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A
though 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 pre-
plant incorporated, preemergence under
sprinkler irrigation, and postemergence
to the weeds and broccoli. All of the trials
summarized in this report were con-
ducted 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 con-
trolling volunteer barley. In the preplant
trials, the herbicides were applied on pre-
shaped beds with a CO₂ constant pres-
sure sprayer. Shortly following applica-
tion, 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 com-
bination with other herbicides, it was ap-
plied on the surface of the soil following
planting of the broccoli.

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

In the preemergence trial following
planting of the broccoli, the herbicides
were applied on the surface of the soil
with a CO₂ 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 and the same proce-
dures were used to evaluate weed control
and herbicide selectivity as in the pre-
plant incorporated trials.

In postemergence studies, following
broccoli and weed emergence, the herbi-
cides were applied with a CO₂ 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 preemer-
gence trials indicated:

(1) The most effective control and most
selectivity was obtained with the
combination of Daclhal 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 pron-
nounced.

(3) Daclhal and Treflan preplant in
combination with TOK preemerg-
genese gave less effective barley con-
trol and caused more retardation
of broccoli growth.

(4) Daclhal, 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 herbi-
cides, 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 se-
lectivity to broccoli. It reduced the
stand and vigor at 1, 2, and 4 lbs
ai per acre when preplant incor-
porated, as well as when surface-
/applied under sprinkler irrigation.

Effectiveness of selective herbicides when prop-
erly 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 Daclhal 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, ground-cherry 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 0.5% 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 0.5% 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 cultivation, 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, ground-cherry, hairy nightshade, pineapple weed, and others.

Planavin, Treflan and other related substituted dinitro anilines 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.

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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