Br. Crop Prot. Counc. Monogr. No. 9 (1974)

EVALUATIONS OF CYANAZINE* AND CYANAZINE MIXTURES FOR SELECTIVE WEED CONTROL IN CEREALS LEEKS AND ONIONS RASPBERRIES AND FORESTRY

M.G. Allen & R.G. Jones
Shell Chemicals (U.K.) Ltd.
D.F. Reid & G.H. MacKenzie
Shellstar Ltd.
H. Vadgaard
A/S Dansk Shell.

Summary

Cereals The cereal trials reported were completed in two basically similar areas, Scotland and Denmark; in Scotland, after the completion of some 50 trials during the period 1969-1972, and alongside limited commercial usage of a cyanazine/phenoxy alkanoic acid herbicide in 1973, five spring barley and two spring oat trials were completed in order to compare cyanazine at rates from 0.25 - 0.37 kg a.i./ha in mixture with various phenoxy alkanoic acid herbicides, commercial standards and untreated control plots, and, in addition to compare the commercial formulation of cyanazine/MCPA at 0.31/1.40 kg a.i./ha in volumes of water ranging from 135 - 280 litres/ha. All treatments were effective but the least effective were two mixtures of cyanazine with .54 or .27 kg a.i./ha of a long chain amine formulation of MCPA/mecoprop and the most effective was the mixture of cyanazine/MCPA at 0.37/1.68 kg a.i./ha. The cyanazine/MCPA mixtures were effective when applied in volumes of water as low as 179 litres/ ha. The Danish trials, on both spring and winter cereals, were completed from 1970 - 1973. The rates of cyanazine ranged from 0.25 - 0.35 kg a.i./ha in mixture with phenoxy - alkanoic acid herbicides. All the mixtures were effective but because of climatic, formulation and weed problems, wettable powder formulations which applied either cyanazine/MCPA/dichlorprop at 0.25/0.3/1.2 kg a.i./ha or cyanazine/mecoprop at 0.25/1.25 kg a.i./ha were preferable to liquid formulations and gave consistently the best weed control.

Leeks and Onions Replicated trials in Scotland in 1971-1973 compared cyanazine at rates from 1.12-6.72 kg a.i./ha with recommended rates of propachlor, prometryne, aziprotryne, and with untreated controls. Cyanazine was applied to transplanted leeks pre or post transplanting or both as a split application, while drilled crops were treated post crook. W.L. 63611 a compound similar to cyanazine was also evaluated.

* cyanazine = 2-(4-chloro-6-ethylamino-s-triazin-2-ylamino) -2-methyl-propionitrile.

Extremely acceptable results were achieved from 2.8 kg a.i./ha of cyanazine applied to transplanted leeks after they were established, or from a split application of 1.12 kg a.i./ha pre transplanting followed by 1.68 kg a.i./ha after recovery from transplanting. In both drilled leeks and onions 2.8. kg a.i./ha applied at the post crook stage of the crop gave long lasting weed control, but the best results were when the crops had been previously treated with a pre-emergence herbicide such as propachlor. Both leeks and onions appeared to benefit from a planned application programme of one or more herbicides.

Raspberries Two trials were laid down in Scotland in 1973 in newly planted raspberries in order to try and evaluate new candidate herbicides, and, at the same time to confirm previous results, not reported, with chlorthiamid (2,6 - dichlorothio-benzamide), at 4.62 kg a.i./ha as a 7½% granule. Two cyanazine/atrazine wettable powder mixtures were used to apply cyanazine at the rate of 1.79, 2.39 & 3.59 kg a.i./ha in the ratio of 2:1 and 0.90, 1.35 and 1.79 kg a.i./ha in the ratio of 1:1. 1.35/1.35 kg a.i./ha of these mixtures was consistently the best of all treatments used, although bromacil (5 - bromo -6- methyl -3- s- butyl uracil) at 1.12 kg a.i./ha also gave acceptable weed control at both sites. Chlorthiamid gave an adequate degree of weed control, but, on one site with a moderately high organic matter the persistence was relatively short. Atrazine wettable powder was better at both sites than equivalent rates of atrazine granules.

Forestry In trials in Scotland in 1973 the same cyanazine/atrazine mixtures were used in forestry as in the raspberry trials, but at cyanazine rates of 2.69, 3.58 and 4.48 kg a.i./ha of the 1:1 mixture and 2.39, 4.78 and 9.55 kg a.i./ha of the 2:1 mixture. They were applied at monthly intervals from March-May to sitka spruce (Picea sitchensis) and in April to Norway spruce (Picea abies), they were compared with application at the same dates of atrazine, as a 50% wettable powder and as 4½% granules, at 4.48 kg a.i./ha and also with the commercial standard, chlorthiamid 7½% granules at 3.36 and 4.2 kg a.i./ha applied in March and April only.

With both the cyanazine/atrazine formulations the degree of weed control improved with rate, without damage to the trees.

The lowest rate of the 1:1 cyanazine/atrazine mixture was comparable to chlorthiamid in March and April, was superior to atrazine granules at all times and was comparable or superior to atrazine wettable powder. Both rates of chlorthiamid were generally superior to both atrazine formulation.

INTRODUCTION

Cyanazine is the common name for 2-(4-chloro -6- ethylamino - s- triazin -2-ylamino) -2- methyl - propionitrile, it was formerly designated D.W. 3418 and W.L. 19805 and now has the B.S.I. name of 'Bladex'. It is already in use commercially for weed control in peas, potatoes and cereals, this paper attempts to present up to date information on current cereal trials completed in Scotland and Scandinavia and to collate the trials results on other crops where there is as yet little or no commercial usage. To save confusion each crop is dealt with separately in the paper.

Cereals

Two of the most commonly occurring weeds in Scottish spring cereals are hempnettle, Galeopsis tetrahit and chickweed Stellaria media. Earlier work had shown that both these weeds were particularly susceptible to comparatively low doses of cyanazine, but that other commonly occurring polygonous weeds such as knotgrass, Polygonum aviculare and redshank, Polygonum persicaria were relatively resistant.

It was therefore decided to evaluate cyanzine in mixture with phenoxy - alkanoic acid herbicides (ref. Luckhurst R.J.' et.al. (1972).

As a result of the extensive trial work carried out, a mixture containing 6.25% cyanazine and 25% MCPA was marketed, specifically for Scotland in 1973.

In Denmark different weeds predominate in spring and winter cereals, the most important weeds in spring cereals are chickweed, Stellaria media, knotgrass Polygonum aviculare, redshank Polygonum persicaria, black bind weed Polygonum convolvulus, fat hen Chenopodium album, hempnettle Galeopsis tetrahit and scentless mayweed Matricaria inodora, while in winter wheat the most commonly occurring weeds are:- chickweed Stellaria media, speedwell Veronica spps, cleavers Galium aparine, and also scentless mayweed Matricaria inodora.

In 1970 Danish trials work with cyanazine mixture in cereals commenced with an evaluation of a cyanazine/2,4- DP mixture of 0.35/1.5 kg a.i./ha cyanazine/2,4- DP a three component mixture of cyanazine/MCPA /2,4- DP . at 0.25/0.3/1.2 kg a.i./ha formulated as a wettable powder was evaluated in 1971 & 1972. The mixture however did not give an adequate control of cleavers Galium aparine in winter cereals.

Because of the importance of cleavers, Galium aparine in winter cereals the 1973 Danish work compared a wettable powder formulation of cyanazine/mecoprop at 0.5/1.5 kg a.i./ha with existing commercial standards.

Leeks and Onions

Although the total area of leeks and onions grown in Scotland is small they are crops which produce a good return per hectare. Hand weeding often has to supplement the herbicides which are used at present and a really effective herbicide or programme of herbicides to give season long weed control is desirable. A pre-transplanting or pre-emergence treatment is often necessary since by the time the crop is well enough established Poa annua or Polygonum aviculare could be out of the seedling stage and so be difficult to control. In this type of crop which often does not offer a great deal of competition, any poorly controlled weed can rapidly spread and colonise areas left by controlled weeds and thus nullify the effect of spraying.

Cyanazine had given good weed control in brassicas and a log sprayer plot in leeks in early 1971 showed the crop to be tolerant; even at the peak dose of 8.0 kg a.i./ha.

It was on the basis of this information that the reported series of trials were initiated. Following satisfactory results on leeks in 1971 the work was extended to onions, a morphologically similar crop.

Raspberries

With some 85% of the total U.K. raspberry acreage being grown in Scotland, raspberries play an important role in the Scottish economy; approximately 1000 acres of new canes are planted each year. Weed control is essential in the establishment period of the young canes, and, although simazine has been used for many years in newly planted canes, it has only recently been given official approval and is not a wholly satisfactory herbicide for the purpose, because the planting time of new canes often coincides with long periods of dry weather and in many cases the predominant weed is knotgrass (Polygonum aviculare) which is moderately resistant. The work described in this paper was designed to assess in newly planted canes, some of the herbicides already widely used in established raspberry plantations and tentatively used in new canes, such as for example chlorthiamid & bromacil, and also to assess new herbicides as candidate herbicides for this purpose.

Forestry

Weed control is essential during the establishment period of newly planted trees. The cost of hand weeding and the size of the areas that require annual weeding make chemical control methods a necessity. Because many new plantations are situated in isolated areas, without ready access to water supplies, granular formulations are generally preferred to formulations requiring the addition of water.

Previous experiments reported by Aldhous (1964) de Gouville and Allen (Gouville and Allen (Columa Conf 1965) Allen (1966), Brown (1968), Allen and Reid (1972) and large scale commercial usage showed that chlorthiamid, as a granule containing 7½% active ingredient, gave an effective control of weeds in certain species of plantations when applied at rates of up to 4.2. kg a.i. per treated hectare during the period January - April in Scotland or January - March in England, Wales and Northern Ireland; however in areas where a large planting programme was being undertaken, if adverse weather conditions delayed tree planting it was often not possible to apply chlorthiamid within the recommended time period. The work described in this paper was designed to evaluate and compare other commercial products, such as atrazine, with chlorthiamid, within the time limits of chlorthiamid, and, also to evaluate other herbicides such as the cyanazine/atrazine mixtures, as candidates for use outside those time limits.

METHODS AND MATERIALS

Cereals

Scotland

Five spring barley and two spring oat trials were completed in Scotland in 1973. The trials were of a randomised block design with four replicates, the plot size was 3.2 metres x 31.1 metres, the method of application was by Land Rover sprayer at a standard volume of 280/litres/ha, with the exception of volume comparisons which were from 135 litres per hectare. Application was at the 4 leaf stage of the barley and the 2 leaf stage of the oats. The control plots were wheel marked at each site. In each trial the six major weed species were assessed twice, the first assessment approximately 21 days after application. A percentage ground cover by weed species was used.

The second assessment was approximately 21 days after the first and a count of individual weeds was taken over one square metre per plot, (i.e. 4 throws of a ¼ metre quadrat). At both assessment times crop damage was scored on the E.W.R.C. scale. 1 = no danger, 9 = complete crop kill). A specially modified combine was used to harvest 62.1 sq. metres from each plot. The weight was corrected to 15% moisture and the treatment means are expressed as a percentage of the control.

Treatments were as follows:- Scotland

	S. Barley Rate kg a.i./ha	Volume/litre/ha
Commercial standard	recommended	280
Cyanazine/ MCPA	0.37/1.68	280
Cyanazine/ MCPA /2,4-DP (W.P.)	0.25/0.3/1.2	280
Cyanazine/ mecoprop (W.P.)	0.33/2.18	280
Cyanazine/ MCPA	0.31/1.40	135
" "	" "	180
" "	" "	225
" "	" "	280
Cyanazine/ MCPA/ mecoprop (Long Chain Amine)	0.37/0.18/0.36	280
" "	" /0.09/0.18	280
Control		

Treatments S. Oats.	Rate kg a.i./ha
Cyanazine/MCPA	0.31/1.40
" "	0.37/1.68
Cyanazine/2,4-DP/MCPA	0.25/1.20/0.30
Cyanazine/ mecoprop	0.33/2.18
Cyanazine/2,4-DB	0.37/0.84
Cyanazine/ MCPA/ mecoprop (Long Chain Amine)	0.37/0.54
Control	

All the treatments in the S. Oat trials were applied in a volume of 280 litres/ha.

Site details	S. Barley	Main Weeds
No. 1 Location	Fife	Sinapis arvensis, Polygonum aviculare, Stellaria media, Atriplex patula, Ranunculus repens, Polygonum persicaria
No. 2	Perthshire	Matricaria matricariodes, Stellaria media, Lamium purpureum Chenopodium album, Polygonum aviculare, Fumaria ssp,
No. 3	Fife	Stellaria media, Fumaria ssp Polygonum convolvulus, Sinapis arvensis Galeopsis tetrahit, Viola ssp,
No. 4	Perthshire	Atriplex patula, Stellaria media, Polygonum aviculare, Polygonum convolvulus. Polygonum persicaria, Galeopsis tetrahit.
No. 5	Stirlingshire	Galeopsis tetrahit, Galium aparine Polygonum persicaria, Fumaria capreolata Matricaria ssp, Viola ssp

Site details	S. Oats	Main Weeds
No. 1		Stellaria media, Polygonum aviculare
Location	Angus	Galeopsis tetrahit, Polygonum persicaria, Spergula arvensis, Atriplex patula.
No. 2		
Location	Perthshire	Galeopsis tetrahit, Fumaria ssp Matricaria ssp, Polygonum perscicaria, Stellaria media, Polygonum aviculare.

Denmark

Treatments were as follows:-

	kg a.i./ha	Formulation	year
Cyanazine/dichlorprop	0.25/0.5	S.C.	70
" "	0.3/1.5	S.C.	71
" "	0.25/1.0	S.C.	70
" "	0.25/1.5	S.C.	71
" "	0.25/2.0	S.C.	70
" "	0.35/1.5	S.C.	70
Cyanazine/MCPA	0.25/0.5	S.C.	70
Cyanazine/MCPA/dichlorprop	0.25/0.3/1.2	S.C.	71,72
" "	0.3/0.3/1.2	W.P.	73
Cyanazine/mecoprop	0.25/1.5	W.P.	73

The appropriate commercial standard was used each year at recommended rates. All trials were designed as randomised blocks with a plot size of 7 x 10 metres. The method of application was by precision sprayer (Harvey) at a standard volume of 250 litres/ha. Spring cereals were treated at the 3-5 leaf stage of the crop. The winter cereals were treated when the weeds were actively growing (April/May.). The trials were assessed at tillering and at harvest. Harvesting of 27 m^2 was by modified combine.

Leeks and Onions

The trials reported were located in East and Mid Lothian, Kincardine and Aberdeenshire and both 50% s.c. and 50% w.p. formulations of cyanazine were used as well as a 50% w.p. formulation of W.L. 63611, a related compound. Commercially used chemicals were employed as standards as well as the untreated controls. Split application involved a treatment pre transplanting followed by a second application post transplanting. Plot size was generally 1.8m x 7.6 or 9.1m although at site 4 it was 23m x 1.4m and treatments were applied at 280 to 920 l/ha (the higher volumes being used post emergence/transplanting) at a pressure of 2.1 - 2.8 kg/cm^2 through a precision sprayer.

Applications to transplants were made pre transplanting and after recovery from transplanting, usually 2-4 weeks after transplanting, pre-emergence or early post emergence of the weeds; drilled crops were treated post-crook (up to 2-3 leaf) when any weeds present were often past the seedling stage.

Site details

Site No.	Crop	Dates of App.	Soil Type	% o.m.
1	Drilled leeks	28.6.71	Sandy Loam	4.0
2	Transplanted leeks	30.5.72	"	14.2
3	" "	6.6.72	"	9.0
		7.7.72		
4	" "	23.4.73	Loamy Sand	12.0
		24.5.73		
5	Drilled leeks	22.6.73	Sandy Loam	2.5
6	Drilled onions	20.12.72	"	6.6

Weed control was assessed visually as a % ground cover at least twice after spraying, and visible crop damage was assessed on the E.W.R.C. scale 1-9. Results were statistically analysed.

Raspberries

In the two trials reported a 7½% granular formulation of chlorthiamid was used at the rate of 4.62 kg a.i./ha, a 75% wettable powder formulation of bromacil was used at 1.12 kg a.i./ha, 50% atrazine W.P. and 4½% atrazine granules were applied at 1.68 kg a.i./ha & two cyanizine/atrazine wettable powder formulations were used, both contained a total active ingredient content of 80% but one formulation was in the ratio of 2:1 cyanazine to atrazine and the other 1:1. The 2:1 formulation was applied at rates of 1.79/0.90, 2.39/1.20 and 3.59/1.80 kg a.i./ha and the 1:1 was applied at rates of 0.90/0.90, 1.35/1.35 and 1.79/1.79 kg a.i./ha. The granular formulations were applied by means of the Horstine Farmery airflow granular applicator as a continuous 1 metre band over the canes and the wettable powder formulations were applied by means of an Oxford precision sprayer to a width of 1 metre in a volume of 528 litres/ha.

The plot sizes were 9.1m x 1m. There were 4 randomised blocks at each site, with an untreated control plot in each block. A ridge of earth was thrown up onto the base of the canes prior to application.

Site details		Main weeds
No.	1	*Stellaria media, Urtica urens,
Location	Angus	Lamium purpureum. *Polygonum aviculare
Variety	Glen Clova.	Atriplex patula, Polygonum convolvulus
Planting Date	10th March, 1973	
Application Date	20th March	
No.	2	Main weeds
Location	Angus	Spergula arvensis, Galeopsis tatrahit,
Variety	Glen Clova.	Matricaria spps, Agropyron repens
Planting Date	19th April, 1973	
Application Date	27th April, 1973	(*common to both sites.)

Forestry

In the two trials reported a 7½% a.i. granular formulation of chlorthiamid was used at rates of 3.36 and 4.20 kg a.i. per treated hectare, atrazine was applied as a 50% w.p. and as a 4½% granule at 4.48 kg a.i. per treated hectare. Resume two cyanazine/atrazine mixtures, were used as in the raspberry trials but the 1:1 formulation was applied at rates of 2.69, 3.58 & 4.48 kg a.i./ha of each compound while the 2:1 formulation was applied at the rates of 2.39/1.20,4.78/2.39 & 9.55/4.78 kg a.i. per treated hectare. Application in trial No. 1 was in April only, and, in trial No. 2 was at monthly intervals from March - May. The granular materials were applied in a continuous band of approximately 1 metre in width over the trees by means of a Horstine Farmery Airflow granular applicator, the wettable powders were applied by an Oxford precision sprayer, again over the trees to the same width of plot in a volume of 574 litres of water/ha. 4 randomised blocks were treated at each application date, there was one untreated control in each block. The plot size was a single row of trees 9.1 metres in length.

Site details		Main weeds
No. 1		Pteridium aquilinium, *Holcus mollis,
Location -	Dumfries	Agrostis stolonifera, *Festuca ovina,
Species -	Norway spruce (Picea abies)	*Holcus lanatus, Juncus spps
No. 2		Main weeds
Location -	Perthshire	Dactylis glomerata,
		Anthoxanthum oderatum,
Species -	Sitka spruce (Picea sitchensis)	Achillea millefolium, Viola lutea,
		Trifolium spps, Ranunculus repens
		*Grasses common to both sites.

RESULTS

Cereals - Scotland

S. Barley. Table I

Mean % weed cover at 1st. assessment (mean of 4 blocks)

Treatment	Dose kg.a.i./ha	Site Nos. 1	2	3	4	5	Total	Mean
Standard	1.76	2.28	4.7	3.7	0.5	6.8	17.98	3.59
Cyan/MCPA	0.37/1.68	1.97	2.7	4.6	0.1	10.4	19.77	3.95
Cyan/2,4-DP/MCPA	0.25/1.20/0.30	2.34	3.7	5.6	0.25	5.4	17.29	3.45
Cyan/mecoprop	0.32/2.18	1.86	2.2	5.0	-	3.8	12.86	2.57
Vol.134.81/ha Cyan/MCPA	0.31/1.40	1.73	3.4	5.9	2.5	10.3	22.83	4.76
Vol. 179.71/ha Cyan/MCPA	" "	2.24	3.0	6.9	0.4	8.8	21.34	4.26
Vol. 224.6 1/ha Cyan/MCPA	" "	2.52	2.6	5.6	0.4	10.0	18.52	3.70
Vol. 280 1/ha Cyan/MCPA	" "	1.94	2.7	5.5	0.4	11.5	22.04	4.40
Cyan/L.C.A.*	0.37/0.54	3.20	3.3	6.5	0.4	8.3	21.70	4.34
" "	0.37/0.27	5.61	5.4	6.4	0.4	9.9	27.71	5.54
Control	-	25.25	53.7	46.8	15.5	70.1	211.35	42.27

* L.C.A. = Long Chain Amine.

S. Barley. Table II

Mean Number of weeds in 4 quadrats/plot (1 sq. metre)

Treatment	Dose kg.a.i./ha	Site Nos. 1	2	3	4	5	Total	Mean
Standard	1.76	13.3 (6)	3.1 (1)	43 (11)	0 (0)	80 (13)	139.4 (8.35)	27.88
Cyan/MCPA	0.37/1.68	3.3 (1)	1.3 (0.2)	42 (10)	0 (0)	86 (14)	132.6 (7.94)	26.50
Cyan/2,4-DP/MCPA	0.25/1.20/ 0.30	16.0 (7)	1.6 (0.8)	57 (14)	2 (7)	41 (7)	117.6 (7.04)	23.52
Cyan/mecoprop	0.33/2.18	6.6 (3)	1 (0)	51 (13)	0 (0)	20 (3)	78.6 (4.70)	15.72
Vol.134.81/ha Cyan/MCPA	0.31/1.40	8.7 (3)	1 (0)	55 (14)	56 (20)	85 (14)	205.70 (12.32)	41.14
Vol.179.7 1/ha Cyan/MCPA	" "	10.3 (4)	1 (0)	57 (14)	0 (0)	65 (11)	133.30 (7.98)	26.66

Treatment	Dose kg.a.i./ha	Site Nos. 1	2	3	4	5	Total	Mean
Vol.224.6 l/ha Cyan/MCPA	0.31/1.40	11.5 (5)	1 (0)	52 (13)	8 (2.9)	69 (12)	141.50 (8.47)	28.30
Vol.280 l/ha Cyan/MCPA	" "	10.6 (4)	1.4 (0.7)	30 (7)	1 (0.3)	95 (16)	138 (8.26)	27.60
Cyan/L.C.A.*	0.37/0.54	19.4 (8)	2.0 (1.4)	66 (16)	3 (1.1)	97 (16)	187.40 (11.22)	37.48
Cyan/L.C.A.*	0.37/0.27	26.9 (12)	2.0 (1.4)	73 (18)	0 (0)	98 (16)	214.9 (12.87)	42.98
Control	-	222 (100)	192 (100)	399 (100)	268 (100)	588 (100)	1669 (100)	333.8

* L.C.A. = Long Chain Amine. Percentage of control = ( )

Site 1. All treatments gave control at this site and there was no evidence to suggest that the amount of water applied with the cyanazine/MCPA mixture 0.31/1.40 kg a.i./ha affected its performance. The best overall weed control on this site was from cyanazine/MCPA at 0.37/1.68 kg a.i./ha where the number of weeds was reduced from 222 in the control to 3.3 in the treated plots.

Site 2. All treatments gave adequate control at the second assessment, but the commercial standard used did not give an adequate control of Matricaria matricarcides at the first assessment. The volume of water applied with the cyanazine/M.C.P.A. treatments had little affect upon performance.

Site 3. At the first assessment Fumaria and Viola spps were not well controlled, but at the second assessment the control had improved and was acceptable.

Site 4. All treatments, with the exception of the cyanazine/MCPA mixture 0.31/1.40 kg a.i./ha in 134.8 l/ha gave excellent control of the weeds.

Site 5. Galium aparine and Fumaria capreolata were not well controlled by any of the treatments with the exception of the two wettable powder formulations, cyanazine/2,4-DP/MCPA and cyanazine/MCPA . There was no evidence to suggest that the volume of water applied with the cyanazine/MCPA mixtures affected their performance.

There was no recorded crop damage in any of the trials.

Spring Oats.

Table III

The second assessment of no. of weeds, 4 quadrats/plot, mean of 4 blocks only is shown.

Treatment	Dose kg a.i./ha	Site Nos. 1	2	Total	Mean
Cyan/MCPA	0.31/1.40	24.5	2.75	27.25	13.62
" "	0.37/1.68	18.75	1.00	19.75	9.87
Cyan/2,4-DP/MCPA	0.25/1.20/0.30	27.50	0.25	27.75	13.87
Cyan/mecoprop	0.33/2.18	30.00	0.25	30.25	15.12
Cyan/2,4-DB	0.37/0.84	20.00	0.50	20.50	10.25
Cyan/L.C.A.*	0.37/0.54	20.25	0.25	20.50	10.25
Control		273.50	254.24	527.74	263.87

* Long Chain Amine * 2,4-DB = 2,4 dichloro phenoxybutyric acid

At both sites the degree of weed control was extremely good, cyanazine/MCPA at 0.37/1.68 gave the best overall control.

There was no crop damage at Site No. 1 but at site No. 2 the cyanazine/long chain amine treatment caused severe crop damage and the cyanazine/mecoprop wettable powder mixture caused moderate crop damage.

Yields

Table IV

Spring barley yields expressed as a % of control (all yields corrected to 15% moisture).

Treatment	Dose kg a.i/ha	Site Nos 1	2	3	4	5	Mean
Standard	Recommended rate	96.7	123+	105+	106	100.5	106.2
Cyan/ MCPA	0.37/1.68	98.1	121+	105+	105	101.6	106.1
Cyan/2,4-DP/ MCPA	0.25/1.20/0.30	97.1	119+	109+	95	103.5	104.7
Cyan/ mecoprop	0.33/2.8	101.5	118+	106+	93	104.2+	104.5
Vol. 138.8 l/ha Cyan/ MCPA	0.31/1.40	98.1	121+	102	93	104.3+	103.6
Vol. 179.7 l/ha Cyan/ MCPA	0.31/1.40	97.4	116+	103	104	104.3+	104.9
Vol. 224.6 l/ha Cyan/ MCPA	0.31/1.40	99.7	124+	107	98	104.9+	105.9
Vol. 280 l/ha Cyan/ MCPA	0.31/1.40	96.7	116+	107+	100	105.0+	104.9
Cyan/L.C.A.	0.37/0.54	96.1	117+	105+	96	103.5	103.5
Cyan/L.C.A.	0.37/0.27	95.0*	117+	99	96	104.5+	102.3
Control kg/ha	-	(5763)	(5770)	(5576)	(5299)	(4789)	-
L.S.D. between treatment means	P=0.05	4.1	10	4	16	4.1	
Least value sig.greater than control		104.1	110	104	116	104.1	
Greatest value signif. less than control		95.9	90	96	84	95.9	

* Significantly less than the control. ( ) Mean control yield kgs/ha at 15%
\+ Significantly greater than the control

The mean yields of all treatments were higher than those of the untreated controls, cyanazine/ MCPA at .37/1.68 kg a.i/ha was comparable to the commercial standard and gave a better yield than any other treatment. The lowest yield was from the cyanazine/long chain amine treatment at 0.37/0.27 kg a.i/ha, this treatment was on three occasions lower than the untreated control, and at site No 1 was significantly lower.

Yields S. Oats.

Table V

Yields corrected to 15% moisture

Yield expressed as a % of the control				
		Site Nos.		
Treatment	Dose kg a.i./ha	1	2	Mean.
Cyan/ MCPA	0.31/1.40	97	115	106
" "	0.37/1.68	98	115	106.5
Cyan/2,4-DP/MCPA	0.25/1.20/0.30	98	115	106.5
Cyan/MECOPROP	0.33/2.18	104	109	106.5
Cyan/2,4-DB	0.37/0.84	94	93	93.5
Cyan/L.C.A.	0.37/0.54	91	106	98.5
Control	-	(4417)	(4580)	
L.S.D. between treatment means		8	12	
Least Value signif. greater than control		108	112	
Greater Value signif. less than control		92	88	

At site no. 1 no treatment was significantly better than the control, but cyanazine/long chain amine was significantly worse than the control and cyanazine/2,4-DB. was significantly worse than cyanazine/mecoprop. At site no. 2 the cyanazine/2,4-DB treatment was significantly worse than any other treatment except for the control. The two cyanazine/ MCPA mixtures and the cyanazine/2,4-DP/MCPA mixture were all significantly better than the control.

Denmark

Results from trials in 1971, 72 & 73 only are shown.

1971 5 spring barley trials and 1 spring oat trial were completed. The predominant weeds in the trials were:- Chenopodium album, Stellaria media, Fumaria officinalis, Polygonum aviculare, Polygonum persicaria, Matricaria indoora, Galeopsis tetrahit, Polygonum convolvulus, Galium aparine; the percentage weed cover in the control plots was generally low ranging from 9% - 50% with a mean percentage cover of 20%.

Treatments were the same in all trials, the mean percentage reduction in weed cover being as follows:-