

WINTER OILSEED RAPE ESTABLISHMENT METHODS ON CLAY SOILS

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ABSTRACT

Experiments were done to evaluate contrasting methods of establishing winter oilseed rape on clay soils in the presence of chopped straw, at two sites in each of the three harvest years 1991-93. Primary cultivation systems using a plough, discs or tines, were compared with systems where the seed was broadcast on to chopped straw and stubble followed by a shallow mixing of seed, soil and straw, or direct drilled. Within the primary cultivation systems, plant populations were generally lower on the tined treatment compared with ploughing or discing, although there were no differences ( $P>0.05$ ) in rapeseed yields. Direct drilling generally gave the lowest plant populations and yields. Overall, the broadcasting system produced intermediate plant populations and rapeseed yields, working well in dry autumn conditions. The choice of establishment system for winter oilseed rape in the presence of straw on clay soils should be dictated largely by soil moisture conditions, although cultivation costs and time considerations will also be important.

INTRODUCTION

The optimum time for establishing winter oilseed rape, which is very dependent on moisture supply from soil to seed, occurs during a period of high evaporation in the UK, late August/September. The ban on straw burning, effective from autumn 1992, has exacerbated the difficulties of producing a fine, moisture retentive seedbed with disc/tine cultivations, particularly on clay soils. Good establishment of the crop in the early autumn is important, as this determines pesticide inputs and yield levels. Oilseed rape is more tolerant of low or variable establishment than cereals but more susceptible to delayed emergence.

MATERIALS AND METHODS

The previous crop at all sites was winter wheat. The straw was chopped and spread by the combine harvester; straw length was approximately 5cm. Chaff was spread at most sites. Site details are presented in Table 1.

TABLE 1. Site details for harvest years 1991-93

Year	Site	Topsoil texture	Soil Association
1991	ADAS Boxworth	clay	Hanslope
	Kneesall, Notts	silty clay loam (Keuper marl)	Worcester
1992	ADAS Drayton	clay	Evesham
	Kneesall, Notts	silty clay loam (Keuper marl)	Worcester
1993	ADAS Drayton	clay	Evesham
	Swineshead, Beds	clay	Denchworth

The following treatments were applied:

1. Ploughed 15-20cm, secondary cultivations with discs, tines and/or power harrow, drilled.
2. Tine cultivation 5-10cm (two passes), one pass of power harrow, drilled.
3. Discs (100 kg) 5-10cm (two passes), one pass of power harrow, drilled.
4. Seed broadcast on to chopped straw, power harrow to 2.5cm depth once.
5. Direct drilled with a Moore drill (2 years only).
6. Direct drilled with a modified direct drill (2 years only).

The Moore drill placed the seed alongside a disc slot adjacent to any straw that had been forced down the slot and the modified drill placed the seed on a shelf 0-15mm from the edge of the disc slot.

All treatments were rolled as the final operation. The sowing rate was 150 seeds  $m^{-2}$ . The experiment was a randomised complete block design with 3 or 4 replicates. Plot size was 144-577 $m^2$ . Plant counts were done in the autumn, winter and spring (March) using ten quadrats of 0.25 $m^2$  randomly sited in each plot. Yields of seed were determined using a small plot combine harvester (harvest area 60-130 $m^2$ ) and samples taken to determine dry matter content.

## RESULTS AND DISCUSSION

Mean plant populations in spring and seed yields are presented in Tables 2 and 3.

TABLE 2. Oilseed rape plant populations in spring each year (plants  $m^{-2}$ )

Sites	1991		1992		1993	
	Boxworth	Kneesall	Drayton	Kneesall	Drayton	Swineshead
Plough	52	62	65	81	71	34
Tines	53	60	23	50	55	21
Discs	52	61	50	74	72	45
Broadcast	39	48	16	44	16	34
Direct drill	-	-	6	24	26	13
Modified direct drill	-	-	4	23	19	13
P <	0.001	NS	0.001	0.001	0.001	0.01
SED $\pm$	2.2	5.4	6.6	8.2	10.2	9.9

TABLE 3. Seed yields ( $t\ ha^{-1}$  at 91% DM)

Sites	1991		1992		1993	
	Boxworth	Kneesall	Drayton	Kneesall	Drayton	Swineshead
Plough	3.60	2.31	1.41	2.58	2.58	0.70
Tines	3.42	2.25	1.37	2.89	2.79	0.56
Discs	3.37	2.30	1.20	2.85	2.66	0.87
Broadcast	3.41	2.35	1.09	2.70	2.14	0.48
Direct drill	-	-	0.79	2.66	2.61	0.46
Modified direct drill	-	-	0.82	2.99	2.01	0.28
P <	NS	NS	NS	0.01	NS	0.05
SED $\pm$	0.068	0.119	0.242	0.132	0.468	0.164

NS = Not significant ( $P > 0.05$ )

Soil conditions were dry for cultivations in the first two years but very wet in the last year. In the second of the dry years and in the wet year, plant populations were generally lower on the tined treatment compared with ploughing or discing. Broadcasting and mixing the seed with straw and soil resulted in a poorer establishment than the other non-direct drilled treatments. It was observed that pigeons were less attracted to graze where straw had been well inverted.

Yield differences between the non-direct drilled treatments were small in the first two years. The broadcasting system tended to reduce yields at Drayton in 1992 and at both sites in 1993. The direct drill treatments resulted in poorer establishment and generally lower yields than the treatments with some cultivation.

The conclusions from this work are that, although slow and expensive, ploughing in straw is the best option especially when topsoils are wet, particularly if the soil has been damaged by combines/trailers. Non-ploughing systems (discs/tines) with minimum cultivation are suitable when the topsoil is dry. Broadcasting seed on to chopped and evenly spread straw, and mixing into the top 2cm of soil is a cheap method of establishment favoured by dry soil conditions, although seedrate might need to be increased by 25%. Direct drilling into chopped straw with existing coulter design is not a reliable means of establishing oilseed rape, particularly in wet autumn conditions.

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