

FORMATION OF THE AVCA HERBICIDE RESISTANCE ACTION
COMMITTEE (A.H.R.A.C.)

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Summary. Weed species showing resistance to herbicides have now been identified in 13 countries throughout the world and involve 58 species and 7 herbicidal groups, with 4 instances of herbicide resistance being reported from Australia. In July 1986 the Australian agricultural chemical industry under the auspices of the Agricultural & Veterinary Chemical Association formed a Herbicide Resistance Action Committee, to co-ordinate and formulate the Industry's approach to all present and future cases of herbicide resistance. The aims of this Committee and the current activities are listed.

INTRODUCTION

Shortly after the introduction of herbicides into commercial use in the U.S.A. in the late 1940's, there were predictions that repeated use would select for resistance (1, 2) as had happened with all other groups of pesticides. Agriculturalists were advised to rotate herbicides to prevent the appearance of resistant weeds (1). In most instances this advice was not heeded and large areas of monoculture were established. The first report of herbicide resistance in the U.S.A. was in 1970 (3), where simazine had been used for the control of common groundsel, *Senecio vulgaris*, once or twice annually since 1958 until 1967 when atrazine was included.

Since this initial report of herbicide resistance many other instances have been identified. A recent review of herbicide resistance throughout the world by H. LeBaron has documented the present situation. (H. LeBaron, pers. comm., 1987). The triazines are the herbicides to which most weeds have developed resistance. So far 36 broad-leaved species are known to be resistant to triazine herbicides; these are located in 32 states of the U.S.A., 4 provinces of Canada, and in 11 other countries of which 9 are in Europe. There are 13 triazine resistant grass species, and these are located in 10 U.S.A. states, 1 Canadian province, and 8 European countries.

Apart from the triazines, weeds have developed resistance to six other herbicides. Eleven species are resistant to these 6 herbicides, and they are located in 3 states of the U.S.A., and 8 other countries, 4 of which are in Europe. LeBaron lists two instances of herbicide resistance in Australia: annual ryegrass, *Lolium rigidum*, resistant to diclofop-methyl, and barley grass, *Hordeum glaucum*, resistant to paraquat. Two further cases of herbicide resistance have been reported, in Australia: paraquat resistant capeweed, *Arctotheca calendula*, and diclofop-methyl resistant wild oats, *Avena fatua* (4).

THE A.V.C.A. HERBICIDE RESISTANCE ACTION COMMITTEE

The agricultural chemical industry associations throughout the world have actively taken up the resistance challenge and are providing the necessary organisational structure.

The Australian agricultural chemical industry under the auspices of the Agricultural and Veterinary Chemical Association formed a Herbicide Resistance Action Committee (A.H.R.A.C.) in July 1986. This committee preceded the formation of similar committees in Denmark, and more recently in the U.S.A.

At this time the International Association of National Associations of Agro-Chemical Manufacturers, GIFAP (the French acronym), have not formed a herbicide resistance committee, although fungicide and insecticide committees were set up in 1980 and 1984 respectively. The insecticide committee was preceded by a less formal body in 1979 called the Pyrethroid Efficacy Group (PEG).

A.H.R.A.C. was formed to co-ordinate and formulate the agrichemical industry's approach to all present and future cases of resistant weeds. In this respect it differs from the insecticide (A.I.R.A.C.) and fungicide (A.F.R.A.C.) committees which each have sub committees responsible for specific groups of chemicals.

Membership is open to companies with commercial or potential herbicides that control a weed species in which resistance has been identified. The present committee contains representatives from ICI, Ciba-Geigy, Hoechst, DuPont, Dow and Schering.

Aims of A.H.R.A.C.

1. To identify and monitor all cases of resistance by weeds to all classes of herbicides.
2. To support and liaise with centres for screening and testing for resistance.
3. To generate interest within the scientific community; to allocate resources for investigating resistance with a view to discovering fundamental mechanisms and practical means of control.
4. To formulate and promote use strategies in the light of information available from all sources likely to minimise the risk, delay the onset of resistance, and provide practical control.
5. To develop a united and responsible industry response to cases of resistance.
6. To liaise with GIFAP and other interested bodies via the Secretariat.

Current activities of A.H.R.A.C.

1. To set up an inventory of all products, either commercial or under development, (those in which 2 year feeding studies have commenced), for the control of species that have developed herbicidal resistance.

The inventory will include:

- * company name
 - * code number of active ingredient
 - * chemical group
 - * common name
 - * trade name
 - * area of development (weed/crop)
2. To determine the distribution of resistant populations of annual ryegrass and to monitor the occurrence of new populations by collecting samples from properties throughout W.A., S.A., Vic. and N.S.W. These samples were collected in 1986 and their resistance to herbicides is presently being

tested at the Waite Institute in Adelaide.

This involves testing by bioassay in which seed of ryegrass is germinated in light at fluctuating temperatures of 15-20°C, and when four days old transferred to petri dishes containing filter papers soaked in various levels of diclofop-methyl. The length of the coleoptile is measured, and surviving seedlings are counted.

The results from these bioassays are analysed and survey techniques are being used to identify the spraying programs that have resulted in resistance using the paddock histories on the respective farms.

3. A.H.R.A.C. in conjunction with personnel from Rutherglen Research Institute and Wagga Research Institute are conducting a series of trials on a property at Howlong, N.S.W. where a population of annual ryegrass has developed resistance to a range of herbicides. The research area is divided into two sections:
 - a. In one area 20 herbicides from various chemical groups will be evaluated for control of ryegrass in wheat, lupins, or a sub-clover pasture, and
 - b. The other area will be used to develop strategies for the longer term management of the resistant population.
4. Information in respect of the present situation regarding resistant weed species is being distributed through many avenues with members of the committee being available to talk to interested groups, release press statements and prepare an information leaflet.
5. Support research projects carried out at various institutions throughout Australia. These include:
 - a. The investigation of the mechanism of herbicide resistance in annual ryegrass
 - b. Studies on the ecology of the resistant annual ryegrass and the development of integrated means of control
 - c. The determination of the genetics of resistance in annual ryegrass
 - d. To determine whether there is a variation in levels of resistance in individuals as opposed to populations of annual ryegrass
 - e. Studies on the levels of resistance of *Avena fatua* to diclofop-methyl in W.A. and possibly other herbicides.
6. Members of the Committee are investigating aspects of resistance specific to their own compounds through the overseas resources of their respective companies.

A.H.R.A.C. believes that through co-operation between the companies, farmers and researchers, appropriate and credible strategies can be devised to manage herbicide resistant weeds and hence preserve the efficiency and cost benefits of herbicide usage.

REFERENCES

1. Abel, A.L. 1954. Proc. 1st Weed Cont. Conf. pp. 249-255.
2. Harper, J.L. 1956. Proc. 3rd Brit. Weed Cont. Conf. 1, 179-188.
3. Ryan, G.F. 1970. Weed Sci. 18, 614-617.
4. Powles, S.B. 1987. Proc. 8th Aust. Weeds Conf. (In press).