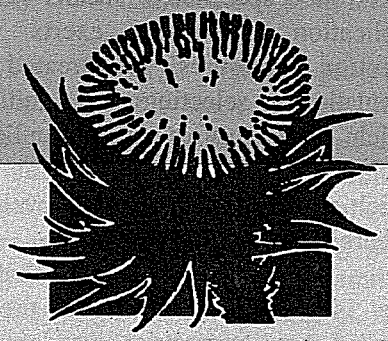
A Good Weed



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The future of the NSW rice industry appears bright, however, this outlook may be darkened somewhat with the knowledge that it is now facing the threat of herbicide resistance. According to Richard Graham, this situation could result in aquatic weeds inundating crops, in turn dramatically reducing yields and income, and possibly lowering land values. The dilemma is that one herbicide is relied upon to control all three of the main aquatic weeds of rice.

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..... Weed Dilemma in NSW Rice

The New South Wales rice industry is a dynamic and progressive industry located on the Riverine Plains in the south west of the state. It produces about 1 million tonnes of rice annually which comprises most of the nation's crop.

Approximately 90% of the crop is exported generating sales of around $234 million in 1993 (Coombs 1994). Total gross returns following value adding are approximately $330 million pa, making this one of the Riverina's most valued industries (Anon 1992).

The future of the industry appears bright, however, this outlook may be darkened somewhat with the knowledge that it is now facing the threat of herbicide resistance. This situation could result in aquatic weeds inundating crops, in turn dramatically reducing yields and income, and possibly lowering land values.

The difficulties associated with herbicide resistance, and the use of a knowledge of weed biology to overcome such problems is described by Norris (1992) who suggests that "at some point, perhaps when our technological crutches (herbicides) have proved to be more hazardous than society will tolerate, have created more problems than they solve, or have been taken away from us, weed science will return to a biology-based approach to weed management into which herbicide use is integrated". It is difficult to know when such events could occur, but the incidence of herbicide resistance is increasing. Australia-wide, resistance has been detected in at least five terrestrial weed species (Powles and Howat 1990), with several more terrestrial and aquatic weeds being detected since 1990.

The rice industry in New South Wales is facing a major problem in that to control its three main aquatic weed species - *Cyperus difformis* (dirty dora), *Damasonium minus* (starfruit) and *Sagittaria montevidensis* (arrowhead) - it is almost totally reliant on one herbicide, and that is Londax® (bensulfuron).

Londax® is a member of the sulfonylurea group of herbicides which act by inhibiting acetolactate synthase activity and the synthesis of branched chain amino acids within the plant, eventually stopping plant growth (Ashton and Monaco 1991). This site specificity means that its application potentially exerts intense selection pressures on treated weed populations, selecting for individuals which may survive such applications. Such activity is one of several criteria which are precursors for the development of herbicide resistance.

Swain (1973) suggests that where rice is sown aerially into previously flooded bays terrestrial weeds such as *Echinochloa* spp. are rarely a problem. However, the aquatic weeds *D. minus* and *C. difformis* are likely to be far more serious weeds under this management system.

Over 90% of Riverina farmers sow their rice aerially and thus aquatic weed occurrence is now widespread. Their existence along with the extensive and almost exclusive use of Londax® for their control makes the industry vulnerable to herbicide resistance and a subsequent explosion in weed numbers.

Research recently conducted by the author identified resistant samples of *C. difformis*, *D. minus* and *S. montevidensis* from rice farms across the Riverina. The problem has thus arrived. However, resistance to other herbicides used for weed control in rice in this region has not yet been detected.

NSW Agriculture advises on the use of other establishment techniques and herbicides in addition to Londax® as alternative strategies. However, the former has disadvantages such as increased workload, greater risk of poor crop establishment and greater difficulty in obtaining good terrestrial weed control. The latter is restricted by the fact that there are only two other chemicals registered for the control of *C. difformis*, being thiobencarb (Saturn®) and MCPA, with MCPA also giving control of *D. minus* and *S. montevidensis*. The use of these two chemicals may also pose difficulties.

For example, thiobencarb may have a narrow application window and water management may be a problem with MCPA.

Because present alternatives to Londax® are limited, an understanding of the biology of these aquatic weeds is the only way to ensure their long-term control.

The author's current project aims to address this issue in part, by elucidating the biology of *D. minus*, an emergent annual weed which is endemic to Australia. McIntyre and Newnham (1988) regard this species as being the most significant rice weed in the family Alismataceae. An understanding of its dormancy, germination characteristics and population dynamics will enable the development of an integrated management strategy for control. Such a strategy would in the long-term supersede the unsustainable herbicide-only based control program currently used.

The advent of herbicide resistance will force rice farmers to adopt more complex farming systems based on an understanding of the biology of relevant weeds. This knowledge then needs to be combined with biological control, hygiene and the strategic use of chemicals to develop an integrated weed management program. Such a program will help ensure the long term survival of this highly important, multi-million dollar industry.

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The advent of herbicide resistance will force rice farmers to adopt more complex farming systems based on an understanding of the biology of relevant weeds.

Damasonium minus *(starfruit) plant and fruit (from Flora of NSW, 1993, vol 4).*

This edited article was written by Richard Graham, a postgraduate student studying at the School of Agriculture, Charles Sturt University (CSU), PO Box 588, Wagga Wagga, 2678. His supervisors are Prof Jim Pratley (CSU), Assoc Prof Stephen Powles (University of Adelaide) and Mr PD Slater (CSU).

Funding has been provided by DEET and Du Pont (Australia) Ltd.

Invaders from South America

Stipa charruana, Stipa leucotricha, Stipa caudata, Stipa megapotamia, Stipa hyalina, Piptochaetium montevidense, Nassella trichotoma, Nassella (Stipa) neesiana.

The list reads like a vegetation survey of South American stipoid grasses. In fact, all these species are naturalised in Australia. How did these grasses enter the country and how long was it before they were identified?

The most well known of these grasses, serrated tussock (*Nassella trichotoma*), was possibly imported in hay or in wool from South America around 1900 but it was not recorded in Australia until 1935. *Stipa charruana* and *Piptochaetium montevidense* have only been recently recorded in Victoria by biologist Geoff Carr but both occur in dense local stands indicating their presence for a considerable period.

There are a host of other South American grasses that would thrive in Australia....

However, we have no information about how they entered Australia and no direct evidence to suggest how long they have been here.

There are a host of other South American grasses that would thrive in Australia but we have no chance of controlling their import if we have no idea how they are getting here.

I am currently studying the biology of *Nassella neesiana* (Chilean needle grass) for my PhD project. *Nassella neesiana* (synonymous with *Stipa neesiana*) is becoming a serious pasture and environmental weed in south eastern Australia. It is a tussocky perennial, is very invasive and forms dense stands in pastures, bushland and parkland.

Chilean needle grass is native to South America and occurs in Chile, Argentina, Uruguay and southern Brazil between latitudes 25° and 55° South. It grows in areas with weather conditions similar to those found in parts of Australia. It has also become a problem in New Zealand and is locally common in several European countries, South Africa and the USA.

This grass was initially identified on the Northern Tablelands of NSW and in the Melbourne district in the early 1940's. It is possible that seeds were carried from South America on contaminated sheep or in wool.

In NSW, it has spread to the Sydney, Cowra, Bathurst and Goulburn districts and to the ACT. Recently, it was identified near Coonabarabran on the western slopes of the Great Divide. In Victoria it is found on the volcanic plains in the Melbourne, Geelong, and Warrnambool districts and in the Midlands around Ballarat, Castlemaine, Maryborough and Benalla. Moving westwards, it has been discovered in south eastern South Australia and in the Adelaide Hills.

My study has revealed several reasons for this plant's success in Australia. The sharp pointed seeds readily attach to livestock, machinery and clothing providing an efficient seed dispersal mechanism. Each plant has the

potential to produce large numbers of viable seeds during the warmer months. The plant displays opportunistic flowering dependent on the timing and amount of rainfall. Furthermore, asexual seeds are produced underground at the base of the tillers which may function as a backup in the event of unsuccessful flowering.

As a result of this profuse seeding, a large bank of viable seeds builds up in the soil (e.g. 4000/m^2). These seeds remain viable for a long period (no significant decrease in the seed bank has occurred over 2 years even though further seed input was prevented). It is from this seed bank that recruitment takes place. The seeds readily germinate in autumn and spring with approximately 85% of the seedlings surviving for six months. These seedlings produced flowers of their own in that time. Adult plants are long lived and successfully compete against pasture species in both wet and dry years.

The biology of Chilean needle grass is well suited to the recommended control measures. The large seed bank is persistent and will not germinate beneath a canopy cover. Therefore, killing the existing vegetation with herbicides or cultivation will simply stimulate massive germination of Chilean needle grass. The seed bank will probably last longer than the person operating the spray rig or the tractor.

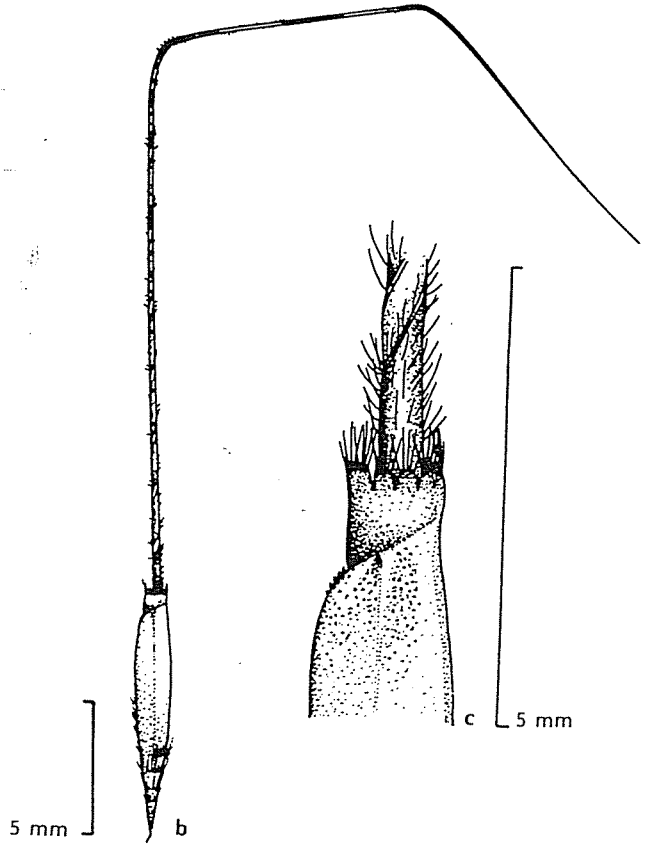
I believe that Chilean needle grass will eventually dominate large areas of south eastern Australia. Control and eradication using conventional means are unrealistic, thus, utilisation appears to be the only possible approach.

Although anecdotal evidence suggests that Chilean needle grass is of poor feed value for stock, at certain times of the year it does produce good quality feed. An example of this is the production of leaf with a crude protein content of 18% during late winter which is traditionally a time of food shortage on the Northern Tablelands.

Current experiments are aimed at determining the quality, quantity and palatability of Chilean needle grass throughout the year. This plant is here to stay so lets learn to live with it!

Control and eradication using conventional means are unrealistic, thus, utilisation appears to be the only possible approach.

Nassella neesiana *can be distinguished from native* Stipa *species by the crown of hairs at the junction of the awn and the seed (drawing from Wheeler, Jacobs and Norton (1984) Grasses of New Soth Wales).*



Mark Gardener is a PhD student in the Department of Botany, University of New England (UNE), Armidale 2351. His supervisors are Associate Professor Wal Whalley and Dr Brian Sindel of UNE and Mr Mick Duncan, NSW Agriculture, Armidale. *Funding is provided by the Meat Research Corporation.*

Chemicals in a Bushland Weed Management Program

This summary article by Louise Brodie from the National Trust is one of several featured in this edition of A Good Weed which were given at last year's Society seminar on Urban Weed Management.

Whilst most bushland regenerators use herbicides, many are ambivalent regarding their use. Concerns include the environmental fate of herbicides, effects on all living organisms (including the user), and effects of additives. However, when used correctly and wisely, herbicides are efficient and effective.

..when used correctly and wisely, herbicides are efficient and effective.

Control of woody weeds by cutting and painting or stem injection has many advantages over laboriously digging out all roots. Obviously, it is quicker. In addition, retention of the roots, although dead, minimises erosion.

Spraying of herbicides can control weeds over a large area cheaply and quickly when compared with hand removal. However, regenerating native plants may be affected.

Knowledge of different types of herbicides will allow an appropriate choice of herbicide. An experienced operator can spot-spray with a non-selective herbicide.

The aims and objectives of any regeneration/restoration project are to allow native species to establish. By their very nature, weeds will be the first species to colonise an area.

Spraying on a continual basis will simply encourage more weeds to grow. To maintain an area by continual spraying does not achieve the regenerator's objectives and the work on the site should be re-evaluated.

Herbicides are a tool to control weeds. In order to use herbicides effectively, safely and within the context of improving our environment, we need to have full knowledge of how each herbicide works so that we can choose our weed control methods wisely.

We need to remember that bush regeneration is about ensuring that native species survive and are able to regenerate naturally. It is not simply about weed control.

Chemical Control - an Update

This article by Mike Barrett, Mike Barrett & Associates, Beecroft, NSW, is a summary of another paper given at the Urban Weed Management seminar.

The use of herbicides in the context of bushland weed management involves an integrated approach. Chemical control alone will not achieve long-term results in most situations.

Recently, the establishment of the Cooperative Research Centre for Weed Management Systems to develop principles and systems is confirmation of this approach. One of the research programs is based around natural ecosystems and will target weeds such as bitou bush, blackberry, bridal creeper and Scotch broom.

Some changes in labels to assist in better use of herbicides will soon include grouping according to mode of action. This is to assist in combating weed resistance.

It is important to ensure that these labels are strictly adhered to when using herbicides in order to meet the obligations one has of care! It is essential to be able to understand labels as the information provided, if correctly followed, will ensure that risks are minimised. Material Safety Data Sheets (MSDS) supply detailed toxicological, storage and environmental information.

Currently, the Farm Chemical User Training Program (FCUTP) provides a competency-based, fully accredited national certificate. This is a voluntary scheme at present.

There are several developments in this area to reduce user hazards such as closed filling systems, dry formulations which are dust-free and soluble packs. The problem of container management is also being addressed.

A recent development in application technology for woody weeds is the Low Pressure Gas (LPG) gun. This enables reduced chemical use and eliminates off-target drift and losses through run-off. It is suitable for scattered infestations of weeds such as bitou bush and lantana (see article later in this newsletter).

Are You Confused? What's Happening with Pesticide Regulation in NSW?

John Hall, Agricultural and Veterinary Chemicals Inspector, NSW Agriculture, spoke about changes in pesticide regulation in NSW at the Society's Urban Weed Management seminar last year.

In brief, he stated that: "Things are changing rapidly in the legislative area, both at State and Commonwealth levels. People using pesticides in the urban bushland situation are under the same constraints as farmers and others involved in pest control. Ignorance is no excuse for incorrect use. However, it is recognised that weed control in the urban bushland situation does have some problems which are unique."

The topics covered in his talk included: 1. National Registration Authority clearance procedures, 2. relationship between Commonwealth and NSW legislation, 3. transfer of the Pesticide Act to the Environmental Protection Authority,

People using pesticides in the urban bushland situation are under the same constraints as farmers and others involved in pest control

4. administration of permits and orders, 5. new restrictions on claims and advertising, and 6. changed claims provisions under the Code Act.

Contact John at NSW Agriculture for more information. ❐

What about Volunteers? Volunteer Bushcare

Virginia Bear, Blue Mountains City Council, comments on Bushcare volunteers in the last of the Urban Weed Management seminar papers.

Volunteer bush regeneration has a very positive image and has generally been well received by land management authorities and the community.

The activities of land management authorities such as local councils are covered by acts of legislation. These acts usually apply to volunteers working for those authorities just as they would to paid staff.

People involved with volunteer bushcare need to be aware of the legislation and how it might relate to their situation. Other issues such as insurance also need to be considered.

Besides improving the condition of bushland, bushcare programs can have educational, therapeutic and social benefits for the participants...

Volunteer bush regeneration has a very positive image and has generally been well received by land management authorities and the community. Besides improving the condition of bushland, bushcare programs can have educational, therapeutic and social benefits for the participants, but only if they are properly organised and supported.

Bushcare is still a fairly new field. A climate of co-operation exists between organisations in the greater Sydney region, such as local Councils, National Parks and Wildlife Service, Catchment Management Trusts and Landcare, where information and experiences are shared. Some 'grey areas' regarding legislation have been identified. Two major ones relate to herbicide applicators and the level of training and supervision required.

Acts that do or could relate to bushcare volunteers include:

- Occupational Health and Safety Act 1983
- Pesticides Act 1978
- Soil Conservation Act 1982
- National Parks and Wildlife Act 1974
- Endangered Fauna Interim Protection Act 1991
- Heritage Act 1977
- Bushfires Act 1949
- Clean Waters Act 1970
- Clean Air Act 1988
- Local Government Act 1993
- Noise Control Act 1975

A successful volunteer bushcare program should be aiming for a balance between adequate levels of training and organisation so that volunteers can work safely and effectively and encouraging the widest possible participation. If potential problems are identified and addressed, this is certainly achievable. ❐

Weeds in the Asian-Pacific Region

In this article, John Swarbrick reports on The 15th Asian-Pacific Weed Science Society Conference (APWSS) which was held in the Hotel Dai-Ichi in Tsukuba Science City (northwest of Tokyo, Japan) from July 24th to 29th 1995.

The Council of Australian Weed Science Societies (CAWSS) paid for my air fares between Brisbane and Tokyo, and the Organising Committee of the Conference waived registration fees and provided free accommodation in the University Guest Hotel during the Conference. I am very grateful both to CAWSS and the Organising Committee for this level of support, without which I could not have afforded to represent Australia at the Executive Committee meeting and the conference.

Report on the executive committee meeting

The Executive Committee consists of the office bearers (President, Vice-President - now President-elect, Treasurer, Secretary and Past-President) and a delegate from each national weed science society. Delegates attended from Australia, Bangladesh, China, India, Indonesia, Japan, Korea, Malaysia, Nepal, New Zealand, Philippines, Sri Lanka, Taiwan, Thailand and USA. The delegates from Laos, Myanmar and Vietnam unfortunately could not attend.

The Executive Committee meets before the conference, and its decisions must be ratified by the members as a whole during the conference. The main business of the Executive Committee meeting in 1995 was as follows:

14th APWSS conference As Past-President I reported briefly on the Brisbane Conference in 1993. The 12.5% share of the profits from that conference was welcomed by APWSS, which it has financially secured. This money was not drawn upon by the Organising Committee of the 15th Conference and remains available to fund future APWSS activities.

President's report Dr Ishizuka (Japan) proposed that the Vice-President be renamed the President-Elect (agreed). He foreshadowed that profits from the 15th Conference would be used to fund the publication of papers by members from developing countries in the Japanese Weed Journal and to establish a weed science training course at a regional University (probably Katsetsart in Thailand). A special effort had been made to sponsor at least one weed scientist from each of the less affluent APWSS countries to the 15th APWSS Conference, including Nepal and Bangladesh.

..the large number of Australian members reflected the location of the previous conference..

Secretary's report Dr Yamasue (Japan) noted that the membership numbered 499 and that the large number of Australian members reflected the location of the previous conference. He reported that since one of the two sponsored developing country students could not get a visa to enter Japan in time for the conference there will be three sponsored students in 1997. Dr Yamasue noted that the Secretary was normally too busy to prepare newsletters and proposed the appointment of a

newsletter editor. This was agreed, and I was appointed to this position.

Treasurer's report Dr Rahman (New Zealand) noted that APWSS is now in a good financial position thanks to the 14th Conference. APWSS funds totalled US$9,543 and NZ$20,387. All overseas accounts have been or will be consolidated into interest-bearing New Zealand accounts.

Minutes of all previous Executive Committee meetings These had been collected by the Past-President, and were passed to the Secretary for safe keeping.

New rules The updated set of Rules developed by the Past- President were briefly discussed and finally approved.

Future APWSS conferences The 16th APWSS Conference will be hosted by the Malaysian Plant Protection Society in Kuala Lumpur in September 1997. The Weed Society of Thailand was the only one to put forward a formal bid for the 17th APWSS Conference in 1999. This bid was accepted, and the 17th APWSS Conference will be probably be held in Phuket. The Weed Science Society of the Philippines expressed interest in hosting the 18th APWSS Conference in 2001.

It is recognised that traditional food production systems are not keeping up with growing demand in the region and that new weed problems are one of the causes.

Office bearers The APWSS office bearers from 1995-1997 are as follows:
President: Dr Ahmed Anwar Ismail, Fundamental Research Division, MARDI, GPO Box 12301, Kuala Lumpur, Malaysia; *Secretary*: Dr Baki Haji Bakar, Botany Dept, University of Malaya, 59100 Kuala Lumpur, Malaysia; *Treasurer*: Dr Anis Rahman, Ruakara Agricultural Research Centre, PB 3123, Hamilton, New Zealand; *Past-President*: Dr Kozo Ishizuka, Institute of Applied Biochemistry, University of Tsukuba, Ibaraki 305, Japan; and *President-elect*: to be advised by Thailand.

The Newsletter Editor is Dr John Swarbrick, Weed Science Consultancy, 15 Katoomba Crescent. Toowoomba, Queensland 4350, Australia.

Extra copies of the report of the 15th APWSS conference Extra copies of the abstracts and of the reports are available from the Secretary of the Organising Committee (Dr Y Yamasue, Dept of Agronomy, Faculty of Agriculture, Kyoto University, Kyoto 606, Japan). Copies of the abstracts cost Yen 5,000, and of parts IA and IB of the Report, Yen 10,000 each. The price of extra copies of Part II is not yet known.

Report on the conference

Over 450 delegates from 20 countries throughout the Asian-Pacific region as well as from Europe and North and South America attended the 15th APWSS Conference in Tsukuba City, Japan in July 1995. One hundred and twelve oral presentations as well as symposium and plenary papers and 70 posters informed the delegates. During his opening remarks the President (Dr Ishizuka) raised the need for a regional weeds journal, but this suggestion was not taken up.

One of the most important papers in the opening session was by Dr Jitsanguan of the Philippines, who spoke on the socio-economic effects of technical innovation on Asian agriculture. Despite its title this paper had important messages for every country in the region, including Australia.

Significant social changes are occurring rapidly throughout the region, including increasing populations, decreasing agricultural productivity, globalisation of supplies and markets, increasing needs for technical and managerial skills, decreasing national food security, environmental challenges to agriculture, migration from villages to cities (from food producers to food consumers), and the need to include social costs when evaluating changing agricultural systems.

Other plenary papers concerned developments in rice weed control in Thailand, USA and India.

The symposium on Innovative Weed Management Strategies for

Sustainable Agriculture also gave overviews of value to Australian agriculture. It is recognised that traditional food production systems are not keeping up with growing demand in the region and that new weed problems are one of the causes. These include new as well as more herbicide tolerant and resistant weeds and the need to reduce herbicide rates and costs for environmental and financial reasons, as well as the need to raise farm profitability to retain farmers on the land and encourage innovation.

New weed problems include the selection of flood-tolerant *Imperata cylindrica*, the shift from grasses to sedges, and the development of variable anthesis, shattering and dormant annual (in field) and perennial (in ditch) *Oryza sativa* biotypes (cf. shattercanes in sorghum in the USA). These may also appear in Australia.

Competition for water between rice farmers and urban and industrial users is already apparent and will become critical; it is already leading to the abandonment of some terraced rice cultivation in Japan.

Several papers examined the development of integrated weed management systems (IWM) in rice in the USA and in SE Asia. IWM systems need to be simple, cheap and effective if they are to be adopted.

Other developments include the breeding of transgenic rice in the USA and SE Asia, and the growing use of allelopathic residues from previous rice, barley, rye, sorghum and cover crop stubbles for weed control mainly in the USA. The latter system ties in well with minimum tillage and the use of desiccant herbicides as well as reducing soil erosion and phosphorus loss from cultivated soils.

A great many interesting papers were presented at the conference on most aspects of weed science and weed control.

One of the more interesting new technologies is the development of Jumbo Granules, the adaptation of which must have potential in Australian rice culture. As formulated for small (0.1 ha) Asian rice fields, these are 2-3 cm diameter granules containing an emulsifiable herbicide concentrate and an effervescent disperser. When thrown into the water they effervesce and the herbicide rises to the surface and disperses rapidly throughout the flooded area.

For foresters there was an interesting paper on the use of allelopathic plants in Taiwan forestry by Dr Chou. Planting kikuyu after forest harvesting reduces annual weed competition but stimulates growth of some hardwood trees. *Delonix regia*, leucaena, camphor laurel, bamboos, sugar cane, eucalypts and coffee all left inhibitory allelochemicals in forest soils.

Rapid advances are being made with herbicide safeners in the USA (Dr Farago). These are expected to extend the life of some existing herbicides and allow greater crop-in-crop selectivity. Safeners are already being factored into the development of new herbicides to increase crop safety, as well as into new herbicide technology. They generally act by increasing the rate of herbicide detoxification by the crop plant.

Dr Cotterman overviewed the management of herbicide resistant weeds and gave some case studies, as well as discussing some of the conflicts that are arising in this area.

One of the more interesting new technologies is the development of Jumbo Granules, the adaptation of which must have potential in Australian rice culture.

Dr Chen reviewed the current developments in herbicide risk assessment in the USA, including hazard identification, dose response curves, assessment and safe levels, exposure assessment, risk characterisation and ecological risk assessment.

A major conference session examined the mode of action of herbicides. The keynote speaker addressed the prospects for reduced rates of use, and was followed by seven papers on modes of action of various chemicals at low and high rates.

The session on new herbicides attracted 14 papers, largely on new herbicides for rice.

Papers on weeds in the environment and in rural ecosystems attracted 9 papers. The keynote speaker updated delegates on the rehabilitation of set-aside land in the UK by sowing various rates of mixed wildflowers.

Weed physiology and ecology was an interesting session of 20 papers. Two of the papers addressed *Vulpia* and wild oats in Australia.

The session on weed impacts and weed status attracted only four papers.

Four papers were presented in the session on noxious weeds, with speakers from Brazil, Sri Lanka, Myanmar and Laos.

Two papers considered the effects of crop-weed density and competition in rice, and a further two papers, recent weed invasions in Taiwan and Japan.

Herbicide formulation and application only attracted four papers, including information on Jumbo Granules. The status of herbicide utilization was addressed by papers from China and Vietnam.

Unless we are vigorously represented at these regional gatherings of weed scientists we risk losing recognition as a regional leader in weed science...

Herbicide behaviour in soils only attracted five papers at this conference.

Ten papers were presented on weed control in rice (6) and dryland crops (4). Two of the rice papers considered the use of no-till weed control and two soaking seeds with herbicides to improve weed control.

Benefits to Australian weed science

It is important that Australian weed scientists continue to attend and actively participate in future Asian-Pacific Weed Science Society conferences.

The Asian-Pacific area is our major market for agricultural exports and expertise and is our major overseas source of post-graduate students in weed science. Unless we are vigorously represented at these regional gatherings of weed scientists we risk losing recognition as a regional leader in weed science, technology, control and education.

I also believe that it is desirable to maintain and if possible strengthen Australian influence in the APWSS, to which end we ran the 10th Australian and 14th APWSS Conferences concurrently in Brisbane in 1993 and I have taken on the editorship of the APWSS Newsletter for the next 2 years.

Australian weed science is usually under-represented at this major regional and increasingly world-wide forum, and we risk being relegated to minor nation status unless we are more forthcoming in the future.

We must continue to give strong and visible support to the APWSS both through its Executive Committee and through its activities. We are very fortunate that Monsanto Australia continues to sponsor both the Best Paper and Best Poster Awards, and I am happy to recognise Brian Arnst's continuing involvement in this area.

The APWSS conferences provide opportunities for multiple interactions between Australian and Asian weed scientists, and although their target crops may be different, our concerns and developmental thrusts are much the same.

On a personal level

On a personal level I benefitted a lot from attending the 15th APWSS Conference in Japan in 1995. The foyers are always alive with activity and interest, the papers are informative as well as stimulative to immediate thought and later reflection.

Attendance at the Executive Committee meetings allows one to have some small influence on the development of weed science in the fastest growing region of the world. And there are the opportunities both to meet old and new friends and professional acquaintances and to serve the interests of Australian weed science. All this, and there is still the opportunity to see something of a new country and a new culture!

Thank you CAWSS for paying my air fares. I hope that you feel that the expense has been worth while. ❐

Senegal Tea Plant Swatted!

A Strategic Weed Action Team (SWAT) has successfully treated a highly noxious foreign weed discovered in January in Redland Shire on the outskirts of Brisbane.

The discovery of the South American water weed, Senegal tea plant, *Gymnocoronis spilanthoides*, was the first in Queensland and only the third in Australia. The initial infestation has been treated successfully but members of the public are asked to be on the lookout for further infestations.

Senegal tea plant has the potential to become a major new water weed throughout tropical and sub-tropical areas (which includes most of Queensland), particularly in shallow and slow-moving bodies of water.

It was introduced into Australia as an aquarium plant in 1975 and was first discovered in a drain in Taree in New South Wales in 1980 and later at Parramatta.

Senegal tea plant is considered to be an aggressive, invasive plant with stems which can grow by up to 15 cm per week. If permitted to spread, it could invade and degrade natural wetlands, where it could compete strongly with slower-growing native plants, affecting wetland birds and other animals dependant upon these native plants. It can also block irrigation ditches, shallow dams and other waterways.

Senegal tea plant spreads via broken stem fragments and seed. Seed can be spread by water and in soil on vehicle tyres and on animal's feet.

The Senegal tea plant is classed as Category P1 in Queensland. This means it is illegal to sell Senegal tea plant anywhere in Queensland and the introduction of this plant into Queensland is prohibited.

Senegal tea plant is an aquatic perennial which grows either over the water surface as floating mats or rooted in damp soil. The leaves are 5-20 cm in length, shiny dark green with serrated margins and the leaves are borne in opposite pairs. Flowers are white and 15-20 mm in diameter. The seed is yellow-brown and ribbed.

If you find an infestation of Senegal tea plant, please contact your nearest NSW Agriculture office.

Report of Weed Society of NSW Annual General Meeting 1995

Eighteen people attended the AGM at Augustine Winery and Vineyard, Mudgee on 29 November, 1995. Office-bearers elected for 1995/96 were:

- *President* - John Cameron,
- *Vice-President* - Dan Austin,
- *Secretary* - Leon Smith,
- *Treasurer* - Alex McLennan,
- *Newsletter Editor* - Brian Sindel,

Executive Committee- J. Mallen-Cooper, P. Michael, L. Greenup, R. Plumbe, R. Trounce, G. Tink, A. Murphy, B. Sindel, M. Barrett, M. Hood, V. Stubs, J. Dellow, G. Beehag, and J. Toth.

The Activities of the Society for 1995 were reported in the Annual Report, which is printed in this newsletter. The Treasurer's report showed a surplus of $4,243 for the past year, with consolidated funds of $28,838.

The meeting approved incorporation of the Society and the revised Constitution was adopted. The CAWSS report noted that a mission statement had been adopted and that a policy on use of CAWSS funds will be ratified at the next CAWSS meeting. A new weed society has been formed in Tasmania and production of a weed and crop list of common and botanical names has been approved.

The meeting suggested that a list of Society members should be compiled and printed in the Newsletter.

The retiring President gave a talk on "Field results with adjuvants on

brush weeds" which highlighted the variability in effectiveness of spray mixtures containing different surfactants on different weeds and with different herbicides.

After lunch, members attended a field day on silver-leaf nightshade on the property "Cumbandry" at Home Rule.

Annual Report - 1995

The Executive Committee met on six occasions. Twenty new members joined the Society during the year and membership is now 240.

Highlights for the year were the new format for the Newsletter, which was named "A Good Weed", and the seminar on Urban Bushland Weed Management held at Sydney University in June. Dr Brian Sindel took over the editorship of the Newsletter from Dr Deirdre Lemerle in January and revised the appearance and layout of the Newsletter, which received favourable comment from many members and interstate Weed Societies. Sponsorship from two private companies was received for the first time for the Newsletter.

Eighty-five people attended the Urban Bush Weed Management seminar which was jointly organised with the National Trust. In March, a "walk and talk" on weeds in the Royal National Park to inspect weed regeneration after the disastrous fires in January 1994 attracted 25 people. A workshop on identification of weeds was held at Sydney University in September. While this initial workshop attracted only 10 participants, it has the potential to meet the needs of several sections of the weed control industry.

Travel Study Grants ($500) were awarded to R. Medd and L. Smith to assist with attendance at the International Biological Control Congress in South Africa and the Second International Weed Control Congress in Copenhagen, respectively.

In 1995 the Society become Incorporated under the Associations Incorporation Act, 1984, and the Constitution of the Society was revised to meet the requirements of the Act. The Annual General meeting of the Society was held at Augustine's Wines and Vineyard, Mudgee at 10 am on 29 November and was followed by a field day on silver-leaf nightshade near Gulgong.

Prizes in the Weed Society Education and Awareness competition at the 8th Noxious Weeds Conference, Goulburn, were awarded to Maria Edmonds, Port Stephens Council ($400 for noxious weeds activity book), Ian Borrowdale, Shoalhaven City Council ($200 for video on bitou bush control) and Val Stubbs, Mid-Western County Council ($100 for weed information handout sheet). A Weed Society prize ($75) was awarded at Sydney University and arrangements made for a similar prize to be awarded at Charles Sturt University. No prize was awarded this year at the University of New England.

The Society provided comment to the EPA Licensing Guidelines on Herbicide Use in or Near Water and two delegates attended the Search Conference at Goulburn to develop the NSW Weed Strategy. The Society exhibited displays at Agview 95 at Camden and at the Noxious Plants Conference at Goulburn.

Members Matter

☐ New members who have joined the Society since September 1995 are:

Don Clinton of Snowy River Council, Berridale;
Jonathon Horton of Ashfield;
Clare Murphy of the University of Sydney;
Ken Pines of NPWS, Armidale;
Bryson Rees of Dubbo; and
Alexandra Wyatt of Forestville.

We welcome you all and look forward to your contributions to the Society. Suggestions regarding activities and/or the newsletter are most welcome as are letters to the editor if you would like your views expressed to a wider audience.

☐ If you change address at any time, please let the Secretary know so that our records and the mailing list can be adjusted accordingly.

☐ While it is generally known that annual subscriptions to the Society are $20 per year, students may not be aware that membership is available at the very low price of just $10 per year. So if you know of any full-time students who may be interested in the issues addressed by the Society, then please put them in contact with the Secretary to obtain a membership form.

☐ We congratulate those members who have been elected to serve on the Executive of the Society for 1996!

☐ Did you know that there is a special Weed Awareness Week from 16 October this year in which the Society will be involved? Do you have any ideas?

☐ As mentioned in the report of the AGM, the Society anticipates publishing a list of its members in a future issue of the newsletter to aid information transfer between us, which is one of the aims of the Society. We will presume that we have your permission to do so unless you contact the Secretary by 29 February 1996 notifying him that you would prefer your name and address not to be published. Many thanks!

Travel Study Grants Available

Travel Study Grants, funded by the Weed Society, are now available to financially assist individuals to attend conferences (e.g. 11th Australian Weeds Conference) or to travel on specific interstate or overseas study tours in the period from 1 July 1996 to 30 June 1997. The grant is open to persons over 18 years of age who are involved with weed research, extension, regulation or practice. Studies of limited interest to the Society will not be considered.

Applications will only be considered from persons who reside in NSW or the ACT. Members of the Society may be given preference. Rarely will the grant meet the full expenses of travel so applicants must arrange additional funds from other sources. Applicants attending conferences are expected to contribute to the conference.

Grantees are expected to return to service within NSW. They will be required to submit a succinct written report for publication in this newsletter soon after returning to duty and/or pass on results of the assignment to other workers in an appropriate manner, e.g. seminar or meeting.

Applications are to be forwarded by 31 March this year to: The Secretary, The Weed Society of New South Wales, PO Box 438, WAHROONGA 2076.

Application forms are available from the Secretary, Leon Smith, at the above address or by telephoning/faxing (047) 393 564.

Sponsorship Interest

The Society is seeking expressions of interest from companies who may wish to sponsor A Good Weed.

We currently have two sponsors (DowElanco and Eagle Environmental Services Pty Ltd) as indicated on the back page of this newsletter.

Companies with an interest in sponsorship should contact the secretary, Dr Leon Smith, 8 Darwin Drive, Lapstone NSW 2773, Fax/Phone (047) 393 564.

World Wide Web Site for WSSA

The Weed Science Society of America (WSSA) now has an operational World Wide Web site. The site will contain information on Society calendar events, plant and chemical terminology, new herbicides and labels, government regulations, new publications and committee efforts, just to name a few.

Although the site is currently being constructed, we are advertising its address to promote the submission of information and stimulate interest in its use. To contact the web site, connect to: http://www.uiuc.edu/ph/www/wssa/wssa / or email David Pike at wssa@uiuc.edu or Larry Llass at LWLASS@ uidaho.edu

Ag-Murf Small Plot Sprayers

These sprayers are purpose-designed for the quick, efficient and accurate application of pesticides for small plot field trials and other research applications.

They are versatile and compatible with a range of off-the-shelf nozzles, tips and accessories, making them ideal for a large range of applications. They are now used by major chemical companies and private and government research bodies.

Features of the standard boom include: extra light weight but robust construction (wet boom type); six nozzles at 500 mm spacings; quality commercially-available fittings; arm rests for comfort and control; positive on-off fingertip control; non-drip valves and one set of tips supplied; quick release couplings; boom mounted pressure gauge visible to operator; quickly disassembling for compact storage in the provided PVC cylinder (1300 x 170 mm).

The sprayer is available with a LP Gas Power Pack or 12 Volt Battery Power Pack. Custom accessories include: non standard boom sizes and configurations; handgun attachment for spot treatments; 9 litre backpack unit for spraying larger areas; additional draw-off adaptors, gas cylinders and batteries.

For information contact: Orana Engineering, PO Box M95, Dubbo East, NSW 2830; Phone (068) 81 8533; Mobile 019 911 066.

Other Good 'Reads'

Dynamics of Weed Populations

By Roger Cousens (La Trobe University) and Martin Mortimer (University of Liverpool); 228 x 152 mm, 300pp; ISBN 0 521 49649 7 (hardback) $150; ISBN 0 521 49969 0 (paperback) $45; postage $6 per book.

What are the ecological attributes of weeds that confer the ability to interfere with human activities? Roger Cousens and Martin Mortimer place weed management within an ecological context, with the focus on the manipulation of population size. The dynamics of abundance and spatial distribution are considered at both geographic and local scales. The base processes of dispersal, reproduction and mortality are described, together with the factors that influence them. Management is shown to modify patterns of behaviour that are intrinsic to populations. Attention is given to the evolution and management of resistance to herbicides.

This book provides weed science with the conceptual basis that has previously been lacking. It also gives ecologists access to the extensive database on the population ecology of weeds.

Contents: 1. Weed population dynamics/the framework; 2. The dynamics of geographic range expansion; 3. Dispersal within and between populations; 4. Processes involved in the regulation of density; 5. The intrinsic dynamics of population density; 6. Extrinsic factors affecting population density; 7. The spatial dynamics of weed populations; 8. The evolution of herbicide resistance; and 9. Weed population dynamics/synthesis and prognosis.

Available from: Orders Dept., Cambridge University Press, PO Box 85, Oakleigh, Vic 3166, Australia.

The Biology of Australian Weeds

Edited by RH Groves, RCH Shepherd and RG Richardson, this book is volume 1 of a collection of reviews on the biology of Australian weeds. Each weed is reviewed in detail and has sections on name, description, history, distribution, habitat, growth and development, reproduction, hybrids, population dynamics, importance, legislation and weed management. The reviews are complemented with line drawings, maps, graphs and photographs.

The weeds reviewed in this book are: *Alternanthera philoxeroides* (alligator weed), *Bromus diandrus* and *Bromus rigidus* (ripgut and rigid brome), *Carduus nutans* ssp. *nutans* (nodding thistle), *Carthamus lanatus* (saffron thistle), *Chondrilla juncea* (skeleton weed), *Echium plantagineum* (Paterson's curse), *Eichhornia crassipes* (water hyacinth), *Eremophila mitchellii* (budda, sandalwood), *Hydrilla verticillata* (hydrilla), *Hypericum perforatum* (St. John's wort), *Mimosa pigra* (mimosa), *Nassella trichotoma* (serrated tussock), *Reseda lutea* (cutleaf mignonette), *Salvinia molesta* (salvinia), *Typha domingensis* and *Typha orientalis* (cumbungi) and *Xanthium occidentale* and *Xanthium spinosum* (noogoora burr and Bathurst burr).

The reviews were originally published in *The Journal of the Australian Institute of Agricultural Science* and *Plant Protection Quarterly* over a period of 14 years. They have now been updated by the original authors where possible, or by other researchers working in the same area. New information and reference material has been added. A list of the original publications is included in the book, together with information about the authors.

This book of 320 pages will be available from November 1995. ISBN 0 646 25956 3, PRICE $59.50 + post and packing. A must for all Weed Science Society Members!

Available from RG and FJ Richardson, PO Box 1108, Frankston, Vic 3199; Fax: 03 9775 4245. Add $10 for post and packaging for each book.

Australian Weed Control Handbook

10th Edition by J. Parsons. Weed control is necessary to protect profits and other benefits derived from the use and management of land. This handbook brings together the basic facts necessary for an understanding of the problems that weeds present and the information necessary for the implementation of an effective weed control system for any one of a wide range of different situations. It also provides up-to-date reference material from which the different aspects of weed control systems can be built up.

550 pages, ISBN 0 7506 8900 5, PRICE $60 + post and packing ($10), also available from RG and FJ Richardson (see above).

Pasture Management

By Rick Bickford. Covers all aspects of pasture management in extensive and informative detail: pasture grasses and legumes; their species, varieties and roles as fodder and in the soil, including the bacterial inoculation of legumes; weeds and pest species; their life cycles

and effect on pastures, plus what to use to control or resist their impact; tillage and sowing techniques; and soil testing and fertiliser requirements. Fodder conservation is also covered.

184 pages, ISBN 0 7506 8913 7, $35.95 + post and packing ($10); also available from RG and FJ Richardson.

Plant Invaders of Southern Africa

By Lesley Henderson. A pocket field guide to the identification of 161 of the most important and potentially important alien species in southern Africa. As well as descriptions, it includes line drawings and distribution maps.

180 pp, 180 x 105 mm (softcover), ISBN: 1 86849 026 2, R36 (includes VAT but not postage outside SA). Order from The Public Relations Officer, PPRI, Private Bag X134, Pretoria 0001, Fax (012) 8080 321.

FISAA Proceedings

More than 75 papers by invited and contributing authors are presented.

The Proceedings of the 4th International Symposium on Adjuvants for Agrochemicals, 3-6 October 1995, Melbourne, Australia is published by the New Zealand Forest Research Institute (FRI Bulletin No. 193) and edited by Robyn E. Gaskin.

Available from FRI, Private Bag 3020, Rotorua, New Zealand. 480 pages; ISSN 0111 8129; NZ$320 (incl. postage)

NB. A copy of these proceedings was made available for the Society by the Council of Australian Weed Science Societies and is held by the Editor.

Videos

The Weird and Wonderful World of Weeds

By Brian Sindel (University of New England). Have you ever wondered how a weed differs from any other plant or why weeds in your garden are such problems, causing you so much back-ache and bother? Did you realise that weeds cost the Australian economy over $3 billion each year in contamination of agricultural products, lost production and control costs? Add to that the irreversible damage of weeds to our natural environment and you'll see why the study of weeds is so important.

In this video, the concepts of 'weediness' are introduced as a basis for understanding this most successful and important group of plants.

ISBN 1 86389 300 8; 8 minutes; $25. Available from: Dr B Sindel, Department of Agronomy and Soil Science, CRC for Weed Management Systems, University of New England, Armidale, NSW 2351 Australia, Telephone (067) 733 747, Fax (067) 733 238, Email: bsindel@metz.une.edu.au

Upcoming Events

14th Congress of the Southern African Weed Science Society

The congress will be held at the Lowveld Agricultural College in Nelspruit, from Monday to Thursday, 15-18 July, 1996.

Sessions will address the following topics: weed management on commercial and small-scale farms; management of bush encroachment and alien invader species; biological weed control; herbicide risk management; herbicide use and fate; and herbicide legislation. A variety of other topics are possible, depending on paper/poster applications.

Contact person:Tel/Fax: Charlie Reinhardt 012-4203227/-3422713 or The Congress Secretary: SAWSS, PO Box 27552 Sunnyside 0132, SA.

Group	Mode of action	Chemical group	Chemical name	Trade names
A	Inhibitors of acetyl coA carboxylase	*Aryloxyphenoxy-propionate ('Fops')*	Diclofop-methyl	various eg Hoegrass®
			Fenoxaprop-ethyl	Puma®
			Fluazifop-butyl	Fusilade®
			Haloxyfop-ethoxy-ethyl	Verdict®
			Propaquizafop	Correct®
			Quizalofop-p-ethyl	Targa®
		Cyclohexanedione ('Dims')	Clethodim	Select®
			Cycloxydim	Focus®
			Sethoxydim	Sertin®
			Tralkoxydim	Grasp®
B	Inhibitors of acetolactate synthase	*Sulfonylurea*	Bensulfuron-methyl	Londax®
			Chlorsulfuron	various eg Glean®
			Metsulfuron-methyl	various eg Ally®
			Sulfometuron-methyl	Oust®
			Thifensulfuron-methyl	Harmony®
			Triasulfuron	Logran®
		Imidazolinone	Imazapyr	Arsenal®
			Imazethapyr	Spinnaker®
		Sulfonamide	Flumetsulam	Broadstrike®
			Metosulam	Eclipse®
C	Inhibitors of photo-synthesis at photosystem II	*Triazine*	Ametyrn	various
			Atrazine	various
			Cyanazine	Bladex®
			Prometryn	various eg Gesagard®
			Propazine	various eg Gesamil®
			Simazine	various eg Gesatop®
			Terbutryn	various eg Igran®
		Triazinone	Hexazinone	Velpar®
			Metribuzin	various
		Urea	Diuron	various
			Ethidimuron	Ustilan®
			Fluometuron	various eg Cotoran®
			Linuron	various eg Afalon®
			Methabenzthiazuron	Tribunil®
			Methazole	Probe®
			Metoxuron	Carrotex®
			Siduron	Tupersan®
			Tebuthiuron	Graslan®
		Nitrile	Bromoxynil	various
			Ioxynil	various eg Totril®
		Benzothiadiazole	Bentazone	Basagran®
		Acetamide	Propanil	Ronacil®
		Pyridazinone	Chloridazon	Pyramin®
		Phenyl-pyridazine	Pyridate	Tough®
		Uracil	Bromacil	Hyvar® X
			Terbacil	Sinbar®
D	Inhibitors of tubulin formation	*Dinitroaniline*	Benfluralin	Balan®
			Oryzalin	Surflan®
			Pendimethalin	Stomp®
			Trifluralin	various eg Treflan®
		Benzoic acid	Chlorthal	various eg Dacthal®

Group	Mode of action	Chemical group	Chemical name	Trade names
E	Inhibitors of mitosis	*Thiocarbamate*	EPTC	Eptam®
			Molinate	various eg Ordram®
			Pebulate	Tillam®
			Tri-allate	Avadex® BW
			Vernolate	Vernam®
		Carbamate	Chlorpropham	various
			Propham	Clopham®
		Organophosphorus	Bensulide	various
F	Inhibitors of carotenoid biosynthesis	*Nicotinanilide*	Diflufenican	Brodal®
		Triazole	Amitrole	various
		Pyridazinone	Norflurazon	Solicam®
G	Inhibitors of protoporphyrinogen oxidase	*Diphenyl ether*	Acifluorfen	Blazer®
			Oxyfluorfen	Goal®
		Oxadiazole	Oxadiazon	Ronstar®
H	Inhibitors of protein synthesis	*Thiocarbamate*	Thiobencarb	Saturn®
I	Disrupters of cell growth	*Phenoxy*	2,4-D	various
			2,4-DB	various
			Dichlorprop	various
			Mecoprop	various
			MCPA	various
			MCPB	Tropotox®
		Benzoic acid	Dicamba	Banvel®
		Pyridine	Clopyralid	Lontrel®
			Fluroxypyr	Starane®
			Picloram	Tordon®
			Triclopyr	Garlon®
J	Inhibitors of fat synthesis	*Alkanoic acid*	Dalapon (2,2-DPA)	various
			Flupropanate	Frenock®
			TCA	TCA®
K	Herbicides with diverse sites of action	*Amide*	Diphenamid	Enide®
			Metolachlor	Dual®
			Napropamide	Devrinol®
			Propachlor	Ramrod®
			Propyzamide	Kerb®
		Organoarsenic	MSMA	various eg Daconate®
		Carbamate	Asulam	Asulox®
			Phenmedipham	Betanal®
		Amino propionate	Flamprop-methyl	Mataven®
		Benzofuran	Ethofumesate	Tramat®
		Phthalamate	Naptalam	Alanap®
		Nitrile	Dichlobenil	various
L	Inhibitors of photo-synthesis at photosystem I	*Bipyridyl*	Diquat	Reglone®
			Paraquat	various eg Gramoxone®
M	Inhibitors of EPSP synthase	*Glycine*	Glyphosate	various eg Roundup®
			Glyphosate-trimesium	Touchdown®
N	Inhibitors of glutamine synthetase	*Glycine*	Glufosinate-ammonium	Basta®

A Good Weed

the NEWSLETTER of
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