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Contaminated Compost Equals Gardening Problems

Organic matter often has been referred to as “a gardener’s best friend”. In addition to improving soil structure, it provides valuable nutrients to garden plants as it decomposes. For every one percent of organic matter in the soil, about 20 pounds per acre of nitrogen are released as it breaks down. Indeed, a “best management practice” for most garden plots is to add and incorporate thoroughly about four inches of well-decomposed organic matter each year.

Compost is an ideal way to add organic matter to garden soil. Properly prepared, its carbon content should be relatively stable and not tie up nitrogen when it is first incorporated into the soil. Additionally, compost is fairly easy to work with, readily available and relatively inexpensive. Recently, however, there has been a widespread outbreak of plant damage which has been traced back to the use of herbicide-contaminated compost. This article is written in an attempt to explain the cause of the contamination and to offer possible preventative measures.

Symptoms of herbicide damage from contaminated compost include poor seed germination, twisted or malformed new growth, elongated fruit and leaves, and death of younger plants. Contaminated compost can result in the total loss of a crop even if plants do not die. Sensitive crops (Table 1) are more at risk than crops which are less sensitive. However, even crops that are somewhat tolerant might respond to contaminated compost by producing yields that are lower than normally would be expected.

In This Issue

Contaminated Compost Equals Gardening Problems.....	1
Understanding Those Fescues	3
September Gardening Calendar	5

Table 1. Horticultural crops sensitive to picloram, clopyralid, or aminopyralid*

Beans	Carrots
Tomatoes	Dahlias
Eggplants	Grapes
Potatoes	Marigolds
Peas	Peppers
Lettuce	Spinach
Roses, some types	Sunflower and its relatives
Strawberries	Flowers, in general

* From the Journal of the NACAA; Vol. 6, Issue 1; May, 2013

Initial reports of the afore-mentioned symptoms came from individuals who made their own compost or obtained some from a neighbor who owned livestock. Recently, however, similar symptoms have been reported by gardeners who purchased commercially available, bagged compost and added it to their garden. The problem, apparently, is still escalating in magnitude.

In nearly every case of damage from contaminated compost, the active ingredient of the herbicide responsible was judged to be either aminopyralid, clopyralid, fluroxypyr, picloram or triclopyr (Table 2). These five herbicides are classified as pyridine carboxylic acids. The latter mimic the action of naturally occurring plant hormones which act as plant growth regulators. Since they are much more potent than the naturally occurring compounds, they are toxic to plants. The EPA has approved the application of these herbicides on pastures and hayfields to control a variety of broadleaf weeds. They benefit the agricultural industry by controlling weeds and producing good quality forage and hay. In fact, some of the weeds controlled are toxic to

(cont. on pg. 2)

(continued from page 1)

livestock and can sicken (or kill) animals that forage on pastures or consume hay containing them.

Table 2. Active ingredients and trade names of herbicides.*

Active Ingredient	Trade Names
Picloram	Tordon, Grazon, Access, Pathway
Clopyralid	Curtail, Redeem, R&P, Transline, Confront, Lontrel
Aminopyralid	Milestone, Forefront, Chaparrel

* From the Journal of the NACAA; Vol. 6, Issue 1; May, 2013

Of the above herbicides, picloram, clopyralid and aminopyralid are of greatest concern because they can remain active in manure, compost and hay for an unusually long time. These herbicides have the ability to go through the digestive system of animals that consume treated forage. They are excreted in the animals' manure or urine, and still remain relatively active. When the manure and/or bedding of animals which have consumed treated forage is used to make compost, the result is compost which is contaminated with one or more of the herbicides. Manure applied directly to the garden and spoiled hay used for mulch or compost are additional methods of accidental herbicide contamination.

Herbicides are broken down naturally through the action of light, temperature, moisture and soil microbes. For the herbicides being discussed, this can take from one month to several years, depending on environmental conditions. Piles of manure or heaps of compost do not encourage rapid herbicide degradation. Additionally, hay has been reported to contain active amounts of residual herbicide even after three years of storage. Therefore, damage might occur years after pastures or hay fields have been treated.

While the above is discouraging, all is not lost. There is a simple, inexpensive bioassay that can be performed to test for the presence of herbicides in compost. To begin with, a random sample of the compost (or manure) in question must be taken. This involves taking several shovelfuls from the source at random locations and combining them into one sample.

Next, fill several small pots with a 50:50 blend of the compost sample and a commercial, soilless growing medium. Additionally, fill several more pots with the growing medium only. This will serve as the check or control. Plant several green bean seeds into each pot and water thoroughly. Place the pots in an environment conducive to seed germination and plant growth. If the pots are located close to one another, place a saucer beneath each to prevent drainage water from one pot being absorbed by

another. Allow the seeds to germinate and plants to grow for 14 to 21 days. By this time there should be at least three sets of true leaves on the plants.

If herbicide-like symptoms appear on the plants growing in the compost blend (i.e. the treatment) but not on the control plants is normal, we can assume the compost is contaminated. If the growth of both treatment and control plants appears to be normal, then the compost most likely is not contaminated. This simple test only is accurate if one does an adequate, thorough job of sampling the compost being tested.

There are additional strategies for preventing plant damage from contaminated compost and, as with most problems, prevention is the best cure. For example, check with the person/company who made the compost to see if they know the history of the manure or plant material used, or if a bean seed test has been performed. Gardeners who make their own compost but use components obtained from others should ask the same questions of the farmer supplying manure or plant material. Gardeners who have animals (and manure) of their own but purchase hay, should make certain the herbicide application history of the hay is known.

Also, avoid the use of grass clipping for making compost unless the herbicide application history of the grass involved is known. The herbicides mentioned above likely would not be used by homeowners, but they are labeled for turf and might be used by golf courses, parks, etc.

Finally, the question arises of what can be done if contaminated compost unknowingly was applied to a garden. It is safe to plant tolerant crops (e.g. sweet corn) in contaminated soil. Since the degradation time of the herbicides in question is uncertain, perform the bean seed test on contaminated garden soil each year before planting sensitive crops in the area. The use of activated charcoal and Zeolite® has been advocated to absorb herbicides from contaminated soil, but probably is not cost-effective.

When all is said-and-done, the worst thing that can happen from this unfortunate circumstance is for gardeners to stop using compost, manure or mulch. Compost and animal manures represent excellent soil amendments that supply plants with needed nutrients while improving soil structure. Mulch is effective in both water conservation and weed control. Gardeners should be encouraged to continue using these resources but to take extra precautions to prevent accidental herbicide contamination. The bean seed bioassay is an easy, inexpensive way to achieve that goal.

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Understanding Those Fescues

When many individuals hear the grass specie “tall fescue”, they envision a coarse, clumpy grass they see in pastures. Too many, this is undesirable for a home lawn. While there is plenty of K-31 grass seed available and often sold as a lawn seed, more desirable tall fescues are available for establishing a fine lawn.

Three types of fescue should be mentioned before we get into a discussion about what to select. The K-31 tall fescue (*Festuca arundinacea*) is considered a forage-type fescue and is seen along Missouri roadsides and in Missouri pastures. It is by far the most prominent grass seen across Missouri and the U.S. Missouri still manages to harvest a half-million to a million acres of lower quality fescue seed each year. Many retailers will usually carry it in 50 pound bags on pallets at their front doors. It is relative cheap (\$0.85 to \$1.00/lb) when compared to other turf-type fescues and it does have a place as a lawn type grass. Where larger acreage is being maintained, like parks and large grassy landscapes; forage-type fescues seeded at 10 pounds per 1,000 square feet can provide excellent cover when mowed at 4-inches. Higher seeding rates create a crowding effect that makes this grass appear finer in texture. If that high density can be maintained with over-seeding; then the large clumpy, coarse appearance can be controlled. It can be used on steep banks, along driveways and ditches. It is a bunch-type grass that does not spread. It does product tillers (additional shoots that develop from the crown) to increase canopy density. It tends to form the large clumps when thinned by disease, insects or drought.

Fine fescues are often described for the turf-type fescues when obviously compared to the coarser forage-type fescues. However, fine fescues are a class of fescues by themselves different from the turf-type fescues and worth mentioning. The fine fescues are extremely fine-leaved fescues that are composed of several species. They include creeping red fescue (*Festuca rubra*), chewing fescue (*Festuca rubra* ssp. *commutata*), hard fescue (*Festuca tryachphylla*), and sheep fescue (*Festuca ovina*). The fine fescues, with very slender leaves, adapt better to low light conditions, such as shade. These fescues are often recommended for shade seed mixtures, but keep in mind that under extreme shade conditions (full-shade all day); no cool-season grass can flourish. Many feel that their grasses are getting sufficient sunlight but do not realize that filtered sunlight through tree canopies is not sufficient and turfgrasses will thin out.

Turf-type tall fescues are the most improved tall fescues and are used primarily for lawn use. They have been developed by seed companies to provide a finer textured leaf blade – somewhere between the forage-type and fine fescues previously mentioned. Their leaf blades are slightly



K-31 Tall Fescue seeded @ 10 lbs/1,000 sq. ft.



Forage-type fescues can have many uses – along roadsides and driveways, ditches and large acreages.



K-31 is a bunch-type grass forming tillers only.

(continued on page 4)



Fine fescues adapt well to low-light conditions like shade. However, no grass does well in full-shade all day.



Fine fescues like creeping red fescues do spread by short rhizomes, while others like chewing, hard, and sheep fescues are bunch-type.



Turf-type tall fescues provide good density, color and the texture desired by many for a lawn grass.

wider than a Kentucky bluegrass. Color is usually a deep emerald green and many of the newer varieties will provide some disease resistance to brown patch. While the turf-type fescues have been considered a bunch-type grass in general; recent developments have provided several rhizomatous tall fescue (RTFs) varieties producing short rhizomes allowing some spreading capabilities. Several new varieties of RTFs are currently available on the market. Other RTFs may have a slightly different identifier indicating rhizomatous capabilities. Some are noted with an RZ after the variety name for RhiZamotous (e.g. – Turbo RZ Cezanne RZ), others an LS for Lateral Spreading (e.g. – Spyder LS, Firecracker LS, and Titanium LS), and SRP for Self-Repair Potential (e.g. – Rambler SRP and 3rd Millennium SRP). Blend and/or mixtures containing any of the RTFs have no downside in using them. While some of the more advanced RTFs do have short rhizomes; observations also indicate that these tall fescues seem to tiller more improving canopy density for weed competition.

Fescues, in general, are more deeply rooted than all other cool-season grasses like bluegrasses and ryegrasses. This allows for better heat and drought tolerance during a Missouri summer. Requiring less water than bluegrass or ryegrass keeps them from greener longer with the onset of droughts. Fescues are recommended in lawns when irrigation is not a choice or option. Establishment rates for fine and turf-type fescues are 6 to 8 pounds per 1,000 square feet. Mowing heights are best at 3.5 to 4 inches high. Brown patch (*Rhizoctonia solani*) is the most important disease limiting tall fescue use in Missouri. The disease occurs during the summer and follows the “6-8 flip-flop” rule, with conducive temperatures being a nighttime low near 68 degree F and daytime highs near or above 86 degrees F. Disease symptoms will vary according to mowing height. Brown patch on higher-cut turfgrass (lawn height of 3.5 to 4 inches) appears as brown or straw-colored round patches 6-inches or more in diameter. A characteristic irregularly shaped straw-colored lesion with a dark brown margin can be seen on newly infected leaves along the margin of patches. When fescue is wet in the early morning, tufts of pathogen mycelium may be seen scattered along patch margins (Fresenburg et al., 2013).

Blends and Mixtures:

Blends (three to four varieties in equal portions) of turf-type tall fescues can give deep emerald green appearances with a slightly coarser texture than Kentucky bluegrasses. They tend to be a deeper rooting plant, therefore requiring less water than a bluegrass lawn. They are not as susceptible to dollar spot and summer patch, but generally will require some fungicides for the control of brown patch disease. Several varieties of turf-type tall fescues offer superior resistance to brown patch and therefore will improve turf

(continued from page 4)

quality. Tall fescues will tiller to help with recovery, but tend to be clumpy with severe thinning. They also grow well in full sun to partial shade.

Mixtures, such as turf-type tall fescues (in a blend) with Kentucky bluegrasses (90 percent fescue, 10 percent bluegrass), combine the advantages or strengths of each species to mask the weaknesses of the other. Any grass seed mixture with perennial ryegrass should not exceed 20 percent perennial ryegrass, as it is susceptible to most of the diseases list above. Ryegrass is not very heat or drought tolerant and does not recover from thinning of cover. Unfortunately, many seed mixtures and blends available to homeowners at local garden centers contain large amounts of ryegrass (both annual and perennial) and fine-leaf fescues (creeping red fescues, hard fescues, etc.). Fine-leaf fescues have little tolerance for direct sunlight.

So which varieties do you select once you decide on a blend or mixture to plant? Various resources provide recommendations for turfgrass varieties for Missouri. Garden centers, MU Extension publications, turfgrass specialists, and other lawn care experts are good sources for information about turfgrass selections. The difficulty for most individuals is to find the varieties suggested. We will discuss several options.

Selecting Seed Products/Varieties:

The number of seed products being sold over-the-counter can be overwhelming. However, by looking at the seed tags on products, the selections can be narrowed. Keep in mind that seed products are packaged for national sales and are excellent products for many areas of the country. However, that does not mean that all seed products grow well in all areas of the country. Missouri weather can be very limiting for some species. Concentrate more on the products that are tall fescue and Kentucky bluegrass blends or mixtures of tall fescue and Kentucky bluegrass.

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Filtered sunlight is still not sufficient for full canopy growth of most cool-season grasses.



Rhizomatous tall fescues spread by short rhizomes and exhibit increased tillering for increased density.



Rhizomes extend underground 1 to 2 inches from the crown developing a daughter plant.

September Gardening Calendar

Category	Week				Activity
	1	2	3	4	
Ornamentals	x	x	x	x	Continue planting evergreens now.
	x	x	x		Cuttings of annuals can be taken now to provide vigorous plants for overwintering.
	x	x	x		Herbs such as parsley, rosemary, chives, thyme and marjoram can be dug from the garden and placed in pots now for growing indoors this winter.
		x	x	x	Except tulips, spring bulbs may be planted as soon as they are available. Tulips should be kept in a cool, dark place and planted in late October.
		x	x		Begin readying houseplants for winter indoors. Prune back rampant growth and protruding roots. Check for pests and treat if necessary. Houseplants should be brought indoors at least one month before the heat is normally turned on.
			x	x	Perennials, especially spring bloomers, can be divided now. Enrich the soil with peat moss or compost before replanting.
			x	x	Divide peonies now. Replant in a sunny site and avoid planting deeply.
			x	x	Lift gladioli when their leaves yellow. Cure in an airy place until dry before husking.
			x		Poinsettias can be forced into bloom for Christmas if they are moved indoors now to a sunny windowsill. Each night, they must be kept in a cool, dark place where there is no light for 14 hours. This must continue until proper color is achieved in 6-10 weeks.
Lawns	x	x	x	x	Cool-season lawns are best fertilized in fall. Make up to 3 applications between now and December. Do not exceed rates recommended by fertilizer manufacturer.
	x	x	x	x	If soils become dry, established lawns should be watered thoroughly to a depth of 4-6 inches.
	x	x	x	x	Begin fall seeding or sodding of cool-season grasses. Seedbeds should be raked, dethatched or core-aerified, fertilized and seeded. Keep newly planted lawn areas moist, but not wet.
		x	x	x	Lawns may be topdressed with compost or milorganite now. This is best done after aerifying.
			x	x	It is not uncommon to see puffballs in lawn areas at this time.
			x	x	Newly seeded lawns should not be cut until they are at least 2 or 3 inches tall.

Gardening Calendar supplied by the staff of the William T. Kemper Center for Home Gardening located at the Missouri Botanical Garden in St. Louis, Missouri. (www.GardeningHelp.org)

September Gardening Calendar

Category	Week				Activity	
	1	2	3	4		
Vegetables	x	x			Egyptian (top-setting) onions can be divided and replanted now.	
	x	x			Sowing seeds of radish, lettuce, spinach and other greens in a cold frame will prolong fall harvests.	
			x	x	x	Keep broccoli picked regularly to encourage additional production of side shoots.
			x	x		Pinch out the top of Brussels sprout plants to plump out the developing sprouts.
			x	x		Harvest herbs now to freeze or dry for winter use.
			x	x		Tie leaves around cauliflower heads when they are about the size of a golf ball.
				x	x	Pinch off any young tomatoes that are too small to ripen. This will channel energy into ripening the remaining full-size fruits.
					x	Sow spinach now to overwinter under mulch for spring harvest.
Fruits	x				Pick pears before they are fully mature. Store in a cool, dark basement to ripen.	
			x	x	Bury or discard any spoiled fallen fruits.	
				x	Paw paws ripen in the woods now.	
				x	Check all along peach tree trunks to just below soil line for gummy masses caused by borers. Probe holes with thin wire to puncture borers.	
Miscellaneous	x	x	x	x	Autumn is a good time to add manure, compost or leaf mold to garden soils for increasing organic matter content.	
	x	x			Monitor plants for spider mite activity. Reduce their numbers by hosing off with a forceful spray of water.	
			x	x	x	Seasonal loss of inner needles on conifers is normal at this time. It may be especially noticeable on pines.

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