# Effects of Commonly-Used Herbicides on Establishing and Mature Kurapia (*Lippia nodiflora* L.)

Cole Thompson[1] and Jim Baird[2]

[1]Cal Poly State University – San Luis Obispo, San Luis Obispo, CA, [2]University of California – Riverside, Riverside, CA

UID: 95700

## BACKGROUND

Kurapia (*Lippia nodiflora* L.) is a low-growing, broadleaf groundcover selected and developed in Japan that has recently been recognized for its low water use and salinity tolerance characteristics. Kurapia use is now increasing in California landscapes, but weed encroachment is a concern since establishment is from plugs and little is known about Kurapia tolerance to pre- and postemergence herbicides at various stages of establishment (Fig. 1).

**Figure 1.** Kurapia (*left*) and weed encroachment in a mature plot of Kurapia (*right*).

## OBJECTIVE

- To evaluate Kurapia tolerance to 15 commercially available herbicides at various stages of establishment.

## MATERIALS AND METHODS

**Locations and Site Management:**
- This study was conducted in 2015 in Riverside and San Luis Obispo, CA.
- Kurapia plugs (2.5 cm diameter) were planted in March 2015.
- Studies were irrigated to prevent drought stress and fertilized every other week with a complete fertilizer (16-6-8, N-P-K) at a rate of 24 kg N $ha^{-1}$.
- Plots were hand-weeded until herbicides were applied.

**Experimental Design, Treatments, and Data Collected:**
- Fifteen commercially available herbicides (Table 1) were applied at labeled rates to Kurapia at 1, 6, or 12 weeks after planting (Fig. 2).
- For simplicity, herbicide application timings were considered separate experiments.
- Each herbicide application timing was evaluated in a randomized complete-block design with four replications in each location. Individual plots were 1.2 m × 1.8 m.
- Herbicides were applied with $CO_2$ powered sprayers with *TeeJet* 8003VS nozzles in 815 L water $ha^{-1}$ at 193 kPa.
- Kurapia injury was visually estimated at 1, 2, 4, and 6 weeks after treatment for each herbicide timing.
- Percent Kurapia ground cover was visually estimated every two weeks from March through July.

**Figure 2.** Kurapia plugs treated with herbicides six weeks after planting in San Luis Obispo on 23 April 2015.

Table 1. Herbicides evaluated for safety on Kurapia in Riverside and San Luis Obispo, CA in 2015.

| Product Tested | Common Name | Rate (kg a.i. $ha^{-1}$) | Additive | Timing and Target Weed |
|---|---|---|---|---|
| Barricade 65WG | Prodiamine | 1.7 | - | PRE grass/broadleaf |
| Pennant Magnum | Metolachlor | 2.2 | - | PRE grass/broadleaf/sedge |
| Gallery SC | Isoxaben | 1.1 | - | PRE broadleaf |
| Specticle FLO | Indaziflam | 0.04 | - | PRE grass/broadleaf |
| Fusilade II | Fluazifop | 0.43 | NIS† | POST grass |
| Sedgehammer | Halosulfuron | 0.07 | NIS | POST sedge |
| Certainty | Sulfosulfuron | 0.07 | NIS | POST grass/broadleaf/sedge |
| Tenacity | Mesotrione | 0.18 | NIS | POST grass/broadleaf |
| Tribute Total | Thiencarbazone + Foramsulfuron + Halosulfuron | 0.02 0.04 0.07 | NIS | POST grass/broadleaf/sedge |
| Celsius | Thiencarbazone + Iodosulfuron + Dicamba | 0.02 0.006 0.18 | NIS | POST broadleaf/grass |
| Drive XLR8 | Quinclorac | 0.84 | MSO‡ | POST broadleaf/grass |
| Turflon Ester Ultra | Triclopyr | 1.1 | - | POST broadleaf |
| Lontrel | Clopyralid | 0.28 | - | POST broadleaf |
| Speedzone Southern | 2,4D + MCPP + Dicamba + Carfentrazone-ethyl | 0.3 0.11 0.03 0.02 | - | POST broadleaf |
| Mecomec 2.5 | MCPP | 0.7 | - | POST broadleaf |

†Nonionic surfactant.
‡Methylated seed oil.

## RESULTS

Table 2. Effects of herbicide treatments within application timings on Kurapia establishment 19 weeks after planting in Riverside and San Luis Obispo, CA in 2015.

| Herbicide | % Cover | | | | | |
|---|---|---|---|---|---|---|
| | Riverside | | | San Luis Obispo | | |
| | Herbicide Application Timing | | | Herbicide Application Timing | | |
| | 1 WAP† | 6 WAP | 12 WAP‡ | 1 WAP | 6 WAP | 12 WAP |
| Untreated | 49a-d§ | 66a | 194a | 24a | 49ab | 53ab |
| Barricade 65WG | 55abc | 56abc | 154ab | 34a | 33a-d | 29bc |
| Pennant Magnum | 73a | 60ab | 127abc | 34a | 33a-d | 36bc |
| Gallery SC | 59ab | 43a-d | 135abc | 1b | 14a-f | 24bc |
| Specticle FLO | 13d-g | 11d | 69bc | 1b | 0f | 1c |
| Fusilade II | 70ab | 66a | 117abc | 21a | 85a | 85a |
| Sedgehammer | 18c-g | 38a-d | 87bc | 0b | 10c-f | 13bc |
| Certainty | 40a-f | 60ab | 136abc | 18a | 49ab | 29bc |
| Tenacity | 2g | 39a-d | 126abc | 0b | 22a-e | 53ab |
| Tribute Total | 2g | 21bcd | 92bc | 0b | 3def | 35bc |
| Celsius | 5fg | 19cd | 104abc | 0b | 1ef | 36bc |
| Drive XLR8 | 0g | 15d | 88bc | 1b | 0f | 21bc |
| Turflon Ester Ultra | 10efg | 25bcd | 52c | 0b | 11b-f | 1c |
| Lontrel | 48a-e | 50a-d | 114abc | 14a | 39a-c | 40bc |
| Speedzone Southern | 34b-g | 33a-d | 96bc | 1b | 6c-f | 4c |
| Mecomec 2.5 | 58ab | 56abc | 118abc | 1b | 24a-d | 18bc |

†Weeks after planting.
‡Percent Kurapia cover was not uniform among treatments when herbicides were applied 12 WAP in Riverside. As a result, Kurapia cover 12 WAP was set to equal 100% and data for subsequent dates were scaled accordingly.
§Within columns, means with the same letter are not significantly different according to Tukey's HSD ($P \leq 0.05$).

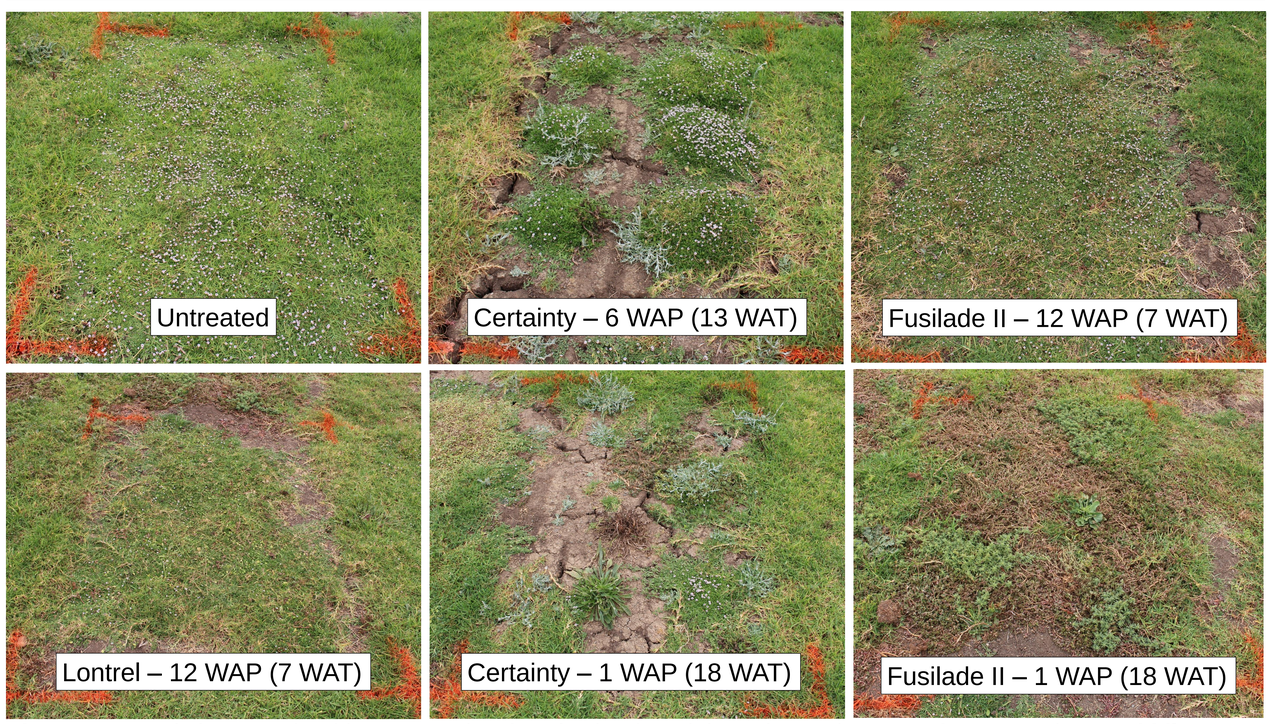


**Figure 3.** Kurapia in San Luis Obispo 19 weeks after planting (WAP) (13 July 2015). **Top Left**: untreated, **Top Middle**: treated with Certainty 6 WAP [13 weeks after herbicide treatment (WAT)], **Top Right:** treated with Fusilade II 12 WAP (7 WAT), **Bottom Left:** treated with Lontrel 12 WAP (7 WAT), **Bottom Middle:** treated with Certainty 1 WAP (18 WAT), and **Bottom Right:** treated with Fusilade II 1 WAP (18 WAT).

## CONCLUSIONS

**Effects of Herbicides on Kurapia Establishment 19 Weeks After Planting (WAP):**
- Barricade 65WG, Pennant Magnum, Fusilade II, Certainty, and Lontrel did not reduce Kurapia cover compared to the untreated at either site, regardless of application timing.
- Gallery SC and Mecomec 2.5 only reduced Kurapia cover compared to the untreated when applied 1 WAP in San Luis Obispo.
- Tenacity and Celsius injured Kurapia, but did not reduce cover compared to the untreated at either site when applied 6 or 12 WAP (Tenacity) or 12 WAP (Celsius).
- Generally, Specticle FLO, Sedgehammer, Tribute Total, Drive XLR8, Turflon Ester Ultra, and Speedzone Southern reduced Kurapia cover compared to the untreated at both sites, regardless of application timing.

Table 3. Summary of herbicides that did not reduce Kurapia cover 19 weeks after planting (WAP) when applied 1, 6, or 12 WAP in Riverside or San Luis Obispo, CA in 2015.

| Product Tested | 1 WAP | 6 WAP | 12 WAP |
|---|---|---|---|
| Barricade 65WG | X† | X | X |
| Pennant Magnum | X | X | X |
| Gallery SC | X‡ | X | X |
| Fusilade II | X | X | X |
| Certainty | X | X | X |
| Tenacity | | X | X |
| Celsius | | | X |
| Lontrel | X | X | X |
| Mecomec 2.5 | X‡ | X | X |

†Indicates herbicide safety relative to untreated 19 WAP.
‡Reduced Kurapia cover when applied 1 WAP in San Luis Obispo.

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