



Pre-emergence WEED IN

H. AGAMALIAN • A. LANG
H. FORD • H. KEMPE

Control of broadleaf weeds in young Salinas lettuce planting with Balan (a preplant-incorporated herbicide)—showing a clean treated bed on the left.

TABLE 1. A SUMMARY OF ALL WEED CONTROL IN LETTUCE UNIFORM TRIALS FROM 1961 TO 1966 IN CALIFORNIA

The University trials included 11 in Monterey, Imperial (2), Riverside (3), Contra Costa (4), Santo Barbara (2), Ventura (1), Kern (1), and University of California, Riverside (8).

Herbicide	lb/A†	Number of Trials*			
		Weed Control		Safety	
		(+)	(-)	(+)	(-)
CDEC	4-6	27	23	22	18
"	8-10	18	14	7	5
IPC	4-8	12	17	22	4
CIPC	3	10	3	8	3
"	4-6	14	1	4	10
"	8	3	0	0	3
DCPA	4-6	3	7	5	3
"	8-10	6	4	5	3
"	12-14	3	1	3	6
Bensulide	4-8	14	12	31	2
"	10-12	17	6	17	3
Benefin	1	17	10	18	2
"	2	10	1	17	3
"	3	4	0	2	2

* Total number of trials showing satisfactory (+) and unsatisfactory (-) weed control and safety (+) and injury (-).

† Rates in lbs active per acre were lumped together in order to emphasize difference and because some rates were used more uniformly than others.

TABLE 2. SUMMARY OF HERBICIDE PERFORMANCE ON SEVERAL WEED SPECIES FOUND IN LETTUCE

Weed species	Herbicides					
	CDEC	DCPA	CIPC	IPC	Balan	Prefar
Pigweed	+	+	+	-	+	+
Purslane	-	+	+	-	+	+
Lambsquarter	+	+	+	-	+	+
Mustard	-	-	-	-	-	-
London rocket	-	-	+	-	-	-
Shepherdspurs	-	-	-	-	-	-
Nightshade	-	-	+	+	-	-
Common nettle	+	-	+	+	-	-
Chickweed	+	+	+	+	+	+
Corn spurry	-	-	+	+	+	+
Cheeseweed	-	-	+	-	-	-
Groundsel	-	-	-	-	-	-
Barnyardgrass	-	-	+	+	+	+
Bluegrass	+	+	+	+	+	+
Volunteer barley	-	-	+	+	+	-
Canary grass	-	-	+	+	+	-

+ = usually controlled at commercial rates.
- = usually not controlled at commercial rates.
No sign indicates insufficient information.

California lettuce growers spend \$11,620,000 per year for weed control. Although mechanical cultivation will control weeds in the furrow and between rows, weeds in the seed row are still controlled by hand chopping at approximately \$20 to \$60 per acre. With increased costs and difficulties of obtaining qualified field labor, more and more emphasis has been put on mechanical thinning and chemical weed control. Inasmuch as the more successful mechanical lettuce thinners do not distinguish between plants in general, weeds cannot be tolerated in the seed row and therefore can be eliminated most economically by selective chemical weed control. Some satisfactory weed control over the years has been obtained with the use of Vegadex and IPC with certain weed species. Several new herbicides have promised a wider spectrum of weed control, and are being used to a limited extent for weed control in lettuce. Balan and Dacthal were used last year commercially and Prefar was used in experimental plantings. Balan was recommended this year by University of California for weed control in lettuce.

ACCORDING TO a recent survey by vegetable crop farm advisors in California, 5000 acres of lettuce were treated with herbicides in 1965. Most prominent weeds were pigweed, purslane, lambsquarter, barnyardgrass and mustard.

Of all the herbicides tested, Prefar (bensulide) probably showed the greatest safety for use in lettuce (table 1 and graph 1). When such weeds as watergrass, pigweed, purslane and chenopodium were present, this herbicide was very effective. In many trials, acceptable weed control has been obtained (at herbicidal rates) with no reduction in yield or delay in harvest. In these tests, Prefar was incorporated into the soil at a depth of 1½ to 4 inches, depending upon the equipment used. Most of the tests summarized were applied with commercial incorporation equipment. Trials under sprinkler and furrow irrigation have given good results with sufficient safety. Prefar appears less effective on the solanaceous weeds—particularly the nightshades, and some of the mustard family (such as London rocket,

the *Brassica* species), cheeseweed, and other broadleaf weeds shown in table 2.

Balan (benefin) has shown some degree of selectivity for weed control in lettuce when incorporated (preplant) to a shallow depth (1 to 2 inches). Rates above 2 lbs per acre have sometimes caused injury (graph 2), whereas rates of 1 to 2 lbs per acre have generally been safe, in the trials summarized here. Weeds controlled were barnyardgrass (watergrass), annual bluegrass, pigweed, lambsquarter, and purslane. Balan, like Prefar, was less effective on many broadleaf weed species such as nightshade, common nettle, cheeseweed and Cruciferae species.

IPC was applied on lettuce with considerable safety, particularly in the heavier soils. While it was also less effective on a number of the weed species, it did control some weeds not affected by Prefar or Balan (such as volunteer barley, annual bluegrass, common nettle, canarygrass, chickweed and corn spurry). IPC has recently shown good results in combination with Balan.

herbicides for CONTROL LETTUCE

• J. LYONS • E. STILWELL
O. MCCOY • F. ROBINSON

CIPC has shown considerable safety on lettuce in certain areas. However, a summary of all the data showed CIPC was generally marginal for weed control in lettuce. Excellent weed control was often obtained, however, on some troublesome weeds not controlled by other herbicides—including nettle, London rocket, pigweed, nightshade, purslane, chickweed, volunteer barley and annual bluegrass. CIPC was less effective on shepherdspurse and mustard in some areas. This herbicide is now being tested at low rates for use in mixtures.

Dacthal (DCPA) offered a rather narrow margin of safety for weed control in lettuce (graph 3). When shallow-incorporated under furrow irrigation, and in soils with low organic matter, it gave excellent weed control—particularly in the desert lettuce area. In heavier soils with high organic matter content, Dacthal herbicidal activity was greatly reduced, however. Dacthal controls annual bluegrass, pigweed, purslane, and lambsquarter. It has been particularly ineffective on hairy nightshade, shepherdspurse and mustard.

Vegadex (CDEC) has been used for weed control in Salinas Valley lettuce for a number of years. It was not successful in Imperial Valley applications and has been inconsistent in other areas. These results (graph 4) substantiate the general observation concerning its inconsistent weed control, and also emphasize the previously reported narrow margin of safety—with injury occurring in about half the trials. Vegadex has usually been effective on lambsquarter, pigweed and chickweed. It has been less effective on common groundsel, hairy nightshade and shepherdspurse.

During the winter time in coastal areas (with the presence of certain weeds such as nettle and Cruciferae weed species), a combination of herbicides will often be necessary to obtain weed control in lettuce. A combination of herbicides will also be necessary in the spring and fall in areas with broadleaf weed problems, because of hairy nightshade and purslane.

In the desert valleys, and where grassy weeds and purslane are the predominant species, Prefar and Balan have given satisfactory weed control without injury to lettuce.

Best results with the herbicides studied thus far have been obtained by using an accurately controlled power tiller to incorporate the chemical. However, additional information is needed on the soil incorporation of herbicides before accurate recommendations can be made. Herbicides have generally given better weed control, with more safety to the germinating lettuce seedling, than other methods in general use.

While such herbicides as Balan and Prefar are known to have residual characteristics, which may be detrimental to certain sensitive crops such as milo and sugar beets, there are enough tolerant crops to make their use feasible in most cropping sequences.

University of California presently recommends CDEC (Vegadex), IPC, and benefin (Balan) for weed control in lettuce. CIPC and Dacthal are registered for use in lettuce but are not presently recommended by U.C. Bensulide (Prefar) is not registered for use on lettuce.

Harry Agamalian is Farm Advisor, Monterey County; A. H. Lange is Extension Weed Control Specialist, University of California, Riverside; J. Lyons is Chairman, Vegetable Crops Department, U. C., Riverside; E. Stilwell is Farm Advisor, Contra Costa County; H. Ford is Farm Advisor, Imperial County; and H. Kempen is Farm Advisor, Kern County. O. D. McCoy is Vegetable Crops Specialist, and F. E. Robinson is Associate Irrigationist, Imperial Valley Field Station.

Cooperation in conducting these studies was obtained from: Harwood Hall, Farm Advisor, Alameda County; Lee Smith and Jim Yeager, University of California Agricultural Extension Service, Davis; Norman Montague, formerly Farm Advisor, Riverside County; A. Van Maren, Farm Advisor, Imperial County; Marvin Snyder, Farm Advisor, Santa Barbara County; Phil Mowbray, Farm Advisor, Riverside County; and Robert Brendler, Farm Advisor, Ventura County.

SUMMARY OF WEED CONTROL AND PHYTOTOXICITY

(Lettuce rating where 0 = no effect and 10 = severe injury, loss of stand, or death of lettuce seedlings.) The triangles represent broadleaf weed control and the black dots represent grass control at each phytotoxicity rating. Note that the more rating points showing 100% weed control and 0 phytotoxicity, the greater the margin of safety.

