Integrated Pest & Crop Management

Weed of the Month: Toothed Spurge *(Euphorbia dentata)*

by Kevin Bradley

Figure 1. Toothed spurge is one species that has been found with increasing frequency in Missouri soybean fields in recent years.

Toothed spurge, Euphorbia dentata, is a summer annual that is native to the eastern United States and Mexico. The plant is also referred to as wild poinsettia but this common name is more properly suited to a close relative of toothed spurge, Euphorbia heterophylla. Wild poinsettia (Euphorbia heterophylla) is a very common weed throughout much of Central America and now also occurs in the southern U.S. from Florida to California, but I have not personally encountered it in Missouri yet. Toothed spurge is one weed that I have seen more of over the past several years in Missouri cropping systems. I would not consider it a common weed yet by any means, but one that has increased in prevalence over the past several seasons,

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Figure 2. Toothed spurge has leaves that are elliptic to ovate in outline and exude a milky sap when broken.

Figure 3. A young toothed spurge plant.

especially in Missouri soybean fields. Toothed spurge can also be found in pastures, along roadsides, and in other non-crop areas.

Toothed spurge can reach up to 2 feet in height and has stems that are light green to reddish green with short hairs. The leaves can be either opposite or alternately arranged along the stem and are from ¾ to 3 inches in length and up to 1 inch in width. The leaves are elliptic to ovate in outline with toothed margins. Leaves occur sparsely along the lower stems but are bunched or whorled near the upper portions of the plants. The upper leaf surfaces are dark green and without hairs, while the lower leaf surfaces are light to medium green and can have short hairs along the veins. The leaves and stems emit a white milky sap when broken. This milky latex sap is poisonous and can produce blisters and dermatitis in humans, cattle, and horses, and can also cause blindness if it comes in direct contact with the eye. The stems terminate in a flat-topped cluster of flowers. Each cluster consists of a mixture of flowers and immature fruits. The flowers are without petals or sepals and are yellow, pink, or white. Toothed spurge typically blooms in mid-summer and the blooming period lasts for about 1 month. After blooming, the flowers are replaced with 3-lobed nodding fruits. The fruits can become light red to purple with maturity. Each fruit contains 3 seeds that are oval in shape and dark brown to black in color. The roots consist of a taproot with a fibrous root system.

Toothed spurge is tolerant to normal use rates of glyphosate, which is more than likely the reason why we have seen more of it in Missouri cropping systems in recent years. The appearance of toothed spurge is an example of a weed shift, which is what occurs when producers rely predominantly on one herbicide or one weed management system to meet all their weed control needs. After continuous application of the same herbicide, in this case glyphosate for post-emergence weed control, species that are naturally tolerant of that herbicide are most likely to appear in that cropping system and become more prevalent. Also, toothed spurge does not typically emerge until later in the season, and in this way "escapes" the residual effects of many pre-emergence residual herbicide treatments.

Unfortunately, there is little information available on the control of toothed spurge in corn and soybeans. What little information I have found indicates that in corn, atrazine and isoxaflutole (Balance Pro, Balance Flexx) provide good pre-emergence control, while dicamba (Banvel, Clarity, Status, Distinct, etc.), glufosinate (Liberty), and a tank-mix of bromoxynil (Buctril) plus atrazine can provide good post-emergence control. In soybean, flumioxazin products (Valor, Fierce, Envive, etc.) have good pre-emergence activity, while lactofen (Cobra, Phoenix) and a tank-mix of imazethapyr (Pursuit) plus bentazon (Basagran) have been shown to provide good post-emergence control. Liberty in Liberty Link soybean is also an option. In both corn and soybean, a single post-emergence application of glyphosate will likely only provide about 50 to 60% control of toothed spurge. Although it is unlikely that complete control will ever be achieved with glyphosate, control can be increased to approximately 70 or 80% with two applications of glyphosate, but toothed spurge seed production will almost certainly still occur.

Plant Diagnostic Clinic Update

by Patricia Wallace

The Plant Diagnostic Clinic has been re-opened for 2 months now. It has been a whirlwind of activity and a lot of learning on my part. I am grateful for all the assistance I've received from specialists in the Division of Plant Sciences and University of Missouri Extension. This write up highlights fruit, vegetable, ornamental and turf samples submitted. Two graphs are included to show the activity in the Plant Diagnostic Clinic thus far (Figure 1 and Figure 2).

Fruits and Vegetables

There have been several issues diagnosed on fruit samples. Winter injury was reported in both blackberry and blueberry. There has been some chemical injury reported on blueberry, blackberry, apple, pear and cherry due to drift from neighboring fields, accidental sprays from the grower or misapplication of fertilizer causing a phytotoxicity. Reporting on diseases, this spring has been a big fire blight year across the state of Missouri. The spring weather was perfect for this. Walking around the MU-Columbia campus there isn't a Bradford pear tree that isn't affected. For fruit-producing and ornamental trees, affected by fire blight, pruning is recommended. The MU-Extension publication, G6020, on fire blight is useful to learn about the disease and recommendations (http://extension.missouri.edu/p/g6020).

Other disease issues include:

Crop	Disease / Pest / Issue
Blueberry	Alternaria leaf spot Phomopsis twig blight
Pear	Cedar-hawthorne rust Fire bligh
Strawberry	Rhizoctonia crown rot Gray mold Calcium deficiency
Watermelon	Bacterial fruit blotch Gummy stem blight
Blackberry	Nutrient deficiency
Apple	Fire blight

A handful of vegetable samples have been submitted, mostly tomatoes. Many of these have had chemical injury. Chemical injury has also been diagnosed on spaghetti squash and potato. The most common injuries are due to a growth regulator herbicide. In some cases the grower used an herbicide between rows or in close proximity. However, in most of the cases the grower is positive they have not made an herbicide application. During the investigation, the source of damage is commonly the compost or manure used in the soil. Many growers don't think about the potential of herbicide carryover in manure or compost (straw, grass clippings or even wood chips).

There is an article from a MU extension specialist (http://extension.missouri.edu/nwregion/hort/current/herbicide.shtml) and an article from North Carolina State University (http://www.ces.ncsu.edu/fletcher/programs/ncorganic/special-pubs/herbicide_carryover.pdf) that covers this topic.

Diseases and issues diagnosed are listed below:

Crop	Disease / Pest / Issue
Garlic	Bacterial soft rot
Tomato	Bacterial canker, Bacterial stem rot, Undetermined virus, Gray mold, Pythium root rot, White mold, Southern blight, Frost injury, Physiological leaf roll, Juglone toxicity

Ornamentals

A number of cases of winter injury on ornamentals was diagnosed this spring. Many woody ornamentals were already stressed going into winter from the 2013 drought. A reminder that when the weather is hot and dry, supplemental watering to woody ornamentals is recommended. The common story with the evergreens is, they stayed green all winter long and when temperatures warmed up dieback was noticed. Green tissues turned brown practically overnight, or so it seems. The reason is that evergreens do not go into complete dormancy during the winter. During warm, sunny days the plants are still biologically active, reduced but still transpiring and using water. If the plants don't have enough water stored in their roots or if the ground is frozen making water unavailable, they become stressed. Since biological activity is reduced the plants will retain their green color. However, once the weather warms up and the plants go back to their full photosynthetic potential the dead parts are quickly abscised (cut off from receiving any water or nutrients), leaving branches, leaves or needles yellow and unaesthetically pleasing.

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The dead branches should be pruned as they can attract bark beetles or other insects. Plant species diagnosed with winter / cold injury include arborvitae, blue atlas cedar, pines (white pine the most prevalent), rhododendron and a tulip tree. There has also been a number of chemical injuries, which include drift from neighboring agronomic fields or misapplications by the homeowner or landscaping company.

Plant diseases and pests diagnosed include:

Ornamental	Disease / Pest / Issue
Boxwood	Boxwood mites
Cypress tree	Pestalotia canker
Geranium	Gary mold, Bacterial blight, Nutrient deficiency
Maple	Bacterial blight
River birch	Anthracnose
Weeping willow	Black cancer

Turfgrass

Turfgrass samples have been submitted from golf courses, parks, schools and lawns. The majority of these samples have come from golf putting greens, due to their need for intensive and aggressive management practices. Submitted plant species included creeping bentgrass, fescue, Kentucky bluegrass, and Zoysia grass.

The diseases and issues are listed below:

Type of turfgrass	Disease / Pest / Issue
Bentgrass	Pink snow mold Yellow patch Anthracnose Pythium root rot Blue green algae Nematodes
Fescue	Aphids, Sand abrasion
Kentucky bluegrass	Septoria leaf spot Pythium root rot
Zoysia	Large patch

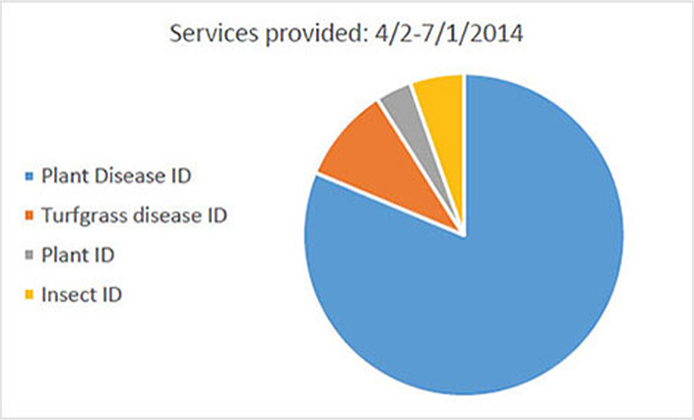

Figure 1: Services requested at the PDC.

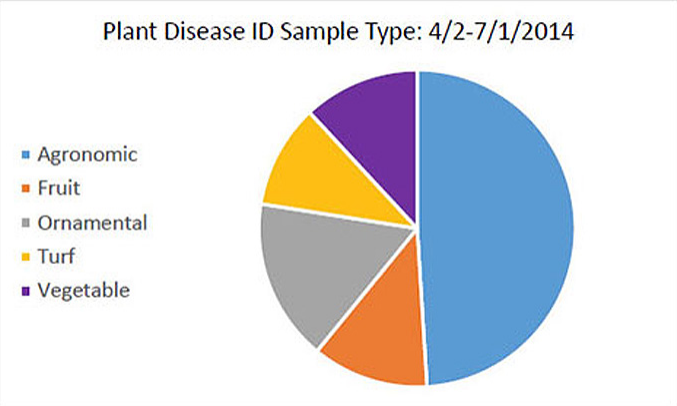

Figure 2: Types of plants submitted to the clinic for disease identification.

Weather Data for the Weekly Period July 22 - July 28, 2014

Station	County	Weekly Temperature (ºF)						Monthly Precipitation (in.)		Growing Degree Days‡	
		Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	May 1-28	Departure from long term avg.	Accumulated Since Apr 1	Departure from long term avg.
Corning	Atchison	89	67	99	58	78	+1	2.86	-1.92	2137	+189
St. Joseph	Buchanan	86	68	94	60	77	0	4.54	+0.35	2006	+71
Brunswick	Carroll	86	66	93	57	77	+1	2.91	-0.95	2142	+168
Albany	Gentry	86	65	93	58	76	-1	3.50	-1.07	1950	+51
Auxvasse	Audrain	86	63	94	55	75	-2	1.81	-1.79	2010	+9
Vandalia	Audrain	84	62	91	56	73	-4	3.56	-0.47	1964	+19
Columbia-Bradford Research and Extension Center	Boone	86	64	93	58	75	-3	1.60	-2.01	1998	-54
Columbia-Capen Park	Boone	90	63	97	57	76	-2	1.87	-2.22	2024	-97
Columbia-Jefferson Farm and Gardens	Boone	87	65	93	60	76	-2	1.86	-1.75	2052	-4
Columbia-Sanborn Field	Boone	88	67	95	61	77	-1	1.75	-2.00	2178	+53
Columbia-South Farms	Boone	86	65	93	59	76	-2	1.88	-1.79	2029	-24
Williamsburg	Callaway	87	62	94	54	75	-2	1.64	-2.13	2021	+74
Novelty	Knox	82	62	91	56	72	-4	2.01	-1.85	1853	-69
Linneus	Linn	85	65	93	59	75	-1	2.01	-2.41	1921	+32
Monroe City	Monroe	83	62	92	55	73	-4	3.48	-0.12	1944	-26
Versailles	Morgan	90	66	95	58	78	0	1.32	-2.42	2156	+52
Green Ridge	Pettis	87	66	93	58	77	0	1.81	-2.00	2043	+23
Lamar	Barton	91	68	99	61	79	0	1.05	-3.24	2175	-6
Cook Station	Crawford	90	62	100	54	77	-1	1.01	-2.16	2065	-43
Round Spring	Shannon	90	61	97	54	75	-2	1.89	-1.52	1987	-34
Mountain Grove	Wright	87	64	94	60	75	-2	2.68	-0.90	1934	-37
Delta	Cape Girardeau	85	62	93	56	74	-5	2.86	+0.13	2155	-218
Cardwell	Dunklin	87	66	92	60	76	-4	3.49	+0.50	2407	-184
Clarkton	Dunklin	87	65	93	59	76	-4	2.30	-0.86	2341	-208
Glennonville	Dunklin	*	*	*	*	*	*	*	*	*	*
Charleston	Mississippi	86	65	93	58	76	-3	1.94	-1.25	2375	-12
Portageville-Delta Center	Pemiscot	87	67	93	62	77	-3	4.39	+1.54	2465	-108
Portageville-Lee Farm	Pemiscot	87	67	93	61	77	-3	3.22	+0.12	2482	-74
Steele	Pemiscot	88	66	94	61	77	-3	3.47	+0.55	2404	-182

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

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Insect Pest & Crop Management newsletter is published by the MU IPM Program of the Division of Plant Sciences Extension. Current and back issues are available on the Web at **http://ipm.missouri.edu/ipcm/**. Mention of any trademark, proprietary product or vendor is not intended as an endorsement by University of Missouri Extension; other products or vendors may also be suitable.

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