WEEDS IN NO-TILL FALLOWS IN NORTHERN NEW SOUTH WALES

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Summary. A survey after the 1989 wheat harvest showed that 50% of fallow paddocks in northern New South Wales had a weed problem. By February 1990 only 10% of paddocks were being sprayed with a herbicide to control weeds whereas over 80% had been cultivated. Weed assessments in 65 no-till paddocks identified almost 100 different weed species. The most important weeds were liverseed grass, native millet, common sowthistle, wireweed, and barnyard grasses. Black bindweed was a problem where atrazine had not been used whereas native millet was the most abundant species where atrazine had been applied.

INTRODUCTION

In northern New South Wales both summer and winter crops are usually sown following accumulation of soil moisture in a fallow. Weeds are controlled by tillage during the fallow period but this has the undesirable effect of removing stubble. The soils, especially on slopes, are prone to erosion (3). Farmers have the opportunity to retain more stubble using conservation tillage practices involving herbicides. But with less tillage and more reliance on herbicides, different weed species may become a more serious problem. For example, common sowthistle, *Sonchus oleraceus,* populations increased rapidly with use of no-tillage practices compared to stubble burning (1).

During summer fallows there are three major periods when weeds appear; weeds present at wheat harvest, those that germinate during summer, and weeds that germinate in autumn. Perennial weeds may be present all the time. In 1983-85, farmers identified the 10 most important summer weed species on northern NSW wheat farms as thornapples, *Datura* spp., Bathurst burr, *Xanthium spinosum,* barnyard grasses, *Echinochloa* spp., mintweed, *Salvia reflexa,* liverseed grass, *Urochloa panicoides,* Noogoora burr, *Xanthium occidentale,* summer grasses, *Panicum* spp., yellow vine, *Tribulus* spp., Johnsongrass, *Sorghum halepense,* and cowvine, *Ipomoea lonchophylla* (2).

Paddocks treated in the previous winter cereal crop with a residual herbicide such as chlorsulfuron may have fewer weeds after harvest. Information on which weeds currently are the most important during the fallow period and which other weeds may become a problem if not controlled, is limited. Weed control strategies can be improved with this knowledge and future changes in weed species monitored (5).

This survey was undertaken to identify fallow management practices being used after wheat harvest by farmers in northern NSW and how these influenced stubble retention and weed control, and which summer weeds were present in no-till fallows.

METHODS

Following the 1989 wheat harvest paddocks were randomly selected in the northern wheat belt bounded by Tamworth, Gunnedah, Narrabri, Moree, Goondiwindi, Warialda, and Manilla to record fallow management practices being used, and the severity of weed infestations. Some

paddocks were included in more than one survey and observations were taken on 151, 134, 120 and 190 paddocks on 18 December, 8 January, 18 January and 20 February respectively. Weed counts were done in 65 no-till fallow paddocks sampled between wheat harvest in 1989 and March 1990. Only no-till paddocks were included as we were primarily interested in weeds of no-tillage systems. An inverse sampling method (2) was used. An area 1 by 100 m was sampled by starting 20 m from the edge of the paddock and moving diagonally or perpendicular to the paddock margin depending upon the paddock size. The direction was changed after each transect. Weeds were recorded by number and species but density data are not considered in this paper. Weed species located adjacent to, but not present in, the transects were recorded as traces. Some weeds were grouped for convenience or because it was difficult to separate some species. For example, medics, *Medicago* spp., and clovers, *Trifolium* spp., thornapples, fleabanes, *Conyza* spp., and *Tribulus* spp. One to five areas were sampled in each paddock depending upon uniformity of the weed infestation. Weed occurrence was calculated as the proportion of paddocks containing each species.

The 65 no-till paddocks were divided into six categories; nothing since harvest [14], not grazed and sprayed with glyphosate [7], not grazed and sprayed with atrazine and glyphosate [5], grazed and not sprayed [11], grazed and sprayed with glyphosate [12], and grazed and sprayed with atrazine and glyphosate [16].

RESULTS

Rainfall from November to March was variable but there was adequate moisture for weed germination. Spraying herbicides on weeds, with or without grazing, accounted for less than 20% of the paddocks (Table 1). Volunteer wheat, *Triticum aestivum,* was the most common weed in both cultivated and uncultivated paddocks during the survey period but was not included in the results. A weed problem was identified in approximately 50% of the paddocks over the sampling period and those with a serious weed problem varied from 5% in early January to 18% in February (Table 1). The most obvious weeds in the general survey were barnyard grasses and liverseed grass; prickly lettuce, *Lactuca serriola,* common sowthistle, spear thistle, *Cirsium vulgare*, wireweed, *Polygonum aviculare*, saffron thistle, *Carthamus lanatus*, and wild oats, *Avena* spp, were common in December; thistles, fleabane, prickly lettuce and wireweed in mid-January; and mintweed and native millet in mid-February. Grazing without spraying resulted in fallows that were weedier.

Where no herbicide was used there were 74 species in ungrazed wheat stubble and 64 in grazed stubble (Table 2). Weeds found in all six fallow systems were Australian bindweed, *Convolvulus erubescens*, barnyard grasses, liverseed grass, native millet, fleabanes and common sowthistle. The number of species decreased where a herbicide had been used, particularly if both glyphosate and atrazine were included in the management program. Although the number of different weeds was reduced with herbicides, the proportion of paddocks with some of the species did not decrease. For example, common sowthistle occurred in over 50% of fallow paddocks irrespective of cultural practice. Liverseed grass was abundant in all paddocks except those which were not grazed but were sprayed with glyphosate. The proportion of paddocks with liverseed grass was greater in the grazed plus glyphosate category. The ungrazed sprayed with glyphosate practice selected black bindweed, *Fallopia convolvulus*, with all surveyed fields treated in this way infested. No black bindweed was present where atrazine had been used. Atrazine also reduced occurrence of barnyard grasses. There was a substantial increase in incidence of native millet with atrazine treatment and this was the most common weed in

atrazine treated paddocks. Grazing reduced native millet populations where atrazine was used. Mintweed was on 50% of paddocks where no herbicide had been applied but was reduced to 25% in grazed plus glyphosate paddocks and was not present where atrazine had been used.

Table 1. The proportion of weedy paddocks in the general survey

	Time of sampling			
	18.12.89	8.1.90	18.1.90	20.2.90
		%		
Nothing	51	5	3	2
Cultivated	38	67	74	73
No-till, grazed	9	9	9	7
No-till, sprayed	1	19	13	17
Moderate weed problem	38	41	29	32
Severe weed problem	13	5	13	18
Number of paddocks	151	134	120	190

Table 2. Weeds with greater than 50% occurrence for each no-till cultural practice

Weed	Fallow - not grazed			Fallow - grazed		
	Nil	Gly[a]	Gly + Atr[b]	Nil	Gly	Gly + Atr
			%			
Barnyard grasses	57	57		82	67	
Bathurst burr			60			
Black bindweed		100				
Bladder ketmia	50	57				
Common sowthistle	57	71	80	55	67	75
Liverseed grass	64		80	82	75	69
Mintweed	50					
Native millet	50	57	100			100
Pigweed				64		
Wireweed						56
No. of paddocks	14	7	5	11	12	16
No. of different weeds	74	37	23	64	41	18

[a] Glyphosate
[b] Atrazine

DISCUSSION

Cultivation was the basis of fallow weed control on most farms (Table 1) but by the end of January stubble was virtually gone from two thirds of paddocks. Some farmers used weeds as cheap pasture. Cattle were not as efficient "weed eaters" as sheep but both graze selectively leaving thornapples, saffron thistle, St. Barnaby's thistle, *Centaurea solstitialis*, groundcherry, *Physalis* spp, Bathurst burr and camel melon, *Citrullus lanatus*. Many weeds suppressed by animals removing the tops, regenerated after stock were removed. More successful weed control was achieved where sheep grazed escapes after spraying rather than spraying to control weeds after grazing. We could not assess if grazing commenced before spraying or if farmers who integrated grazing into their management program were less timely applying herbicides.

A feature of the summer rainfall wheat region is that there are many weed species capable of invading and expanding into both fallows and crops. Over 100 species were found in the December to February period of this study. The climate provides an environment that allows weeds to be a problem at any time during the year. This places pressure on both herbicide selection and timing application.

The initial impact of herbicides was with selective in-crop weed control. More recently there has been increasing success in substituting tillage operations with spraying. In some situations weeds in the entire fallow period have been effectively and economically controlled without cultivations (4). When herbicides were used instead of cultivating the number of weed species in paddocks was reduced and some previously common species became less of a problem, for example atrazine reduced black bindweed, thornapples and barnyard grasses. But there is an increase in other species, for example perennial grasses, especially native millet which was widespread in the region and can be more difficult and more expensive to control.

The most significant change in wheat production in northern NSW in the last 10 years has been the acceptance of chlorsulfuron by farmers. Chlorsulfuron provides good control of many weeds which had increased during the 1970's with the use of herbicides such as 2,4-D, MCPA, dicamba, picloram and bromoxynil. Now we see emerging a new range of weeds which chlorsulfuron does not control, for example melons and common sowthistle. Glyphosate is the most widely used fallow herbicide but mixtures with other herbicides are used to improve control. These include 2,4-D, metsulfuron, triclopyr for melons, clopyralid for thistles, atrazine for mintweed and residual control, and fluroxypyr if drift with 2,4-D is a danger. Metsulfuron is often the second best alternative for many broadleaf weeds. Its broader spectrum of activity and price advantage has it currently the most popular option in mixtures with glyphosate.

A comparison with important weeds identified in 1985 (2) shows that liverseed grass, barnyard grasses, native millet, Australian bindweed, common sowthistle, fleabanes, and bladder ketmia, *Hibiscus trionum*, were more important in no-till fallows in 1990.

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