WEED CONTROL IN BLACKCURRANTS AND RASPBERRIES BY A COMBINATION OF WEEDICIDES AND MOWN SWARD

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Summary

A promising method of weed control and soil management in raspberry and blackcurrant plantations has been evolved at the Horticultural Research Station, Levin, over several years.

The plants are grown on a hedge system with the weeds beneath them controlled mainly by diquat, paraquat and simazine while the central portion of the inter-row alley is maintained by a mown sward.

Trials leading up to this method are described.

INTRODUCTION

FOR MAXIMUM production from blackcurrants and raspberries, weeds must be controlled. When cheap labour was readily available, hand-weeding close to the bushes, coupled with mechanical cultivation between them, was acceptable, but today alternative methods are needed.

Weedicides show promise in virtually eliminating cultivation, but as a consequence other problems occur. Robinson (1962) studied some of these problems and concluded that, if economically possible, an organic mulch is desirable in any system of non-cultivation in soft fruits. A mown sward has some of the characteristics of such a mulch.

A brief description is given of trials leading to a weed control method combining soil management by mown sward, and the weedicides diquat, paraquat and simazine. All rates of chemicals quoted are in lb active ingredient per acre.

TRIALS

A: BLACKCURRANT: COMPARISON OF PLANTS IN CULTIVATED SOIL AND MOWN SWARD TREATMENTS

1. *Mown sward*: Sown in white clover (*Trifolium repens*) and Italian ryegrass (*Lolium italicum*); rye dominant in first season then clover, mixed weeds and *Poa* species: mown when 6 in. down to 2 in.; clippings thrown to plant bases; 8 to 10 mowings between September and April.
2. *Cultivation*: Rotary 3 in. to cut in cover crop in September, otherwise 1 in. to 2 in.; cover crop subterranean clover (*Trifolium subterraneum*) in autumn and winter; 6 to 8 cultivations between September and March.

Variety: Goliath

Planted: 1954

Spacing: 6 ft 6 in. × 6 ft 6 in.

Replications: 4

Treatments commenced: Autumn, 1957

Results:

	Annual Yields (lb/bush)					
	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63
Sward	2.5 b	2.2 a	6.7 a	7.7 a	6.5 b	3.0 a
Cultivation	3.2 a	2.5 a	7.7 a	8.8 a	8.3 a	3.2 a

The decreased yield under sward in 1957-58 was attributed to severe competition from Italian ryegrass and occurred in spite of the wet season. The overall increase in yield in 1959-60 was due to a modification in pruning.

B: BLACKCURRANT: SIMAZINE AND HAND-HOEING COMPARED

Treatments and Results

1. *Hand-hoeing*: Push-hoed ($\frac{1}{2}$ in.) beneath bushes; strip 5 ft wide; diquat on weeds in strip during winter.
Yields—1962-63 (lb/bush) 3.6 a
2. *Simazine*: Rate 4 lb; strip 6 ft beneath bushes (actual bare area 5 ft); diquat in strip during winter.
Yields—1962-63 (lb/bush) 3.8 a

Varieties: Magnus, Climax, Cotswold Cross, Goliath, and Laxton's Giant

Plant spacing: 8 ft $\times$ 4 ft

Replications: 5

Inter-row strips: mown sward 3 ft wide

Irrigation: January, 1963, about 2.5 in.

Diquat: applied early June and September, by off-centre nozzle (i.e., lower 1.5 to 2 ft sprayed); rate 1 lb in 300 gal water, in 6 ft strip.

Simazine: date September 29, 1962; off-centre nozzles; plants bud break to bud burst.

There was no interaction between treatments and varieties.

No damage by diquat to buds or wood was seen. Weed control with simazine was sufficient to eliminate five hand-weedings between application and early February.

C. BLACKCURRANT: TOLERANCE TO SEVERAL DILUTIONS OF PARAQUAT

Treatments and Results

<i>Treatment (lb)</i>	<i>Observation November 27, 1962</i>
Paraquat 1/300 gal water	Normal (active growth)
Paraquat 1/200 gal water	Normal (active growth)
Paraquat 1/100 gal water	Almost normal: some reduced growth and fruit
Paraquat 1/50 gal water	Reduced basal and middle growth; reduced fruit; upper growths almost normal.

Variety: Eagers Late

Spreader: Agral LN, 15 fl. oz/100 gal

Stage of Growth: Dormant

Replication: Observation

Application: Over whole plant to run-off; knapsack sprayer.

Date: September 11, 1962

D: RASPBERRY: COMPARISON OF PLANTS IN CULTIVATED SOIL AND MOWN SWARD (1957-60)

Treatments

1. *Mown sward*: Volunteer species following subterranean clover cover crop; included white clover, *Agrostis* and *Poa* species, couch (*Agropyron repens*) and buttercup (*Ranunculus repens*); mown from 6 in. to 2 in.; clippings to plant bases.
2. *Cultivation*: Rotary; 1 in. to 2 in. deep apart from 3 in. to cut in cover crop in September; cover crop subterranean clover in autumn and winter; some hand-weeding of stools.

Variety: Marcy

Plant training and spacing: 6 ft 6 in. $\times$ 6 ft 6 in. on hill system.

Replications: 5

Treatments commenced: Spring, 1957

Results

Treatment					Yields (lb/stool)		
					1957-58	1958-59	1959-60
Mown					6.6 a	7.7 b	6.6 a
Cultivation					6.5 a	10.1 a	5.8 b

Yield under sward reduced in 1958-59, probably because of the dry October to December. There appeared no reason for increased yield from sward in 1959-60. There was a considerable weed problem at bases of hills.

E: RASPBERRY: COMPARISON OF PLANTS ON CULTIVATED SOIL AND MOWN SWARD (1960-63)

Management of Inter-row Alley		Mean No. of Canes/Plot*		Yields (cwt/acre)	
Centre	Edge	1960-61	1961-62	1962-63	
Mown	Mown	38	56.0 b	179.5 a	
Mown	Weedfree	39	65.8 b	174.8 a	
Cultivated	Cultivated	62	82.0 a	180.8 a	
Cultivated	Weedfree	72	84.0 a	176.8 a	

* Canes of 8 mm or more diameter at 6 in. high.

Note: Alley centre 4 ft 0 in. in 1960-61, then 3 ft 0 in. Alley edge 1 ft 3 in. in 1960-61, then 1 ft 6 in. on each side of alley centre.

Mown: Regrowth clover from sward in which the other species eradicated by amitrole and dichloropropionic acid: mown at 6 in. down to 2 in.

Cultivation: Rotary 1 in. to 2 in. early September to early June. Weed-free alley edge: Rotary cultivation, hand hoeing (½ in.), diquat in winter.

Planted: September 1, 1960.

Winter diquat 1 lb per acre to cane bases: applied with off-centre nozzles; i.e., lower 1.5 to 2 ft sprayed

Treatments commenced: Spring, 1960

Replications: 4 in 1960-61 and 1961-62; 3 in 1962-63

Training: Hedges 8 ft apart

From January, 1962, shading by canes considerably reduced sward and weed growth in the alleys so that mowing and cultivation were needed after this only from spring until early January. Areas at the cane base remained virtually weed-free due to shading from September to April.

The dry period of December to March in 1960-61 apparently caused the reduced cane growth under sward; this in turn resulted in the decreased yield in 1961-62. No damage from diquat was seen on fruiting or new canes.

F: RASPBERRY: SIMAZINE APPLICATIONS DURING THE EARLY AND LATE DORMANT PERIODS OVER SUCCESSIVE SEASONS

		Yields (cwt/acre)	
Early Dormant*	Late Dormant†	1961-62	1962-63
1. —	Simazine 4 lb	19.5 a	100.9 a
2. Simazine 2 lb	Simazine 4 lb		92.6 a
3. —	Simazine 2 lb		
4. Simazine 2 lb	Simazine 2 lb	18.6 a	101.8 a
5. Simazine 4 lb	Simazine 2 lb		98.6 a
6. Hand-weed	Hand-weed	18.9 a	98.8 a
			100.9 a

* None in 1961, early July, 1962.

† Mid-September, 1961, late September, 1962.

Variety: Lloyd George
 Planted: September 5, 1960
 Training: Hedges, rows 7 ft apart
 Alley centres: 3 ft mown clover sward: stand reduced from January, 1962
 Replications: 7
 Winter diquat 1 lb per acre to cane bases: while plants dormant: off-centre nozzle
 A few simazine-chlorotic leaves developed in Treatments 1, 2, 4 and 5 in the November-December, 1962, period.

G: RASPBERRY: SIMAZINE AND HAND-WEEDING ON RECENTLY SET PLANTS
Treatments and Results

	No. canes (1962-63)
Hand-weed (bush bases)	31
Simazine 2 lb 6 ft bush bases)	45
Simazine 3 lb 6 ft (bush bases)	42

Variety: Marcy
 Planted: August 24, 1962
 Training: Hedge, rows 10 ft apart
 Alley Centre: 5 ft mown sward, white clover and perennial ryegrass (*Lolium perenne*) dominant; mixed weeds
 Application: Off-centre nozzle; date October 11, 1962
 Replications: 4
 Irrigation: 2 in. early February
 Weed control by simazine was effective until early February. It appeared that hand-weeding decreased the production of canes.

H: RASPBERRY: TOLERANCE TO SEVERAL DILUTIONS OF PARAQUAT
Treatments and Results

Treatment (lb)	Observation October 3, 1962
Paraquat 1/300 gal water	Normal (bud burst)
Paraquat 1/200 gal water	Normal (bud burst)
Paraquat 1/100 gal water	Normal (bud burst)
Paraquat 1/50 gal water	Slight yellowing but otherwise normal.

Variety: Lloyd George
 Other details as for Trial C.

OBSERVATION ON USE OF DIQUAT AND PARAQUAT

Diquat and paraquat were used with varying rates of water in an attempt to obtain maximum wetting of mature weeds with moderately coarse nozzles. It was concluded that 300 gal/ac was needed.

DRY AND WET PERIODS

Daily soil tensiometer recordings, at 6 in., indicated periods of soil moisture deficiency.

DISCUSSION

Most reductions of yield by sward were apparently due to excessive competition for soil moisture during the period of fruit growth. Yields were also depressed if, in the previous season, fruiting wood was reduced by moisture shortage.

If bush fruits are to yield fully when grown in association with sward, irrigation is essential at times.

When the basal growths from bushes commenced spring growth without competition from weeds they retained dominance until leaf-fall. This was particularly so with the hedge system.

Diquat proved useful for eradication of weeds but paraquat would have increased the range of control. Results from tolerance trials indicated that provided paraquat was sufficiently dilute it was safe on dormant raspberries and blackcurrants. Information is needed to determine how early diquat and paraquat can be applied in the autumn-winter.

Continuing weed control was needed adjacent to bushes and this was obtained with simazine. Raspberries appeared to be tolerant to 4 lb which seemed to be the upper limit. Newly planted raspberries tolerated 3 lb. Weed control at 2 lb was good. Blackcurrants easily tolerated 4 lb. No varietal susceptibility was seen with either plant. Difficulties with weeds resistant to simazine are to be expected.

In these trials white clover was a suitable sward plant as it was easily controlled, did not require excessive mowing and tolerated the weedicides. Unfortunately even slight shading considerably reduced its vigour.

CONCLUSIONS

An outline of the method of weed control evolved for blackcurrants and raspberries is as follows:

- (1) Bushes should be planted in a hedge-row system.
- (2) Mown clover sward established in the inter-hedge-row area but not too close to the bushes.
- (3) While bushes are dormant, weed growth beneath and close to them should be eradicated with diquat (1 lb) or paraquat (0.5 lb) applied in 200 to 300 gal of water per acre, to which bushes appear tolerant.
- (4) When plants reach the late dormant stage, simazine at up to 4 lb should be applied to the weed-free strips.
- (5) Some hand-hoeing, in blackcurrants especially, is probably needed between late summer and mid-autumn.
- (6) Weeds growing after this can be eradicated by the winter diquat or paraquat.
- (7) Some increase in irrigation is required.

ACKNOWLEDGEMENTS

G. D. Hyde, G. Van der Mespel, A. F. Thompson and the field staff of the Horticultural Research Station, Levin, did the field work on the trials. The Biometrics Section, Department of Agriculture, assisted in designs, and did biometrical analyses of yield data.

REFERENCE

- Robinson, D. W., 1962: "Recent developments in chemical control of weeds in soft fruits". *First Irish Crop Protection Conference*, 1962.