



# Horticultural Development Council

## Working for Growers

### Research Report

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Green Beans: Broad-leaved weed  
control with fomesafen

(Project jointly funded by the HDC  
and ICI)

## PROCESSORS &amp; GROWERS RESEARCH ORGANISATION

Green beans (*Phaseolus vulgaris*): broad-leaved weed control with fomesafen  
(FD 4276)

Project GB 50-92-H810

HDC Project in Collaboration with ICI Agrochemicals - 1992

**SUMMARY:** In the third and final year of trials fomesafen applied early post-emergence at 0.45, split dose 0.45 & 0.45, 0.9 or 1.8 l/ha at simple leaf and 1st trifoliolate leaf stage was compared with Basagran applied later at 6 sites in commercial crops of green beans.

Fomesafen was highly selective even at simple leaf stage. Fomesafen did not reduce crop yield: at Kirton End and Three Holes, yields of treated beans were similar to untreated in the absence of weed competition. There was considerable yield reduction (up to 94%) at Carters Bridge on untreated plots with high weed populations

In warm weather crop growth appeared faster than weed growth and weed control with fomesafen was excellent this season. Although fomesafen at 0.9 l/ha gave more reliable control, 0.45 l/ha was sometimes sufficient (Three Holes, Carters Bridge and Kirton End) and a split dose treatment was useful in controlling late-emerging species at Dilham Hall.

Fomesafen controls a wide weed spectrum including competitive species *Urtica urens*, *Chenopodium* spp., volunteer oilseed rape and also *Solanum nigrum* and severely stunts volunteer potatoes. *Stellaria media*, *Poa annua* and *Matricaria metricarioides* (pineapple weed) are resistant.

Further work with fomesafen in tank-mixes with graminicides would be useful to confirm safety following an observation study.

**OBJECT:**

1. To confirm weed control on most important weed species
2. To confirm crop safety
3. To monitor effect of soil residues on following crops (to be reported later)
4. To obtain samples (quick-frozen and canned) for taint testing

**TREATMENTS:**

Sites - 1 Kirton End, 2 Carters Bridge, 3 Swaffham, 4 Dilham Hall and 5 Three Holes

Material	Product Rate l/ha	Timing Crop Growth Stage
1 untreated	-	-
2 fomesafen	0.45	simple leaf
3 fomesafen	0.45&0.45	simple leaf & 1 trifoliolate leaf
4 fomesafen	0.9	simple leaf
5 fomesafen	0.9	1 trifoliolate leaf
6 fomesafen	1.8	simple leaf
7 Basagran	3.0	1½-2 trifoliolate leaf

Site - 6 Friday Bridge

Material	Product Rate l/ha	Timing Crop Growth Stage
1 untreated	-	-
2 fomesafen	0.45	simple leaf
3 fomesafen	0.45&0.45	simple leaf & 1 trifoliolate leaf
4 fomesafen	0.9	simple leaf
5 fomesafen&Basagran	0.9&2.0	simple leaf & 2 trifoliolate leaf
6 fomesafen&Basagran	0.45&2.0	simple leaf & 2 trifoliolate leaf
7 Basagran	3.0	simple leaf & 2 trifoliolate leaf
8 fomesafen	1.8	simple leaf

Sites - 1 and 3 pre-sowing Treflan (trifluralin) applied @ 1.75 l/ha  
 - 4 pre-emergence Arresin (monolinuron) @ 3.0 l/ha

Site 7 - Thornhaugh, observation trial see later

Fomesafen (YF 7816) as a 250 g a.i./l formulation with additional wetter.

All treatment were applied with a Van der Weij sprayer and Lurmark 02F110 flat fan nozzles, at 200 l water volume/ha (except at site 7) and 2 bar pressure.

LAYOUT: Randomised block, 4 replications. Plot area 2 m x 8 m (or 10 m). Harvest area 1 row x plot length. Row widths 35 cm or 45 cm.

METHOD: Trials were conducted at Thornhaugh and at 6 sites in commercial crops on a range of soil types. The green beans were sown with pneumatic precision drills except at Thornhaugh where a cereal drill was used. Normal husbandry for the green bean crop was carried out at all sites.

Application data is shown later for each site. Crop effects were assessed at intervals. Counts of weed species for 3 x 1/3m<sup>2</sup> quadrats were made. Scores for weed control were recorded.

Three sites, 1, 2 and 5 were harvested by hand. Yields of pods were recorded. Maturity of the pods was assessed by measuring 10 bean seed lengths - the most mature seed taken from the most mature pod from each of a random sample of 10 plants per plot.

Samples of beans from the untreated and twice normal rate of fomesafen 1.8 l/ha were quick-frozen and canned and sent for taint testing by CFDR.

Results for yield and maturity were statistically analysed.

WEATHER SUMMARY: Conditions were dry during May until mid June. Temperatures during May and June were higher than normal. Rainfall during June, July and August were well above average. Much of July and August was cool and windy.

KEY: Weed species - Bayer code for weed names

Weed score - 0 = no control	Crop score - 0 = complete kill
7 = acceptable control	7 = acceptable damage
10 = complete control	10 = no damage

SITE 1: KIRTON END, LINCOLNSHIRE

The beans cv. Labrador were sown on 12th June on a silt loam soil, 35 cm row width at 40 plants/m<sup>2</sup>. Treflan (trifluralin) was applied pre-sowing at this site and weed populations remaining were low. Species were mainly those resistant to trifluralin - *Capsella bursa-pastoris*, *Sinapis arvensis* and *Senecio vulgaris*. Weed emergence was late relative to crop emergence.

APPLICATION DATE:

Application date	Weather	GS crop	GS weed
T <sub>1</sub> 16/7 tr (2,3,4&6)	24°C 58 RH 50% cloud cover	1 - 1½ trifoliolate leaf, vigorous 50% crop cover	CHEAL cot, 2-6 TL SINAR, CAPBU, MAT & SENVU 2-4 TL
T <sub>2</sub> 18/7 tr (3&5)	21°C 50 RH sunny	1½ trifoliolate leaf	SINAR, CAPBU, MAT, CHEAL & SENVU 6 TL
T <sub>3</sub> 23/7 tr (7)	19°C 58 RH 100% cloud cover	2 trifoliolate leaf	SENVU 6 TL MAT Spp. 4 TL SONOL 4 TL

RESULTS:

1. Weed control: Kirton End, Lincolnshire

Treatments	Rate l/ha	Timing	No. weed spp./m <sup>2</sup> 31/7									Weed Score 31/7 20/8	
			CHEAL	CAPBU	STEME	URTUR	MAT Spp.	SINAR	SONOL	SENVU	Total		
1 Untreated	-	-	7	27	3	4	6	18	4	3	72	0	0
2 fomesafen	0.45	T <sub>1</sub>	3	-	2	-	-	-	-	-	4	9.9	9.7
3 fomesafen	0.45&0.45	T <sub>1</sub> &T <sub>2</sub>	1	-	1	-	-	-	-	-	2	10	10
4 fomesafen	0.9	T <sub>1</sub>	-	-	2	-	-	-	-	-	2	10	10
5 fomesafen	0.9	T <sub>2</sub>	2	-	1	-	-	-	-	-	3	9.9	9.5
6 fomesafen	1.8	T <sub>1</sub>	-	-	1	-	-	-	-	-	1	10	10
7 Basagran	3.0	T <sub>3</sub>	1	-	-	2	-	-	-	-	3	10	9

There was a small uneven distribution of large *Polygonum persicaria* which was severely scorched by all treatments, but there was re-growth later from all except treatment 6.

2. Crop damage, yield and maturity: Kirton End, Lincolnshire

The beans were harvested on 26th August.

Treatments	Rate l/ha	Timing	Crop Score				Yield pods as % untreated	Maturity 10 seed length mm
			18/7	23/7	31/7	7/8		
1 Untreated	-	-	10	10	10	10	100.0	107
2 fomesafen	0.45	T <sub>1</sub>	10	10	10	10	95.5	108
3 fomesafen	0.45&0.45	T <sub>1</sub> &T <sub>2</sub>	(10)	10	10	10	96.1	108
4 fomesafen	0.9	T <sub>1</sub>	10	10	10	10	98.3	104
5 fomesafen	0.9	T <sub>2</sub>	-	10	10	10	93.6	105
6 fomesafen	1.8	T <sub>1</sub>	9.1	10	10	10	95.3	109
7 Basagran	3.0	T <sub>3</sub>	-	-	9.8	10	97.4	102
Yield of untreated t/ha							17.32	
Significance @ P = 0.05							NSD	NSD
LSD @ P = 0.05							-	-
CV%							6.8	4.9

Crop effects from the herbicide treatments were negligible. Crop growth was vigorous and suppressed the low weed population. In the absence of weed competition, herbicide treatments had no statistically significant effect on yield or maturity of the green beans, even for the 2 N rate of fomesafen applied at 1 trifoliolate leaf stage.

SITE 2: CARTERS BRIDGE, CHATTERIS

The beans cv. Kent was sown on 27th June on 45 cm row width and final population was 40 plants/m<sup>2</sup>. The trial site was on an organic soil and no pre-sowing or pre-emergence herbicide was applied. The crop suffered from severe manganese deficiency with symptoms of interveinal chlorosis on leaves and manganese was applied @ 10 kg/ha of manganese sulphate plus Agral wetter on 5th August.

APPLICATION DATA:

Application date	Weather	GS crop	GS weed
15/7 tr 2,3,4&6	16°C 95 RH misty	simple leaf	cot, a few CHEAL & URTUR at 2 TL
22/7 tr 3&5	21°C 41 RH sunny 10% cloud cover	1 trifoliolate leaf	URTUR, CHEAL 4 TL a few 6 TL - small plant, CAPBU 2-4 TL POLPE 2 TL
28/7 tr 7	21°C 35 RH sunny 10% cloud cover	2 trifoliolate leaf severe manganese deficiency symptoms	URTUR, CHEAL, CAPBU, POLPE 6 TL CORSQ 4-6 TL MALSY (mallow) 3 TL

## RESULTS:

## 1. Weed control: Carters Bridge, Chatteris

Treatments	Rate l/ha	Timing	No. weed spp./m <sup>2</sup> on 26/7 (and 4/8 tr. 7)											Weed Score				
			CHEAL	CORSO	URTUR	SOLNI	CAPBU	POLPE	POAN	VEREB	STEMB	MALSY	MYOAR	MAL sp.	CHEBI	Total	26/7	4/8 4/9
1 Untreated	-	-	43	1	30	3	5	2	29	5	3	4	2	2	7	136	0	0
2 fomesafen	0.45	T1	-	-	-	-	-	10	-	1	-	-	-	-	-	11	10	10
3 fomesafen	0.45&0.45	T1&T2	-	-	-	-	-	2	-	1	-	-	-	-	-	3	-	10
4 fomesafen	0.9	T1	-	-	-	-	-	8	-	1	-	-	1	-	-	10	10	10
5 fomesafen	0.9	T2	6	-	-	-	-	5	-	1	-	-	1	-	-	13	-	9
6 fomesafen	1.8	T1	-	-	-	-	-	7	-	-	-	-	-	-	-	7	10	10
7 Basagran	3.0	T3	15	-	-	-	-	25	2	-	-	-	-	-	2	42	-	7

§ *Tripleurospermum inodorum* (scentless mayweed)

Fomesafen at 0.45 l/ha gave excellent control of *Chenopodium album* and *ficifolium* and *Urtica urens* the main species, and also *Malva sylvestris* and a wide range of other species. *Coronopus squamatus* also appeared to be controlled but populations were low. Rates of fomesafen up to and including 1.8 l/ha did not control *Poa annua*, and it was ineffective on *Stellaria media* (low populations). *Myosotis arvensis* may also be resistant but populations were low.

Fomesafen split dose 0.45 & 0.45 l/ha and the early application of 0.45 l/ha performed better than the full dose of 0.9 l/ha at late timing on large *C. album*, which were scorched but grew away in the wet weather.

Basagran gave poor control of *C. album*, a tank-mix with oil is normally used for this species. There were several volunteer potatoes at this site. Treatments 2, 3, 4, 5 & 6 caused severe damage to shoots. By harvest, although more shoots appeared, competition was less than on untreated plots.

2. Crop damage, yield and maturity: Carters Bridge, Chatteris

The beans were harvested at quick-freezing stage of maturity on 4th September.

Treatments	Rate l/ha	Timing	Crop Score				Yield pods as % untreated	Maturity 10 seed length mm
			22/7	26/7	4/8	25/8		
1 Untreated	-	-	10	10	10	10	100.0	77
2 fomesafen	0.45	T <sub>1</sub>	10	10	10	10	194.4	90
3 fomesafen	0.45&0.45	T <sub>1</sub> &T <sub>2</sub>	(10)	10	10	10	187.2	89
4 fomesafen	0.9	T <sub>1</sub>	10	10	10	10	193.8	88
5 fomesafen	0.9	T <sub>2</sub>	-	10	10	10	191.4	89
6 fomesafen	1.8	T <sub>1</sub>	9.8	10	10	10	180.5	92
7 Basagran	3.0	T <sub>3</sub>	-	-	7	10	141.7	86
Yield of untreated t/ha							6.56	
Significance @ P = 0.05							SD	SD
LSD @ P = 0.05							72.77	6.32
CV%							28.8	4.9

Crop effects from all rates and timings of fomesafen were negligible. The crop later suffered from manganese deficiency and thus severe scorch from Basagran but subsequent growth and vigour were normal after a manganese treatment was applied over the trial area.

High populations of tall competitive species *U. urens* and *C. album* reduced yields on untreated plots. Bean yields on plots treated with fomesafen were higher than for Basagran which gave poor control of *C. album* but differences were not statistically significant. Weeds also delayed pod maturity on untreated and Basagran treated plots.

SITE 3: SWAFFHAM, NORFOLK

The beans cv. Provider were sown on 25th May on 35 cm rows. Final population was 47 plants/m<sup>2</sup>. The soil type was a loamy sand. Treflan was applied pre-sowing at this site and failed to control resistant species *U. urens*, *Senecio vulgaris* and *Matricaria* spp. There was a very uneven weed distribution, and the site was abandoned after tractor wheeling damage occurred.

APPLICATION DATA:

Application date	Weather	GS crop	GS weed
T <sub>1</sub> 14/6 @ 9am tr 2, 3, 4&6	22°C 46 RH hazy sun no cloud	simple leaf	URTUR, MAT, CHEAL 2 TL VIGAR 4-6 TL SENVU 2-4 TL
T <sub>2</sub> 21/6 @ 8am tr 3&5	12°C 66 RH 50% cloud cover, sunny & hot later	½ trifoliolate leaf	URTUR, CHEAL, MAT 6 TL
T <sub>3</sub> 26/6 @ 8am tr 7	17°C 53 RH sunny. Hot later	1½ trifoliolate leaf	CHEAL 6 TL, other spp. small plant

The weather was very hot and dry before mid-June when the first application was made.

RESULTS:

1. Weed control, Swaffham

Treatments	Rate l/ha	Timing	No. weed spp./m <sup>2</sup> on 5/7							Weed Score		
			MAT spp.	VERPE	CAPBU	SENVU	CHEAL	URTUR	SOLNI	Total	5/7	30/7
1 Untreated	-	-	49*	2	5	11	18	45	3	133	0	0
2 fomesafen	0.45	T <sub>1</sub>	18	-	-	1	21	13	-	53	3.2	2.2
3 fomesafen	0.45&0.45	T <sub>1</sub> &T <sub>2</sub>	28	-	-	5	3	5	-	41	6.5	2.2
4 fomesafen	0.9	T <sub>1</sub>	21	-	-	2	-	5	-	28	5.2	4.8
5 fomesafen	0.9	T <sub>2</sub>	27	-	-	4	1	5	-	37	5.5	4.1
6 fomesafen	1.8	T <sub>1</sub>	19	-	-	-	5	1	-	25	7.8	5.0
7 Basagran	3.0	T <sub>3</sub>	-	1	-	8	21	15	-	45	5	2.2

\*Untreated *Matricaria* spp. were 50:50 percent population of pineapple weed, *Matricaria matricarioides* and scentless mayweed, *Tripleurospermum inodorum*.

Fomesafen at all rates and timings gave good but not complete control of *T. inodorum* but did not appear to control *M. matricarioides*.

Fomesafen at all rates and timings controlled *Capsella bursa-pastoris*, *Solanum nigrum* and *Veronica persica*, but higher rates than 0.45 l/ha were needed to control *Urtica urens* and *Chenopodium album*. Basagran gave poor control of advanced *C. album*. Hot conditions may have increased leaf wax and tolerance to herbicides of *C. album*.

There were low populations of *Artemisia vulgaris* at this site which were controlled by fomesafen, and also a cranesbill sp. which was resistant.

All treatments gave poor weed control at this site, possibly the weeds had become resistant under hot weather conditions.

2. Crop damage: Swaffham

The crop was harvested at quick-freezing stage on 9th August.

Treatments	Rate l/ha	Timing	Crop Score			
			21/6	5/7	12/7	30/7
1 Untreated	-	-	10	10	10	10
2 fomesafen	0.45	T <sub>1</sub>	9.6	10	10	10
3 fomesafen	0.45&0.45	T <sub>1</sub> &T <sub>2</sub>	9.6	10	10	10
4 fomesafen	0.9	T <sub>1</sub>	9.5	10	10	10
5 fomesafen	0.9	T <sub>2</sub>	-	10	10	10
6 fomesafen	1.8	T <sub>1</sub>	9	10	10	10
7 Basagran	3.0	T <sub>3</sub>	-	7.2	9	10

There was little crop damage from treatment with fomesafen even at the twice normal rate at simple leaf stage. Effects were in the form of leaf crinkling. Basagran caused severe leaf scorch under hot weather conditions, but crop growth was good and vigour was not affected.



SITE 4: DILHAM HALL, NORFOLK

Green beans cv. Labrador were sown on 12th June on 35 cm row width, final population 43 plants/m<sup>2</sup>. The soil was a sandy loam. Arresin (monolinuron) was applied pre-emergence to a dry seedbed and weed control was poor.

APPLICATION DATA:

Application date	Weather	GS crop	GS weed
T <sub>1</sub> 6/7 tr 2,3,4&6	15°C 100% cloud cover	simple leaf	CHEAL 2-4 TL weed beet 2 TL some VIOAR emerged later than 6/7
T <sub>2</sub> 15/7 tr 3,5&7	16°C 65 RH 100% cloud cover	most 1½ trifoliolate leaf a few 1 trifoliolate leaf	CHEAL 6 TL - small plant VIOAR cot STEME & MAT spp. 2TL

RESULTS:

1. Weed control: Dilham Hall, Norfolk

Treatments	Rate l/ha	Timing	No. weed spp./m <sup>2</sup> on 24/7					Weed Score		
			CHEAL	VIOAR	MAT sp.	STEME	Weed beet	Total	24/7	21/8
1 Untreated	-	-	95	144	13	2	1	255	0	0
2 fomesafen	0.45	T <sub>1</sub>	7	27	-	1	1	26	8.6	8.1
3 fomesafen	0.45&0.45	T <sub>1</sub> &T <sub>2</sub>	-	-	-	1	-	1	10	10
4 fomesafen	0.9	T <sub>1</sub>	1	15	-	1	-	17	9.2	9.4
5 fomesafen	0.9	T <sub>2</sub>	7	-	-	-	-	7	9.9	10
6 fomesafen	1.8	T <sub>1</sub>	-	-	-	1	-	1	10	10
7 Basagran	3.0	T <sub>3</sub>	3	76	-	-	a	79	7.9	8

a = not present before application

At this site there was rapid growth of crop and weeds. There was a late emergence of some species including, *Viola arvensis*, which were therefore not controlled by treatments with fomesafen at the first timing T<sub>1</sub> but the 1.8 l/ha rate appeared to have some residual activity. Basagran gave poor control but the weed was uncompetitive. Fomesafen at 0.45 l/ha gave very good control of a high population of *Chenopodium album*, even those at 4 true leaf stage, and the 0.9 l/ha rate gave complete control at this stage but was less effective when applied later. Fomesafen did not control *Stellaria media*.

There was a variable population of seedling rye grass on the trial area and fomesafen caused severe scorch. Treatments 3, 5 and 6 appeared to give some control.

Overall, the best treatment was with the split dose which controlled the *C. album* early and also the late emerging *V. arvensis*.

Fomesafen applied at 0.9 l/ha to a separate area with a high population of weed beet at the 2 true leaf stage gave complete control.

2. Crop damage: Dilham Hall, Norfolk

The beans were at quick-freezing harvest stage on 21st August.

Treatments	Rate l/ha	Timing	Crop Score		
			12/7	24/7	21/8
1 Untreated	-	-	10	10	10
2 fomesafen	0.45	T <sub>1</sub>	9.8	10	10
3 fomesafen	0.45&0.45	T <sub>1</sub> &T <sub>2</sub>	-	10	10
4 fomesafen	0.9	T <sub>1</sub>	9.3	10	10
5 fomesafen	0.9	T <sub>2</sub>	-	9.9	10
6 fomesafen	1.8	T <sub>1</sub>	9	10	10
7 Basagran	3.0	T <sub>3</sub>	-	9.6	10

Basagran was applied a little earlier than the label recommendation when a few beans were only at 1 trifoliolate leaf stage but there was little crop damage.

Fomesafen at 0.9 and 1.8 l/ha at simple leaf stage caused slight temporary damage in the form of leaf crinkling.

SITE 5: THREE HOLES, CAMBRIDGESHIRE

The crop cv. Kent was sown on 19th June on a row width of 45 cm. Final population was 39 plants/m<sup>2</sup>. The crop suffered from soil-borne fungal disease, *Fusarium solani* and symptoms were blackened roots. Initially simple leaves were affected but later above ground growth was normal for this tolerant cultivar. This site was on soil with 15% organic matter and no pre-sowing or pre-emergence herbicides were applied. Weed populations were low, however.

APPLICATION DATA:

Application date	Weather	GS crop	GS weed
T <sub>1</sub> 16/7 @ 8pm tr 2,3,4&6	19°C 58 RH sunny	4-1 trifoliolate leaf	OSR, CHEAL, MAT sp. 2 TL GALTE cot-2 TL
T <sub>2</sub> 20/7 tr 3&5	24°C 52 RH 50% cloud cover	1-1½ trifoliolate leaf	OSR, CHEAL, MAT 4 TL VERPE, GALTE, LAMPU 2 TL POLPE, BILCO 2-4 TL
T <sub>3</sub> 24/7 @ 5pm tr 7	23°C 36 RH 10% cloud cover	2 trifoliolate leaf	SINAR, POLPE, VERPE 4 TL MYOAR 2-4 TL CHEAL 4-6 TL & small plant MAT sp. small plant

RESULTS:

1. Weed control: Three Holes, Cambridgeshire

Treatments	Rate l/ha	Timing	No. weed spp./m <sup>2</sup> on 24/7 (30/7 for tr 7)											Weed Score	
			SINAR	CHEAL	OSR	MAT Spp.#	VERPE	STEME	MYOAR	POLPE	GALTE	LAMPU	Total	30/7	1/9
1 Untreated	-	-	7	5	2	18	6	3	9	4	2	1	57	0	0
2 fomesafen	0.45	T <sub>1</sub>	-	1	-	-	-	2	7	-	-	-	10	9.8	9.9
3 fomesafen	0.45&0.45	T <sub>1</sub> &T	-	-	-	-	-	1	1	-	-	-	2	10	9.9
4 fomesafen	0.9	T <sub>1</sub>	-	-	-	-	-	1	2	-	-	-	3	10	10
5 fomesafen	0.9	T <sub>2</sub>	-	-	-	-	-	2	1	-	-	-	3	10	10
6 fomesafen	1.8	T <sub>1</sub>	-	-	-	-	-	1	1	-	-	-	3	10	10
7 Basagran	3.0	T <sub>3</sub>	-	1	-	-	3	-	-	-	1	1	6	10	9.5

\* *Tripleurospermum inodorum* (scentless mayweed)

Fomesafen at all rates and timings gave good control of *Tripleurospermum inodorum* and low populations of *Sinapis arvensis*, *C. album*, *Veronica persica*, *Polygonum persicaria*, *Lamium purpureum* and *Galeopsis tetrahit*. It did not control *Stellaria media*, and control of *Myosotis arvensis* was incomplete.

All treatments gave good weed control overall.

2. Crop damage, yield and maturity: Three Holes, Cambridgeshire

The crop was harvested at quick-freezing stage on 1st September.

Treatments	Rate l/ha	Timing	Crop Score			Yield pods as % untreated	Maturity 10 seed length mm
			20/7	24/7	30/7		
1 Untreated	-	-	10	10	10	100.0	91
2 fomesafen	0.45	T <sub>1</sub>	10	10	10	103.4	94
3 fomesafen	0.45&0.45	T <sub>1</sub> &T <sub>2</sub>	10	10	10	102.3	92
4 fomesafen	0.9	T <sub>1</sub>	9.9	10	10	102.4	92
5 fomesafen	0.9	T <sub>2</sub>	-	10	10	102.5	93
6 fomesafen	1.8	T <sub>1</sub>	9.2	10	10	95.9	91
7 Basagran	3.0	T <sub>3</sub>	-	-	8	99.8	92
Yield of untreated t/ha						10.89	
Significance @ P = 0.05						NSD	NSD
LSD @ P = 0.05						-	-
CV%						8.6	3.1

Crop damage from fomesafen even at twice normal rate, 1.8 l/ha, was negligible at this site. Basagran caused some leaf scorching.

The weed population was low and weeds offered little competition with the crop. There were no statistically significant differences for yield or maturity between any herbicide treatment or between treated and untreated beans in the absence of weed competition.

SITE 6: FRIDAY BRIDGE, CAMBRIDGESHIRE

The beans cv. Mqodus were sown on 2nd July on 45 cm rows. Plant population was 45 plants/m<sup>2</sup>. No pre-sowing or pre-emergence herbicides were applied at this site on a silt loam soil. Emergence and growth of weeds were fast compared with crop emergence and growth.

APPLICATION DATA:

Application date	Weather	GS crop	GS weed
T <sub>1</sub> 23/7 tr 2,3,4,5,6&7	20°C 56 RH 100% cloud cover	simple leaf (just) no sign of a trifoliolate	VERPE, SOLNI cot 2 TL STEME small plant CHEFI 4-6 TL CHEAL, MAT sp., POLPE 2 TL URTUR 2 TL & a few 4 TL SINAR 2-4 TL SENVU 1 TL
T <sub>2</sub> 30/7 @ 7pm tr 3	20°C 60 RH sunny	2 trifoliolate leaf	very few weeds remaining
T <sub>3</sub> 6/8 @ 7pm tr 5,6&7	20°C 38 RH sunny	2 trifoliolate leaf	CHEAL, CHEFI, STEME all large plant

1. Weed control: Friday Bridge, Cambridgeshire

Treatments	Rate 1/ha	Timing	No. weed/m <sup>2</sup> on 30/7 (and 21/8 tr. 5, 6 & 7)										Weed Score						
			STEMS	CHEAL	CHEBI	POAN	PAPRO	URTUR	MAT sp.	POLPE	VERBE	SENVU	CAPBU	SINAR	Total	30/7	21/8	18/9	
1 Untreated	-	-	22	8	18	102	25	5	16	5	10	11	4	9	2	237	0	0	0
2 fomesafen	0.45	T1	2	2	2	2	1	-	-	-	4	-	1	1	-	15	9.9	6.8	5.6
3 fomesafen	0.45&0.45	T1&T2	-	2	2	1	2	-	-	-	-	-	-	-	-	7	-	-	9.4
4 fomesafen	0.9	T1	-	1	-	-	1	-	-	-	1	-	-	-	-	3	10	9.5	8.8
5 fomesafen&Basagran	0.9&2.0	T1&T3	1	-	1	1	4	-	-	-	-	-	-	-	-	7	-	-	9.5
6 fomesafen&Basagran	0.45&2.0	T1&T3	5	-	5	13	3	-	-	-	-	-	-	-	-	26	-	-	6.8
7 Basagran	3.0	T3	19	-	15	45	4	1	2	-	-	5	1	-	-	92	-	-	4.2
8 fomesafen	1.8	T1	-	-	-	-	-	-	-	-	-	-	-	-	-	0	10	10	3.2

Control of the main weed species *Chenopodium album* and *ficifolium* was good with 0.45 and 0.9 1/ha fomesafen applied when these weeds were small. The few *Chenopodium* remaining at harvest on plots treated with 0.45 1/ha fomesafen would have caused harvesting difficulties, and a follow-up treatment gave better control. Potato seedlings were also well controlled. Basagran at 3.0 1/ha applied 14 days later gave very poor control. Basagran as a follow up treatment at 2.0 1/ha (treatments 5 and 6) after fomesafen was useful in controlling the *Stellaria media* which remained but populations were low, but was ineffective on large *Chenopodium*. Weed control was complete with 1.8 1/ha of fomesafen.

The crop was ready for harvest on 21st September.

2. Crop damage: Friday Bridge, Cambridgeshire

Treatments	Rate l/ha	Timing	Crop Score		
			30/7	10/8	21/8
1 Untreated	-	-	10	10	10
2 fomesafen	0.45	T <sub>1</sub>	10	10	10
3 fomesafen	0.45&0.45	T <sub>1</sub> &T <sub>2</sub>	(10)	10	10
4 fomesafen	0.9	T <sub>1</sub>	9	10	10
5 fomesafen&Basagran	0.9&2.0	T <sub>1</sub> &T <sub>3</sub>	(9)	9	10
6 fomesafen&Basagran	0.45&2.0	T <sub>1</sub> &T <sub>3</sub>	10	9	10
7 Basagran	3.0	T <sub>3</sub>	-	8	10
8 fomesafen	1.8	T <sub>1</sub>	7.2	10	10

Crop damage from fomesafen at 0.45 & 0.9 l/ha was negligible. At twice normal rate 1.8 l/ha of fomesafen the crop suffered leaf crinkling and temporary stunting but at an acceptable level. Damage may have been more severe for this trial because crop growth was soft and only just at simple leaf stage (there was no sign of a trifoliate leaf). By the 10th August crop vigour was similar to untreated beans.

SITE 7: THORNHAUGH, CAMBRIDGESHIRE

Observation trial tank-mixes with graminicides (2 replications); volumes water (3 replicates).

The beans cv. Lasso were sown on 3rd June on fine sandy loam soil on 25 cm row width at 45 plants/m<sup>2</sup>. The following weed species were sown:- SINAR, GALAP and Mayweed species. *Tripleurospermum maritimum*, (*Matricaria matricarioides* and *Matricaria recutita* did not emerge), oilseed rape and wheat. No pre-sowing or pre-emergence herbicides were applied.

APPLICATION DATA:

Application date	Weather	GS crop	GS weed
22/6 tr 2a,b,c,3&4	19°C 62 RH 100% cloud cover	simple	GALAP cot CAPBU, STEME 6 TL CHEAL 2-4 TL SINAR, OSR, VERPE 2 TL TRIMA 4 TL
9/7 tr 5,6,7,8,9	19°C 55 RH 100% cloud cover	most 2 trifoliate a few 1 <sup>st</sup>	vol wheat beginning to tiller CHEAL, OSR 4-6 TL TRIMA small plant SINAR flowering LAMPFU in bud STEME, VERPE large plant GALAP 3 whorl SOLNI 4TL large plant

RESULTS:

1. Weed control: Thornhaugh

Treatment fomesafen l/ha Material	Rate l/ha	Timing	Volume water l/ha	Crop score 18/7	Vol. wheat	No. weed species/m <sup>2</sup>					Weed score 18/7							
						(TRIMA)	(OSR)	(GALAP)	SINAR	CHEAL		STEMB	CAPBU	LAMPB	VERPB	SOLNI	POAAN	
A. 1 Untreated	-	-	-	10	-	98	22	21	7	39	14	8	22	8	9	11	118	0
2a fomesafen	0.45	T1	100	10	-	-	-	-	-	28	14	1	8	-	10	11	63	5.5
2b fomesafen	0.45	T1	200	10	22	5	6	2	-	11	14	1	2	1	-	9	38	6
2c fomesafen	0.45	T1	300	10	-	-	-	-	-	9	15	-	4	-	-	10	38	7.5
3 fomesafen	0.45 & 0.45	T1 & T2	200	10	-	-	-	3	-	1	16	-	2	-	-	10	29	9
4 fomesafen	0.9	T1	200	10	22	-	-	3	-	6	26	-	1	-	-	32	65	9.6
5 fomesafen	0.9	T2	200	10	-	-	-	8	-	9	19	-	18	-	-	25	71	5.3
B. 6 fomesafen+Laser†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Actipron	0.9+1.0	1.8 T2	200	9	-	-	-	-	-	-	15	-	-	-	-	6	21	9
7 fomesafen	0.9	T2	200	10	22	-	-	-	-	1	12	-	7	-	-	5	25	7.2
8 fomesafen+Fusilade 5+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agral#	0.9+1.0	T2	200	10	-	-	-	-	-	-	11	-	1	-	-	2	14	8.8
9 fomesafen	0.9	T2	200	10	20	-	-	-	-	2	14	-	9	-	-	4	29	7.2
0 untreated	-	-	-	10	29	-	-	-	-	16	13	7	55	8	5	11	115	0

KEY: ( ) - 1st rep only \*Agral @ 1 l in 1000 l

A. Weed species: A dose rate of 0.9 l/ha or a split dose 0.45 & 0.45 l/ha of fomesafen was needed to give complete control of oilseed rape volunteers.

Fomesafen at 0.45 l/ha gave good control of *Tripleurospermum maritimum*, *Solanum nigrum*, *Veronica persica*, *Capsella bursa-pastoris* and *Sinar arvensis*, but control of *C. album* was poor. Early applications of fomesafen were effective on *Galium aparine*, 0.9 l/ha applied at 3 whorl stage was inadequate, the same was true for *Lamium purpureum*, *Stellaria media* and *Poa annua* were resistant to all treatments.

Volume of water: There seemed to be a response to application volume, weed control with 300 l water was slightly superior to 200 l/ha which was more effective than 100 l/ha.

B. Tank-mixes with graminicides: Tank-mixes with 0.9 l/ha fomesafen with Laser + Actipron oil or Fusilade + Agral applied at 2 trifoliolate leaf stage caused little or no increase in crop effects. "Volunteer" wheat was completely killed and there appeared to be a synergistic effect on broad-leaved weed control - possibly because of additional oil/wetter so that good control of large weeds was achieved.

SITE 8: WESTON, LINCOLNSHIRE - OBSERVATION TRIAL, UNREPLICATED FOR OILSEED RAPE CONTROL

Treflan (trifluralin) pre-sowing and Arresin (monolinuron) were applied at this site but a very high population of oilseed rape volunteers emerged and competed with the crop.

APPLICATION DATA:

Application date	Weather	GS crop	GS weed
27/6 @ 8pm tr 2,3&4	14°C 100% cloud cover	4-1 trifoliolate leaf	oilseed rape 2-6 TL population 51 plants/m <sup>2</sup>

RESULTS:

1. Weed control: Weston, Lincolnshire

Treatments Material	Rate l/ha	Weed control
1 Untreated	-	0
2 fomesafen	0.45	small plants dead, large plants affected 20% control
3 fomesafen	0.90	100% control
4 Basagran	3.0	only small plants dead 10% control

Basagran treatment was at earlier timing than the label recommendation but the crop suffered little damage possibly because the temperature was low and application was in the evening.

The rest of the crop was treated at a later stage with Basagran + oil which gave good control, but may have been too late to prevent competition with the crop.

The full dose rate of 0.9 l/ha fomesafen applied early gave excellent control of even large oilseed rape at 6 true-leaf stage.

CONCLUSIONS: In three years of trials fomesafen was highly selective in green beans. With the exception of one site (Friday Bridge) where there was temporary crop stunting from 1.8 l/ha, crop damage was negligible. Early post-emergence applications of fomesafen at 0.45+ 0.9 l/ha at simple leaf stage had a wide margin of crop safety. In the absence of weed competition fomesafen did not suppress crop yield: at sites (Kirton End and Three Holes) where weed populations were low, yields of treated beans were similar to the untreated, and pod maturity was not affected by herbicide treatment.

There was a considerable yield reduction (up to 94%) at one site (Carters Bridge) where high weed populations were not controlled.

Fomesafen also appeared safe in programmes with trifluralin, monolinuron or bentazone, and all these three herbicides control *S. media* which is resistant to fomesafen.



In one trial, tank-mixes with Laser + Actipron (being registered for green beans) or Fusilade + Agral also appeared safe to the crop and gave good control of volunteer wheat and broad-leaved weeds but further work is needed.

Limited work suggested that there is a response of weed control to water volume.

Weed control with fomesafen was excellent this season - under warm conditions crop emergence appeared faster than the weeds and growth was vigorous. Weed growth was soft, *Chenopodium album* (sometimes difficult to kill at advanced stage) was controlled at 4 true leaves. The early sown Swaffham site, which suffered dry conditions before application was an exception.

Although fomesafen at 0.9 l/ha gave more reliable control, 0.45 l/ha was sometimes sufficient (Three Holes, Kirton End and Carters Bridge) and a split dose treatment was useful in controlling late-emerging weeds (Dilham Hall).

This years trials programme suggested the following weed susceptibility (S) or resistance (R) to fomesafen @ 0.9 l/ha early post-emergence.

S	MR	R
<i>Urtica urens</i>	<i>Myosotis arvensis</i>	<i>Stellaria media</i>
<i>Capsella bursa-pastoris</i>		<i>Poa annua</i>
<i>Sinapis arvensis</i>		<i>Matricaria matricarioides</i>
<i>Chenopodium album</i>		
<i>Chenopodium ficifolium</i>		
<i>Malva sylvestris</i>		
<i>Viola arvensis</i>		
<i>Polygonum persicaria</i>		
<i>Veronica persica</i>		
<i>Solanum nigrum</i>		
<i>Papaver rhoeas</i>		
<i>Coronopus squamata</i>		
<i>Artemisia vulgaris</i>		
<i>Sonchus oleracea</i>		
<i>Senecio vulgaris</i>		
<i>Tripleurospermum inodorum</i>		
<i>Lamium purpureum</i>		
<i>Galium aparine</i> (small)		
Volunteer potato seedlings		
Weed beet		
Oilseed rape		

Volunteer potato shoots from tubers severely stunted, but more shoots appear later.

C.M. Knott  
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