HERBICIDE TRIALS IN ONIONS IN THE PRINCIPAL ONION-GROWING AREAS IN SOUTH AUSTRALIA

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Twenty one pre-and/or post-emergent herbicide trials were carried out over three seasons 1965-68 in the main onion-growing areas of South Australia. Trial sites were set up on properties in the Barossa Valley, Adelaide Hills, Northern Adelaide Plains, Lower River Murray and Lower South East. In this way as wide a range as possible of soils and climate was included, the extremes being the cool wet climate of the Lower South East to the relatively hot dry weather conditions of the Lower River Murray areas.

This paper deals with particular aspects such as:-

1. overcoming the problem of large numbers of weed species,
2. climatic factors,
3. soil factors, and
4. spraying pressures and selectivity

OVERCOMING THE PROBLEM OF LARGE NUMBERS OF WEED SPECIES

The first step was to screen as many as possible of the pre-emergent and post-emergent herbicides at differing rates in widely varying situations. In the first 2 years of trials the primary aim was to obtain information on single chemicals particularly with relation to weed species controlled as well as crop performance.

It was obvious from this work that it was usually not possible to find a herbicide which would control all weeds in a given situation.

One method of approach, having determined weed control data for different herbicides would have been the use of herbicide mixtures.

Unfortunately the use of mixtures is complicated by interactions that can occur, such as an increase in herbicidal activity including increased damage to the crop. In addition to this, it would have been necessary to forecast accurately the expected weed flora. Unfortunately in practice this is often not possible. It was considered that a better approach would be the use of pre-+ post-emergent treatments. Having applied the pre-emergent treatment it is then possible to apply the appropriate post-emergent treatment as the exact weed flora will by then be known.

Especially selected combinations would have been one method of approach in trials of this nature, but the problem in that case would have been to predict the composition of weed species before hand. By laying down factorial experiments all possibilities were covered.

The following table illustrates an example (top figure lb/Ac., in brackets kg/ha)

1.	chlorthal	- 7.5 a.i. (8.4)	1.	ioxynil	- 1 a.i. (1.12)
2.	propachlor	- 5.2 a.i. (5.8)	2.	linuron	- ½ a.i. (0.56)
3.	chlorpropham	- 2 a.i. (2.24)	3.	prometryne	- ½ a.i. (0.56)
4.	ioxynil (hook-stage)	- ½ a.i. (0.56)	4.	nitrofen	- 2.4 a.i. (2.7)
5.	untreated		5.	untreated	

As expected the chlorthal + ioxynil treatments gave the most consistent and best results at all sites. Virtually all weed species were controlled with this combination with the exception of a few grasses.

This trial also established the principle that the pre and post treatments should consist of different chemicals. The ioxynil + ioxynil treatment for example failed completely on grasses. Another principle established was that it was not always possible to predict a good combination of pre- and post-emergent herbicides in a given situation even although the weed control spectra of each of the herbicides was known. Using this information as a basis, propachlor + ioxynil would have been expected to give good results, but in one trial it was poorer than the best treatment at the .001% level for no apparent reason.

CLIMATIC FACTORS

The importance of climate is best illustrated in the case of onions by its effect on post emergent herbicides. The ready availability of irrigation tends to ensure sufficient moisture for the activity of pre emergents. The one exception to this is chlorpropham which often fails when conditions are warm.

Prometryne was the post emergent herbicide most affected by climatic conditions and became extremely active under heat wave conditions. In hot weather ½ lb/ac a.i. (0.56 kg/ha) caused almost complete crop loss whereas in cool weather there was no reduction of yield at 1 lb/ac a.i. (1.12 kg/ha). It also appeared that prometryne could be recommended quite safely in the Lower South East of South Australia but not in the River districts.

SOIL TYPE

The predominance of sandy soils in South Australia was probably the main reason for the outstanding success of chlorthal. On the other hand it would explain the widespread failure of chlorpropham due to crop damage.

Propachlor was also unsuccessful on light soils for a different reason viz., - lack of weed control. However, it did not cause crop damage on any soil type - and on the heavy soils gave excellent results. One theory advanced is that propachlor may be too readily leached from the lighter soils.

SPRAYING PRESSURE AND SELECTIVITY OF POST EMERGENTS

In all trials the low pressure of 10 p.s.i. (0.7 kg.s.cm.) was used mainly to avoid drift of spray in the wind as it was not often possible to select ideal weather. Post-emergent herbicides were applied with wetting agents to ensure sufficient wetting of the weed leaf surfaces.

Subsequent larger trials using ioxynil with boom spray equipment indicated that high pressures such as 40-50 p.s.i. (2.8-3.5 kg s.cm) and up to 150 p.s.i. (10.5 kg s.cm) were causing considerable crop damage with or without wetting agent. It is probable that the high pressure caused a small droplet size with a resultant increase in wetting of the onion leaves. Present recommendations for ioxynil are that the pressure of application is kept as low as possible. Some growers in the Lower River districts of South Australia are achieving a high degree of success with ioxynil at pressures as low as 10-15 p.s.i. (0.7-1.0 kg s.cm). An example of this is the excellent control of Bathurst burr achieved in this area with ½ lb/ac (½ kg/ha) in the seedling stage. This is normally a hard to kill weed but it can be killed with virtually no damage to the crop.