

Evaluation of preemergence and postemergence herbicides for use in cowpea. Cudney, D.W., A.N. Eckard, C.A. Frate, and H.M. Kempen. Weed management in cowpea is made difficult by such problem weeds as black nightshade and nutsedge spp. A new herbicide, imazethapyr, has shown activity on these weeds in previous tests when used at elevated rates. These elevated rates may pose a problem to susceptible crops which would follow cowpea in the crop rotation. The following trials were established to investigate the weed control potential and cowpea phytotoxicity of imazethapyr under lower use rates where potential residual activity to following crops would be reduced. The addition of pendimethalin and trifluralin to imazethapyr was also explored to broaden the weed control spectrum. Two trials were established at the University of California, Riverside Experiment Station: a trial to compare the efficacy of incorporation methods (mechanical incorporation prior to planting vs preemergence application followed by heavy furrow irrigation) and a trial to compare preplant and postemergence applications. Two trials were established in Tulare County: a preplant and a postemergence evaluation of black nightshade control. One test was conducted in Kern County to evaluate imazethapyr for its potential in controlling yellow nutsedge as a postemergence application. All treatments were applied with a constant pressure CO₂ backpack plot sprayer. Each treatment was replicated four times.

Table 1 shows the results of the comparison of furrow irrigation and mechanical incorporation as preemergence and preplant treatments. None of the treatments of trifluralin, pendimethalin, imazethapyr, and combinations of trifluralin or pendimethalin plus imazethapyr injured the cowpeas. Mechanical lambsquarter control when trifluralin was included. Furrow irrigation incorporation was superior to mechanical incorporation when pendimethalin was included. There was little difference in control for incorporation methods with imazethapyr. Imazethapyr at the rate tested (0.048 lbs ai/A) did not control pigweed or lambsquarter.

Table 2 shows the results of the comparison between preplant and postemergence applications at Riverside. No weeds were present in the trial area to offer a chance for weed control evaluations. All combinations containing either trifluralin or pendimethalin as a preplant application caused initial stunting of the cowpeas; however, the initial stunting could not be observed at the second evaluation one month later. Postemergence applications of imazethapyr or imazethapyr plus pendimethalin did not cause significant cowpea phytotoxicity. There was a slight delay in maturation and a lower test weight for the highest rates of imazethapyr and imazethapyr plus pendimethalin applied as postemergence applications.

The results of a preemergence trial in Tulare County in table 3. showed a slight reduction in vigor for the initial ratings for the highest rate of imazethapyr, however the cowpeas soon recovered and three weeks later no difference in vigor was evident for any of the treatments. None of the treatments controlled crabgrass, yellow nutsedge, or the selection of broadleaved weeds present (mainly chickweed) in the plot area.

Table 4 shows the results of the postemergence applications in Tulare County. None of the treatments caused observable phytotoxicity to the cowpeas. Control of black nightshade was variable with a trend toward control at the highest rate of application in early evaluations and a reduction in black nightshade height particularly at the highest rate of application.

The results of the postemergence trial in Kern County are recorded in Table 5. There was some initial phytotoxicity to cowpea which the plants soon outgrew. The yellow nutsedge was temporarily stunted but it also recovered.

The overall results of these trials were disappointing for weed control. It is evident that when used at the lower rates to avoid soil residual activity in sensitive rotational crops, weed control efficacy may be compromised. Black nightshade was found in only one of the trials and some stunting and initial control was noted; further study may be justified with this problem weed. It is evident that yellow nutsedge will not be controlled by imazethapyr at the rates tested. There was some initial cowpea phytotoxicity in most cases from the use of imazethapyr, but the cowpeas recovered quickly and yield was unaffected. (University of California, Botany & Plant Sciences Department, Riverside CA 92521.)

Table 1. Herbicide Incorporation¹ Trial
at Riverside, California

Treatment	Incorp- oration Method ²	Rate #ai/A	Control ³	
			pigweed 9/5/89	lambsquarters
Hand Weeded			3.50	2.50
trifluralin	W	0.75	4.75	2.25
imazethapyr	W	0.48	4.00	3.00
pendimethalin	W	0.75	8.75	9.50
trifluralin	M	0.75	7.50	6.50
imazethapyr	M	0.048	5.25	3.75
pendimethalin	M	0.75	5.50	5.00
trifluralin+ imazethapyr	W	0.75+0.048	5.25	5.50
pendimethalin+ imazethapyr	W	0.75+0.048	9.00	8.25
trifluralin+ imazethapyr	M	0.75+0.048	9.00	9.00
pendimethalin+ imazethapyr	M	0.75+0.048	7.75	8.25
Check			2.00	3.25
LSD 0.05			1.45***	1.94***

¹herbicide applications made 7/19/89

²W = incorporation by furrow irrigation

³M = mechanical incorporation by Lilliston prior to irrigation

³0 = no control; 10 = 100% control

Table 2. Preplant¹ and postemergence²
at Riverside, California

Treatment		Rate #ai/A	Phytoxicity ³ 6/27/89 7/27/89		Delayed ⁴ Maturation 9/5/89	Yield ⁵ 10/4/89	Test ⁶ Wt.
Hand Weeded			0.50	0.00	6.50	1910	26.6
trifluralin	preplant	0.75	3.00	0.00	7.00	1951	25.1
imazethapyr	preplant	0.125	2.50	0.00	6.50	1718	25.2
imazethapyr	preplant	0.063	3.50	0.00	7.00	1800	25.7
imazethapyr	preplant	0.048	3.25	0.00	6.50	2058	25.7
trifluralin+							
imazethapyr	postemergent	0.75+0.125	3.00	1.75	4.25	1639	24.5
trifluralin+							
imazethapyr	postemergent	0.75+0.063	3.75	1.50	6.00	1799	24.4
trifluralin+							
imazethapyr	postemergent	0.75+0.048	2.25	1.00	5.75	1897	25.1
imazethapyr	postemergent	0.125	0.25	0.75	5.25	1860	24.7
imazethapyr	postemergent	0.063	0.00	1.50	6.25	1835	25.3
imazethapyr	postemergent	0.048	0.25	0.50	6.75	1856	25.8
imazethapyr	postemergent	0.125	0.75	2.00	3.75	1462	23.4
imazethapyr	postemergent	0.063	0.75	0.50	5.50	1969	25.5
imazethapyr	postemergent	0.048	0.00	1.25	5.75	1710	24.8
Check			0.75	0.50	7.00	1767	25.5
LSD 0.05			0.812***	0.881***	0.772**	N.S.	1.4

¹Preplant treatments made 6/23/89

²Postemergence treatments made 7/24/89

³0 = no effect; 10 = total necrosis; greater than 3 = not acceptable

⁴0 = green pods; 10 = all pods mature

⁵Kg/Ha at 10% moisture content

⁶weight in grams of 100 seeds at 10% moisture

Table 3. Cowpea preplant incorporated¹ trial
at Farmersville, California

Treatment	Rate lbs ai/A	Cowpea		Crab- grass Control	Nut- Sedge	Chick- weed
		Vigor 8/2/89	Vigor 8/25/89			
					9/6/89	
imazethapyr	0.032	9.0	9.25	8.38	9.0	5.75
imazethapyr	0.047	8.75	9.0	6.62	8.0	6.0
imazethapyr	0.067	8.00	8.8	8.25	8.5	6.25
pendimethalin	0.75	7.75	8.0	9.38	7.5	6.25
imazethapyr + pendimethalin	(0.047)+0.75	9.00	9.0	8.75	8.0	7.25
Check		9.50	9.0	6.88	8.5	6.25
LSD 0.05		1.14	N.S.	N.S.	N.S.	N.S.

¹all treatments incorporated 4" with a Tandom disk on 6/28/89 preplant.

Table 4. Cowpea postemergence¹ trial
at Porterville, California

Treatment	Rate #ai/A	#Night- shade Seedlings per ft of row 7/14/89	#Night- shade Seedlings per ft of row 7/21/89	#Night- shade Seedlings per ft of row 8/4/89	#Night shade Seedlings per ft of row 8/24/89	Avg. Ht. (in.) of 5 Night Shades 9/4/89
imazethapyr	0.032	2.5	1.4	1.1	0.8	3.58
imazethapyr	0.047	1.8	1.3	1.0	0.9	3.30
imazethapyr	0.067	2.3	0.7	1.2	0.3	1.62
imazethapyr + pendimuralin	0.032	2.9	0.7	1.3	0.6	3.02
imazethapyr + pendimuralin	0.047	1.4	0.7	0.6	0.4	1.8
imazethapyr + pendimuralin	0.067	1.25	0.3	0.5	0.2	1.8
Check	--	4.3	2.5	1.4	0.6	5.5
LSD 0.05		N.S.	1.4	N.S.	N.S.	1.8

¹postemergence treatments applied 6/28/89.

Table 5. Cowpea postemergence¹ herbicide trial
Kern County, California

Treatment	Rate #ai/A	Phytoxicity ²	Yellow Nutsedge Control ² 5/30/89
imazethapyr	0.032	1.75	1.00
imazethapyr	0.064	2.50	2.00
imazethapyr	0.047	2.75	2.00
imazethapyr	0.084	2.75	3.00
pendimethalin	0.67	0.50	0.25
pendimethalin	1.34	0.25	0.25
imazethapyr	0.047 + 0.67	1.75	1.25
imazethapyr	0.094 + 1.34	1.75	2.75
imazethapyr + X-77 @ 1/4	0.047 + 0.67	2.50	2.50
imazethapyr + X-77 @ 1/4	0.094 + 1.34	2.50	3.00
Check		0.00	0.00
LSD 0.05		0.81	0.92

¹postemergence application made 6/28/89.

²0 = no effect; 10 = all plants dead.