



Comparison of the performance of organic herbicides for weed control. Kai Umeda (University of Arizona Cooperative Extension, Maricopa County, Phoenix, AZ 85040). Four small plot experiments were conducted in dormant bermudagrass turf and in non-turf bare ground sites in Tempe, AZ. The experimental treatment plots measured 5 ft by 10 ft and were replicated three times in a randomized complete block except experiment no. 4 that had single replicate treatment plots measuring 10 ft by 10 ft. Treatments in experiments number 1, 2, and 3 were applied using a backpack CO₂ sprayer equipped with a hand-held boom with three TurboTeeJet 11002 flat fan nozzles spaced 20 inches apart (Table 1). Experiments no. 1 and 2 were sprayed in 40 gpa water pressurized to 35 psi. Experiment no. 3 was sprayed in 80 gpa water (Table 2). Experiment no. 4 was sprayed with a 1-gallon hand-pump sprayer with a single nozzle delivering 25, 50, or 100 gpa water per plot containing a 10% v/v concentration of Prizefighter (ammonium nonanoate).

Experiment 1. Weed Slayer (eugenol plus adjuvants) exhibited extraordinarily excellent weed control as soon as it was applied and no weeds regrew in plots because the rate applied was 8 times greater than intended. All other herbicides demonstrated rapid activity at one day after applications (1 DAT) and maximum levels of activity were observed at 7 DAT (Figs. 1, 2, 3). Vinegar 20% and Prizefighter (ammonium nonanoate) were the fastest to cause desiccation of foliage of rescuegrass (*Bromus catharticus*), black medic (*Medicago lupulina*), and knotweed (*Polygonum aviculare*). At 28 DAT, rescuegrass regrowth dominated all treated plots and the black medic and knotweed were severely suppressed except Weed Slayer treated plots which remained clean at up to 77 DAT. Avenger (d-limonene), BurnOut (citric acid and clove oil), vinegar, and Prizefighter gave nearly acceptable weed control of broadleaved weeds without complete elimination and were relatively weaker on the rescuegrass.

Experiment 2. At 9 DAT-1 (of the first application on 14 February), vinegar caused the most desiccation of Mediterraneangrass (*Schismus barbatus*) approaching 80% (Fig. 4). Weed Slayer, Avenger, and Prizefighter gave about 50 – 60% control of the grass. At 14 DAT-1, Weed Slayer controlled the grass and the vinegar control diminished as did as the other herbicides. Weed Slayer progressively controlled *Cryptantha* from 9 DAT-1 to 14 DAT-1 (Fig. 5). The other herbicides exhibited initial activity but the weed recovered and regrew. Stinknet (*Oncosiphon piluliferum*) was completely controlled by Weed Slayer and new growth occurred when treated by the other herbicides (Fig. 6). At the time of the sequential application on 20 March, most the Weed Slayer plots were clear of weeds. At 11 DAT-2, *Schismus* control was 70 – 80% for Avenger, BurnOut, vinegar, and Prizefighter. Vinegar and Prizefighter induced rapid burning of the grass within a day of the second application. Only Prizefighter exhibited rapid burning of stinknet and provided 70% control as regrowth occurred.

Experiment 3. Within 1 DAT, Prizefighter applied in 80 gpa water exhibited more than 90% and 80% control of stinknet and *Schismus*, respectively (Figs. 7, 8, 9). Avenger and vinegar also showed 80% desiccation of the grass. At 11 DAT, Weed Slayer and Prizefighter provided the most efficacious control of both grass and broadleaved weeds. Prizefighter treated stinknet had regrowth after the initial desiccation of the whole plant.

Experiment 4. The application volumes trended to exhibit greater efficacy with higher volumes of water being used 100 gpa > 50 gpa > 25 gpa (Fig. 10, 16, 17, 18). At 1 DAT, Prizefighter in 25 gpa water showed barely perceptible activity while 50 and 100 gpa water treatments were very pronounced on stinknet. Using 100 gpa was slightly enhanced over a volume of 50 gpa water for Prizefighter. Stinknet control was achieved within 1-DAT and *Schismus* control was at 6-DAT while 25 and 50 gpa treatments were not as efficacious.

Table 1. Description of experimental sites, Tempe, AZ.

Experiment Number	Site	Date initiated	Conditions at application	Weeds present
1	Dormant bermudagrass Kiwanis Park	13 December 2019	Air temp – 58°F, no wind, clear sky, 54°F soil temp	Rescuegrass (<i>Bromus catharticus</i>), black medic (<i>Medicago lupulina</i>), knotweed (<i>Polygonum aviculare</i>)
2	Bare ground repeat application	14 February 2020 + 20 March 2020	NA Air temp – 70F, overcast	Mediterranean grass (<i>Schismus barbatus</i>), <i>Cryptantha</i> spp., stinknet, (<i>Oncosiphon piluliferum</i>)
3	Bare ground high volume	20 March 2020	Air temp – 70F, overcast	
4	Bare ground volume comparison	21 March 2020	NA	

Table 2. Treatments applied in experiments number 1, 2, and 3.

Weed Slayer eugenol + molasses + Agro Gold WS <i>Bacillus</i> spp. + Latron CS-7 (NIS)	Caution	3 qt/A + 3 qt/A + 10 oz	9.7 ml + 9.7 ml + 1.5 ml
Avenger d-limonene	Caution	RTU	514 ml
BurnOut citric acid + clove oil	Danger	1:2 water	171 ml : 343 ml
Vinegar 20%	Danger	RTU	514 ml
Prizefighter ammonium nonanoate	Warning	10%	51.4 ml

Plot size = 5 ft x 10 ft x 3 replicates = 0.0034 A/trt
 Spray mix 514 ml per treatment = 40 gpa water in exp. 1 & 2
 Spray mix 1028 ml per treatment = 80 gpa water in exp. 3 and
 product rates doubled.

Figure 1. Experiment 1 rescuegrass control

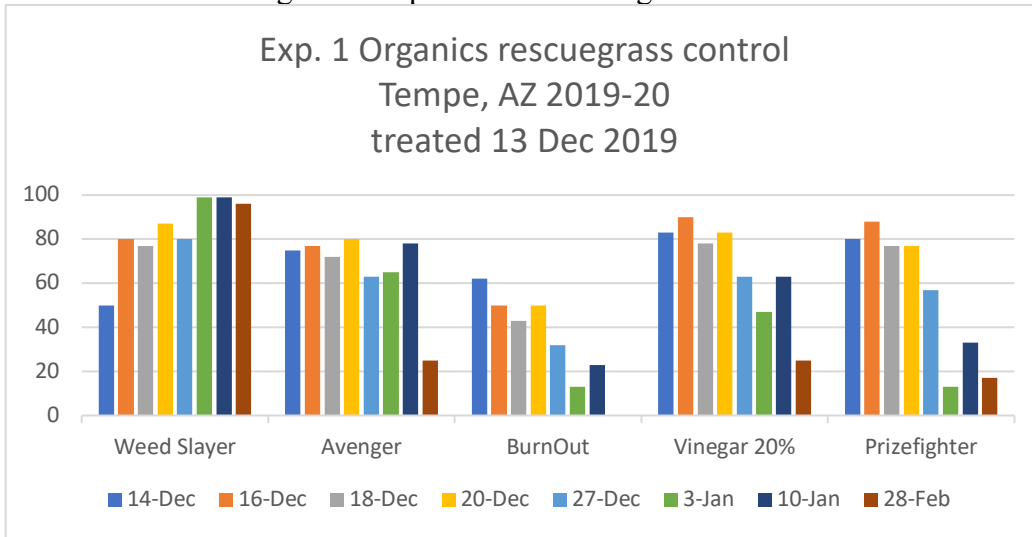


Figure 2. Black medic control.

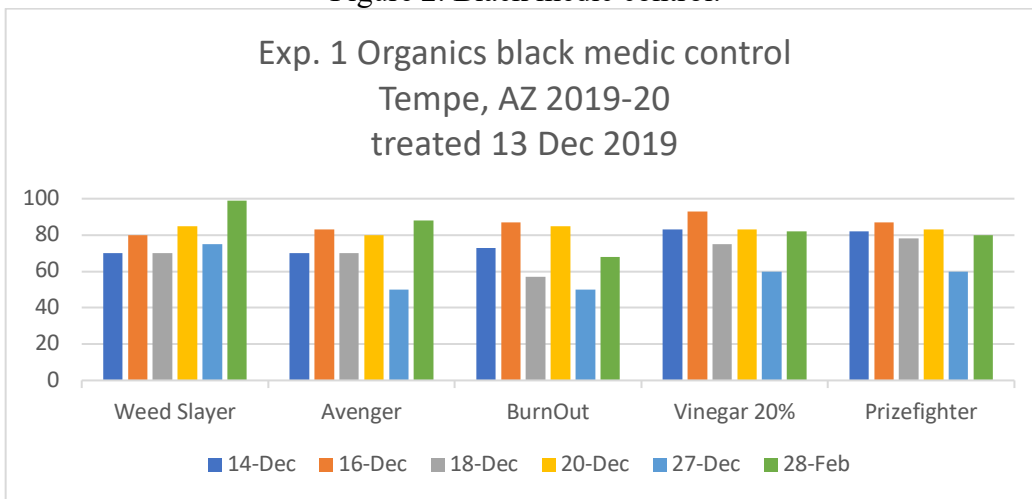


Figure 3. Knotweed control.

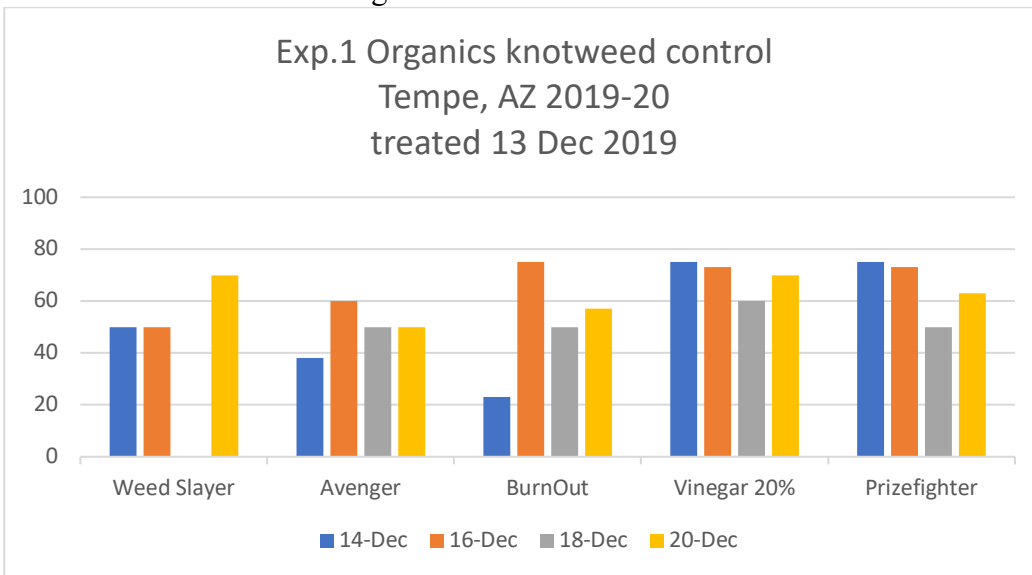


Figure 4. *Schismus* control with 2 applications.

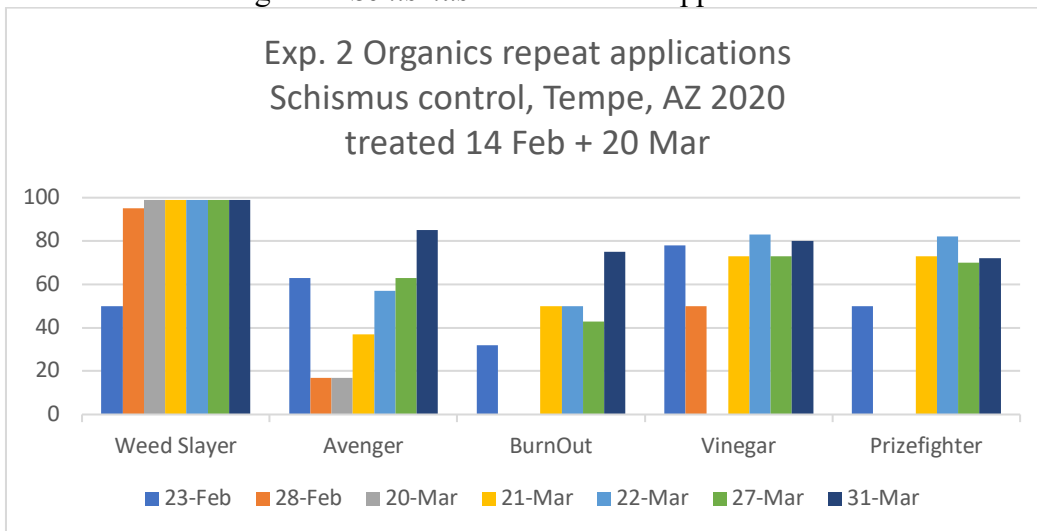


Figure 5. *Cryptantha* control with 2 applications.

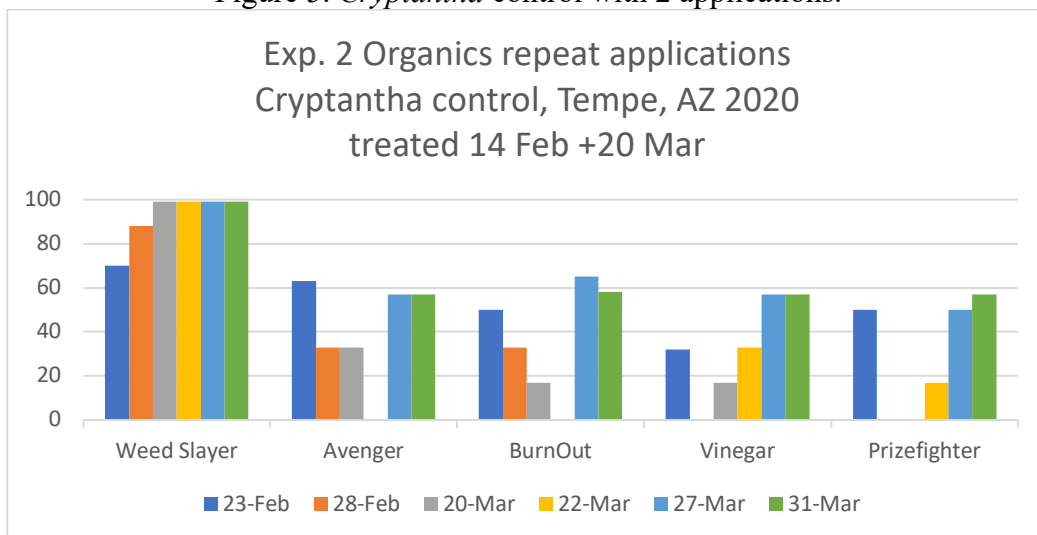


Figure 6. Stinknet control with 2 applications.

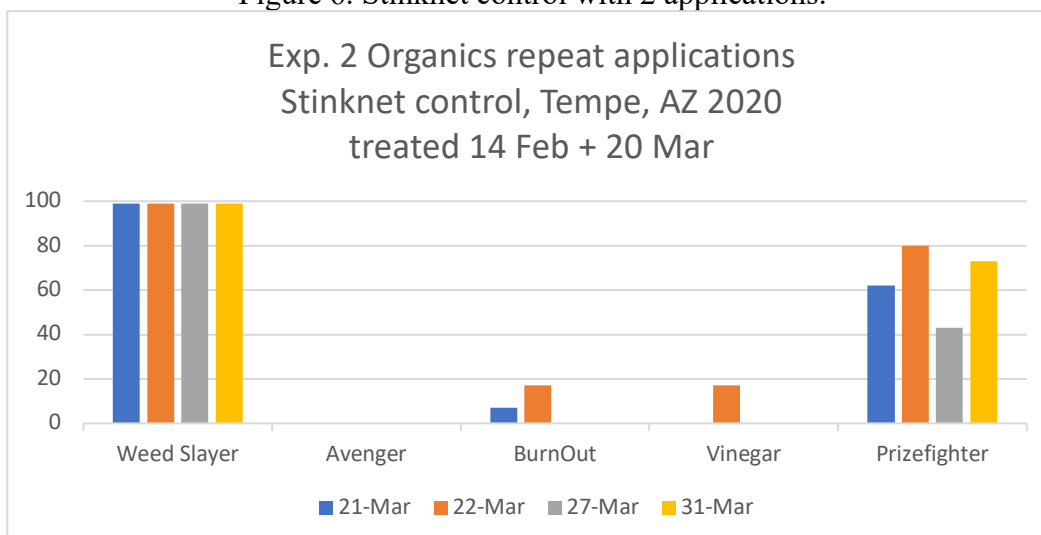


Fig. 7 Organics high volume
Schismus control, Tempe, AZ
treated 20 March 2020

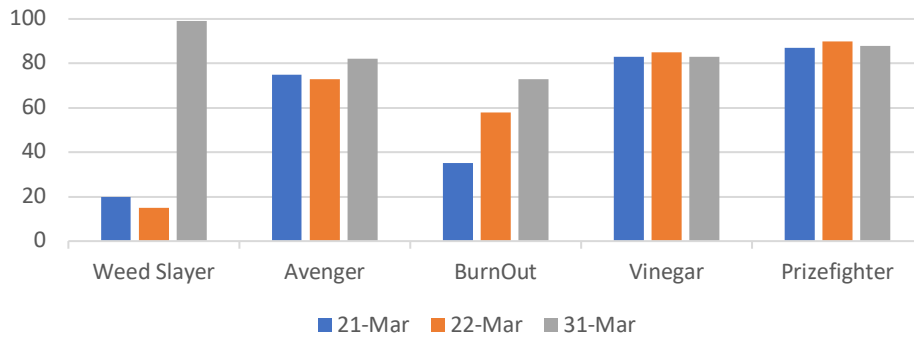


Fig. 8 Organics high volume
Stinknet control, Tempe, AZ
treated 20 March 2020

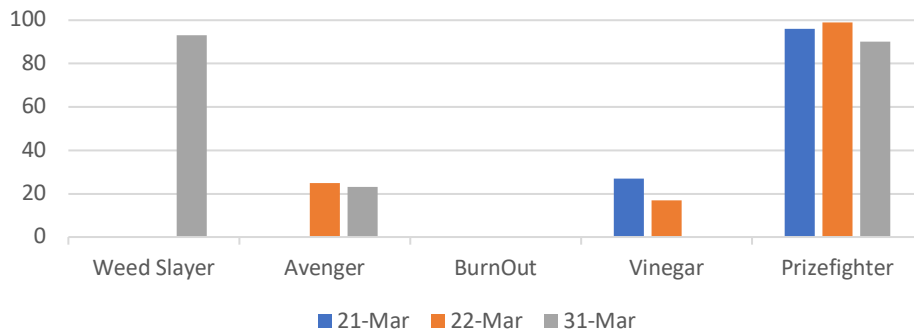


Fig. 9 Organics high volume
Cryptantha and overall control, Tempe, AZ
treated 20 March 2020

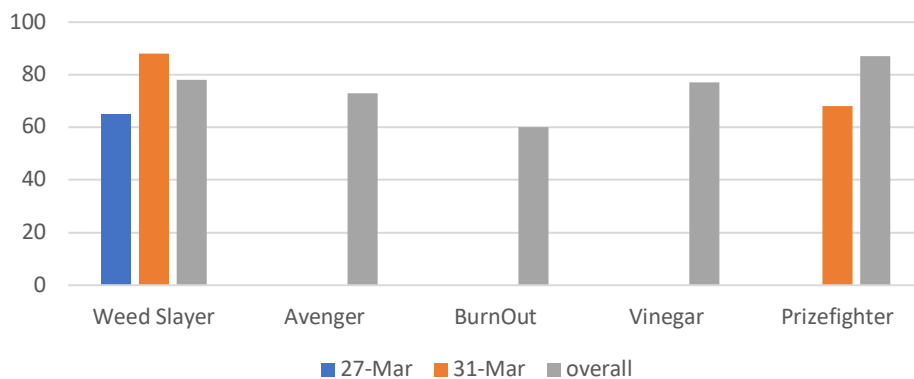


Fig. 10 Exp. 4. Organics volume comparison
 Weed control efficacy, Tempe, AZ
 treated 21 March 2020

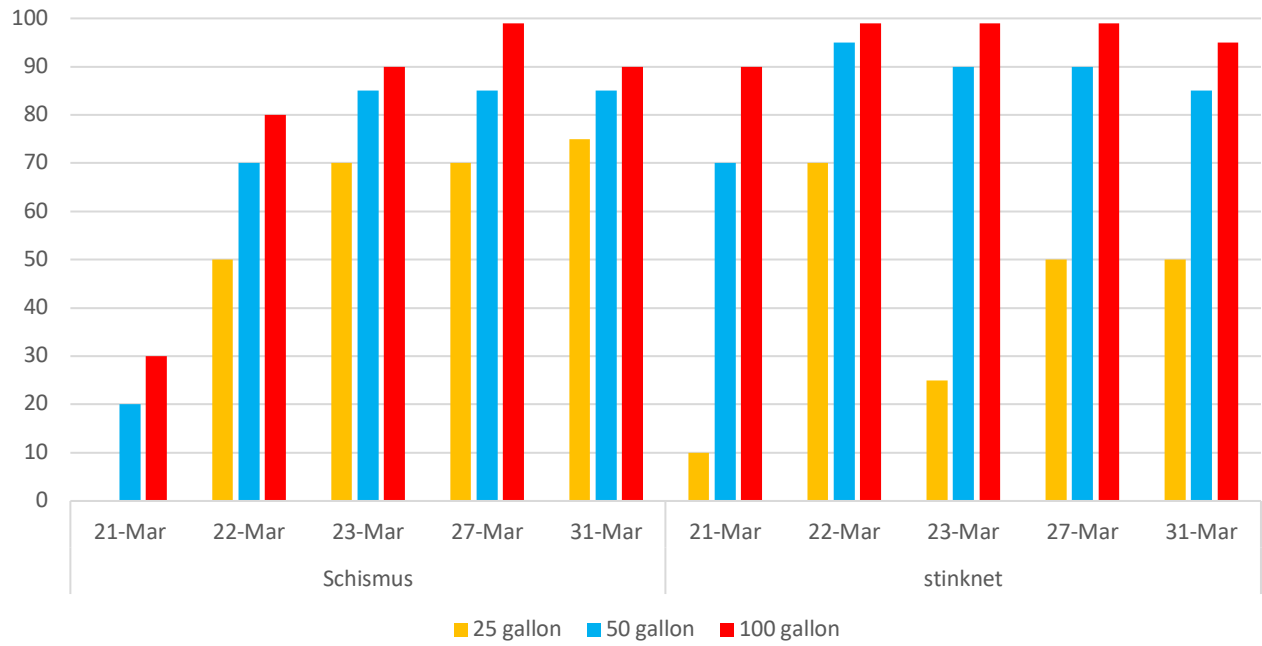


Figure 11. Day of applications dormant bermudagrass, 13 December 2019, 11 AM



Figure 12. 2 DAT on 14 December 2019



Figure 13. 5 DAT on 18 December 2019



Figure 14. 10 DAT on 23 December 2019



Figure 15. 69 DAT on 20 February 2020



Figure 16. Prizefighter 10% in 25 gpa water 7 DAT



Figure 17. Prizefighter 10% in 50 gpa water 7 DAT



Figure 18. Prizefighter 10% in 100 gpa water 7 DAT

