

PROCEEDINGS OF THE

EIGHTH

BRITISH WEED CONTROL

CONFERENCE

22 - 24 November, 1966

HOTEL METROPOLE, BRIGHTON

ENGLAND

The Conference was organised by the British Weed Control Council. The Proceedings may be obtained from the Secretary, 9 Grosvenor Street, London, W.1.

CONTENTS

TUESDAY, 22ND NOVEMBER, 1966

Session I

	<u>Page</u>
Opening address MR. W. EIRYS JONES, President of British Weed Control Council .....	(Vol. 3)
The role of weed control in agricultural development DR. L. G. HOLM, Food and Agriculture Organisation of the United Nations .....	(Vol. 3)

Session II

The economics of herbicide use in Britain and overseas DR. P. G. JAMES, University College of North Wales, Bangor .....	(Vol. 3)
Future trends in British agriculture with special reference to the role of herbicides MR. J. G. JENKINS, Childerley Estates, Dry Drayton, Cambridgeshire .....	(Vol. 3)

Session III (A)

POTATOES

The effect of cultivations on yield of the potato crop P. M. BREWER, University of Nottingham .....	1
Metobromuron. A residual herbicide for use in potatoes G. HELM, J. G. SMITH and A. V. LEWIS, CIBA Laboratories Ltd. .....	8
Chemical weed control in potatoes - a summary of N.A.A.S. regional trials in 1963/64 J. R. A. NEILD, National Agricultural Advisory Service, Leeds .....	(Vol. 3)
Weed control in potatoes at Harper Adams, 1963-66 M. EDDOWES, Harper Adams College .....	14
Investigations into the use of herbicides in potato crops on experimental husbandry farms. Part 2 1964-1966 F. E. SHOTTON, Terrington St. Clement Experimental Husbandry Farm .....	21
Evaluation of chemical and cultural methods of weed control in maincrop potatoes in East Anglia J. J. NORTH and J. M. PROCTOR, National Agricultural Advisory Service Cambridge .....	28
Flame cultivation trials 1965-66 B. J. CREEK, Maywick Appliances Ltd. .....	36

## FRUIT, ORNAMENTALS AND FORESTRY

Prevention of simazine damage to strawberries using charcoal root dips MISS H. M. HUGHES, National Agricultural Advisory Service, Efford Experimental Horticulture Station .....	45
Herbicide toxicity in newly planted strawberries - a progress report D. J. ALLOTT and S. J. HAY, Horticultural Research Centre, Loughgall .....	50
Trials with new strawberry herbicides G. W. IVENS and D. V. CLAY, A.R.C. Weed Research Organisation .....	57
Trials with herbicides on young strawberry plants T. CLARKE, Soft Fruits Research Centre, Clonroche, Eire .....	62
Lenacil as a selective strawberry herbicide D. TYSON, Pan Britannica Industries Ltd .....	68
Observations on herbicides for spring control of knotgrass in strawberries MISS H. M. HUGHES, National Agricultural Advisory Service, Efford Experimental Horticulture Station .....	73
Experiments with 2,6-dichlorothiobenzamide (chlorthiamid) in raspberries M. G. ALLEN, Shellstar Ltd .....	76
An interim report on a soil management study in raspberries D. V. CLAY and G. W. IVENS, A.R.C. Weed Research Organisation .....	85
A comparison of chemical and cultural methods of weed control in gooseberries D. W. ROBINSON, Horticultural Centre, Loughgall .....	92
The effect of growth-regulator herbicides on fruit trees - a progress report on experiments with apples G. W. IVENS and D. V. CLAY, A.R.C. Weed Research Organisation .....	103
Linuron as a herbicide on narcissus and tulip MRS. E. D. TURQUAND, Kirton Experimental Horticulture Station .....	110
Selective weed control in chrysanthemums with chloramben and other herbicides D. TYSON, Pan Britannica Industries Ltd .....	117
The effect of repeated doses of simazine on budded roses - an interim report J. W. EWAN, National Agricultural Advisory Service .....	124
Pot experiments with herbicides on <u>Oxalis latifolia</u> Kunth. C. PARKER, Unit of Experimental Agronomy, Oxford .....	126
Experiments with 2,6-dichlorothiobenzamide (chlorthiamid) in planted areas of soft and hardwoods M. G. ALLEN, Shellstar Ltd .....	135

	Page
Experiments with picloram, amitrole and dicamba for bracken control H. N. NOLLE, Aglukon-Gesellschaft, M.B.H., Dusseldorf .....	141
Bracken control in forestry with dicamba, picloram and chlorthiamid J. R. ALDHous, Forestry Commission Research Station, Farnham .....	150
Control of <u>Rhododendron ponticum</u> in forest plantations J. R. ALDHous and R. HENDRICK, Forestry Commission Research Station, Farnham .....	160

### Session III (c)

#### TRAINING IN CROP PROTECTION

University education in crop protection - present and future PROF. L. BROADBENT, Bristol College of Science and Technology, Bath ..	(Vol. 3)
Three papers on the employment of graduates in the crop protection industry and the N.A.A.S. D. LUIN ROCKLIFFE, Institute of Corn and Agricultural Merchants Ltd .. J. CRONSHAY, I.C.I. Plant Protection, Haslemere .....	(Vol. 3)
P. J. MACFARLAN, National Agricultural Advisory Service .....	(Vol. 3)

### Session IV (A)

#### CEREALS

Introduction to research reports and review of the present position in cereal weed control S. A. EVANS, National Agricultural Advisory Service .....	(Vol. 3)
Control of weeds in cereals with new herbicides, N.A.A.S. experiments 1964-66 J. M. A. BANK, National Agricultural Advisory Service .....	167
Bromoxynil and ioxynil esters as selective herbicides in cereals in the United Kingdom B. J. FULLAND, H. J. TERRY and C. W. WILSON, May & Baker Ltd .....	177
Further studies with ioxynil for broadleaf weed control in cereals R. JOICE and J. MORRIS, A. H. Marks & Co. Ltd .....	188
Field experience with benazolin in admixture with other herbicides G. B. LUSH, A. J. MAYES and B. L. AM, Boots Pure Drug Co. Ltd .....	197
Project N.A.S. 30 The efficiency of weed control in cereals on commercial farms R. G. HUGHES, National Agricultural Advisory Service .....	200
The control of <u>Alopecurus myosuroides</u> (blackgrass) in winter wheat J. HOLCOMBE, N.R.C. Weed Research Organisation .....	206

Action of several herbicides applied pre-emergence for control of blackgrass ( <u>Aloëurus myosuroides</u> Huds.) in winter wheat J. ROGNON, Institut Technique des Céréales et des Fourrages, Paris .....	215
The use of chlorthiamid and dichlobenil for the control of blackgrass in winter wheat H. S. MURDOCH and P. FULLER LEWIS, Shellstar Ltd .....	223
Pre-emergence control of blackgrass and broad-leaved weeds in winter wheat with 2-methylmercapto-4-ethylamino-6 tert. butylamino- s-triazine R. K. PFLEIFFER and H. M. HOLMES, Fisons Pest Control Ltd .....	225
Effect of seed-bed preparation on the weed flora of spring barley R. JONES, University College of Wales .....	227
The interaction of cycocel 2-chloroethyltrimethylammonium chloride and nitrogen top dressing on the growth, lodging and yield of wheat J. J. B. CALDICOTT, Cyanamid of Great Britain Ltd .....	229
The effect of cycocel (2-chloroethyl) trimethylammonium chloride on the growth and physiology of wheat and barley M. B. ALCOCK, E. W. MORGAN and R. S. JESSOP, University College of North Wales .....	240
CCC: its combination with certain herbicides and special considerations of dosage rate as related to disease incidence in cereals J. JUNG, H. STURM and S. D. FLEMING, BASF Agricultural Experimental Station and BASF (United Kingdom) Ltd .....	245
CCC and nitrogen in winter wheat M. LECOMPT, Syndicat Professionnel de l'Industrie des Engrais Azotés, Paris .....	257

#### Session IV (B)

##### **SCIENTIFIC STUDIES ON THE BEHAVIOR OF HERBICIDES**

Dicamba - dissipation in and on living plants W. H. ZICK and T. R. CASTRO, Velsicol Chemical Corporation Chicago, U.S.A. ....	265
The uptake, translocation and metabolism of fluometuron and metobromuron in plants G. VOSS and H. GLASSBUHLER, CIBA Ltd. Basle, Switzerland .....	266
Differential uptake and movement as a factor influencing selective toxicity of MCPA and LCPB MISS M. L. ROBERTSON and R. C. KIRKWOOD, University of Strathclyde .....	269
Herbicides and electron transport J. B. SMITH, D. PATON and MISS M. L. ROBERTSON, University of Strathclyde .....	279

Biological and physical attributes of several amiben derivatives S. R. LELAND and L. D. PARKE, Amchem Products Inc., Ambler, U.S.A. . . . .	283
--	-----

### Session IV (c)

#### GRASSLAND I - RESEARCH REPORTS

Autumn and spring applications of herbicides for sward destruction G. P. ALLEN, A.R.C. Weed Research Organisation .....	291
A progress report on the use of fertilisers and paraquat on a hill sward DR. G. M. DAVIES, University College of North Wales, Bangor .....	298
Some factors influencing the selectivity of paraquat in grassland G. P. GRIFFITHS, University College of Wales, Aberystwyth .....	304
A renovation technique for marsh land I. B. WARBOYS, University College of Wales, Aberystwyth .....	306
The role of paraquat in pasture renovation D. EVANS, Plant Protection Ltd .....	308
Effect of herbicides on grass and clover seedlings T. J. ARTHUR and J. P. SHILDRICK, National Institute of Agricultural Botany, Cambridge .....	314
Further experiments with growth regulator herbicides on S.48 timothy seed crops T. J. ARTHUR and J. P. SHILDRICK, National Institute of Agricultural Botany, Cambridge .....	320
Further experiments on the control of <u>Alopecurus myosuroides</u> (blackgrass) and other grass weeds in grass seed crops T. J. ARTHUR and J. P. SHILDRICK, National Institute of Agricultural Botany, Cambridge .....	325
Weed control in red clover intended for the production of fodder or seed F. BOUCHET, Institut Technique des Céréales et des Fourrages, Paris J. M. AUDY, Fédération Nationale des Agriculteurs Multiplicateurs de Semences, Paris .....	337
Development of grasses, clovers and weeds in relation to methods of establishment G. P. ALLEN, A.R.C. Weed Research Organisation .....	345
The use of asulam for the control of docks in pasture R. T. G. FORBES and J. H. COLEBROOK, May & Baker Ltd. Ongar .....	355
Herbicides on bracken ( <u>Pteridium aquilinum</u> (L) Kuhn): trials with dicamba and picloram G. L. HOAGSON and C. DONALDSON, Department of Agriculture, University of Oxford .....	360

## CONTENTS

WEDNESDAY, 23RD NOVEMBER, 1966

<u>Session V</u>	<u>Page</u>
DEVELOPMENT OF NEW HERBICIDES	
An industrial viewpoint DR. R. A. E. GALLEY, "Shell" Research Ltd. Woodstock Agricultural Research Centre .....	(Vol. 3)
The Weed Research Organisation viewpoint J. D. FRYER, A.R.C. Weed Research Organisation .....	(Vol. 3)
 <u>Session VI</u> 	
NEW AND RECENTLY DEVELOPED HERBICIDES	
C 6313, a new CIBA bromo-substituted urea herbicide D. H. GREEN, J. SCHULER and L. EBNER, CIBA Ltd., Switzerland .....	363
A new herbicide 2-azido-4-ethylamino-6-t-butylamino-1,3,5-triazine G. E. BARNSLEY and P. A. GABBOTT, "Shell" Research Ltd., Woodstock Agricultural Research Centre .....	372
SD 11831 - a new herbicide from Shell R. H. SCHIEFERSTEIN and W. J. HUGHES, Shell Development Co., U.S.A. ....	377
Field evaluation in Great Britain during 1963-1966 of trifluralin as a selective soil-acting herbicide D. TYSON, Pan Britannica Industries Ltd. C. B. F. SMITH, Murphy Chemical Co Ltd .....	382
Variation in herbicidal performance of trifluralin associated with various implements used for soil incorporation J. F. SCHWER, Eli Lilly International Corporation .....	391
4,5-dichloro-2-trifluoromethyl benzimidazole (chlorflurazole) research progress in 1966 R. K. PFEIFFER, Fisons Pest Control Ltd .....	394
$\alpha$ -chloro-6-t-butyl-o-acetotoluidide (Monsanto CP 31675) K. HOLLY, S.D. HOCOMBE and J. HOLROYD, A.R.C. Weed Research Organisation .....	397
Salts of mecoprop and dicamba with oleyl propylenediamine W. FURNESS, Farm Protection Ltd. J. L. FORRYAN, Armour Hess Chemicals Ltd .....	405

## SUGAR BEET

The use of herbicides in the British sugar beet crop R. A. BOND, British Sugar Corporation Ltd .....	407
The use of herbicides in sugar beet in the Netherlands H. J. DE BRUIN, Instituut Voor Biologisch en Scheikundig Onderzoek Van Landbouwgewassen, Wageningen, Netherlands .....	412
Review of current Belgian work on post-emergence treatments L. DETROUX, Station de Phytopharmacie de l'Etat, Gembloux M. MARTENS and G. PETERS, Sugar Beet Institute, Tirlemont, Belgium ....	420
Herbicide trials with sugar beet in Northern Ireland D. J. ALLOTT, Horticultural Research Centre, Loughgall .....	426
Further studies with herbicidal combinations containing medinoterb acetate for sugar beet D. H. BARTLETT and G. A. EMERY, Murphy Chemical Co. Ltd .....	433
The influence of moisture on the action of pyrazon H. BEINHAUER and L. SIPOS, BASF Experimental Station, Limburgerhof .....	440
Pre-emergent herbicide weed control in sugar beet W. M. CALDWELL and M. EDDOWES, Harper Adams College .....	444
Preliminary studies with herbicides in sugar beet M. EDDOWES, Harper Adams College .....	448
The control of weeds in sugar beet with a new granular herbicide S. EVEREST-TODD, Mirvale Chemical Co. Ltd. ....	451
Field development of lenacil in the United Kingdom for weed control in sugar beet J. D. FORREST, B. H. BAGNALL and R. J. MAKEPEACE, Baywood Chemicals Ltd. ....	455
Commercial application of prophan and diuron for weed control in sugar beet W. FURNESS and A. C. JUBEY, Farm Protection Ltd .....	463
Results with lenacil in 50 sugar beet experiments in 1965 H. M. HOLMES, Fisons Pest Control .....	465
The post-singling use of pyrazon to control weeds in sugar beet G. B. LUSH, A. J. MAYES and B. L. REA, Boots Pure Drug Co. Ltd .....	467
Lenacil, a new residual herbicide for the control of annual weeds in sugar beet T. G. MARKS, Pan Britannica Industries Ltd .....	470
Post-emergence weed control in sugar beet with pyrazon and chloro- pyrazon H. SANDFORD and T. THOMAS, Shellstar Ltd .....	478

Session VII (B)

Page

## FORMULATION OF HERBICIDES

Physical - chemical principles of formulation for foliage application DR. G. S. HARTLEY, Fisons Pest Control .....	(Vol. 3)
Physiology of entry of herbicides into plants in relation to formulation DR. J. R. SARGENT, A.R.C. Unit of Experimental Agronomy, University of Oxford .....	(Vol. 3)

Session VII (C)

## INDUSTRIAL WEED CONTROL

The contribution of triazine herbicides to industrial weed control A. GAST and E. FANKHAUSER, J. R. Geigy S.A. Basle Switzerland .....	485
Weed control on British Rail R. C. JENNINGS, Chipman Chemical Co. Ltd. ....	491
The use of total herbicides in Germany L. BUE, Farbenfabriken Bayer AG, Leverkusen, Germany .....	494
Weed problems of Local Authorities E. P. WHITAKER, Fisons Pest Control Ltd. ....	499
Spraying of roadside verges: long-term effects of 2,4-D and maleic hydrazide A. J. WILLIS and E. W. YEMM, University of Bristol .....	505
Chemical control of Japanese knotweed C. W. HARPER and K. G. STOTT, Long Ashton Research Station, Bristol ...	511
The use of picloram as a residual herbicide for industrial weed control D. MONTGOMERY, Borax Consolidated Ltd .....	516
Field trials with simazine/amitrole mixtures E. P. WHITAKER, Fisons Pest Control Ltd .....	520

Session VIII (A)

## PERENNIAL WEEDS IN ARABLE LAND

The significance of rhizomatous grass weeds in arable crop production today K. G. HUGHES, National Agricultural Advisory Service, South-Eastern Region .....	(Vol. 3)
Regeneration from depth of small rhizome fragments of <u>Agropyron</u> <u>repens</u> (L.) Beauv., <u>Aegopodium podagraria</u> L. and <u>Polygonum amplexicum</u> L. H. J. CHALLICK, A.R.C. Weed Research Organisation .....	533

A study of the effects of rhizome length, soil nitrogen and shoot removal on the growth of <u>Agropyron repens</u> (L.) Beauv.	
D. J. TURNER, A.R.C. weed Research Organisation .....	538
Some experience of testing new herbicides on perennial weeds in pots	
C. PARKER, A.R.C. Unit of Experimental Agronomy, Oxford .....	546
Pot experiments with new herbicides on <u>Allium vineale</u> L.	
C. PARKER, A.R.C. Unit of Experimental Agronomy, Oxford .....	553
The control of perennial and annual grasses and annual broad-leaved weeds in potatoes with pre-emergence applications of EPTC	
D. H. BARTLETT, Murphy Chemical Co. Ltd.	
T. G. MARKS, Pan Britannica Industries Ltd. .....	563
The control of perennial grasses before and during the production of potatoes	
J. G. ELLIOTT, T. I. COX and B. J. WILSON, A.R.C. Weed Research Organisation .....	569
Chemical control of perennial grass weeds in cereal stubbles, N.A.A.S. (South west region) experiments 1964-65	
J. N. A. BANKS, National Agricultural Advisory Service, South Western Region .....	576
A note on the response of spring cereals to the control of couch grass by dalapon and aminotriazole	
S. A. EVANS, National Agricultural Advisory Service .....	580

### Session VIII (B)

#### APPLICATION OF HERBICIDES

The farmer's future requirements	
R. A. BURTON, Wordslet House Farm, Stonnall, Walsall .....	(Vol. 3)
The biologist's requirements	
J. HOLROYD, A.R.C. Weed Research Organisation .....	(Vol. 3)
Can the engineer meet these requirements?	
G. P. ALLMAN, E. Allman & Co. Ltd., Chichester .....	(Vol. 3)

### Session VIII (C)

#### WEED CONTROL IN WATER

Recent developments and investigations in the chemical control of aquatic weeds in the Netherlands	
Dt. H. G. VAN DER WIJ, Instituut Biologisch en Scheikundig Onderzoek van Landbougewassen, Wageningen, Netherlands .....	(Vol. 3)

	Page
Some ecological observations on the use of paraquat and diquat as aquatic herbicides J. F. HEMMING, Jealott's Hill Research Station J. H. WAY, The Nature Conservancy .....	582
Observations on the use of diquat for the control of water weeds R. C. JENNINGS, Chipman Chemical Co. Ltd .....	586
Aquatic weed control in Sweden A. ANDERSSON, College of Agriculture, Uppsala, Sweden .....	589
Some studies of the persistence of 2,4-D in natural surface waters in Britain T. O. ROBSON, A.R.C. Weed Research Organisation .....	594
Further progress with the aerial application of aqueous solutions of dalapon to drainage ditches T. O. ROBSON, A.R.C. Weed Research Organisation .....	598
The use of herbicides as invert emulsions for aquatic weed control F. R. STOVELL, Shellstar Ltd. London .....	600

THURSDAY, 24TH NOVEMBER, 1966

Session IX (A)

PERSISTENCE OF HERBICIDES IN  
PLANTS AND SOIL

Problems in the persistence of herbicides DR. T. J. SHEETS, Pesticide Residue Laboratory, University of North Carolina, U.S.A. ....	(Vol. 3)
The persistence of some new herbicides in the soil S. D. HOCOLME, K. HOLLY and C. PARKER, A.R.C. Weed Research Organisation .....	605
Some studies on the fate of picloram and dicamba in soils underlying bracken C. PARKER and G. L. HODGSON, A.R.C. Unit of Experimental Agronomy, Oxford .....	614
Pre-treatment of soil with MCPA as a factor affecting persistence of a subsequent application K. KIRKLAND and J. D. FRYER, A.R.C. Weed Research Organisation .....	616

Session IX (B)

Page

GRASSLAND II - WEEDS IN GRASSLAND -  
A GENERAL SURVEY

Weeds and animal productivity DR. C. R. W. SPEDDING, Grassland Research Institute, Hurley .....	(Vol. 3)
Weeds and the farmer J. F. ORMROD, National Agricultural Advisory Service, Wolverhampton ...	(Vol. 3)
A commercial viewpoint R. L. HARPUR, Fisons Pest Control Ltd .....	(Vol. 3)

Session X (A)

## VEGETABLES

Weed control experiments on umbelliferous crops in Northern Ireland D. J. ALLOTT and S. D. UPRICHARD, Ministry of Agriculture, Northern Ireland .....	622
Weed control trials on transplanted and direct sown brassica crops in Northern Ireland D. J. ALLOTT, Ministry of Agriculture, Northern Ireland .....	631
Experiments with herbicides in direct drilled cabbage and cauliflower J. C. CASSIDY, Agricultural Institute, Kinsealy, Malahide, Eire .....	639
Herbicide trials in french beans J. C. CASSIDY, Agricultural Institute, Kinsealy, Malahide, Eire .....	646
Prometryne - a report on its use in peas J. M. KING, Pea Growing Research Organisation, Peterborough .....	656
Weed control in dwarf beans - a progress report 1965-66 J. M. KING, Pea Growing Research Organisation, Peterborough .....	663
Trials on the use of charcoal to make safe the use of some triazine herbicides on green peppers Z. KOSOVAC, Institute for Agricultural Research, Novi Sad, Yugoslavia .	668
Evaluation of herbicides for weed control in dwarf beans H. A. ROBERTS and B. J. WILSON, National Vegetable Research Station, Wellesbourne .....	672
Experiments with alpha-chloro-n-isopropylacetanilide in vegetable crops H. A. ROBERTS and B. J. WILSON, National Vegetable Research Station, Wellesbourne .....	679

<u>Session X (B)</u>	Page
THE PRACTICE OF MINIMUM CULTIVATION	
The agronomic aspects of direct drilling R. S. JEATER, Imperial Chemical Industries Ltd., Jealott's Hill Research Station, Berks .....	(Vol. 3)
The weed problem G. W. CUSSANS, A.R.C. Weed Research Organisation, Oxford .....	(Vol. 3)
The soil problems of minimum tillage PROF. E. W. RUSSELL, University of Reading .....	(Vol. 3)
 <u>Session XI</u>	
Effect of herbicides on soil micro-organisms PROF. W. W. FLETCHER, University of Strathclyde .....	(Vol. 3)

## CONTENTS

<u>Session I</u>	Page
<b>Opening address</b> MR. W. EMRYS JONES, President of the British Weed Control Council .....	687
<b>The role of weed control in agricultural development</b> DR. L. G. HOLM, Food and Agriculture Organization of the United Nations .....	689
<u>Session II</u>	
<b>Economic aspects of herbicide use</b> DR. P. G. JAMES, University College of North Wales, Bangor .....	702
<b>Discussion</b> .....	710
<b>Future trends in British agriculture with special reference to the role of herbicides</b> J. G. JENKINS, Childerley Farm Estates, Cambridge .....	711
<b>Discussion</b> .....	717
<u>Session III A</u>	
<b>POTATOES</b>	
<b>Chemical weed control in potatoes</b> (A summary of Regional National Agricultural Advisory Service trials in 1963 and 1964) J. R. A. NEILD, National Agricultural Advisory Service .....	718
<b>Discussion</b> .....	732
<u>Session III B</u>	
<b>FRUIT, ORNAMENTALS AND FORESTRY</b>	
<b>Discussion</b> .....	733
<u>Session III C</u>	
<b>TRAINING IN CROP PROTECTION</b>	
<b>Education in crop protection in British universities</b> PROF. L. BROADBENT, Bath University of Technology .....	735
<b>The employment of graduates in the crop protection industry</b> M. E. FUTHAM, Institute of Corn & Agricultural Merchants .....	742
<b>Education in crop protection</b> J. F. H. CRONSHAY, Plant Protection Ltd., Haslemere .....	745

Education in crop protection with special reference to weed control requirements of the National Agricultural Advisory Service  
P. J. MACFARLAN, National Agricultural Advisory Service, London ..... 749

Discussion ..... 751

#### Session IV A

##### CEREALS

A review of the present position in cereal weed control and an introduction to research reports  
S. A. EVANS, National Agricultural Advisory Service ..... 753

Discussion ..... 764

#### Session IV B

##### SCIENTIFIC STUDIES ON THE BEHAVIOUR OF HERBICIDES

Discussion ..... 766

#### Session IV C

##### GRASSLAND I - RESEARCH REPORTS

Discussion ..... 768

#### Session V

##### DEVELOPMENT OF NEW HERBICIDES

The development of new herbicides - an industrial view  
DR. R. A. E. GALLEY, Woodstock Agricultural Research Centre ..... 770

A viewpoint of the Weed Research Organisation  
J. D. FRYER, A.R.C. Weed Research Organization ..... 780

Discussion ..... 784

#### Session VI

##### NEW AND RECENTLY DEVELOPED HERBICIDES

Discussion ..... 789

#### Session VII A

##### SUGAR BEET

Discussion ..... 791

<u>Session VII B</u>	Page
FORMULATION OF HERBICIDES	
Physics of foliar application in relation to formulation DR. G. S. HARTLEY, Fisons Pest Control Ltd., Chesterford Park .....	794
The physiology of entry of herbicides into plants in relation to formulation DR. J. A. SARGENT, A.R.C. Unit of Experimental Agronomy, University of Oxford .....	804
Discussion .....	812
<u>Session VII C</u>	
INDUSTRIAL WEED CONTROL	
Discussion .....	814
<u>Session VIII A</u>	
PERENNIAL WEEDS IN ARABLE LAND	
The significance of rhizomatous grass weeds in arable crop production today R. G. HUGHES, National Agricultural Advisory Service .....	815
Discussion .....	819
<u>Session VIII B</u>	
APPLICATION OF HERBICIDES	
The farmer's future requirements R. A. BURTON, Wordsley House Farm, Stornall, Walsall .....	820
The biologists' requirements J. HOLROYD, A.R.C. Weed Research Organization .....	824
Can the engineer meet these requirements? G. P. ALLMAN, E. Allman & Co. Ltd., Chichester .....	831
Discussion .....	833
<u>Session VIII C</u>	
WEED CONTROL IN WATER	
Recent developments and investigations in the chemical control of aquatic weeds in the Netherlands H. G. VAN DER WEIJ, Institute for Biological and Chemical Research on Field Crops and Herbage, Wageningen, Netherlands .....	835
Discussion .....	840

Session IX A

Page

PERSISTENCE OF HERBICIDES IN PLANTS AND SOIL

Problems in the persistence of herbicides in plants and soil DR. T. J. SHEETS, North Carolina State University, U.S.A. ....	842
Discussion .....	852

Session IX B

GRASSLAND II - WEEDS IN GRASSLAND -  
A GENERAL SURVEY

Weeds and animal productivity C. R. W. SPEDDING, The Grassland Research Institute, Hurley .....	854
Weeds and the farmer J. F. ORMROD, National Agricultural Advisory Service .....	861
A commercial viewpoint R. L. HARPUR, Fisons Pest Control Ltd., Cambridge .....	865
Discussion .....	871

Session X A

VEGETABLES

Discussion .....	872
------------------	-----

Session X B

PRACTICE OF MINIMUM CULTIVATION

Agronomic aspects of direct drilling R. S. L. JEATER, I.C.I., Jealott's Hill Research Station, Berks .....	874
The weed problem G. W. CUSSANS, A.R.C. Weed Research Organization .....	884
The soil problems of minimum tillage PROF. E. W. RUSSELL, Reading University .....	890
Discussion .....	894

Session XI

Effect of herbicides on soil micro-organisms PROF. W. W. FLETCHER, University of Strathclyde .....	896
Discussion .....	907

DELEGATES' MEETING

DELEGATES' MEETING	Page
Minutes .....	909
Secretary's Report .....	913
List of Delegates .....	928
<b>ERRATA</b>	
Corrections to Volumes 1 and 2 .....	945
<b>INDEX</b> .....	946