Optimizing Organic Herbicide Activity

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In recent years, several organic herbicide products have appeared on the market. These include Weed Pharm (20% acetic acid), C-Cide (5% citric acid), GreenMatch (55% d-limonene), Matratec (50% clove oil), WeedZap (45% clove oil + 45% cinnamon oil) and GreenMatch EX (50% lemongrass oil). All are contact-type herbicides and will damage any green vegetation they contact. However, they are safe as directed sprays against woody stems and trunks.

These herbicides kill weeds that have emerged, but have no residual activity on those emerging subsequently. While these herbicides can burn back the tops of perennial weeds, perennial weeds recover quickly.

These organic products are effective in controlling weeds when the weeds are small and the environmental conditions are optimum. In a recent study, we found that weeds in the cotyledon or first true leaf stage were much easier to control than older weeds (**Tables 1** and **2**). We also found that broadleaf weeds were easier to control than grassy weeds, possibly due to the location of the growing point (at or below the soil surface for grasses) or the orientation of the leaves (horizontal for most broadleaf weeds).

Organic herbicides could be applied when preparing the seedbed for turfgrass sod production and then again with the first flush of weeds. Grass seed could be planted a bit deeper (1/4 to ½ inch deeper) to delay turfgrass emergence, so that the organic herbicide could control the broadleaf flush without adversely affecting the turfgrass.

Organic herbicides kill only contacted tissue so good spray coverage is essential. A large, flat nozzle (ie. 8006) would be preferable in turfgrass production. In tests comparing various spray volumes and product concentrations, high concentrations at low spray volumes (20% concentration in 35 gallons per acre) were less effective than lower concentrations at high spray volumes (10% concentration in 70 gallons per acre). We also found that adding an organically acceptable adjuvant resulted in improved control. Among the organic adjuvants tested thus far, Natural wet, Nu Film P, Nu Film 17 and Silwet ECO spreader have performed well.

Although the recommended rate of these adjuvants is 0.25 % volume per volume (v/v), increasing the adjuvant concentration up to 1% v/v often leads to improved weed control, possibly due to better coverage. Work continues in this area, as manufacturers continue to develop more organic adjuvants. Because organic herbicides lack residual activity, repeat applications will be needed to control new flushes of weeds.

Temperature and sunlight have both been suggested as factors affecting organic herbicide efficacy. In several field studies, we observed that organic herbicides work better when temperatures are above 75° F. Sunlight has also been suggested as an important factor for effective weed control. Anecdotal reports indicate that control is better in full sunlight.

However, in a greenhouse test using shade cloth to block 70% of the light, we found that weed control with WeedZap improved in shaded conditions (**Table 3**). The greenhouse temperature was around 80° F. It may be that under warm temperatures, sunlight is less of a factor.

Recent experiments have assessed winter weed control during cool conditions (Table 4). In spite of cold temperatures, plantain control was very good with Weed Pharm, or the high rates of Weed Zap or Biolink. Annual bluegrass control was also good with these same materials.

Organic herbicides are expensive and may not be affordable for commercial crop production at this time. Moreover, because these materials lack residual activity, repeat applications will be needed to control perennial weeds or new flushes of weed seedlings. Finally, approval by one's organic certifier should also be checked in advance as use of such alternative herbicides is not cleared by all agencies.

Table 1. Broadleaf (pigweed and black nightshade) weed control (% control at 15 days after treatment) when treated 12, 19 or 26 days after emergence.

	----------Weed age----------		
	12 Days old	19 days old	26 days old
GreenMatch Ex 15%	89	11	0
GreenMatch 15%	83	96	17
Matran 15%	88	28	0
Acetic acid 20%	61	11	17
WeedZap 10%	100	33	38
Untreated	0	0	0

Table 2. Grass (Barnyardgrass and crabgrass) weed control (% control at 15 days after treatment) when treated 12, 19 or 26 days after emergence.

	----------Weed age----------		
	12 Days old	19 days old	26 days old
GreenMatch Ex 15%	25	19	8
GreenMatch 15%	42	42	0
Matran 15%	25	17	0
Acetic acid 20%	25	0	0
WeedZap 10%	0	11	0
Untreated	0	0	0

Table 3. Weed control with WeedZap (10% v/v) in relation to adjuvant, spray volume and light levels. Plants grown in the greenhouse in either open conditions or under shade cloth, which reduced light by 70%.

	Pigweed control (%)		Mustard control (%)	
	Sun	Shade	Sun	Shade
WeedZap + 0.1%v/v Eco Silwet (10 gpa)	31.7	93.3	26.7	35.0
WeedZap + 0.5%v/v Eco Silwet (10 gpa)	31.7	48.3	43.3	71.7
WeedZap + 0.5%v/v Natural Wet (70 gpa)	26.7	94.7	26.7	30.0
Untreated	0.0	0.0	0.0	0.0
LSD.05*	5.7		11.5	

* Values for comparing any two means. Pigweed and mustard were each analyzed separately.

Table 4. Plantain and annual bluegrass control (%) at 4 and 9 days after treatment (DAT). Applications made on Jan. 6, 2011 - 40ºF. All treatments included Eco Silwet 0.5% v/v.

Treatment	Plantain control		Annual bluegrass control	
	4 DAT	9DAT	4DAT	9DAT
Biolink 3% v/v	52	48	15	35
Biolink 6% v/v	63	80	40	63
MOI-005 5% v/v	2	13	0	2
MOI-005 10% v/v	10	20	0	3
GreenMatch 7.5% v/v	12	13	3	5
GreenMatch 15% v/v	23	38	10	52
Matran 7.5% v/v	5	8	2	3
Matran 15% v/v	20	17	5	30
Weed Zap 7.5% v/v	18	28	10	42
Weed Zap 15% v/v	52	78	23	78
Weed Pharm 100%	82	90	53	87
Untreated	2	0	0	0
LSD .05	23	19	13	29