

Weed Control in Vegetable Crops - 1962

Garvin Crabtree - Department of Horticulture
Luther Fitch - Malheur Experiment Station
Oregon State University

Summary

Bush Snap Beans - None of the new materials screened on beans showed extreme value as a selective herbicide in this crop. Materials that gave good weed control but have questionable crop tolerance and should be further evaluated are trifluralin, prometryne, and G-34698. Bean yields were reduced with granular applications of DNBP amine and with early post-emergence sprays of DNBP amine or PCP sodium salt.

Red Table Beets - A herbicide designated as CP32179 continued to show promise as a selective herbicide in beets. DuPont 634 appeared to merit further testing. No significant yield responses were noted when several herbicides were compared although Tillam showed a slight advantage over EPTC in selectivity.

Broccoli - In a broccoli screening trial, trifluralin gave outstanding results in weed control and crop tolerance. The combination of Dacthal with CDEC gave better weed control than either material used alone.

Carrots - Amiben and propazine continued to show promise as selective herbicides in carrots. None of the compounds tested for the first time on carrots showed consistent weed control and crop tolerance in this test.

Onions - Of new materials screened in 1962, only trifluralin and G-34690 exhibited sufficient weed control and onion selectivity to be considered for another year's tests. Proban and Dacthal continued to look promising and further testing is planned with these materials.

Bush Snap Beans

A screening test to evaluate weed control and crop tolerance was conducted in 1962. Pre-plant applications were made May 28 and either incorporated into the soil to a depth of approximately 3 inches with a rotary tiller or shallowly with a spike tooth harrow. The crop was planted May 29 and the pre-emergence applications made on June 1. Average weed control and crop response ratings are listed below. Predominant weed species were redroot pigweed, mustard (Brassica rapa), and lambsquarters.

(0 = no effect, 10 = complete kill)

Chemical	lb. ai/A	Crop Response Ratings		Weed Control Ratings	
		June 26	July 27	June 26	July 27
(Pre-plant, deep incorporated)					
EPTC	4	2	0	7	5
EPTC	6	3	0	8	6
Tillam	4	1	0	6	4
Tillam	6	2	0	7	5
Tillam	8	2	0	6	3
R 4572	2	0	0	3	0
R 4572	4	3	0	3	0
R 4572	6	4	0	3	2
Trifluralin	2	4	2	5	7
Trifluralin	4	8	7	7	7
Trifluralin	6	9	8	8	8
(Pre-plant, shallow incorporated)					
R 4461	10	2	0	4	2
R 4461	20	2	0	6	2
R 4518	10	4	0	6	2
N 3291	6	3	0	6	6
Ba 40557	4	3	0	5	2
Trifluralin	4	5	5	9	8
Hyvar	$\frac{1}{2}$	5	1	5	3
Hyvar	1	5	2	7	4
DP 634	$\frac{1}{2}$	2	2	5	5
DP 634	1	0	0	3	1
DP 762	$\frac{1}{2}$	1	0	5	1
DP 762	1	4	1	5	3
DP 976	$\frac{1}{2}$	1	0	5	5
DP 976	1	5	3	7	2
Diphenamid	6	0	0	4	4
Nia 2995	6	1	2	7	5
Alipur	2	3	2	5	4
Alipur	4	4	0	3	1
FW 925	6	3	0	4	2
Dicryl	6	0	1	6	3
Prometryne	2	4	2	6	6
G 34698	2	3	0	7	6
CP 17029	2	2	0	4	0
CP 41142	2	0	1	2	0
CP 41329	2	2	0	6	3
BP 8	6	2	1	5	1
BP 9	6	1	0	2	0
BP 10	6	1	0	3	0
Dacthal	9	0	0	4	5
(Pre-emergence)					
R 4461	5	1	0	5	3
R 4461	10	1	0	6	3
R 4461	15	1	0	6	5
R 4518	5	1	0	3	2
R 4518	10	4	1	6	6
N 3291	3	1	0	6	4
N 3291	6	1	0	6	2

Ba 40557	2	3	0	2	0
Ba 40557	4	2	1	6	4
Trifluralin	4	2	0	8	8
Trifluralin	6	0	0	7	9
Trifluralin	8	1	1	7	8
Diphenamid	6	0	0	4	4
Diphenamid	8	0	0	3	1
Hyvar	$\frac{1}{2}$	3	3	6	4
Hyvar	1	4	3	6	3
Hyvar	2	5	7	8	7
DP 634	$\frac{1}{2}$	2	0	3	0
DP 634	1	0	0	3	0
DP 634	2	4	1	2	1
DP 762	$\frac{1}{2}$	1	0	3	1
DP 762	1	2	2	4	4
DP 762	2	3	0	3	0
DP 976	$\frac{1}{2}$	4	4	8	6
DP 976	1	3	2	5	3
DP 976	2	5	6	7	5
Nia 6370	10	0	0	2	2
Nia 6370	15	0	0	6	5
Nia 2995	3	1	0	5	2
Nia 2995	6	1	1	5	5
Alipur	2	3	0	4	3
Alipur	4	2	2	5	4
Alipur	6	3	4	6	5
FW 925	4	2	0	4	4
FW 925	6	1	1	6	5
Dicryl	6	0	0	6	0
Prometryne	2	1	1	7	6
Prometryne	4	4	0	8	7
G 34698	2	3	0	8	7
G 34698	4	3	3	7	5
CP 17029	2	2	0	3	0
CP 17029	4	3	0	3	0
CP 41142	2	2	0	4	0
CP 41142	4	0	0	4	5
CP 41329	2	3	0	4	3
CP 41329	4	3	0	6	5
BP 8	4	1	1	3	1
BP 8	6	1	0	5	0
BP 9	4	1	0	4	2
BP 9	6	2	0	4	1
BP 10	4	0	0	4	1
BP 10	6	2	1	5	3
DNBP amine	3	1	0	5	3
DNBP amine	6	0	0	6	5
PCP	12	3	3	8	6
Dacthal	9	0	0	4	4
Untreated Check		1	0	4	1

A yield trial on bush snap beans was set up in 1962 to test several promising herbicides and compare them with materials now being used commercially. The beans were planted May 29, pre-emergence herbicide applications were made June 1, and post-emergence (crook-stage) applications were made June 7. Crop response and weed control ratings were made June 26 after which all plots were maintained free of weeds. Harvest was made August 8 with a single hand picking to simulate machine harvesting.

Summary of analysis of variance of yields:

	<u>df</u>	<u>MS</u>	<u>F</u>
Herbicide treatments	17	10.93	2.03*
Replications	4	29.94	
Residual	68	5.38	

* Significant F test at 5% probability level.

LSD for herbicide treatments: 5% = 2.92, 1% = 3.90

The analysis of the yield data indicates that significant reductions occurred with the use of granular formulations of DNBP amine and with post-emergence spray applications of DNBP amine or PCP sodium salt.

A summary of ratings and yields are included in the following table.

<u>Chemical</u>	<u>lb. ai/A</u>	<u>Ave. yield</u> <u>lb/plot</u>	<u>Ave. Crop</u> <u>Response Rating</u>	<u>Ave. Weed</u> <u>Control Rating</u>
(Pre-emergence applications)				
DNBP amine (spray)	3	14.5	0	3
DNBP amine (spray)	6	14.5	0	4
DNBP amine (granular)	3	11.3	1	6
DNBP amine (granular)	6	9.7	1	6
PCP in oil	9	14.5	0	3
PCP sodium	6	12.1	1	4
PCP sodium	9	13.2	0	6
PCP sodium	12	13.4	0	6
PCP (granular)	9	13.3	0	2
Amiben (spray)	2	13.9	0	7
Amiben (spray)	4	12.1	2	8
Amiben (spray)	6	13.2	1	8
Amiben (granular)	2	12.8	1	6
Amiben (granular)	4	13.0	1	7
Amiben (granular)	6	14.1	1	8
(Post-emergence applications)				
DNBP amine (spray)	2	11.1	2	8
PCP sodium	9	10.4	3	5
Untreated Check	-	14.7	0	2

Red Table Beets

A large number of compounds were evaluated for crop tolerance and weed control effectiveness on beets in 1962. Pre-plant applications were made June 6, the crop was planted June 7. The pre-emergence applications were made June 8, and the post-emergence applications were made June 28. Predominant weed species present were redroot pigweed, lambsquarters, mustard (Brassica rapa), and morning glory (Ipomoea sp.). Ratings (0 = no effect, 10 = complete kill) were made on July 10.

<u>Chemical</u>	<u>lb. ai/A</u>	<u>Ave. Crop Response Rating</u>	<u>Av. Weed Control Rating</u>
(Pre-plant, deep incorporated)			
EPTC	2	3	7
Tillam	4	2	6
R 4572	3	2	4
R 4572	6	0	4
(Pre-plant, shallow incorporated)			
Alipur	2	0	3
Alipur	4	2	7
Alipur	6	4	7
CP 32179	4	1	7
Nia 6370	16	1	4
R 4461	10	1	5
R 4518	5	0	4
R 4518	10	1	3
R 4518	15	0	4
N 3291	3	1	6
N 3291	6	0	5
Hyvar	$\frac{1}{2}$	1	5
DP 634	$\frac{1}{4}$	0	5
DP 634	$\frac{1}{2}$	0	3
DP 634	1	1	6
DP 762	$\frac{1}{2}$	0	4
DP 976	$\frac{1}{2}$	0	6
BP 8	6	0	4
BP 9	6	2	6
BP 10	6	0	4
Ba 40557	2	1	4
(Pre-emergence)			
Alipur	2	1	3
Alipur	4	3	6
Alipur	6	3	8
CP 32179	2	0	7
CP 32179	4	1	7
CP 32179	6	1	7
Herc 7531	4	2	6
Herc 7531	6	4	5
Endothal	6	0	2
Nia 2995	3	2	6
Nia 2995	6	5	6
Nia 6370	8	0	4

Nia 6370	16	0	1
Nia 6370	24	1	2
R 4461	10	2	4
R 4461	20	4	5
R 4518	5	0	4
R 4518	10	0	5
R 4518	15	2	7
N 3291	6	0	1
Hyvar	$\frac{1}{2}$	0	4
Hyvar	$\frac{1}{2}$	1	4
DP 634	$\frac{1}{2}$	1	3
DP 634	$\frac{1}{2}$	0	1
DP 634	1	0	5
DP 762	$\frac{1}{2}$	0	3
DP 976	$\frac{1}{2}$	1	5
CP 17029	2	0	2
CP 17029	4	0	4
CP 41142	2	0	5
CP 41142	4	0	3
CP 41329	2	2	5
CP 41329	4	7	5
BP 8	4	1	2
BP 8	6	2	4
BP 9	4	2	5
BP 9	6	2	1
BP 10	4	0	4
BP 10	6	2	6
Ba 40557	2	0	2
Ba 40557	4	0	4
(Post-emergence)			
Alipur	2	5	7
Alipur	4	8	8
Alipur	6	8	9
Endothal	2	4	7
Untreated Check		0	3

A test to compare some promising herbicide programs on beets was conducted in 1962. Pre-plant applications were made June 6, the crop planted June 7, and pre-emergence applications were made June 8. Crop response and weed control ratings were made June 27, after which all plots were maintained free of weeds. Principal weed species present were redroot pigweed, lambsquarters, mustard (Brassica rapa) and morning glory (Ipomoea sp.) At harvest, beets were separated for size at the $2\frac{1}{2}$ inch diameter level to reflect any effects of stand thinning on grade.

<u>Chemical</u>	<u>lb.ai/A</u>	<u>Ave. Total Yield</u> <u>lb/plot</u>	<u>Ave. yield of</u> <u>small beets</u> <u>lb/plot</u>	<u>Ave. Crop</u> <u>Response</u> <u>Rating</u>	<u>Ave. Weed</u> <u>Control</u> <u>Rating</u>
(Pre-plant, deep incorporated)					
EPTC	2	8.7	6.1	2	6
Tillam	4	10.0	7.0	3	8
(Pre-plant, shallow incorporated)					
Endothal	8	12.2	8.2	1	5
(Pre-emergence)					
Endothal	6	11.2	8.5	0	4
CDEC	6	9.9	6.4	1	6
Alipur	3	12.1	8.5	1	5
CP 32179	4	12.7	8.7	2	8
Untreated Check		11.2	8.5	1	3

The summary of the analyses of the yield data follows:

Total Yield of Beets

	<u>df</u>	<u>MS</u>	<u>F</u>
Herbicide treatments	7	11.13	NS
Replications	5	9.96	
Residual	35	7.28	

Yield of Small Beets

	<u>df</u>	<u>MS</u>	<u>F</u>
Herbicide treatments	7	6.49	NS
Replications	5	10.43	
Residual	35	5.66	

Greenhouse Test of Weed Control in Beets - 1962

Six pounds per acre rates of endothal, TD 305, and CP 32179 were compared in the greenhouse, with two places of herbicide application and two watering procedures. Red beets, redroot pigweed (Amaranthus retroflexus) and barnyard-grass (Echinochloa crus-galli) were planted one inch below the soil surface in sterilized soil which was a total of four inches deep in plastic pans. In half of the pans the seeds were covered with one inch of soil and the surface was sprayed. In the other half the seeds were covered with one-half inch of soil, the surface sprayed and the remaining one-half inch of soil added. In one-half of the pans all water was applied from the bottom by setting the containers in shallow pans of water, and water added as needed to maintain the soil moisture adequate for plant growth. In the other half, the containers were watered the first time with one inch of water which brought the soil to approximately field capacity. This was sprayed on during two 15 minute intervals separated by a 30 minute interval. After this initial watering, these were also watered only from the bottom.

The treatment combinations and plant response ratings are presented in the table. It will be noted that TD 305 resulted in severe damage to all species regardless of application method. This would suggest that further comparisons of this type should be tried at lower rates of application. Endothal showed rather poor control of either of the weed species when applied as a surface application. Application one-half inch below the surface improved activity on the weed species regardless of how the watering was done, but also resulted in a slight injury to the beets. CP 32179 exhibited selectivity of control of weeds but did cause beet injury and should be tried at lower rates. Incorporating this compound into the soil and overhead water both appeared to result in increased activity.

Chemical	Herbicide Application	Water Application	Average Response Rating *					
			Beets		Pigweed		Barnyardgrass	
			4 wks.	8 wks.	4 wks.	8 wks.	4 wks.	8 wks.
Endothal	surface	bottom only	1	0	5	3	3	2
"	"	Top, then bottom	0	0	4	2	6	5
"	½ in. deep	bottom only	3	2	7	6	8	7
"	"	Top, then bottom	0	2	9	6	4	4
TD 305	surface	bottom only	7	8	8	10	10	10
"	"	Top, then bottom	8	10	7	9	10	10
"	½ in. deep	bottom only	8	10	9	10	10	10
"	"	Top, then bottom	9	10	10	10	10	10
CP 32179	surface	bottom only	4	3	7	10	8	10
"	"	Top, then bottom	3	5	9	10	10	10
"	½ in. deep	bottom only	4	4	8	10	9	10
"	"	Top, then bottom	4	7	9	10	10	10
Check	-----	bottom only	2	1	2	2	5	4
"	-----	Top, then bottom	0	0	0	0	2	1

* Ratings made 4 and 8 weeks after herbicide application;
0 = no effect, 10 = complete kill or no emergence.

Broccoli

Several herbicides were screened on direct seeded broccoli for crop tolerance and weed control effectiveness. The crop was planted on June 15 immediately after the pre-plant applications were made on the same day. Pre-emergence applications were made June 18. Crop response and weed control ratings (0 = no effect, 10 = complete kill) were made July 10. Predominant weed species present were redroot pigweed and lambsquarters.

Chemical	lb. ai/A	Ave. Crop Response Rating	Ave. Weed Control Rating
(Pre-plant, deep incorporated)			
EPTC	3	5	6
Tillam	6	4	6
R 4572	3	1	2
R 4572	6	0	0
(Pre-plant, shallow incorporated)			
R 4572	6	1	2
Dacthal	8	0	5
Trifluralin	1	0	8
Trifluralin	2	0	8
(Pre-emergence)			
Dacthal	8	0	5
Dacthal + CDEC	8 + 4	0	7
Dacthal + CIPC	8 + 2	2	4
Trifluralin	1	0	4
Trifluralin	2	0	6
Trifluralin	4	1	7
N 3291	3	0	2
N 3291	6	0	1
R 4461	5	0	1

R 4461	10	0	3
R 4461	15	0	3
R 4518	5	0	5
R 4518	10	1	6
R 4518	15	4	7
diphenamid	2	0	2
Nia 6370	16	0	3
BP 1	4	0	2
BP 1	8	0	0
BP 8	4	1	3
BP 8	8	2	4
BP 9	4	3	3
BP 9	8	5	3
BP 10	4	0	0
BP 10	8	1	4
SD 7961	1½	0	3
SD 7961	1	0	1
SD 7961	1½	0	3
FW 925	4	0	6
Alipur	2	6	3
Alipur	4	6	4
Ba 40557	2	0	2
Ba 40557	4	0	1
Untreated Check -		0	1

Carrots

A screening test in carrots was planted on June 13, 1962. Pre-plant applications were made June 13, pre-emergence applications on June 13, immediately following planting, and post-emergence applications on July 6. Crop response and weed control ratings (0 = no effect, 10 = complete kill) were made on July 10. Principal weed species present were redroot pigweed and lambsquarters.

<u>Chemical</u>	<u>lb. ai/A</u>	<u>Ave. Crop Response Rating</u>	<u>Ave. Weed Control Rating</u>
(Pre-plant, deep incorporated)			
Tillam	3	0	2
R 4572	2	0	1
R 4572	4	0	2
(Pre-plant, shallow incorporated)			
Propazine	2	1	7
Amiben	4	1	9
Trifluralin	1	1	6
Trifluralin	2	2	7
R 4518	5	2	4
R 4518	10	0	2
R 4518	15	1	4
N 3291	6	4	4
Alipur	2	1	4
Alipur	4	1	5
Lorox	2	1	5
DP 762	1	1	3

(Pre-emergence)		
Trifluralin	2	7
R 4518	5	2
R 4518	10	3
R 4518	15	6
N 3291	4	4
N 3291	6	6
Alipur	2	1
Alipur	4	7
Alipur	6	6
Lorox	1	1
Lorox	2	6
DP 762	$\frac{1}{2}$	3
DP 762	1	2
FW 925	4	1
FW 925	6	4
Dicryl	4	3
Dicryl	6	2
Nia 2995	3	3
Nia 2995	6	6
Nia 6370	10	2
Nia 6370	15	3
Nia 6370	20	4
Ba 40557	2	6
Ba 40557	4	2
Herc 8043	2	1
Herc 8043	4	4
(Post-emergence)		
Herc 8043	2	4
Herc 8043	4	5
Untreated Check -	0	2

1962 Herbicide Screening Trials in Onions
Malheur Experiment Station, Ontario, Oregon

Of new materials screened in 1962, only trifluralin, applied pre-emergence and G-34690 post-emergence exhibited sufficient weed control and onion selectivity to be considered for another year's tests. Trifluralin at 2 and at 4 lbs. per acre compared favorably in weed control activity with CIPC pre-emergence and with Radox and Dacthal as pre-plant materials. Some stand thinning of the onions was suspected with Trifluralin, but no loss of vigor was noted.

G-34690 at 1 and 2 lbs. per acre gave good control of both pigweed and watergrass but exhibited a tendency to temporarily retard onion growth. At both 1 lb. and 2 lbs. per acre there was some evidence of the onion mortality that was very notable at the 4 lbs. per acre rate. It is felt that G-34690 might well be tested again at low rates; alone, in combination with Radox, and as a follow-up to Radox or Dacthal.

Proban was tested for the third year as a combination post-emergence treatment with Radox. Results were very similar to those of 1961 with good weed control being obtained, but very definite stunting of the onions. Continued work with Proban should be in the nature of full-season yield trials to determine how severely limiting the stunting action actually is on yields.

Results with Dacthal were consistent with the previous two year's tests. Both fall and spring applied Dacthal gave sixty-five percent or better control of pigweed, lambsquarter, watergrass and foxtails with little or no visible onion injury. However, as indicated in the following onion yield data, there is evidence for suspicion that some onion yield reduction may be possible with Dacthal even though it has not been visually apparent. As seen in Table W-1, some yield reduction apparently occurred in the 16 lb/A fall applied Dacthal plots, and in both the 6 lb/A and 12 lb/A spring applied plots.

These tests were small in scale and certainly do not represent conclusive evidence of injury, but it does appear that more extensive tests to prove or disprove this data are in order for 1963, and that it might be well to caution growers who may plan to use Dacthal, to keep use on a small scale for at least a year.

Table W-1 Weed Control Observations and Onion Yields Following Application of Dacthal

Treatment		Treatment Date	Weed Control		Yield in 100 lbs/A
Chemical	Lbs./A		Broadleaf	Grasses	
Dacthal	4	11-17-61	6.3	6.7	756.5
"	8		7.7	8.3	756.5
"	12	"	6.3	8.0	779.7
"	16	"	7.0	8.7	628.7
Dacthal	6	3-23-62	4.7	7.0	563.4
	12	3-23-62	6.0	7.7	599.7
Radox	6	3-23-62	5.3	9.0	736.2
Untreated Check			0.0	0.0	756.5

The entire treated area was harrowed lightly immediately following spring applications, and prior to planting onions.

Table W-2. Degree of Weed Control and Onion Injury
as Determined by Visual Evaluation, and Based on
the Average of Three Replications.

Chemical	Treatments	Crop Injury	Weed Control	
	Lbs/Acre		Broadleaf	Grass
		Pre-plant (applied in fall)		
Dacthal	4	0.0	6.3	6.7
	8	0.0	7.7	8.3
	12	0.0	6.3	8.0
	16	0.7	7.0	8.7
		(applied in spring)		
Dacthal	6	0.0	4.7	7.0
	12	0.0	6.0	7.7
Radox	6	0.0	5.3	9.0
		Pre-emergence		
Radox	6	0.0	0.0	2.0
CIPC	6	1.3	6.1	6.8
Radox & Proban	6 & ½	0.0	1.7	2.7
	6 & 1	0.0	1.7	1.7
Proban	1	0.0	0.0	0.0
Nia 2995	4	3.7	6.2	5.3
	8	6.3	9.5	7.2
Trifluralin	2	1.0	4.7	7.7
	4	1.3	7.3	8.7
	8	4.5	6.7	10.0
FW 925	2	1.7	3.7	3.7
	4	3.0	4.0	3.7
	8	5.3	6.3	6.3
H 7531	1	7.0	0.0	4.3
	2	9.3	1.0	5.0
	4	9.7	5.0	10.0
Du Pont 326	1	7.7	8.3	8.0
	2	10.0	9.0	9.3
	4	10.0	10.0	10.0
		Post-emergence		
Radox	6	0.0	2.7	6.7
Radox & Proban	6 & ½	3.0	9.0	7.3
	6 & 1	3.7	8.8	4.7
Nia 2995	4	4.3	7.3	2.0
	8	7.3	10.0	8.3

TD 191	1	2.3	1.7	0.0
	2	2.3	2.7	1.0
Paraquat	$\frac{1}{4}$	0.0	0.0	0.0
	$\frac{1}{2}$	0.7	0.0	0.0
	1	4.0	2.3	0.0
Stam 34	2	5.7	8.0	5.0
	4	8.0	9.0	5.7
	8	10.0	10.0	10.0
CP 17029	1	6.0	7.7	3.3
	2	4.7	8.7	7.7
	4	5.7	8.2	3.3
G 34690	1	2.0	8.3	6.0
	2	3.7	8.7	7.7
	4	5.3	9.7	8.5
Du Pont 326	1	6.3	7.7	5.3
	2	8.3	9.3	10.0
	4	10.0	10.0	10.0
Radox (Pre)	6	0.0	1.3	1.3
Radox (Post)	6	1.0	3.0	6.3

Onions planted March 27, 1962.

Pre-plant treatments applied November 17, 1961 (fall) and March 23, 1962 (spring).

Pre-emergence treatments applied April 6, 1962.

Post-emergence treatments applied April 23, 1962.

Ratings: 0 = check; 10 = complete control.