ESTABLISHMENT OF WINTER OILSEED RAPE IN THE PRESENCE OF THE STRAW OF THE PREVIOUS WHEAT CROP

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INTRODUCTION

The area of straw and stubble burnt prior to oilseed rape establishment in England is not known but general observation suggests it is likely to be a substantial proportion, and certainly more than 50 per cent. The Government is proposing to ban straw and stubble burning after the 1992 harvest. There is a need to develop more suitable techniques for establishing rape in the presence of chopped straw, particularly after wheat on the heavier soils. The short interval between wheat harvest and rape sowing precludes the use of all except shallow cultivations on most of these soils. Light loams present few problems following ploughing. Medium loams are more suited than clays to ploughing before rape but the better option in dry conditions is often cultivation rather than ploughing.

Techniques of establishing oilseed rape by broadcasting seed into the standing cereal crop were investigated at Boxworth (clay) in harvest years 1987-89. The effects of baling and removing straw, or leaving chopped straw on the surface or incorporating the chopped and spread straw were also evaluated; treatments were modified slightly each year.

MATERIALS AND METHOD

The experiments were done each year on a clay soil of the Hanslope series with cultivar Bienvenu.

Treatments
Method of establishment

1. Straw burnt, shallow cultivation, drilled.
2. Seed broadcast into wheat crop on day of harvest, straw chopped and spread.
3. Seed broadcast into wheat crop on day of harvest, straw chopped, spread and incorporated.
4. Seed broadcast into wheat crop on day of harvest, straw baled and removed.
5. Seed broadcast onto chopped and spread straw and incorporated - 1989 only.
6. Seed broadcast into wheat crop 15-28 days before harvest, straw chopped and spread - 1987 and 1988.
7. Seed and chopped straw incorporated by single pass machine - 1988 only.

Seed rates
1. 7 kg/ha
2. 14 kg/ha

Design
Four randomised blocks with seed rates tested on sub-plots.

Plot size
Each sub-plot was 12.0m x 24.0m and harvest area was 2.6m x 22.0m.

The previous wheat crops were combine harvested with a Deutz-Fahr 36.30 with 4.8m width of cut. Straw was chopped and spread by a chopper and chaff spreader mounted on the back of the combine. Seed was broadcast into the standing wheat crops or on top of chopped straw by a pneumatic fertiliser spreader with a 12m spread. Straw burning followed chopping in 1987 and swathing in the two following years. Ash was incorporated by a power harrow working to a depth of 5cm and this operation was followed by a roll before drilling. The mixture of seed and straw in treatment 5 was incorporated with a rotary harrow working to a depth of 3cm into the soil. The single pass machine was the Horsch Accord rotary cultivator/pneumatic drill working at 3cm depth of soil; it was used at 7 kg/ha seed rate only. Plant populations were assessed in the spring. Pesticides and fertilisers were applied in accordance with good crop husbandry. Plots were combine harvested direct and the yields were corrected for moisture content.

RESULTS

Table 1. Spring plant populations.

Treatment	Plants per sq m					
	1987		1988		1989	
Seed rate kg/ha	7	14	7	14	7	14
SED	± 7.45		h ± 5.02 v ± 4.65		h ± 5.24 v ± 9.05	
1. Straw burnt, shallow cultivation, drilled	72.5	124.5	43.0	61.7	65.7	91.7
2. Seed broadcast on day of harvest, straw chopped and spread	36.1	56.4	Failed		7.7	14.0
3. Seed broadcast on day of harvest, straw chopped, spread and incorporated	50.7	86.2	34.3	51.5	8.2	16.5
4. Seed broadcast on day of harvest, straw baled and removed	42.0	65.5	Failed		15.2	19.2
5. Seed broadcast onto chopped straw and incorporated	NA		NA		39.2	64.2
6. Seed broadcast 15-28 days before harvest, straw chopped and spread	8.8	15.9	Failed		NA	
7. Seed and straw incorporated by single pass machine	NA		51.2	NA	NA	
(df)	29		6		15	
CV%	22.0		14.9		21.7	

NA = treatment not applied.

The highest plant populations with the non-burning methods tested in 1987 tended to be where the seed was broadcast into the wheat on the day of harvest and then the straw was chopped, spread and incorporated. Many of the systems failed to establish a crop in 1988 but where they were successful the differences in plant population were not significant ($P<0.05$) at either seed rate. In the last year only two treatments (burnt; and chopped, spread, seed broadcast and incorporated) gave significantly ($P<0.01$) greater plant populations than the remaining treatments.

Table 2. Yield of seed, t/ha at 91 per cent dry matter

Treatment	Yield t/ha 1987		1988		1989	
Seed rate kg/ha	7	14	7	14	7	14
SED	h ± 0.171		h ± 0.197		h ± 0.239	
	v ± 0.389		v ± 0.196		v ± 0.615	
1. Straw burnt, shallow cultivation, drilled	3.18	3.28	4.21	3.76	3.12	3.14
2. Seed broadcast on day of harvest, straw chopped and spread	3.49	3.45	Failed		1.06	1.63
3. Seed broadcast on day of harvest, straw chopped, spread and incorporated	3.73	3.10	4.28	3.64	1.73	1.33
4. Seed broadcast on day of harvest, straw baled and removed	3.52	3.40	Failed		2.40	2.57
5. Seed broadcast onto chopped straw and incorporated	NA		NA		2.82	2.98
6. Seed broadcast 15-28 days before harvest, straw chopped and spread	1.98	2.22	Failed		NA	
7. Seed and straw incorporated by single pass machine	NA		3.93	NA	NA	
(df)	105		6		15	
CV%	10.6		7.0		14.8	

NA = treatment not applied.

Yields were significantly ($P<0.05$) reduced where the seed was broadcast early into the wheat crop in 1987. In the few treatments where the crops did not fail in 1988 the differences in yield between treatments at the same seed rate were not significant ($P<0.05$). In 1989 the yield reductions resulting from broadcasting the seed into the wheat crop were significant ($P<0.05$).

DISCUSSION

The previous wheat crops in 1988 and 1989 gave mean yields of 7.1 t straw, 2.1 t chaff and 6.8 t/ha grain (all at 100 per cent dry matter) measured from hand-harvested areas cut at ground level. The wheat stubble lengths were in the range of 10-15cm.

The straw was burnt on the day after harvest and the rape drilled the next day in the first two years; in 1989 there was a delay of eight days in burning because of rain falling (49mm in the first four days). Similarly the straw was baled within two days in 1987 and 1988 but this operation and the incorporation of straw were delayed in the last year. Traps for slugs using methiocarb were placed in the plots but very few were found each year.

In the favourable conditions in 1986/87 good seedbeds were obtained and the rape grew well. Most of the treatments gave good establishment (Table 1) and satisfactory yields (Table 2). The low plant population and yield where rape seed was broadcast into the standing wheat crop 28 days before harvest emphasised the risk of sowing prematurely; the seed germinated within a week and most plants were at the 2 true leaf stage by wheat harvest.

In the three treatments where rape was broadcast and straw chopped and spread, or chopped, spread and incorporated, or baled, the yields tended to be greater than on the burnt treatments.

Wet conditions in June and July 1987 led to a prolific growth of Stellaria media (chickweed) on the trial site which may well have contributed to the poor results of treatments without incorporation. The problem of delaying harvest of the wheat crop because of weather conditions was encountered again with the early broadcast treatment. The interval between broadcasting and harvest was intended to be 10 days but was extended to 15 days and at wheat harvest most of the rape plants were at the cotyledon stage.

A long-term straw disposal trial in a neighbouring field in the same year was free of weed problems. After broadcasting rape seed into the wheat the effect of incorporation by rotary harrow after straw chopping was tested. On plots which had been either tined and ploughed or tined to 5cms for the previous four seasons there were no yield differences between incorporation or non-incorporation of the chopped straw.

Heavy rain over the period of cereal harvest in 1988 again highlighted the problems associated with sowing rape seed into standing wheat (Tables 1 and 2) as there was a six day interval between harvest and incorporation of straw and seed. The most likely explanation for poor establishment from these treatments is that the seed rotted under the wet straw. A higher proportion of the seed broadcast on to the chopped straw survived and this seed would have been lying on or close to the surface of the straw during the wet period. Sowing into the wheat crop and baling the straw (7 day interval) resulted in a low plant population and a moderate yield. Although straw burning followed by cultivation and drilling was delayed for nine days after wheat harvest this treatment gave the best plant population and yield.

Treatments were tested at seedrates of 7 kg and 14 kg/ha each year. Plant populations were larger at the higher seedrate but they rarely increased yield.

CONCLUSIONS

Satisfactory establishment and yield were achieved with broadcasting rape seed into standing wheat crops in ideal conditions. There were

problems if the interval between broadcasting of seed and harvest of wheat was extended beyond 2 or 3 days.

Difficulties in establishment in wet autumns and in weedy wheat crops were encountered.

Shallow incorporation of straw and seed usually produced more consistent results.

Seed rate probably needs to be increased slightly compared with drilling after burning straw and stubble from 6 kg to 7-9 kg/ha.

No problems with slug grazing were encountered but monitoring by means of traps was necessary.

Broadcasting rape seed on top of chopped straw followed by shallow incorporation and single pass machines that incorporate some of the straw and sow rape seed, have both shown promising results.