were almost as effective. These plots are to be harvested and yield figures will be available later.

The original plots from 1963 were sown to wheat in 1964 to establish the effect of chemical treatment 12 months earlier on both Amsinckia and wheat. No Amsinckia population counts have been made, but wheat yields will be recorded.

Observations have shown that Amsinckia is growing on the hand-weeded and prometryne plots with both the same vigour and density as on untreated plots, although the crops seem taller and greener. Amsinckia control on picloram plots is 100% without any apparent effect on the crop. Of the other treatments which gave greater than 90% kill of Amsinckia, dicamba and atrazine both have more vigorous crops and slightly less Amsinckia than the untreated. What are the complications of these results?

1. Prometryne is well suited for selective control of Amsinckia in wheat crops. The increased yield appears greater than would be due to elimination of weed competition and suggests some form of crop stimulation.
2. Picloram is more suited to long-term or total eradication than selective control in crops because of its persistence in the soil.
3. A possible way of using picloram for selective control would be to spray in an oat crop as oats tolerate picloram more than wheat. Wheat could then be grown, in the absence of Amsinckia, on the oat stubble.

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STUDIES ON THE CHEMICAL CONTROL OF AMSINCKIA SPECIES IN WHEAT

Species of Amsinckia commonly occur in some Victorian wheat areas. Seed of these species commences to germinate soon after the autumn rains and germination often continues throughout the winter. As a result, cultural control practices are frequently inadequate, crops become heavily infested, and wheat yields are reduced.

The chemical control of Amsinckia in wheat using 2,4-D (2,4-dichlorophenoxyacetic acid) has not proved reliable, as in some years the plant appears to develop a physiological resistance to 2,4-D as it approaches flowering (Harrison 1956). Trials were therefore initiated to evaluate more recently available chemicals.

In two trials at Longerenong Agricultural College in 1963, six chemicals were applied in 9 gallons of water at varying rates per acre to two wheat crops moderately infested with Amsinckia (7.7 and 6.2 plants per square foot). In trial 1, Olympic wheat was treated with linuron (N-(3,4-dichlorophenyl)-N-methoxy-N-methylurea)

(6, 12, and 24 oz), diuron (N-(3,4-dichlorophenyl)-NN-dimethyl-urea) (6, 12, and 24 oz), and 2,4-D ethyl ester at 8 oz, when the crop had just commenced tillering and had formed 3-4 leaves. The ethyl ester of 2,4-D (8 and 12 oz) was also applied when the wheat had completed tillering and was commencing to joint. In trial 2, Emblem wheat was sprayed with dicamba (2-methoxy-3,6-dichlorobenzoic acid) (4, 6, and 8 oz), picloram (4-amino-3,5,6-trichloropicolinic acid) (1, 2, and 4 oz), prometryne (2-methyl-mercapto-4,6-bis(isopropylamino)-s-triazine) (4, 8, and 16 oz), and 2,4-D ethyl ester (8 oz) when the wheat was tillering and had formed 4-5 leaves. In both trials, most of the Amsinckia plants had formed at least 10 leaves when the early treatments were applied, and were budding at the time of the later spraying in trial 1. Each trial was of the randomized block design with four replicates.

Random plant counts of Amsinckia at flowering indicated that all chemicals had reduced Amsinckia populations when compared with the untreated controls. These reductions in plant populations varied from 100% using the high rates of linuron, prometryne, and picloram to a non-significant 40% after the later spraying with 8 oz of 2,4-D.

In all treatments, except 2,4-D applied at the later stage of wheat growth, the reduction in the dry weights of Amsinckia harvested from random quadrats ranged from 93% to 100%. 2,4-D applied at rates of 8 and 12 oz when the wheat had completed tillering resulted in dry weight reductions of 74% and 86%, respectively.

Competition as measured by dry weight was significantly reduced in all sprayed treatments, but only in some were wheat yields significantly increased; these treatments were dicamba 8 and 16 oz, picloram 1 oz, prometryne 4 oz, linuron 6 oz, and diuron 6 oz. The largest increases of 17%, 20%, and 22% were obtained after spraying with the low rates of linuron, picloram, and prometryne, respectively.

The high rates of prometryne, picloram, and diuron eradicated Amsinckia, but picloram and diuron depressed wheat yields by 20% and 23%, respectively, while the prometryne treatment resulted in a yield similar to the unsprayed control. At the high rates used in the experiments, these chemicals do not appear sufficiently selective for use in wheat crops.

Although the number of Amsinckia plants surviving after spraying is decreased by early application of 2,4-D, spraying wheat with 8 oz of 2,4-D before the completion of wheat tillering depressed wheat yields, even though the competing weed was removed earlier and more completely than with a later spray at the same rate. Increasing the rate of 2,4-D to 12 oz applied at the completion of wheat tillering improved the control of Amsinckia

but did not significantly increase wheat yields.

It is suggested that much of the competitive effect of Amsinckia is expressed before wheat has reached a growth at which it can be safely sprayed with 2,4-D, and chemicals which may be applied earlier without adverse effect on the crop offer increased possibilities of achieving economic control.

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PROBLEMS ASSOCIATED WITH CONTROL OF WEEDS IN CEREAL CROPS

A survey carried out in 1961 revealed a number of problems in crop spraying practice in South Australia.

1. Ester 2,4-D (2,4-dichlorophenoxyacetic acid) was being promoted by some commercial firms and this was encouraged by farmers since it gave a quick kill of weeds.
2. Ester 2,4-D was being applied at rates as high as 12 oz/ac and damage to crops was further aggravated by poor boom spray maintenance and calibration.
3. In some seasons hard-to-kill weeds, sheep weed (Lithospermum arvense), red-flowered fumitory (Fumaris muralis), and deadnettle (Lamium amplexicaule), were resistant to 2,4-D and MCPA (2-methyl-4-chlorophenoxyacetic acid).
4. The early competing weeds, particularly white-flowered fumitory (Fumaria parvifolia) and deadnettle, were a problem. By the time sprays could be applied at the fully stooled stage these weeds had probably ceased competing with the crop. It is doubtful if any yield advantage was gained from such spraying.

An investigation was commenced and included the following treatments:

(a) Type of herbicide - Ester and amine 2,4-D, MCPA, 4-CPA, 2,3,6-TBA (2,3,6-trichlorobenzoic acid), dicamba (2-methoxy-3,6-dichlorobenzoic acid), prometryne (2-methylmercapto-4,6-bis(isopropylamino)-s-triazine), PP-831, diquat (9,10-dihydro-8a,10a-diazoniaphenanthrene cation), 2,4-DB (4-(2,4-dichlorophenoxy)butyric acid), and picloram (4-amino-3,5,6-trichloropicolinic acid).

(b) Rates of herbicide - A range of rates applied by the Chesterford logarithmic sprayer from 2 lb active per acre to below 1 oz active in some instances.

(c) Time of application

(i) at the fully tillered stage of crop development

(ii) seedling-crop-spraying - a new departure from the accepted practice