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Tolerance of Hooker's Evening Primrose Transplants to Preemergence Herbicides

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Summary. **No research has investigated the phytotoxic response of hooker's evening primrose (*Oenothera elata*) plug transplants to preemergence herbicides. Varied phytotoxic responses of common evening primrose (*Oenothera biennis*) to preemergence herbicides suggest that options may exist for the safe control of weeds present within hooker's evening primrose when grown as an agronomic field crop. Enhanced weed control during early establishment may reduce competition for water and nutrients as well as increase seed yield and oil content. Therefore, the objective of this research was to determine the phytotoxic effect of preemergence herbicides on hooker's evening primrose plug transplants grown in the greenhouse. Research was conducted in 2010 and 2011 at the Plant and Soil Science greenhouse complex at Texas Tech University in Lubbock, TX. Herbicide treatments were applied on 13 July 2010 and 5 Apr. 2011 and consisted of oxadiazon at 3 lb/acre, isoxaben at 0.5 lb/acre, oryzalin at 2 lb/acre, prodiamine at 1.5 lb/acre, dithiopyr at 0.5 lb/acre, s-metolachlor at 1.8 lb/acre, pendimethalin at 0.6 lb/acre, and isoxaben + trifluralin at 2.5 lb/acre. One 4-month-old hooker's evening primrose plug (2 inches wide) was transplanted into each pot (3 gal) 2 days after treatment (DAT). Dithiopyr and s-metolachlor treatments exhibited similar lack of phytotoxicity as the untreated control 7 DAT. Phytotoxicity ≥13% was observed for trifluralin + isoxaben, pendimethalin, prodiamine, oryzalin, isoxaben, and oxadiazon 7 DAT, with the highest level of phytotoxicity (24%) exhibited by trifluralin + isoxaben treatments. Hooker's evening primrose phytotoxicity decreased (plants grew out of the damage) for all treatments except trifluralin + isoxaben, pendimethalin, and oryzalin 28 DAT. Oryzalin (16%) and trifluralin + isoxaben (60%) were the only two treatments that did not exhibit similar phytotoxicity to the untreated control 28 DAT. There were no significant differences in aboveground or belowground biomass nor plant growth index (PGI) of any of the treatments when compared with the untreated control 28 DAT. Based upon the results of this trial, pendimethalin, prodiamine, dithiopyr, s-metolachlor, oryzalin, isoxaben, and oxadiazon may be used for preemergence weed control in hooker's evening primrose without causing excessive phytotoxicity (>20%), potential yield loss, or both. Trifluralin + isoxaben treatments exhibited 60% hooker's evening primrose phytotoxicity 28 DAT, which resulted in too low of an initial plant stand to warrant use.**

Hooker's evening primrose is a biennial to short-lived perennial native to areas as far north as Oregon, south as Panama, east as Texas, and west as coastal California (Dietrich et al., 1997). Plants are often found in full sun along streams and rocky slopes as well as in meadows and disturbed areas (Arnold, 2008; Dietrich et al., 1997). Hooker's evening primrose shoots (1.5 to 8 ft tall) emerge from the center of a basal rosette at about the 20- to 50-leaf stage (Dietrich et al., 1997; Harte, 1994). Leaves are dull green to gray-green with bluntly dentate or subentire margins (Dietrich et al., 1997). Showy yellow flowers (1.2 to 1.4 inches wide) usually only occur once at sunrise or sunset during periods of long days and short nights (Correll and Johnston, 1970; Dietrich et al., 1997; Harte, 1994). Flowers are pollinated by hawk moths (family Sphingidae) and give rise to seed capsules measuring 0.8 to 2.6 inches long (Dietrich et al., 1997). Each capsule splits in four places and may contain up to 500 seeds (Harte, 1994).

Drought tolerance and floral attributes of hooker's evening primrose have led to its use as an ornamental plant in xeriscapes throughout arid and semiarid regions of the United States (Arnold, 2008). High levels of γ-linolenic acid, an omega-3 fatty acid essential for human metabolism, present in seed oil has further increased interest in the cultivation of this plant as an agronomic crop (Balch et al., 2003). However, because of poor field germination, hooker's evening primrose must first be propagated in the greenhouse and transplanted into the field following maturation to the rosette stage (Murphy et al., 1999).

The presence of weeds in agricultural fields often increases the time and costs of crop production as well as reduces crop yields and quality (Anderson, 1996). Bridges (1992) estimated that the average annual monetary loss because of weed competition in 46 U.S. grown crops was $4.1 billion in 1991. Losses are directly proportionate to the amount of light, water, and nutrients that weeds intercept from the agronomic crops they infest (Buchanan and Burns, 1970). The critical weed free period for many crops exists during early establishment. The critical weed free period for sorghum (*Sorghum bicolor*), beet (*Beta vulgaris*), and field bean (*Phaseolus vulgaris*) to prevent yield loss is 4, 9 to 12, and 5 to 7 weeks, respectively (Burnside and Wicks, 1967; Dawson, 1964, 1965). Early critical weed-freeperiods and phytotoxicity concerns associated with many postemergence herbicides make preemergence herbicide applications even more important.

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Units

To convert U.S. to SI, multiply by	U.S. unit	SI unit	To convert SI to U.S., multiply by
0.3048	ft	m	3.2808
3.7854	gal	L	0.2642
9.3540	gal/acre	L·ha^{-1}	0.1069
2.54	inch(es)	cm	0.3937
1.1209	lb/acre	kg·ha^{-1}	0.8922
28.3495	oz	g	0.0353
6.8948	psi	kPa	0.1450
(°F – 32) ÷ 1.8	°F	°C	(°C × 1.8) + 32