THE WEED SOCIETY/ OF NEW SOUTH WALES

c/o Department of Agriculture,
State Office Block,
Phillip Street,
Sydney. 2000.

[redacted]

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OFFICE-BEARERS AND COMMITTEE MEMBERS 1971/72

PRESIDENT:	Mr. A. D. Mears Dept. of Agriculture, (Phone: 20661)
VICE-PRESIDENT:	Dr. P.W. Michael, Dept. of Agronomy, University of Sydney. (Phone: 660-0522)
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COMMITTEE:	Dr. B. Brown, Messrs. K. Green, A.N. Johnston, L. Minter, J. Strang, J. Swain, R. Truman, K. Watson and P. Weiss.

CHEMICAL WEED CONTROL

(Presidential Address given by Mr. A.D. Mears at the Annual General Meeting on February 24, 1971.)

Chemical weed control methods have been made complex because of the many chemicals used, and the sophistication required in their use. There is no real chemical or agronomic evidence to suggest that this trend will be halted within the near future. There may be need to restrict the increase in the number of chemicals used. Pressures from many groups are pointing an accusing finger at herbicides. As well, the real problem of the user needs to be recognised. If the present rate of new chemical registrations continues, users will require a compendium to select the correct herbicide for a particular use.

With this background, I intend to spend some time discussing the development of chemical methods of weed control and the problems confronting each of us, researcher, administrator, extension worker and user. I want in this brief time to look at this matter as an individual with specialised experience in the subject. For these reasons I will not outline any official viewpoints but rather draw on my experiences to make comments and draw some conclusions.

The Past.

Early methods of use of chemicals such as arsenic, sulphuric acid, kerosene and other petroleum fractions were clumsy, unsophisticated and to some extent dangerous to the user. Despite a low level of selectivity, a great deal of arsenic and kerosene is still used and new chemicals have not completely replaced them.

Other inorganic materials came into use without any great increase in selectivity or sophistication of use, but mammalian toxicity was reduced. These chemicals are again being replaced slowly for use in non-selective situations.

Undoubtedly the first real steps towards sophistication and reliable selectivity was the discovery of the plant hormones 2,4-D and MCPA. These two synthetic plant auxin-like substances were the fore-runners of many similar chemicals. They did, however, emphasise the then urgent problem of controlling broad-leaved weeds in gramineous crops. On the debit side they have almost certainly resulted in an increase in groups of weeds which require them, or the more common of them, to be used at rates which do not allow a suitable level of selectivity. In some crops they were, of course, of limited use and in many areas may have accentuated the development of grass weed problems by reducing competition from broad-leaved weeds.

Development of many other herbicides belonging to different chemical groups allowed a considerable expansion of control of weeds in new crop

types and of the plant hormone resistant weeds in gramineous crops. While selectivity of plant hormones rested on simple factors of size of leaf, morphology of plant and inter-species reaction to the chemicals, the new groups introduced concepts of solubility, soil type, incorporation differential absorption, and other factors.

These new chemicals opened up new vistas because of their ability to provide residual weed control.

It is of course in the past that problems of herbicide residues became of importance and compromises were, and are, necessary with respect to crop rotation. Thus their strength is also a weakness and efforts have already been made, on agronomic grounds, to find other chemicals with a shorter soil life, or methods which will assist rapid break-down. It seems that a change in rotation is not generally considered to be a suitable alternative.

Along with the increasing efficiency of herbicides, both in terms of crop plant safety and weed killing, has come an increase in the sophistication of their use. These newer chemicals can be chosen and used to kill, or control, both grass and broad-leaved weeds in broad-leaved and gramineous crops with reasonable selectivity.

Probably the most interesting group of chemicals developed has been the bipyridyls which have no, or very limited soil life. Perhaps these have taken the process too far as in many cases they rely on a single germination of a high proportion of weed seed. This does not always occur.

The Present.

So, we have a choice of upward of one hundred different chemicals which we might use for any weed problem. These range from non-selective contact and soil-active materials to highly selective chemicals capable of taking closely related weeds species from a crop species. We can remove wild oats from wheat, barnyard grass from rice, skeleton weed and other broad-leaved weeds from lucerne, and if we try very hard, cockle burr from soybeans with 2,4-D.

On the other side of the coin, we are building-up serious weed problems in some situations. Among these are solanaceous weeds in solanaceous crops, couch grass in some cereals, and many others. We have also run into residue problems, been accused of poisoning fish, wild life, and there are hints of abnormal foetuses, and human ills of a myriad kind. We have created major extension problems for government and company workers, been accused of killing cotton and other crops at imaginative distances, reducing apple exports and increasing disease incidence, ruining cigarettes and almost everything anyone opposed to chemicals thinks may be appropriate.

There is of course an element of truth in most of these direct and indirect claims. I would suggest that several issues merit our most earnest efforts in the future.

The Future.

It is patently obvious that there is an urgent need to answer many of these problems, and also continue to improve our use techniques. To ignore the problems would be unrealistic and almost certainly deny the community a useful tool in the major long-term effort of increased food production.

The chemicals used as herbicides can also become useful tools in vegetation management and already some workers are studying new groups which have actions similar to giberrellins and kinetins.

Problems which I feel require urgent action fall into several groups, the plant, the chemical, methods of extension and education.

PLANTS: Already some classic studies have been undertaken demonstrating the time of weed freedom required to remove crop competition. This has been studied in beans and maize and a period of about 50 to 60 days is indicated. The competition of wild oats, in wheat, under Canadian conditions, is most pronounced up to the four - five leaf stage.

Studies are required to establish the levels of weed infestation which will allow economic use of herbicides. I am firmly of the opinion that 100% weed control in crops is not cecessary and is an expensive and unrealistic goal.

Too short a term of weed control in crops can lead to later adverse competition and to harvest difficulties in some situations.

Our further work must, I believe, provide a better understanding of crop ecology and endeavour to develop weed control systems which use herbicides. I think that at present we tend to regard the herbicide as the system, rather than as part of it.

CHEMICALS: It is important that we continue to develop new chemicals for use as herbicides and as vegetation control agents. I would in this regard ask for a much better understanding of the behaviour of these chemicals with respect to the total environment as well as their use as herbicides. This deeper understanding, combined with a better understanding of crop ecology can reduce the many problems already facing us.

I visualise that it is essential to develop our expertise of the use of herbicides to the point at which minor differences in a weed situation can require a discreet change in attack. This does not imply that mixtures of herbicides can not provide a satisfactory answer. With each new problem I meet, I become increasingly aware that the development of herbicide mixtures based on sound definition, not on "shot-gun" principles, is a necessary and progressive step forward.

EXTENSION: No matter how good the knowledge of the researcher, it is useless unless available and useable by the end user. I almost apologise for

this rather axiomatic statement. You will of course be fully aware that despite its recognition by most people, many do not observe its truth.

I want several things:

(a) better understanding of the individual chemicals and their relationship to the problem;

(b) better knowledge available to the end user;

(c) honesty in advice to users by sales personnel who are prepared to admit their product is not suitable for a particular use;

(d) labels which are simpler and supported by suitable technical advice both verbal and written. Let us be sure the user can "read and heed the label."

EDUCATION: Education at all levels is required to achieve the principles and put them into practice. At present this is developing, but is it fast enough? good enough? and wide enough? I cannot truthfully answer my questions in the affirmative. A quick examination of the situation reveals that few formal steps have been taken in this direction.

A University has appointed a lecturer with a heavy commitment to weed science. The content of agricultural college courses in respect of weed science is spasmodic and depends on the interest in it of individual principals and lecturers, and on the availability of a suitably qualified lecturer. In the main, together with technical colleges the information given can often only be defined as recipes, not science. At the secondary levels, recognition is growing, but depends largely on the attitudes of individual teachers.

In-service-training by departments, councils and companies occurs, but one must query if much is not designed only to answer really immediate organisational problems. This in itself is commendable, but greater depth is required. I would like to support the training of government extension officers in weed science. These workers have an enormous need for good information and a deeper understanding of chemical weed control methods.

An almost ignored area of training is at the user level, but I appreciate the excellent efforts of government and some companies to train end users. The greatest effort is aimed at local government and departmental users of herbicides. We need to increase our efforts in this regard and also in the training of farmers.

CONCLUSION.

Herbicides are, and are likely to continue to be, useful tools in agricultural production, maintenance of transport arteries and in many other situations. I believe it is urgent in view of economics, human and environmental safety and increased production, to, individually and collectively, direct our attention towards the solution of the problems I have discussed. We must increase our efforts in understanding the problems of better use of chemicals in answering critics and in education at all levels.

THE FUTURE OF AQUATIC WEED CONTROL

W.P.Dunk, Chief Irrigation Officer,
State Rivers and Water Supply Commission, Victoria.

(Talk given at the Symposium on Water Weed Control, Grafton, March 9, 1971.)

Aquatic weed control is developing in scope and importance; there are two main reasons for this.

First, the extent of the problem is better appreciated these days. The cost of aquatic weed control would run into millions of dollars per annum for Australia as a whole. The State Rivers and Water Supply Commission in Victoria, alone, spends $1/3 million annually on chemical control measures for aquatic weeds and substantially more if mechanical measures are included.

Second, water for recreation is now regarded as a valuable asset, and so there is a strong demand to keep lakes and reservoirs clear of aquatic weed growth to add to their recreational value.

The present trend towards increasing emphasis on aquatic weed control problems might be expected to be continued in future years.

Aquatic Weeds Present a SPECIAL Problem.

When considering aquatic weed control the first thing to bear in mind is that this is a special problem which generally requires special chemicals and special application methods for a satisfactory solution. These special features of aquatic weeds include the following:-

1. Water weeds are often hard to get at. Access is difficult and aerial or water borne equipment might be required to apply the chemicals, alternatively, special roads or access tracks could be necessary.

2. Control is difficult with available chemicals, requiring high rates of application. This results from the protective effect of the water medium in which the plants grow. Emergent weeds for example have the roots and growing crowns covered in water and so a mobile translocated herbicide is required. Submersed weeds are completely covered with water and there is no way of applying existing chemicals to the submersed leaf. Specially formulated chemicals are required to overcome the diluting and protective effect of the water medium in which these plants grow.

3. Water weeds will fight back, they have tremendous recuperative powers. They grow and spread with great rapidity both vegetatively and by seed. Ten plants of water hyacinth for example, can multiply to 65,000 solely by vegetative means in 8 months. A single head of cumbungi may have 700,000 seeds, 95% of which are viable.

   With most submersed weeds, any piece broken from the plant will develop roots in water.

4. A further problem, of particular importance with water weed control, is pollution of water after treatment. This has been our prime concern in Victoria for over ten years now, and it would be fair to say that in our research programme we have been more concerned with finding safe treatments which can be used in water supplies, than we have with improving effectiveness or reducing cost of treatments.

   The only answer to pollution in these situations is to KNOW WHAT YOU ARE DOING, to know precisely the effects chemical programmes will have on humans, stock, irrigated crops, fish and wildlife.

   Based on this knowledge safe operating limits must be set and the spray programme designed AND CONTROLLED to keep within these limits.

THE FUTURE.

As indicated above any aquatic weed control programme - and there will be many more developed in the years ahead - must be based on KNOWLEDGE, SET STANDARDS AND CONTROL. It will be necessary for these requirements to be built in to this work if problems are to be avoided. Bearing in mind the possibilities of water pollution which exist from these sources, it is to be expected that Government Agencies could provide this information and control in future; it is highly desirable that they should do so.

The other prediction one might make is that better, safer herbicides, specifically designed for use on aquatic weeds will become available. These herbicides will be specially formulated for use in water, they will be designed to stick to the submersed leaf, and after entry into the plant they will be designed to break down to a harmless, non toxic degradation product.

At present we are making the best use of the available chemicals, chemicals which were designed initially for use in air, not in water. This is far from ideal, we actually need chemicals formulated and designed to overcome the protective effects of the water medium within which aquatic plants grow.

There are signs that these chemicals could be coming forward now. In particular, laboratory and field experience with basic aluminium salts of well known terrestrial herbicides such as endothal, diquat, silvex, 2,4-D, dalapon and TCA show great promise. If they live up to expectations, these chemicals, being tested by the 3M Company in Minnesota will present a great step forward in the field of aquatic weed control; this work should be carefully watched by all concerned with the control of aquatic weeds. The solution to our problems could well be just around the corner.

N O T E S

Mr. K. Watson will be representing our Society at the third Conference of the Asian-Pacific Weed Science Society to be held in Kuala Lumpur in June this year.

Arrangements are in hand for a post-graduate training course for weed agronomists, to be held at the Camden Farms, University of Sydney, from the 9th to the 19th August, 1971. The Course is being run by the Extension Board of the University of Sydney, in association with the Australian Weeds Committee. Further details may be obtained from Dr. P. W. Michael, University of Sydney.

Mr. J. Strang of the Department of Agriculture, State Office Block, Phillip Street, Sydney, would appreciate contributions for the Australian Weeds Research Newsletter, as soon as possible.
