5	216.6	223.6	1,204.0	1461.5	1,332.8	118.5	120.0	119.3

Weed coverage was determined on November 20, 1968 and October 17, 1969. The number of plants surviving after establishment (transplanting) was determined on November 14, 1968. Soil below the treatments was tested to determine treatment effects on soil nutrients. Samples were obtained in June of 1969 by removing the mulch and taking random core samples throughout the plot.

Check plots, which received no mulch or herbidide, were completely covered with weeds 3 to 4 months after the treatments were applied in both 1968 and 1969, Table 5. The best weed control was obtained in 1968 with a 2-inch sawdust mulch, 2-inch sawdust mulch plus 6.5 lb. per acre of dichlobenil, 1-inch compost mulch plus 6.5 lb. per acre of dichlobenil and 2-inch compost mulch plus 6.5 lb per acre of dichlobenil. Herbicide mulches gave effective control of most broadleaf weeds for approximately 9 months.

Higher percentage plant loss occurred with garbage compost mulches (28.4) than with sawdust mulches (4.4) or no mulch (8,1). Where dichlobenil was used 18.9 per cent of the plants died, whereas 13.9 per cent died where it was not used. The poorest plant survival was observed in plants mulched with two inches of compost plus a dichlobenil treatment. Table 6.

Compost mulches increased the pH, phosphorus and potassium levels of the soil, Table 7. Sawdust mulches reduced the phosphorus, potassium, calcium, and magnesium content.

Table 5. Influence of Mulches with and without Dichlobenil Herbicide Incorporation on Weed Control

Treatment	Weed Control		
	1968	1969	Mean
	Pct.	Pct.	Pct.
No mulch; no herbicide	100	100	100
No mulch; dichlobenil 4.5 lb./A	94	58	76
Sawdust, 1 in.; no herbicide	23	69	46
Sawdust, 1 in.; no herbicide	2	45	24
Sawdust, 1 in.; dichlobenil 6.5 lb/A	30	40	35
Saw dust, 2 in.; dichlobenil 6.5 lb./A	1	16	9
Compost, 1 in.; no herbicide	17	81	49
Compost, 1 in.; no herbicide	11	94	53
Compost, 2 in.; dichlobenil 6.5 lb./A	0	42	21

Table 6. Influence of Mulch and Herbicide Treatments on Plant Loss 4 Months After Application.

	No mulch or herbicide	No mulch plus dichlobenil	1 in. sawdust	2 in. sawdust	1 in. sawdust with dichlobenil	2 in. sawdust with dichlobenil	1 in. compost	2 in. compost	1 in. compost with dichlobenil	2 in. compost with dichlobenil	Mean
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Buxus harlandi	7.0	26.7	0.0	13.0	0.0	7.0	66.7	73.3	46.7	86.7	32.7
Rhododendron obtusum japonicum	0.0	7.0	7.0	0.0	0.0	0.0	13.0	33.3	13.0	60.0	13.3
Juniperus chinesis 'Pfitzer	0.0	0.0	7.0	0.0	0.0	7.0	0.0	20.0	7.0	13.0	5.4
Viburnum burkweedi	20.0	13.0	7.0	0.0	20.0	13.0	40.0	33.5	73.3	73.3	29.3
Ilex cornuta	0.0	0.0	0.0	0.0	0.0	7.0	0.0	13.0	13.0	0.0	3.3
Juniperus conferta	0.0	13.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	13.0	3.3
Thuja pyramidalis	13.0	13.0	7.0	20.0	0.0	7.0	13.0	13.0	20.0	46.7	15.3
Mean	5.7	10.4	4.0	4.7	2.9	5.9	20.0	26.6	24.7	41.8	14.7

1/ Dichlobenil was applied at the rate of 4.5 lb./A when applied alone, and 6.5 lb./A when applied in mulch.

Table 7. Effect of Various Mulches on Soil pH and Nutrient Content

Mulch and herbicide treatment	pH	Elements per/A			
		P	K	Ca	Mg
		Lb.	Lb.	Lb.	Lb.
No mulch; no herbicide	6.3	157.6	116.0	486.4	120.0
No mulch; dichlobenil 4.5 lb./A	6.2	143.0	73.4	446.4	120.0
Sawdust, 1 in.; no herbicide	6.0	142.0	63.0	332.8	114.0
Sawdust, 2 in.; no herbicide	6.0	126.0	49.6	331.2	110.4
Sawdust, 1 in.; dichlobenil 6.5 lb./A	6.5	191.2	95.4	374.4	116.8
Sawdust, 2in.; dichlobenil 65. 1.b/A	6.2	85.0	62.8	373.6	120.0
Compost, 1 in; no herbicide	6.4	272.6	113.2	431.2	120.0
Compost, 2 in.; no herbicide	6.5	256.8	151.0	439.2	120.0
Compost, 1 in.; dichlobenil 6.5 lb./A	6.4	239.2	109.6	409.6	120.0
Compost, 2 in; dichlobenil 6.5 lb./A	6.3	263.8	107.4	436.8	118.8

SUMMARY AND CONCLUSIONS

A compost product of the Municipal Compost Plant of the City of Mobile, Alabama was used in experiments as a mulch for ornamentals. This compost contained a small amount of sewage and was coarsely ground. A large amount of plastic was prominent in the compost.

Conclusions from the experiments were as follows:

1. Compost was as satisfactory as other materials such as pine straw when used as a mulch for ornamentals.
2. Compost mulches raised the pH of the soil and increased the amount of phosphorus, potassium, calcium and magnesium in the soil.
3. Sawdust was superior to compost as an herbicide mulch on nursery liners.