PROCESSORS & GROWERS RESEARCH ORGANISATION

Final report (December 1993)
First year of project (FV72a) 1992 reported end of 1992
Second year of project (FV72a) 1993, extension for one year.

Project Number: FV72a

Project Title: Peas, broad beans and green beans: Evaluation of air assisted spray application technique.

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Location of Project: PGRO, Great North Road, Thornhaugh, Peterborough, Cambridgeshire PE8 6HJ.

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Key Words: Vining peas, broad beans, green beans
Air assisted sprays and conventional sprays, spray drift, deposition
Pest, disease and weed control

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PRACTICAL SECTION FOR GROWERS

Evaluation of air assisted spray application techniques in vining peas, broad beans and green beans

In 1992 and 1993 the efficacy of sprays applied with a Hardi Twin-boom air assisted sprayer was compared with conventional spray applications, both using flat fan nozzles at 100 and 200 l/ha water volume with full and half doses of pesticides.

Some results, for Laser + Actipron and Pulsar + Fortrol tank-mixes in peas, and Basagran in broad beans suggested that with air assistance there was slightly better control of moderately susceptible weeds species sheltered by the crop.

Air assisted sprays with Ronilan were more effective than conventional sprays for control of *Botrytis*, a disease which occurs on the lower part of the pea plant. With air Folio appeared to give better control of downy mildew in broad beans possibly because air moved and circulated the spray to the mildew spores on the underside of the leaves.

However, air assisted sprays appeared to give poorer control of pests such as pea aphid which occur in the growing point at the top of the plant. Basagran sprays applied over a closed soil surface, to cotyledon weeds in green beans at early growth stages, gave better results without air.

With the exception of Laser (for souch control in vining peas) there seems little opportunity for reduction in spray dose to ½ N rates and still achieve reliable control. However volumes of 100 l/ha were generally as effective as 200 l/ha for both application methods.

In tests in (field) beans (pod fill stage) and peas (flat pod), air assistance considerably reduced spray drift and could possibly allow more safe spraying opportunities at higher wind speeds.

Pest control (Decisquick) 1 spray programme for vining peas: In 1992 there was virtually no pea moth damage on untreated plots at vining pea harvest stage.

There were no statistically significant differences between sprayer treatments for aphid control, but a significant reduction in numbers compared with the untreated (17 aphid mean per plant). However trends suggested that air assistance, which deposits less spray on the aphid infested growing point gives no better and possibly worse control than conventional spray application.

In 1993 the percentage pea moth damage on untreated peas was very low at vining pea harvest stage and there were no significant difference between spray applications.

Aphid numbers were low (5 mean per plant) on untreated peas. Air assistance at 100 l/ha and ½ N dose rate gave significantly poorer control compared with other treatments probably because aphid infested the growing point at the top of the pea plant. Otherwise there were no effects of water volume, dose rate or air assistance.

2 spray programme for combining peas: In 1992 there was no further infestation of aphid, and a very low level of pea moth larvae damage found at dry harvest stage on untreated peas, and with no significant differences between sprayer treatments.

In 1993 there were no further aphid attacks. Assessments of mature dry pea seed for pea moth larvae damage showed no statistically significant differences in control but trends suggested slightly better control for N compared with ½ N dose rates and better control without air assistance.

Botrytis control (Ronilan) 1 spray programme for vining peas: In the 1992 trial air assisted sprays gave better control of *Botrytis* than conventional sprays. Half dose rates were less effective than full doses, but with air assistance ½ dose rate at 100 l/ha performed similarly to the full dose at 200 l/ha at vining pea harvest stage.

The weather in 1993 was very wet during the period of flowering and pod set and levels of *Botrytis* infection were high. Several pods aborted or were infected on untreated plants.

Irrespective of application volume or method, ½ N dose rates gave significantly worse control than N dose rates. Volumes of 100 and 200 l/ha performed similarly.

Air assistance performed better than conventional application to give a significant reduction in numbers of pods infected with *Botrytis* which occur at the lower nodes on the pea plant.

2 spray programme for combining peas: In 1992, at combining pea harvest stage, assessments for "chalky" peas caused by *Botrytis* infection showed that all treatments significantly reduced *Botrytis* and there were no significant differences between them, although the least effective treatment appeared to be conventional application at ½ dose rate at 100 l/ha.

Similarly in 1993 the least effective treatments were for ½ N dose rates with conventional sprays. There were no significant differences between N and ½ N dose rates applied with air assistance.

Water volume had no significant effect on levels of control.

volumes. Air assistance resulted in only slight increases in crop damage in 1993, none in 1992. The greatest effect was from the more concentrated spray at 100 l/ha in 1993.

In 1993, for comparison, sprays were also applied later when there was 50% crop and weed cover. There was little difference between sprays applied with or without air assistance or between volumes.

Spray Drift

Spray drift was evaluated over field beans at pod fill stage in 1992 and results can be extrapolated to broad beans. In 1993 drift over a semi-leafless pea crop at flat pod growth stage (GS 205) was measured.

The greatest drift was with fine spray quality conventional sprays, the least for medium spray quality with air assistance. Drift was considerably reduced by air assistance for every nozzle comparison and could therefore allow more safe spraying opportunities at higher wind speeds than the guidelines by the Code of Practice for Safe Use of Pesticides suggest. It may also be possible to use a finer nozzle to give better spray cover for certain target pests and diseases.

Spray Deposition

Spray deposition on upper, middle and lower parts of the crop plant was measured by using a fluorescent marker dye. Limited data (3 spray occasions over 2 years) show that in dense pea crops, a higher percentage of spray droplets were deposited on the lower part of the plant where air assistance was used. In principle this could improve control of *Botrytis*, but not aphid sited in the growing point at the top of the crop. Results were similar for broad beans in 1993, but in 1992 in a less vigorous crop with a more open canopy there was little difference in spray droplet distribution between air assisted and conventional sprays.

Broad-leaved Weed Control in Peas

METHOD:

Material: Pulsar + Fortrol (bentazone/MCPB + cyanazine). Normal rate N 4.0 + 0.4 l/ha. (Label recommendation water volume 200 l/ha, fine spray quality).

Applied: 7th May.

Pea growth stage: 4 - 5 node. Thrip damage and poor leaf wax on lowest leaves, crop cover 75%.

Weed growth stage: Cleavers cotyledon - 3 whorls
Fools parsley 2 TL
Black-bindweed 1 - 2 TL
Fat-hen 4 TL
Speedwell, field 2 - 4 TL
Chickweed small plant

Crop & weed cover: 100%.

Weather: 13°C 40 RH sunny, no cloud. Wind NE, mean wind speed 4 metres/sec.

Assessments: The crop was assessed for herbicide damage effects. Counts of weed species within 6 random 0.33m^2 quadrats per plot were made. Scores for weed control were recorded.

RESULTS:

Table 1 - Broad-leaved weed control crop and weed scores

Spray Treatment						
	Volume water	Rate	Crop score#		Weed score	
Air	l/ha		3/6	20/6	29/5	12/7
1 +	100	N	8.1	7.9	9.8	8.6
2 +	100	½N	9.1	10	6.9	5.9
3 -	100	N	8.3	7.9	9.5	8.2
4 -	100	½N	9.4	9.9	5.0	3.8
5 +	200	N	8.5	8.4	9.4	8.2
6 +	200	½N	9.2	10	5.0	4.0
7 -	200	N	8.5	8.7	9.2	7.8
8 -	200	½N	9.2	10	3.5	3.0
0 Untreated	-	-	10	10	0	0

#Crop score 10 = no visible damage
7 = acceptable damage
0 = complete kill

Weed score 10 = complete control
7 = acceptable control
0 = no control

Peas which were treated with Pulsar + Fortrol at N dose rate suffered from slight temporary epinasty, scorch and stunting. Visible effects were slightly greater at the lower water volume and with air assistance.

Table 3 - Number of weed species/m^2 (data transformed to log_{10})

Sprayer Treatment			No. weed species/m^2 (transformed)												
Air	Volume l/ha	Rate	Fools parsley	Cleavers	Fumitory	Poppy	Field speedwell	Annual meadow-grass	Black-bindweed	Charlock	Chickweed	Small nettle	Red dead-nettle	Mayweeds	Fat-hen
1 +	100	N	0	0.29	0.08	0	0.21	0.54	0	0	0	0	0	0	0
2 +	100	½N	0.2	0.90	0.21	0.22	0.25	0.59	0	0	0	0	0	0	0
3 -	100	N	0.16	0.43	0.12	0	0.20	0.52	0	0	0	0	0	0	0
4 -	100	½N	0.16	1.28	0.32	0.31	0.56	0.70	0	0	0	0	0	0	0
5 +	200	N	0	0.35	0	0	0	0.68	0	0	0	0	0	0	0
6 +	200	½N	0.12	1.18	0.28	0.04	0.47	0.61	0	0	0	0	0	0	0
7 -	200	N	0	0.48	0	0.02	0.33	0.73	0	0	0	0	0	0	0
8 -	200	½N	0.56	1.25	0.74	0.22	0.21	0.67	0	0	0	0	0	0	0
0 Untreated	-	-	2.17	1.19	0.89	0.61	1.55	0.58	1.36	0.78	1.12	1.06	1.09	0.49	1.87
Significance @ P = 0.05			SD	SD	SD	SD	SD	NSD	SD	SD	SD	SD	SD	SD	SD
LSD @ P = 0.05			0.43	0.40	0.36	0.27	0.23	-	0.13	0.22	0.15	0.24	0.09	0.34	0.27
CV %			79.2	33.7	87.3	116.7	37.0	28.0	57.6	178.1	82.3	139.7	48.4	428.6	87.9

RESULTS:

Table 4 - Grass weed control (score and reduction number of live couch shoots compared with untreated) and crop effects in vining peas

Sprayer Treatment Air	Volume l/ha	Rate	Crop score	Couch control visual score	% couch control
		Date:	5/6	8/7	8/7
1 +	100	N	10	10	99.6
2 +	100	½N	10	9.2	90.1
3 -	100	N	10	9.7	95.2
4 -	100	½N	10	6.8	74.7
5 +	200	N	10	9.7	98.2
6 +	200	½N	10	7.3	85.6
7 -	200	N	10	9.8	97.5
8 -	200	½N	10	6.6	67.9
0 Untreated			10	0	0
Significance @ P = 0.05					SD
LSD @ P = 0.05					27.45
CV %					23.8

Crop score 10 = no visible damage, 7 = acceptable damage, 0 = complete kill
Couch score 10 = complete kill, 7 = acceptable control, 0 = no effect

There were negligible crop effects from Laser + Actipron.

Ten days after application of the graminicide, couch shoots for treatments 1 and 3 were reddish/yellow and dead and at the 100 l/ha volume action appeared more rapid than with 200 l/ha. On the 5th June, 16 DAT, most couch treated with air assisted applications was dead. Foliar control was variable in plots where conventional sprays were applied which were more effective where the couch plants were exposed compared with couch which was sheltered by the peas.

All treatments gave statistically significant reductions in number of couch shoots compared with the untreated. Applications at 100 l/ha were just as effective as the 200 l/ha volume for air assisted and conventional applications. Air assistance at ½ N dose rate was nearly as effective as the N dose rate (and statistically similar). However, without air assistance the ½N dose rate gave poorer control than the N dose and was unacceptable.

Pest and Disease Control in Peas

METHOD:

Application data: Plots were split for a 1 (vining peas) and a 2 (combining peas) spray programme and a tank-mix of fungicide and insecticide was used on each occasion. The fungicide was for control of *Botrytis* and *Mycosphaerella* and the insecticide for control of pea aphid and pea moth.

Pest and Disease Control after 1 Spray Programme (Vining Peas)

RESULTS:

Table 5 - Aphid (data transformed to $\log_{10}$) pea moth and *Botrytis* control in vining peas at harvest stage for quick-freezing on 6th July

Spray Treatment			No. aphid/ plant (transformed)	Pea moth larvae damage % (by weight)	*Botrytis* infected pods number/plant
Air	Volume water l/ha	Rate			
1 +	100	N	0.009	0.11	1.8
2 +	100	½N	0.175	0.14	3.1
3 -	100	N	0.000	0.07	4.1
4 -	100	½N	0.013	0.08	5.2
5 +	200	N	0.000	0.13	1.5
6 +	200	½N	0.004	0.20	3.8
7 -	200	N	0.000	0.11	3.4
8 -	200	½N	0.013	0.28	4.7
0 Untreated	-	-	0.752	2.30	7.2
Significance @ P = 0.05				SD	SD SD
LSD @ P = 0.05			0.098	0.257	0.925
CV %			62.6	46.1	16.3

Aphid numbers were low, 4.83 per plant on untreated peas and the data has been transformed. All pesticide treatments significantly reduced aphid numbers. The least effective treatment was with air assistance at 100 l/ha water volume and ½ N dose rate and differences in aphid numbers compared with other treatments were statistically significant. Otherwise there appeared to be no significant effect of water volume, air assistance, or N or ½ N dose rate (although control was slightly better for the full dose but not significantly so).

There were also low percentages of pea moth larvae damage at quick-freezing stage. All treatments significantly reduced % damage, but there were no significant differences between treatments in respect of water volume, ½ N or N dose rate or with and without air assistance.

The weather was very wet during the period of flowering and pod set and levels of *Botrytis* infection were high. Several pods were aborted or infected on untreated plants.

All spray applications significantly reduced infected pods. Irrespective of application volume or method, ½ N dose rates performed significantly worse than full N dose rates. Application volumes of 100 or 200 l/ha gave similar levels of control. Air assistance performed better than conventional application to give a significant reduction in numbers of infected pods, which occurred at the lower nodes on the pea plants.

I. EFFICACY

BROAD BEANS

METHOD (Layout, site and sprayer treatment):

LAYOUT: Randomised block, 4 replications, plot size 6 m (½ boom width) x 18 m.

SITE: Big Meadow Field, Thornhaugh; sandy loam soil.

CULTIVAR & SOWING DATE: Metissa which is susceptible to downy mildew. Sown on 23rd March at 18 plants/m^2, row width 40 cm.

SPRAYER TREATMENTS FOR WEED, PEST AND DISEASE CONTROL IN BROAD BEANS:

Air	Sprayer	Water volume l/ha	Nozzle type (spray quality)	Pressure bar	Pesticide rate
1 +	Hardi twin boom	100	411012	2	N Normal
2 +	Hardi twin boom	100	411012	2	½N
3 -	Conventional hydraulic	100	411012	2	N
4 -	Conventional hydraulic	100	411012	2	½N
5 +	Hardi twin boom	200	411014 (fine)	5	N
6 +	Hardi twin boom	200	411014	5	½N
7 -	Conventional hydraulic	200	411014	5	N
8 -	Conventional hydraulic	200	411014	5	½N
0	Untreated	-	-	-	-

Tractor speed 7.2 km/hr
Flat fan nozzles at 50 cm spacing
Height nozzles above top of crop 50 cm
Treatments: + air, air stream at 30° angle rearwards (opposite direction of travel)
- air, nozzles vertical
Full air (about 20 metres/sec) was used for all air assisted treatments

Broad-leaved Weed Control in Broad Beans

METHOD:

Material: Basagran (bentazone) at normal rate N 3.0 l/ha (label recommendation water volume 220 l/ha, fine spray quality).

Applied: 11th May

Bean growth stage: 4 leaf pairs, 3 node stage, GS 103, healthy.

Weed growth stage: Redshank 2 TL, field pansy 2-4 TL, fumitory 2-4 TL.
Black-bindweed 1-2 TL
Cleavers 1 whorl, a few 2 whorl stage
100% ground cover crops and weeds

Weather data: 20°C 46 RH, sunny, no cloud. Wind NE, start 2.7 metres/sec, finish 3.3 metres/sec.

Table 8 - Weed species counts on 29th May

Sprayer Treatment			No. weed counts/m^2										
Air	Volume l/ha	Rate	Field speedwell	Black-bindweed	Redshank	Chickweed	Knotgrass	Cleavers	Hempnettle	Field pansy	Common poppy	Fumitory	Total
1 +	100	N	2	10	0	0	14	1	2	48	8	0.25	85
2 +	100	½N	6	87	0	0	12	17	1	42	10	1.25	176
3 -	100	N	2	51	0.8	0	14	2	3	42	6	0.25	121
4 -	100	½N	4	113	0.3	0	14	22	2	38	12	6.25	212
5 +	200	N	4	9	0	0	17	1	1	32	6	2.5	72
6 +	200	½N	3	86	0	0	27	9	2	53	10	2.5	192
7 -	200	N	2	31	0	0	13	4	2	58	3	1.25	114
8 -	200	½N	3	127	0.8	0	24	33	4	53	7	3.0	255
0 Untreated	-	-	3	1211	56	23	16	27	3	136	3	6.0	1484
Significance @ P = 0.05			NSD	SD	SD	SD	NSD	SD	NSD	NSD	NSD	NSD	
LSD @ P = 0.05			-	157.3	43.5	4.38	-	24.2	-	-	-	-	
CV %			102.0	56.3	468.3	116.1	92.1	129.9	78.4	127.4	84.1	154.2	

RESULTS:

Aphid and downy mildew control in broad beans

Table 9 - Percentage leaf area infected with downy mildew (mean for 15 plants) at top of the plant, and at each node (1 at the top of the plant), and as a mean of nodes on 6th July

Sprayer Treatment Air	Volume l/ha	Rate	% leaf area infected downy mildew top	Node: 1	2	3	4	5	6	7	8	% leaf area infected/plant (mean of nodes)
1 +	100	N	0.0	0.5	2.0	3.2	11.4	23.1	8.1	0.8	0.08	5.5
2 +	100	½N	7.8	9.8	13.6	19.2	25.4	35.3	13.3	2.3	0.00	14.1
3 -	100	N	2.9	4.9	7.4	13.8	15.8	32.8	9.8	1.2	0.00	9.8
4 -	100	½N	11.9	15.6	17.7	26.5	30.0	37.0	15.4	5.4	3.67	18.1
5 +	200	N	0.3	0.7	2.2	3.5	10.3	23.6	8.8	1.5	0.08	5.7
6 +	200	½N	10.5	15.9	22.3	24.3	27.4	40.2	11.4	2.8	0.25	17.2
7 -	200	N	2.3	3.4	7.9	17.0	16.0	36.6	14.8	3.3	1.50	11.4
8 -	200	½N	8.6	13.5	15.8	35.0	35.6	50.8	15.0	6.5	2.67	20.4
0 Untreated	-	-	45.6	53.3	56.8	59.2	62.7	55.2	30.6	14.4	2.08	42.2
Significance @ P = 0.05			SD	SD	SD	SD	SD	SD	SD	NSD	NSD	SD
LSD @ P = 0.05			12.29	12.06	11.35	15.35	15.38	16.75	10.57	-	-	8.63
CV %			84.4	63.2	47.0	40.4	51.2	30.9	51.2	171.6	211.4	36.9

I. EFFICACY

GREEN BEANS

METHOD (Broad-leaved weed control green beans):

LAYOUT: Observation trial, only 2 replications, plot size 6 m (½ boom) x 20 m.

SITE: Big Meadow Field, Thornhaugh; fine sandy loam.

CULTIVAR & SOWING DATE: Nerina sown on 14th May. Target population of 40 plants/m^2, row width 30 cms.

SPRAYER TREATMENTS FOR WEED CONTROL IN GREEN BEANS

Air	Sprayer	Volume water l/ha	Nozzle type	Pressure bar
1 + ½	Hardi Twin-boom	100	411012 (fine)	2
2 -	Conventional hydraulic	100	411012 (fine)	2
3 + ½	Hardi Twin-boom	200	411014 (fine)	5
4 -	Conventional hydraulic	200	411014 (fine)	5
0 Untreated		-	-	-

Flat fan nozzles at 50 cm spacing
Height nozzles above top of crop 50 cm
Tractor speed 7.2 km/hr
Treatments: Only + ½ air (mean 9 metres/sec) used for 1 and 3 in short open crop, little weed or crop cover; airstream at 30° angle rearwards - air, nozzles vertical

Material: a. 1st timing Basagran (bentazone) rate for split-application recommendation 2.0 l/ha for weeds at cotyledon stage (label recommendation water volume 100 l/ha, fine spray quality). Here only one application at 2.0 l/ha was made.

Applied: 8th June.

Green bean growth stage: ½ trifoliate.

Weed growth stage: Black-bindweed cot - 1 TL
Fumitory cot - 1 TL
Cleavers cot - 1 whorl
Chickweed 6 TL

Ground cover: 20%.

Weather: At 6 pm sunny no cloud, 24°C 30 RH. No wind.

Material: b. 2nd timing Basagran (bentazone) 3.0 l/ha. Recommended Normal rate.

Applied: 22nd June.

Green bean growth stage: 1½ trifoliate.

II. DRIFT IN PEAS

METHOD: Spray drift was measured for the Hardi Twin-boom Sprayer using air assistance and for sprays without air assistance using the same sprayer with the sleeves rolled up and tied down and without air to simulate a conventional sprayer. Hydraulic flat fan nozzles to give a range of spray qualities were used.

Drift measurements were carried out on 23rd June using a technique where drifting droplets of spray solution containing fluorescent dye (fluorescein) were caught on pipe cleaners attached to masts placed 5 m down wind of the spray boom. The solution was washed out of the pipe cleaners and the amount measured, making corrections for changes in concentration of solution where appropriate, using analyses of samples of spray solution taken from the tank.

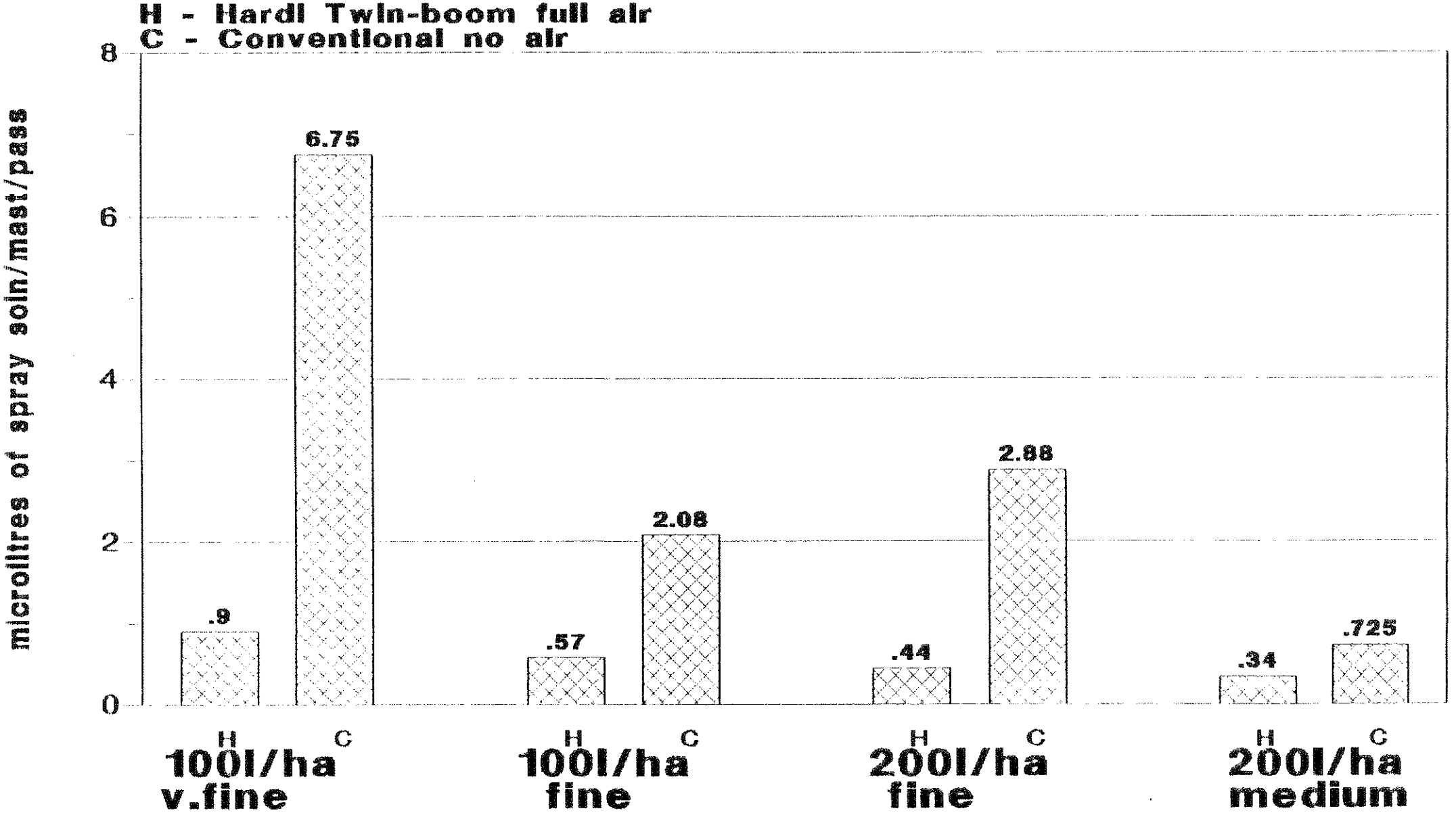
There were 4 masts with pipe cleaners at 8 positions at 0.5 m intervals at heights of 1.5 m - 5.0 m inclusive per mast. The sprayer made 4 passes a 100 metres distance, 2 each in opposite directions. Wind speed was measured as the sprayer reached each mast for the 4 passes and the mean was calculated.

Crop: peas (combining) semi-leafless cv. Baroness.

Growth stage: 5 nodes with pods set, 2 nodes flowers open and 2 nodes buds emerged. Overall GS 205 flat pod.

Weather: sunny, about 10% cloud cover, 21°C.

PEAS: Drift in microlitres/mast/pass per 100l/ha sprayed.



III. SPRAY DEPOSITION STUDIES

Spray deposition observation studies were carried out on two spray occasions. A solution of Helios, a fluorescent dye, as a 10 g/l formulation was added to the spray tank at 0.5 l/ha.

Peas on 20th June

Untreated peas were sampled before Helios was handled and before spraying other treatments. Treated peas were sampled immediately after treatments were applied. For each treatment, leaf discs of 16 mm diameter were removed, from each of 10 random plants one disc from upper, middle and lower portions of the plant. This was repeated for the four replicates. Samples of spray solution from the tank were also taken. Samples were quickly transferred to black polythene bin liners to exclude light, deep frozen and later analysed (it should be pointed out that the reliability of analyses of deep frozen samples is still being tested). Helios was dissolved from the leaf discs with 20 ml solvent per 10 disc sample and analysed to give g/l Helios per sample.

Broad beans on 22nd June

Sampling procedures were carried out in the same manner as for peas taking leaf discs from upper, middle and lower parts of the plants.

RESULTS:

Many plants have natural fluorescence. In this study both untreated peas and untreated broad beans fluoresced and the average for untreated leaf discs at each position on the plant was deducted from results for the sprayed samples.

Results in the following table show % spray distributed over upper, middle and lower portions of the plants as a mean of 4 replicates. Some data for the 100 l/ha value are missing and only that for 200 l/ha are presented.

Spray Treatment			Leaf position	% spray deposited	
Air	Volume	Spray quality		Peas	Broad beans
			23 June	20 June	
5 + air	200 l/ha	fine	upper	43.6	42.9
			middle	32.2	31.2
			lower	24.0	25.9
7 - air	200 l/ha	fine	upper	49.4	59.1
			middle	33.6	25.9
			lower	16.9	17.6

On both occasions for peas and broad beans a higher percentage of spray droplets were deposited on the lower part of the plant where air assistance was used.

Contract between PGRO (hereinafter called the "Contractor") and the Horticultural Development Council (hereinafter called the "Council") for research/development project.

1. TITLE OF PROJECT **Contract No: FV72a**
Contract date: 27.10.92

PEAS, BROAD BEANS AND GREEN BEANS: EVALUATION OF AIR ASSISTED SPRAY APPLICATION TECHNIQUE

2. BACKGROUND AND COMMERCIAL OBJECTIVES

The use of air to direct sprays down into the crop canopy could offer possibilities of improving spray deposition and better control of some pests and foliar diseases of legumes, and reduction of drift in some situations. Purchasers of air assisted sprayers also seek information on efficacy for weeds at low (100 l/ha) volumes of application.

3. POTENTIAL FINANCIAL BENEFIT TO THE INDUSTRY

Air assisted sprayers using half the normal application volume of water would reduce spraying time, and reduction in drift could reduce risks of accidental spray damage or allow more spray opportunities. If efficacy is improved, there could perhaps be potential for reducing dose rate and hence cost.

4. SCIENTIFIC/TECHNICAL TARGET OF THE WORK

The aim of the investigation is:

To evaluate efficacy of spray applications with an air assisted sprayer compared with conventional hydraulic nozzle equipment for control of weeds, pests and diseases in legume crops.

5. CLOSELY RELATED WORK - COMPLETED OR IN PROGRESS

Comparison of a spray application technique with air assisted and conventional sprayers for pest and disease control was made in some vegetable crops by ADAS in 1991. Work to investigate weed control on sugar beet and cereals has been carried out at Morley Research Centre in 1990 and 1991.

6. DESCRIPTION OF THE WORK

a. <u>Evaluation of efficacy</u>

<u>Sprayer treatments</u>

		Water volume l/ha	Rates/ha
1.	Hardi twin boom + air	100	N
2.	Hardi twin boom + air	100	½N
3.	Conventional hydraulic	100	N

4.	Conventional hydraulic	100	½N
5.	Conventional hydraulic	200	N
6.	Conventional hydraulic	200	½N
7.	Untreated		

3, 4, 5 & 6 - Hardi without Air

Experimental design

Plot size (½ boom width) 6m x 20m plot length. 4 replications of each treatment in a randomised complete block design.

Application Product	N Rate/ha	Target	Timing	Spray	Label (volume rec.)
Broad beans					
(i) Basagran	3.0 l/ha	weeds	before flower buds present	fine	(220)
(ii) Aphox + Folio	280g+2.0l	aphid + chocolate spot, downy mildew	early flower	fine	(200) + (200)
(iii) Aphox + Folio	280g+2.0l	aphid + chocolate spot downy mildew	early flower + 14 days	fine	(200) + (200)
Peas					
(i) Pulsar+ Fortrol	4.0l+0.4l	weeds	3 node (103)	fine	(220)
(ii) Decisquick + Ronilan	300ml+1.0l	aphid/pea moth + *Botrytis*	1st pod (204)	fine/ medium	(200)
Green beans (possibly observation area and not replicated)					
(i) Basagran	2.0l	weeds cotyledon	early post-em	fine	(100)

Product

- Basagran (bentazone)
- Pulsar (bentazone/MCPB)
- Aphox (pirimicarb)
- Fortrol (cyanazine)
- Decisquick (deltamethrin + heptenophos)
- Folio (metalaxyl chlorothalonil)
- Ronilan (vinclozolin)

Assessments

The levels of pest, disease and weed control will be determined during the experiment.

b. Drift studies

Comparisons of drift from air assisted and conventional spray applications.

c. Spray deposition studies

To evaluate the proportion of spray deposited on crop leaves (upper, middle and lower) for applications with and without air assistance.

d. Residue analyses

Will also be carried out to determine whether there are differences between the air assisted and hydraulic spray application systems.

7. COMMENCEMENT DATE AND DURATION

Start date 01.03.92; duration 1 year. It is likely that the work will be extended for a second year providing the first year results demonstrate that air assisted spray application has some positive benefits.

8. STAFF RESPONSIBILITIES

Project Leader : C M Knott

9. LOCATION

PGRO, Thornhaugh.

Contract No: FV/72A

TERMS AND CONDITIONS

The Council's standard terms and conditions of contract shall apply.

Signed for the Contractor(s)

Signature.....

Position.....

Date.....

Signed for the Contractor(s)

Signature.....

Position.....

Date.....

Signed for the Council

Signature.....

Position CHIEF EXECUTIVE

Date 27.10.92

Contract between PGRO (hereinafter called the "Contractor") and the Horticultural Development Council (hereinafter called the "Council") for research/development project.

PROPOSAL

1. **TITLE OF PROJECT** — **Contract No: FV/72a (Extension for a second year)**
Contract date: 22.7.93

PEAS, BROAD BEANS AND GREEN BEANS: EVALUATION OF AIR ASSISTED SPRAY APPLICATION TECHNIQUE

2. **BACKGROUND AND COMMERCIAL OBJECTIVE**

As for FV/72a.

3. **POTENTIAL FINANCIAL BENEFIT TO THE INDUSTRY**

As for FV/72a.

4. **SCIENTIFIC/TECHNICAL TARGET OF THE WORK**

As for FV/72a.

5. **CLOSELY RELATED WORK - COMPLETED OR IN PROGRESS**

As for FV/72a.

6. **DESCRIPTION OF THE WORK IN YEAR 2**

a. Evaluation of efficacy

i. Sprayer treatments

	Water volume l/ha	Nozzle	Rates/ha
1. Hardi twin boom + air	100	411012	N
2. Hardi twin boom + air	100	411012	½N
3. Conventional hydraulic	100	411012	N
4. Conventional hydraulic	100	411012	½N
5. Hardi twin boom + air	200	411014	N
6. Hardi twin boom + air	200	411014	½N
7. Conventional hydraulic	200	411014	N
8. Conventional hydraulic	200	411014	½N
9. Untreated	-	-	-

Tractor speed 7.2 km/h

ii. Experimental design

Plot size (½ boom width) 6m x 20m (or 15m) plot length. Four replicates of each treatment in a randomised complete block design.

iii) Application

Product	N Rate/ha	Target	Timing	Spray quality	Label rec. volume
Broad beans					
i. Basagran	3.0 l/ha	weeds	before flower buds present	fine	(220)
ii. Aphox+Folio	280g+2.0l	aphid+ chocolate spot, downy mildew	early flower	fine	(200)+ (200)
iii. Aphox+Folio	280g+2.0l	aphid+ chocolate spot, downy mildew	early flower + 14 days	fine	(200)+ (200)
Peas					
i. Pulsar+Fortrol	4.0l+0.4l	weeds	4 node (103)	fine	(220)
ii. Laser + Actipron oil	2.25 l+ (0.8%)	grass weeds	4 node + 10 days	fine	(100)
iii. Decisquick+ Ronilan	300ml+1.0l	aphid/pea moth+*Botrytis*	1st pod (204)	fine/ medium	(200)
Green beans					
i. Basagran	2.0 l/ha	weeds	cotyledon stage	fine	(220)

Product

- Basagran (bentazone)
- Pulsar (bentazone/MCPB)
- Aphox (pirimicarb)
- Fortrol (cyanazine)
- Decisquick (deltamethrin + heptenophos)
- Folio (metalaxyl/chlorothalonil)
- Ronilan (vinclozolin)
- Laser (cycloxidim)

iv) Assessments

The levels of pest, disease and weed control will be determined during the experiment.

b. Drift studies

Comparisons of drift from air assisted and conventional spray applications in peas at reproductive growth stage.

c. Spray deposition studies

To evaluate the proportion of spray deposited on crop leaves (upper, middle and lower) for applications with and without air assistance in peas and broad beans.

7. COMMENCEMENT DATE AND DURATION

Start date 01.03.92; duration 2 years.

The final report detailing the results for year 2 together with a summary of the results from year 1 will be produced by 28.02.94.

8. STAFF RESPONSIBILITIES

Project Leader: C M Knott

Project Co-ordinator: P Shepherd

9. LOCATION

PGRO, Thornhaugh

Contract No: FV/72a-ext

TERMS AND CONDITIONS

The Council's standard terms and conditions of contract shall apply.

Signed for the Contractor(s)

Signature.....

Position.....DIRECTOR.....

Date.....23.7.93.....

Signed for the Contractor(s)

Signature.....

Position.....

Date.....

Signed for the Council

Signature.....

Position.....CHIEF EXECUTIVE.....

Date.....22.7.93.....