AERIAL APPLICATION OF HERBICIDES IN DRY-SEEDED RICE IN QUEENSLAND

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Summary. Two demonstration areas were established in the Burdekin district to evaluate the aerial application of herbicides to commercial rice crops. The first demonstration, in a summer crop, produced excellent weed control with both 1.98 and 3.96 kg a.i./ha of propanil. However, weed recovery occurred at the lower rate presumably in response to a 10 day delay in the application of permanent water. The delay in application of permanent water had no adverse effect on weed control at the higher rate. Two types of Micronairs (A.U.3000 and A.U. 5000) were compared with both producing very good results. In the second demonstration, a winter crop, good weed control was achieved using 1.98 kg a.i./ha of propanil, even with a 10 day delay in the application of permanent water. This suggests that the prompt application of permanent water is less critical in the winter crop. A thiobencarb plus propanil mixture gave good residual weed control.

INTRODUCTION

Rice is currently one of the major industries in the Burdekin Irrigation Area in North Queensland with approximately 2,000 hectares grown each year from two plantings. However, with the completion of the Burdekin Falls Dam and the imminent release of 45,000 hectares of land for new farms the industry is set for a major expansion. Rice is considered one of the most suitable crops to be grown on many of the new areas and the Department of Primary Industries has active research programs on rice breeding, rice agronomy and insects and other pests.

One problem which has plagued the industry since its commencement in 1967 is weed control. Weeds are regarded as a serious problem because they not only compete with the crop for nutrients and light but also reduce tillering, cause secondary lodging and increase harvesting difficulties. The predominant weeds are barnyard grass, *Echinochloa colona*, and the sedges, *Cyperus iria* and *C. difformis*.

Of the currently registered chemicals, propanil, a contact herbicide is the most widely used and is aerially applied. Under commercial situations, results achieved with the recommended rate of 3.96 kg/ha have been variable. However in small plot experiments, rates of propanil as low as 0.72 kg/ha have given effective weed control (D. Hawton, pers. comm., 1985). In view of this evidence it was decided to investigate the application of herbicides to rice under commercial situations to provide some local guidelines for effective chemical application.

METHODS

Two demonstration areas were established in the Burdekin district in 1986. The first demonstration (D1) was conducted in a commercial summer crop of the cultivar Starbonnet. Two rates of propanil (3.96 kg/ha and 1.98 kg/ha) were applied using the two types of Micronair rotary atomizer currently available: A.U. 3000 (four large cages) and A.U. 5000 (eight small cages).

The second demonstration (D2) was conducted the following season in a commercial winter crop of the cultivar Lemont. Only one type of Micronair rotary atomizer was used (A.U.5000). A low rate of propanil (1.98 kg/ha) was

compared with a thiobencarb plus propanil tank mix (2.8 kg/ha and 1.62 kg/ha respectively), and a split application of propanil (1.98 kg/ha applied twice, four days apart).

In both demonstrations the Micronairs were set to produce 300*u* droplets while delivering 55 L/ha. The majority of weeds, *E. colona* and *C. iria*, were at the 3-4 leaf stage and actively growing. Prior to spraying, plastic sheets (9 m^2) were placed in each treatment to provide control areas receiving no chemical. Weed counts were taken using 0.25 m^2 quadrats prior to spraying, three days after spraying, and prior to flooding. The weed counts prior to spraying and prior to flooding are presented in the results. The effect of the herbicide treatment on the rice crop was assessed and recorded as a subjective phytotoxicity rating of either low, moderate or severe.

Ten days after treatment (10 D.A.T.) permanent water was applied to both demonstrations. In D2 the water was removed from one of the bays receiving the thiobencarb plus propanil mixture, two weeks after flooding. This enabled observations to be made of the residual activity of the thiobencarb. Water was reapplied to this bay ten days later.

At maturity, grain yield was determined by harvesting eight 0.25 m^2 quadrats per plot in both demonstrations. Unfortunately the control areas in D1 were lost due to spray drift from the rest of the block after the plastic sheets were removed.

RESULTS AND DISCUSSION

Demonstration 1. All treatments generally gave very good weed contol with excellent results achieved from both types of Micronairs at the high rate of propanil.

Table 1. The effect of Micronair rotary atomizer and propanil on weed control, rice phytotoxicity and yield.

Micronair atomizer	Rate of Propanil (kg/ha)	Weed Density Prior to spray (plants/m^2)	Weed Density 10 D.A.T. (plants/m^2)	Phytotoxicity rating	Grain Yield (t/ha)
A.U.5000	1.98	286 ± 37	32 ± 8.9	Moderate	5.85 ± 0.40
A.U.3000	1.98	336 ± 64	12 ± 4.6	Low	6.28 ± 0.63
A.U.5000	3.96	626 ± 98	1 ± 0.7	Moderate	6.81 ± 0.04
A.U.3000	3.96	371 ± 47	2 ± 0.7	Low-Mod.	7.00 ± 1.01

Permanent water was delayed until ten days after treatment and it was noted that weed recovery occurred in the treatments receiving the lower rate (1.98 kg/ha of propanil. The higher rate (3.96 kg/ha) however, was more effective and weeds did not recover.

Hodgson (1) found that propanil is metbolised rapidly under high temperatures (32°C). Hence it appears that following spraying, the hot, summer conditions combined with the delay in flooding favoured the inactivation of propanil and the growth of many of the weeds. The manufacturer's

recommendation for propanil suggests that permanent water should be applied within 24 hours of spraying to achieve a complete weed kill. However, these results suggest that the effects of delayed flooding on propanil efficacy can be overcome by using high rates (3.96 kg/ha) of the chemical.

The results from Table 1 show that when both types of Micronairs are correctly adjusted and operated, excellent weed control can be achieved. Local experience, however, suggests that over a range of conditions aircraft equipped with eight Micronair A.U.5000 rotary atomizers generally produce more consistent results and give better coverage than aircraft fitted with four Micronair A.U.3000 rotary atomizers. These observations have been confirmed in private testing by various aerial operators (E. Blanch, pers. comm. 1987). In this trial the A.U.5000 Micronairs tended to cause more phytotoxicity and this is probably due to the better coverage achieved with these atomizers.

Demonstrations 2. All of the herbicide treatments gave excellent weed control and increased grain yield (Table 2). However in contrast to D1, all treatments caused considerable burn to the rice. This was probably due to cooler conditions at the time of spraying. Further, the split application of propanil may have had an adverse effect on the rice as demonstrated by the relatively low yield for this treatment.

Table 2. The effect of propanil and tank-mixes of propanil plus thiobencarb on weed control, rice phytotoxicity and yield

Treatment (kg a.i./ha)	Weed Density prior to spray (plants/m²)	Weed Density 10 D.A.T. (plants/m²)	Phytotoxicity rating	Grain Yield Untreated (t/ha)	Grain Yield Treated (t/ha)
1.98 kg Propanil	853 ± 279	0.25 ± 0.4	Severe	4.23 ± 1.11	6.08 ± 0.50
2 x 1.98 kg Propanil (applied twice)	782 ± 98	0 ± 0	Severe	4.28 ± 0.47	5.17 ± 0.50
2.8 kg thiobencarb + 1.62 kg propanil[a]	831 ± 167	0 ± 0	Severe	3.58 ± 1.11	5.80 ± 0.65
2.8 kg thiobencarb + 1.62 kg Propanil	924 ± 267	2 ± 1.6	Severe	4.07 ± 1.61	5.80 ± 0.21

[a] Water was removed from this bay for ten days.

The ten day delay in applying permanent water had virtually no effect on the efficacy of the herbicides, as even the low rate of propanil (1.98 kg/ha) resulted in complete weed kill. This result is in marked contrast to the results of D1. Therefore it appears that in the winter crop, when temperatures are lower, the prompt application of permanent water is less critical than in the summer crop. This is advantageous to farmers as they often have to delay flooding in the winter crop for up to ten days to avoid drowning the rice.

Very few weeds emerged in the treatment where the water was removed from the bay for ten days, indicating that the thiobencarb plus propanil mixture gave good residual control. A mixture of these two chemicals offers interesting possibilities for farmers in situations where permanent flooding has to be delayed. This is likely to be particularly relevant if rain falls and/or an additional flushing is required between spraying and the application of permanent flood. Evaluation of this mixture in a summer crop is warranted.

CONCLUSION

The results show that good weed control can be achieved in commercial rice crops with the aerial application of propanil. Low rates of propanil (1.98 kg /ha) appear very effective in a winter crop even if flooding is delayed for up to ten days. Higher rates of propanil (3.98 kg/ha) however, are likely to be more effective in a summer crop if flooding is delayed. Both types of Micronair (A.U.3000 and A.U.5000) are precision atomizers and when properly adjusted and operated produce good results. Local experience however tends to favour the Micronair A.U.5000. A thiobencarb plus propanil mixture gave good residual weed control and warrants further investigation.

REFERENCES

1. Hodgson, R.H. 1971. Weed Sci. 19, 501-507.