

## Field Evaluation of Various Herbicide Formulations Combined with Mulches

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**Significance to the industry:** Weeds have always been a problem for nurserymen and landscapers. Weeds not only compete for resources like nutrients, light and space, but also reduce the aesthetics of plants and landscape. Increased production/maintenance costs have continuously been challenging the green industry and weed control is one of the major production cost activities. Organic mulches have been widely used by nursery and landscape industry due to many advantages, but weed control and soil moisture conservation are of highest importance. Preemergence herbicides are the most important chemicals that are used by the green industry. Combinations of herbicides and mulches can be a potential approach to control weeds for a longer period of time, while reducing the weed control costs and herbicides in the environment. Herbicide treated mulch is an integrated weed management approach in which two or more weed control methods are combined in order to control weeds effectively. Previous studies demonstrated that herbicide treated mulches work effectively in controlling weeds. Fretz (1973), and Fretz and Dunham (1971) reported higher weed control efficiency with herbicide impregnated mulches. Case and Mathers (2006) found that pine nuggets combined with various herbicides provided weed control for one year in field. Mathers (2003) obtained higher weed control efficacy with herbicide treated bark nuggets in containers. The objective of this study was to evaluate weed control efficacy with previously untested granular herbicides and mulch combinations at various depths of mulching compared to liquid formulations of herbicides combined with mulches. In addition, two new granular + mulch combinations were evaluated in which one is currently commercially available.

**Materials and methods:** Two types of mulches, hardwood and pine nuggets, were trialed alone at different depths (1, 2.5, and 5 inches) and in combination with Snapshot 2.5TG [isoxaben + trifluralin at 1.0 lb ai/ac + 4 lb ai/ac respectively (Dow AgroSciences, Indianapolis, IN)] or a liquid formulation consisting of Treflan HFP (Dow AgroSciences) + Gallery (Dow AgroSciences) at 1.0 lb ai/ac + 4 lb ai/ac, respectively. The three mulching depths represent the recommended depth (2.5 in), the depth previously evaluated (1 in) and a depth closer approximating what is often found in landscapes (5 in). Snapshot was directly applied to bare ground or on top of the mulch in the field. The liquid formulation was applied to bare ground and below or above the mulch at each depth and was used to pretreat the mulches. The experiment was started in May, 2007 at The Ohio State University's Waterman Agricultural and Natural Resources Laboratory, Columbus, Ohio with randomized complete block design replicated five times. There were a total of 35 treatments including untreated mulches at three depths, herbicides applied alone, two commercially available herbicide treated mulches, and untreated control. Mulches were pretreated with herbicides by placing the mulch on a plastic sheet at the depths described above and herbicide was sprayed evenly on top of the mulch and allowed to dry for 48 hours before applying them to field. Visual readings were taken at 30, 60, 90 and 120 days after treatment (DAT). Visual readings were based on a scale of 0 (no control) to 10 (complete control), with 7 and above commercially acceptable.

Weed fresh weights were determined by taking a one square foot area within each 3' x 3' (0.92m x 0.92m) plot. To reduce bias, the same area (center, upper right corner, left side, etc.) within each plot was used.

**Results and Discussion:** Eight treatments had below commercially acceptable levels of weed efficacy by visual ratings at 30, 60, 90, and 120 DAT: snapshot applied alone, snapshot applied over one inch hardwood, treflan + gallery applied alone, treflan + gallery applied over one inch pine nuggets (except at 30 DAT), treflan + gallery treated pine nuggets at one inch (except at 120 DAT), untreated pine nuggets at one inch depth, untreated hardwood at one inch depth, and control. All other treatments have shown above commercially acceptable level of weed efficacy (Table 1). There was not a significant difference in terms of visual rating between 2.5 inch depth and 5.0 inch depth mulching depth either applied alone or with herbicides (data not shown). Some of the one inch depth mulch treatments also performed well (commercially acceptable level) in controlling weeds until 120 DAT. Visual ratings of some of the treatments that have less than commercially acceptable level were not always supported by weed fresh weights. This may have been due to the one square foot area within each plot may/may have not had weeds present, but were present elsewhere in the plot. Weed fresh weight data (Table 2) was not consistent across all the evaluation periods but generally increasing at each date. At 30 DAT, there was no significant difference with any of the treatments from the control in terms of weed fresh weight (little weed growth present at 30 DAT). At 60 DAT, all the treatments were different from the control except snapshot applied alone. At 90 DAT, five treatments (snapshot applied over one inch hardwood mulch, treflan+gallery, treflan+gallery over one inch pine nuggets, treflan+gallery treated pine nuggets at one inch depth, untreated pine nuggets at one inch depth, and untreated hardwood at one inch depth) did not provide significantly higher weed fresh weight than the control. The only treatment that was not significantly different from the control at 120 DAT for weed fresh weight was untreated pine nuggets. Since there were no significant differences between 2.5 and 5.0 inches (either with herbicide or without) for pine nuggets of hardwood, it would be economically feasible to use the 2.5 inch depth.

Data was also analyzed as a factorial, which excluded the untreated plots to determine which depth, mulch, method, herbicide and different combinations of these are superior for weed control. Although data will not be shown, a summary of the analyses follows.

*Herbicide* (Snapshot vs. Treflan + Gallery as a liquid). Across all other factors, there was no significant difference between the two types of formulations.

*Method* (herbicide applied over, under, or used to pretreat mulch). Herbicides applied under the mulches have significantly better weed control than the herbicides applied over mulches and herbicide treated mulches across all the herbicide and mulch combined treatments.

*Depth* (1 inch, 2.5 inches, or 5 inches). Visual ratings and weed fresh weights of one-inch depth mulch are significantly lower from the other two depths (2.5 and 5.0 inches) of mulches across all methods, mulches and herbicides, and visual ratings for 2.5 inches depth mulch are significantly lower than five inches depth across methods and herbicides.

*Mulch* (pine nuggets vs. hardwood). Pine nuggets were significantly better than hardwood for weed control; however, there was also a significant interaction with

herbicide. Pine nuggets and snapshot provided better weed control than pine nuggets and Treflan + Gallery; however, hardwood provided better weed control when combined with Treflan + Gallery when compared to hardwood combined with Snapshot across the other effects. The herbicide and mulch interaction was not as evident with pretreating with hardwood and pine nuggets performing equally well with Treflan + Gallery.

Future research: For this study, soil analysis will be performed to determine herbicide presence in the soil at different intervals. Future research could also include phytotoxicity to various annuals and perennials, use of different herbicides, and use of granulars below mulch (as opposed to on top of like this study).

#### Literature Cited:

Case, L. and H. Mathers. 2006. Field Evaluation of Herbicide Treated Mulches. Proc Southern Nurs. Assoc. Research Conference. 51:402-405

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Mathers, H. 2003. Novel methods of weed control in containers. *HortTechnology* 13:28-31.

**Table 1. Visual ratings at 30, 60, 90, and 120 days after treatment during 2007**

<b>Treatments</b>	<b>30 DAT</b>	<b>60 DAT</b>	<b>90 DAT</b>	<b>120 DAT</b>
Snapshot	6.2 ghi <sup>z</sup>	5.8 gh	4.2 g	2.8 h
Snapshot over pine nuggets (PN) @ 1 inch depth	9.8 ab	9.6 abc	8.8 abcd	9.2 ab
Snapshot over pine nuggets @ 2.5 inches depth	9.6 abc	9.5 abc	10 a	9.6 ab
Snapshot over pine nuggets @ 5.0 inches depth	10 a	9.8 ab	10 a	9.6 ab
Snapshot over Hard wood (HW) @ 1 inch depth	5 i	4.6 h	6.2 f	5.6 efg
Snapshot over Hard wood @ 2.5 inches depth	9.6 abc	9 abcd	9 abcd	9.6 ab
Snapshot over Hard wood @ 5.0 inches depth	10 a	10 a	10 a	10 a
Treflan + Gallery	6.8 fgh	5.2 gh	4.6 g	4.2 gh
Treflan + Gallery over pine nuggets @ 1 inch	7.6 efg	6.8 efg	6.5 ef	6.6 de
Treflan + Gallery over pine nuggets @ 2.5 inches	10 a	9.6 abc	10 a	9.6 ab
Treflan + Gallery over pine nuggets @ 5.0 inches	10 a	10 a	9.8 ab	10 a
Treflan + Gallery under pine nuggets @ 1 inch	10 a	9.8 ab	9.8 ab	9.4 ab
Treflan + Gallery under pine nuggets @ 2.5 inch	9.8 ab	9.6 abc	9.8 ab	9.6 ab
Treflan + Gallery under pine nuggets @ 5.0 inch	9.8 ab	10 a	9.8 ab	9.6 ab
Treflan + Gallery over HW @ 1 inch	8 def	7.6 def	9 abcd	8.8 abc
Treflan + Gallery over HW @ 2.5 inch	9.4 abcd	8.6 abcd	8.4 bcd	8.6 abc
Treflan + Gallery over HW @ 5.0 inch	9.6 abc	9.4 abc	9.6 abc	9.4 ab
Treflan + Gallery under HW @ 1 inch	9.2 abcd	8.2 bcde	8 de	8.6 abc
Treflan + Gallery under HW @ 2.5 inch	10 a	10 a	10 a	10 a
Treflan + Gallery under HW @ 5.0 inch	9.8 ab	9.2 abcd	10 a	10 a
Treflan + Gallery treated PN @ 1 inch	6.2 ghi	6.4 fg	6.5 ef	7.6 cd
Treflan + Gallery treated PN @ 2.5 inches	10 a	9.6 abc	9.8 ab	10 a
Treflan + Gallery treated PN @ 5.0 inches	10 a	10 a	10 a	10 a
Treflan + Gallery treated HW @ 1 inches	8.4 bcde	8 cdef	8.6 abcd	8.6 abc
Treflan + Gallery treated HW @ 2.5 inches	9.8 ab	9.4 abc	9.8 ab	9.4 ab
Treflan + Gallery treated HW @ 5.0 inches	10 a	9.8 ab	10 a	9.8 ab
Untreated PN @ 1.0 inch	5.8 hi	4.6 h	5.2 fg	4.6 fg
Untreated PN @ 2.5 inch	8.2 cdef	8 cdef	8.2 cd	9 abc
Untreated PN @ 5.0 inch	10 a	10 a	10 a	10 a
Untreated HW @ 1.0 inch	5 i	4.4 h	6.4 f	6 ef
Untreated HW @ 2.5 inches	9 abcde	8.6 abcd	8.4 bcd	8.4 bc
Untreated HW @ 5.0 inches	9.6 abc	9.2 abcd	9.6 abc	10 a
Weedstop (HW) at recommended depth	9.8 ab	9.4 abc	9.6 abc	9.6 ab
Mulch (HW) with snapshot	10 a	9.8 ab	9.6 abc	10 a
Control	0 j	0 i	0 h	0 i

z = Treatments with similar letters in the same column are not significantly different based on LSD ( $\alpha = 0.05$ ).

**Table 2. Weed fresh weights at 30, 60, 90, and 120 days after treatment during 2007**

<b>Treatments</b>	<b>30 DAT</b>	<b>60 DAT</b>	<b>90 DAT</b>	<b>120 DAT</b>
Snapshot	1.22 <sup>z</sup> *	72 *	102.8	42.66
Snapshot over pine nuggets (PN) @ 1"	0 *	1.12	0	14.18
Snapshot over PN @ 2.5"	0 *	0	15.4	0
Snapshot over PN @ 5.0"	0 *	0	0	0
Snapshot over Hard wood (HW) @ 1"	0.48 *	15.6	165.2 *	29.26
Snapshot over Hard wood @ 2.5"	0 *	0	41.7	0
Snapshot over Hard wood @ 5.0"	0 *	0	0	0
Treflan + Gallery	0.12 *	40.8	252.4 *	104.44
Treflan + Gallery over PN @ 1"	0.44 *	22	171.2 *	0
Treflan + Gallery over PN @ 2.5"	0 *	0.6	33.8	4.64
Treflan + Gallery over PN @ 5.0"	0 *	0	5.1	0
Treflan + Gallery under PN @ 1"	0 *	1.16	0	0
Treflan + Gallery under PN @ 2.5"	0 *	0	5.8	0
Treflan + Gallery under PN @ 5.0"	0 *	0	2.4	0
Treflan + Gallery over HW @ 1"	0.18 *	0	19.8	0
Treflan + Gallery over HW @ 2.5	0.26 *	3.6	4.2	9.16
Treflan + Gallery over HW @ 5.0"	0 *	0	1	1.8
Treflan + Gallery under HW @ 1"	0 *	0	27	79.64
Treflan + Gallery under HW @ 2.5"	0 *	0	12.5	1.2
Treflan + Gallery under HW @ 5.0"	0 *	0	0	0
Treflan + Gallery treated PN @ 1"	1.2 *	42.2	144.6 *	56.84
Treflan + Gallery treated PN @ 2.5"	0 *	0	0	29.48
Treflan + Gallery treated PN @ 5.0"	0.46 *	0	0	0
Treflan + Gallery treated HW @ 1"	0.24 *	25.2	47	13.4
Treflan + Gallery treated HW @ 2.5"	0 *	9.2	0	13.96
Treflan + Gallery treated HW @ 5.0"	0 *	0	0	0
Untreated PN @ 1.0 inch	0.68 *	25	126.68 *	208.44 *
Untreated PN @ 2.5 inch	0.3 *	8.8	115	22.4
Untreated PN @ 5.0 inch	0 *	0	0 g	0
Untreated HW @ 1.0 inch	0.76 *	13.6	190.6 *	43.7
Untreated HW @ 2.5 inches	0.22 *	3	56.5	13.48
Untreated HW @ 5.0 inches	0 *	0	5.8	0
Weedstop at recommended depth	0 *	0	0	2.8
Mulch with snapshot	0 *	0	9	0
Control	0.52	106	253.46	283.68

z = Weed fresh weight as expressed in grams

Values marked with \* are not significantly different from control using Dunnett's means separation ( $\alpha = 0.05$ ).