

## INFLUENCE OF WEED SPECIES AND DENSITY ON THE YIELD OF CROPS

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Every plant in a wheat crop that is not wheat is a weed. Some weeds command a great deal more attention and money for control than others. These are the "serious" weeds. Over time they have developed a host of morphological features which help them to survive in the agricultural situation. They become particularly important when their presence in the crop causes an economic loss. This paper deals with only one of the possible economic losses; decreased yields.

## WEED SPECIES

In order to cope with the variety of weeds that occur in cereals the term "competitive index" (CI) is used and this describes the status of the weed as a competitor with the crop. In the literature there are many competitive indices and as many ways of calculating them. The one chosen here is based on the following relationship:-

$$\text{Yield} = \text{Potential Yield} \times \frac{\text{Wheat Density}}{(\text{Wheat Density} + \text{CI} \times \text{Weed Density})}$$

Trial data indicates this relationship is reasonable for normal seeding rates and up to moderate weed densities (i.e. weed densities that would cause a 30% yield reduction). The competitive index (CI) is the reciprocal of the number of weed plants that would have the same competitive effect as one wheat plant.

## WEED DENSITY

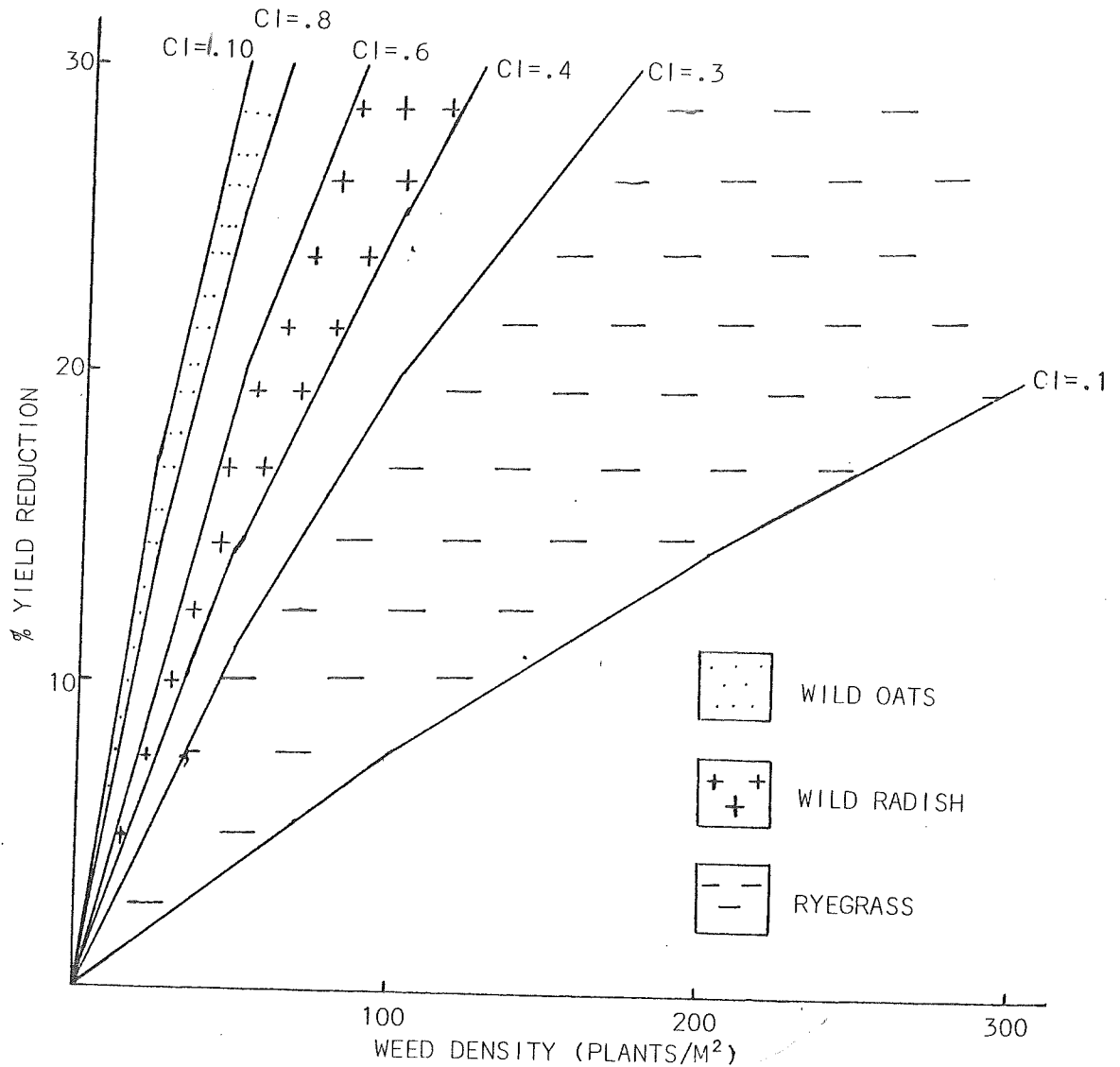
The loss of crop yield depends on the CI and weed density as shown in Graph 1. For annual ryegrass the competitive index varies between .1 and .3 depending on factors such as soil type, seasonal conditions and nutrient status. Trials are under way to determine the exact causes of this variation. On data presently available the percentage loss for ryegrass should fall in this shaded area. Similarly the boundaries of yield loss expected for wild radish and wild oats are shown.

## GROWTH STAGE OF WEED COMPARED TO WHEAT

The results presented so far have been for weeds that germinate at approximately the same time as the crop. Weeds that are well established and survive the seeding operation will have a far greater effect than that predicted above, and weeds germinating some time after the crop will have less effect on yield. For example, up to 400 plants/m<sup>2</sup> of annual ryegrass or up to 50 radish plants/m<sup>2</sup> sown 4 weeks after the crop caused no yield reduction.

GRAPH 1

PERCENT YIELD REDUCTION vs WEED DENSITY FOR ANNUAL RYEGRASS, WILD RADISH AND WILD OATS. (WHEAT SOWN AT 50 KG/HA)



#### TIMING OF HERBICIDE APPLICATION

Trials throughout the state have shown that all weeds studied cause an irreversible depression of potential yield very early in the life of the crop. Thus Graph 1 could only be used to determine the expected yield increase for pre emergent or early post emergence application of herbicides. Preliminary data suggests that yield increases for late post emergence spraying (5 leaf stage of the crop onwards) yield increases of about 85% of the amount predicted from Graph 1 are likely.

### WHEAT DENSITY

Increasing wheat densities reduces the yield depressing effect of given population of weeds. For example a weed population that would reduce yields by 10.0% in a crop sown at 50 kg/ha would only reduce yield by 5.5% if the crop were sown at 100 kg/ha. For a 1.5 tonne/ha crop, 67.5 kg/ha extra yield would accrue from an investment of 50 kg/ha of extra seed. The problem with using wheat seeding rate as a weed control tool is that the farmer must fairly accurately predict at the time of seeding the weed density that will come up in the crop. For annual ryegrass at densities between 50 and 100 plants/m<sup>2</sup> seeding rate could be used to advantage. However at this point in time it is not feasible to predict densities that accurately.

### CONCLUSION

Trial work by the Department of Agriculture has set fairly broad limits to the expected yield reductions with increasing densities of weed. Work is continuing in an effort to define the factors that influence the competitive index and to extend the range of weeds covered.

# Economics

Weeds / m<sup>2</sup> for 5% Yield loss

Barley grass	40
Brome grass	30
Capeweed	60
Clover	70
Dock	100
Doublgees	70
Fumitory	100
Peas	50
Pimpernel	200
Prickly lettuce	70
Ryegrass	40
Silver grass	133
Soursob	40
Toad rush	400
Vetches	80
Wild oats	25
Wild radish	20
Wild turnip	33
Wireweed	200

from DASA

\$12/ha yield loss.

*Competitive Index is approximately 15 ÷ number above*