BROCCOLI WEED

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ALTHOUGH BROCCOLI was cultivated by the ancient Romans, it did not become a popular vegetable in the United States until about 50 years ago. It has been produced in California primarily in the coastal counties where the climate is moderate to cool. However, broccoli has also been grown on limited acreage in the Central San Joaquin Valley for harvest during the winter months. More recently, the fresh market and processing industry has become interested in the possible expansion of broccoli production in the Central Valley. Toward this end, extensive studies of varieties, time of planting, fertilization, and population, were conducted at the West Side Field Station, Five Points, and in cooperation with interested growers. Experiments were also conducted for the evaluation of many herbicides in the selective control of weeds in broccoli.

Profitable production of broccoli in the San Joaquin Valley hinges on effective and economical methods of weed control. The scarcity and rising costs of hand labor makes chemical or mechanical means increasingly attractive. In this study, herbicides were evaluated preplant incorporated, preemergence under sprinkler irrigation, and postemergence to the weeds and broccoli. All of the trials summarized in this report were conducted on Panoche clay loam soil.

Because broccoli is usually double-cropped with, or planted following it, barley was sown in the trial to evaluate the effectiveness of the herbicides in controlling volunteer barley. In the preplant trials, the herbicides were applied on preshaped beds with a CO_2 constant pressure sprayer. Shortly following application, the herbicides were incorporated to a depth of 2½ inches with a power-driven rotary tiller. Where the herbicide TOK was used, whether alone or in combination with other herbicides, it was applied on the surface of the soil following planting of the broccoli.

The trial area was furrow irrigated to establish a stand. Following crop emergence, stand-counts were made in two 4-ft areas in each plot. Weed control, broccoli injury and vigor were rated. Yield data were obtained only in one trial. All the spears were cut from 15-ft × 40-inch area, trimmed to 5-inch lengths, graded and weighed.

HERBICIDES EVALUATED IN THIS STUDY INCLUDE:

Trade name® or Code	Common name
Dacthal	DCPA
Dowpon	dalapon
EL-119	oryzalin
EL-179 (Paarlan)	isopropalin
ER-5461	.....
IPC	propham
Lasso	alachlor
NIA-20439	.....
Planavin	nitralin
Prefar	bensulide
Preforan	fluorodiphen
R-7465	.....
TOK	nitrofen
Treflan	trifluralin
Vegadex	CDEC

®Trade Names are registered and they appear in capital letters.

In the preemergence trial following planting of the broccoli, the herbicides were applied on the surface of the soil with a CO_2 constant pressure sprayer. Shortly following the application of the herbicides, the trial area was sprinkler irrigated with two acre inches of water. Following stand establishment, the field was furrow irrigated. The same procedures were used to evaluate weed control and herbicide selectivity as in the preplant incorporated trials.

In postemergence studies, following broccoli and weed emergence, the herbicides were applied with a CO_2 sprayer. The stage of broccoli and weed growth at the time of treatment varied among the trials. Weed control and broccoli injury were also rated.

Preplant, preemergence

Results of the preplant and preemergence trials indicated:

(1) The most effective control and most selectivity was obtained with the combination of Dacthal and IPC in the preplant incorporated as well as in the preemergence sprinkler-irrigated trials.

(2) A Treflan plus IPC combination also gave good weed control but the broccoli injury was more pronounced.

(3) Dacthal and Treflan preplant in combination with TOK preemergence gave less effective barley control and caused more retardation of broccoli growth.

(4) Dacthal, Planavin and Treflan alone provided effective pigweed control but they did not adequately control the barley. Retardation in the early growth of broccoli was pronounced in the Planavin and Treflan treated areas.

(5) Vegadex did not give adequate barley control in the furrow, nor in the sprinkler-irrigated plots. Greater selectivity was observed with this herbicide when applied preplant and furrow - irrigated rather than when surface applied under sprinkler irrigation.

(6) TOK used preemergence alone, or in combination with other herbicides, reduced the early growth of the broccoli, and in some trials it also reduced the stand. It failed to control barley and provided only marginal control of broadleaf weeds under furrow as well as under sprinkler irrigation.

(7) Lasso did not exhibit sufficient selectivity to broccoli. It reduced the stand and vigor at 1, 2, and 4 lbs ai per acre when preplant incorporated, as well as when surface-applied under sprinkler irrigation.

Effectiveness of selective herbicides when properly used for weed control in broccoli is shown in this photo of a weedy untreated row to left, as compared with the weed-free herbicide treated plot to right (treated with Dacthal plus IPC).

CONTROL STUDIES

(8) NIA-20439 severely reduced the broccoli stand and vigor. It gave better barley control when surface-applied under sprinkler irrigation. The broadleaf weed control was comparable under both methods of irrigation.
(9) R-7465 provided effective weed control but it did not have sufficient selectivity on broccoli.
(10) EL-119 under sprinkler irrigation severely reduced the broccoli stand.
(11) EL-179 preplant incorporated failed to control the barley. It effectively controlled the pigweeds but at 2 lbs ai per acre it severely reduced the size and vigor of the broccoli stand.

Postemergence trials

Results of postemergence trials indicated:

(1) TOK plus a surfactant effectively controlled pigweed, lambsquarter, sowthistle, prickly lettuce, groundcherry and certain other broadleaf weeds when applied postemergence to the weeds and broccoli.
(2) The wettable powder (WP) formulation of TOK caused less broccoli injury than emulsifiable concentrate (EC) formulation.
(3) The addition of the surfactant X-77 significantly improved the broadleaf control.
(4) Use of a nonphytotoxic oil (Orchex) at 2 gpa in combination with TOK caused somewhat more severe marginal burn of the broccoli leaves than the surfactant used at ½% of the spray volume.
(5) The most effective control was obtained in plots treated with TOK WP at 4 lb ai per acre plus X-77 at ½% of the spray volume.
(6) Weeds were more effectively controlled as seedlings than in their advanced stage of growth.
(7) Barnyard grass as well as broadleaf weeds in the mustard family were not adequately controlled. TOK was also weak on knotweed, purslane and chickweed.
(8) Preforan effectively controlled the weeds, especially at the higher rate, but it severely injured the broccoli.

Conclusions

From the trials conducted and observations made in commercial fields it appears that effective weed control in broccoli will depend on a combination of proper field selection, timely cultivations, a vigorously growing crop, and effective use of selective herbicides.

Proper field selection is especially important. No herbicide is available at present that will selectively control mustard, shepherds purse, London rocket and wild radish. Therefore, selection of fields free of weeds of the mustard family is an important first step toward effective economical weed control, especially when planting broccoli during the cooler months.

Effective selection and use of herbicides presupposes knowledge of the weed infestation. Planavin and Treflan effectively controlled the summer annual grasses and certain broadleaf weeds but failed to control volunteer barley, mustard, shepherds purse, prickly lettuce, sowthistle, groundcherry, hairy nightshade, pineapple weed, and others.

Planavin, Treflan and other related substituted dinitro analins retarded the early growth of the broccoli. Shallow incorporation and conditions favorable for the rapid emergence and growth of the broccoli seedling lessened the severity and duration of the retardation.

Dacthal, whether preplant incorporated or surface applied under sprinkler irrigation, was well tolerated by the broccoli and with adequate irrigation it provided effective control of the susceptible weeds without reducing broccoli vigor.

Volunteer barley control was obtained only with IPC. But the weakness of this herbicide in controlling broadleaf weeds is well known. IPC in combination with Dacthal, Planavin or Treflan provided the broadest spectrum control in the trials conducted.

TOK applied preemergence, alone or in combination with other herbicides, failed to provide adequate control of weeds commonly occurring in the Central San Joaquin Valley. It offers the greatest promise when combined with a surfactant and used postemergence to the weeds and broccoli. The wettable powder formulation caused less broccoli injury. It effectively controlled sowthistle, prickly lettuce and nightshade, weeds not controlled by Dacthal, Planavin or Treflan.

Effectiveness of the herbicide Dacthal used on broccoli at 8 lbs of active ingredient per acre in the foreground, as compared with an untreated section of the same row showing heavy weed growth in the background.

TOK also gave good control of pigweed and lambsquarter, but it was somewhat less effective on purslane and knotweed, and it failed to control mustard, shepherds purse, wild radish, volunteer barley, and grasses in general. Susceptible weeds were most effectively controlled when they were treated in their seedling stage while they were growing vigorously.

It was demonstrated that there are a number of herbicides useful in broccoli production but knowledge of the weed infestation is essential to enable a grower to select materials that will provide the most effective control. The use of herbicides, preplant or preemergence, and postemergence coupled with careful field selection and timely cultivations can facilitate the possibility for complete mechanization of broccoli production in the central San Joaquin Valley.

This is a progress report of research, and data are not to be considered recommendations of the University of California at this time.

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