INCORPORATING THE WEED SCIENCE SOCIETY NEWSLETTER NO. 93, AUGUST 1990.

Next Meeting - What's new in Weed Science?

- a Review of the 9th Australian Weeds Conference

At: Charles Hawker Conference Centre
Waite Agricultural Research Institute

On: Thursday 23rd August at 7.30pm

Speakers: Alan Mayfield

on "New developments in cereal weed control"

Steve Powles and John Matthews

leading a discussion on the practical control of herbicide resistant ryegrass

It is no exaggeration to claim that this will be one of our most important meetings ever. The problem of herbicide resistance is no longer an exceptional item, but it is a phenomenon which will have to come to grips with now. The time for theorising has passed so the forum discussing the practical measures at this meeting is of great importance. (As a background we have another article on the problem by Steve Powles in this Newsletter). Obviously, the greater the range of inputs to this meeting the better. Be there!

SEPTEMBER MEETING:

Dry seeding
Seeding with minimum rainfall
Press wheels

Speakers include Bob Holloway (Minnipa) and Chris Norris

Thursday 20th September at Roseworthy Agricultural College
DO WE REALLY WANT TO RAISE GRAIN PROTEIN?

By John Gartrell, Principal officer, Plant Nutrition Branch
Department of Agriculture

Market signals of price and saleability are not yet in line with the warning that Western Australian wheat producers risk difficulties in marketing their grain unless they raise its protein level.

Department of Agriculture research workers have done much to help farmers wishing to respond to the Australian Wheat Board's reported warnings to wheat growers to increase grain protein levels - but the market signals getting to farmers have not reflected a serious problem of inadequate grain protein levels. If they did, many growers would try to use the technology available to them to increase grain protein.

The premium of $2.00 or $3.00 a tonne per one per cent protein increase is insignificant compared with the cost and feasibility of increasing grain protein by applying extra nitrogen fertiliser.

It's also small compared with the management implications farmers face if they have to adjust their machinery, operations and farming systems to obtain higher protein levels.

If there is a real need to increase grain protein the pricing system should be revised to encourage growers to produce more saleable wheats. Otherwise it must be assumed that the prices for all grades of our wheats are in line with market demands and farmers do not see price differentials as great enough to encourage them to change their farming practices.

Although Western Australian wheats seem to sell readily compared with some of those from other States, there is a problem of low grain protein with some of our wheat. This affects the value of some varieties more than others.

Most people want simple answers to complex questions; unfortunately, many aspects of the grain protein question are biologically and managerially complex. Soils, rotations, fertiliser, climate and varieties must all be considered in relation to market requirements and the farmer's opportunity to change his operational situation.

Department of Agriculture research has looked into all these factors. The most important were discussed in the Journal of Agriculture in 1987 (Vol. 28 No. 4). Anybody seriously interested in the grain protein question should read the articles in this issue.
Do we really want to raise grain protein?

Research results can be summarised as:

- The real long term trends of grain protein levels in Western Australia wheats have been established.
- Sound information has been provided on the effect on grain protein levels of alternative nitrogen fertiliser strategies, rotations with legumes, farming systems and other practices.
- Breeders have produced higher yielding or higher quality wheats without sacrificing grain protein.
- Wheats have been bred which are suitable for niche markets, such as for biscuit and noodle production, in which high grain protein is not needed and can be undesirable.
- Improved pasture legumes released by the Department of Agriculture are better able to regenerate and replenish soil nitrogen in cereal rotations.
- Lupins and other legume crops bred or developed in research programmes greatly improve the nitrogen supply to cereals in rotations.

**Yield and protein trends**

There has been a trend to higher grain yields, higher total protein output in the grain, and almost static, but seasonally fluctuating, grain protein levels in recent years.

Our research has shown that the premium for protein level would have to be at least $15 per tonne for each one percent increase in protein for it to be profitable for farmers to use fertiliser nitrogen to raise protein levels where there is little or no increase in grain yield.

At the current price differentials, increases in grain yield are far more important in determining the most profitable nitrogen fertiliser rate than are any effects on grain protein levels.

The Department's recommended nitrogen fertiliser rates, which are based on greatest profit, do raise grain protein by an average of half of one per cent above those with no nitrogen fertiliser.

On many farms there are technical opportunities for using pasture legumes, lupins or field peas to markedly improve both the yield and grain protein levels of wheat crops, but there are often financial and management constraints which mean that farmers will not or can not take advantage of these opportunities.
Do we really want to raise grain protein?

Alternatives

However, there are other alternatives. The Department’s wheat breeders have produced the varieties Tincurrin and Corrigin for biscuit manufacture and Eradu for noodle production for the significant niche markets for lower protein Western Australian wheats. The very high yielding variety Reeves is expected to be accepted for noodle production.

Farmers could consider switching to growing malting barley where they have situations that are likely to produce low protein wheat, so reducing the quantity of low protein wheat in our range of grades.

Several new pasture varieties, including Serena and circle Valley medics and Dalkeith sub. Clover, which perform much better over a wide area of some of our important wheat growing soils, have been selected and released, along with recommendations for their use.

Western Australian lupin breeders are famous for developing sweet lupins as an important nitrogen producing crop suitable for rotation with wheat over large areas of the state.

The value of field peas in increasing grain protein levels on heavy wheatbelt soils has been highlighted by the Department's research workers.

Farmers who want to raise the protein level of their grain should examine the possibilities for growing more and better legume based pastures, use rotations of two or in some situations one year legume pasture to one year wheat; make good use of longer term lupin/wheat or pea/wheat rotations; and look for the varieties that give the best returns for the grain protein level their location is most likely to produce.

They should also check that they are not using lower rates of nitrogen fertiliser than those recommended by the Department.

Our researchers are providing the sound, objective information needed for industry and farmers to get on top of any grain protein problems within the constraints of the real world. But there are many areas which will continue to require a strong research effort.
HERBICIDE RESISTANT WEEDS IN AUSTRALIA

Dr Stephen B Powles
Waite Agricultural Research Institute
University of Adelaide

Herbicides are major technological tools that are used successfully in crop production in Australia and elsewhere in the world. Herbicides are very useful in substituting for cultivation to achieve cost-effective weed control. However, an adverse consequence of persistent application has been the emergence of weed populations that are resistant to herbicides. Since the first report in America in 1970 there have been many reports of herbicide resistant weeds and currently, world-wide, there are over 100 weed species in which resistant populations have developed. In Australia there are currently seven weed species which have developed resistance to herbicides. By far the most important of these is annual ryegrass, Lolium rigidurn, which has developed cross-resistance to a wide range of herbicides. There are biotypes of annual ryegrass in southern Australia with simultaneous resistance to Hoegrass®, Verdict®, Assure®, Fusilade®, Grasp®, Sertin®, Glean®, Logran®, Atrazine, Simazine, Diuron, Dosanex, Trifluralin and many other herbicides. Control of such a cross-resistant ryegrass is quite difficult to achieve and poses quite a challenge to farmers. Currently only a small number of farmers in southern Australia have a problem with herbicide resistance. Our objective should be to maintain this situation.

Why does herbicide resistance develop in weeds?

Farmers are well aware that in any biological system (such as a paddock of weeds) there is considerable genetic variation between individuals. This is evident as in the case of plant height or other morphological traits but the variation is also present at the physiological and biochemical level. For example, there is considerable biochemical variation between individuals in susceptibility to herbicides. When a farmer applies a modern highly effective herbicide to the weed population the herbicide represents a powerful selection pressure resulting in the death of susceptible individuals. However, a small number of individuals survive the herbicide because they have a genetic trait which makes them resistant to the herbicide. This process happens almost every time that a farmer sprays a herbicide and in the great majority of cases this is inconsequential because the resistant individuals do not get the chance to become dominant. In the normal course of events on most farms the resistant weeds are consciously or unconsciously controlled by various means such as cultivation, grazing, crop rotation etc. This is why herbicide resistance need not ever be a problem and indeed herbicides have been used for a long time with very few problems due to resistance. However, it is possible to get a problem with herbicide resistance if the same herbicide or herbicide family is used year in and year out. If a farmer continues to apply a herbicide for a number of years to the same paddock then this provides an ideal opportunity for the resistant individuals to survive and ultimately become dominant. We now know that in a continuous cropped paddock with minimal cultivation herbicide resistance can develop after four to five consecutive years of the same herbicide. If resistance occurs in annual ryegrass this can be a major problem as there can be cross-resistance to a wide range of other herbicides. The lesson to be drawn from this is that as a general rule farmers should not apply the same herbicide in a very persistent manner to weed populations.
What can you do to minimise the possibility of getting herbicide resistance.

Most farmers in Australia use a combination of methods to obtain weed control. The average southern Australian wheat-sheep farmer practices a cropping-pasture rotation and uses herbicide only in the cropping phase of the rotation. Weed control may involve some combination of cultivation, herbicides, grazing animals, pasture-topping, crop rotation, burning, haymaking etc. What farmers are actually practising is **INTEGRATED WEED MANAGEMENT** (although they would probably not use this term to describe these varying ways of controlling weeds). Integrated weed management is a good thing because it does not rely on just one herbicide to control weeds and this means that herbicide resistance will not develop, or will only develop very slowly. In such systems the grazing sheep play a major role in weed control during the pasture phase and this breaks the cycle of selection for resistance by herbicides used in the cropping phase. Australian farmers should continue to maintain such a diversity of practices in achieving weed control because this will keep herbicide resistance at bay. It follows that the converse is represented by those Australian farmers who rely heavily (or exclusively) on the use of herbicides for weed control and who crop intensively or continuously on some paddocks. Our research and observations identify that it is these farmers who are at risk of rapidly developing herbicide resistance because under such conditions a consistent selection pressure is placed on the weed populations and resistance develops.

In summary the best means of minimising herbicide resistance is to maintain a diversity of approaches to weed control. Use rotations and grazing animals in combination with herbicides for a good balance in your weed control methods. If you are getting excellent results with a particular herbicide it is prudent to not use it every year. In this way you will ensure that you will be able to use the product in the long term because resistance will not develop. Perhaps this little ditty will explain it all:
‘CONFIDENCE WITH AGRICULTURAL CHEMICALS’

1.30PM Monday 17th of September
Roseworthy Agricultural College

9.00AM Tuesday 18th September
Northfield Research Centre
Seminar Room

1.30PM Tuesday 18th September
Charles Hawker Conference Centre
Waite Institute

A seminar designed to put the hazards of agricultural chemicals in perspective with other risks in our environment.

**Using Agricultural Chemicals:**
Mr Don Mathews
ICI Crop Care

**Poisons in our Environment and our Diet:**
Dr Brian Priestly
Adelaide University

**Why Do Chemicals Scare Us?:**
Ms Judy Tompkins
Dept of Agriculture
Farm Chemicals Management
& Services Division

The seminar is planned to run for 90 minutes with time for questions.