Weed seeds in white clover seed lots: losses during seed cleaning

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Abstract

In an examination of samples of field dressed and subsequently machine dressed seed lots of white clover cv. Merwi grown in Canterbury, seeds of 28 different weed species were detected. In field dressed seed lots weed content was dominated by suckling clover, hawksbeard, clustered clover, yarrow, wireweed, speedwell and viola. Seed cleaning successfully removed all the seeds of 21 of these 28 weed species. The implications of trying to remove the others, especially suckling clover, fathen, scarlet pimpernel, clustered clover, hedge mustard, field madder and field pansy are discussed in terms of the concurrent loss of white clover seed during cleaning. Cleaning losses ranged from 8% to nearly 30% of the white clover seed weight in the field dressed sample. Failure to control problem weeds pre-harvest can result in substantial financial losses as seed is cleaned in attempts to achieve purity standards.

Additional key words: field dressed seed, machine dressed seed, purity.

Introduction

Seed cleaning is the largest single cost in white clover seed production after heading. Currently the cost to the grower of having white clover seed cleaned (dressed) is approximately $0.30-0.35/kg of machine dressed seed weight. A further consideration is the loss of valuable white clover seed (worth up to $3.80/kg) during the removal of impurities.

In this paper we examine the number and types of weed seed species found in field harvested and subsequently machine cleaned seed lots of white clover (*Trifolium repens* L.) cv. Merwi and discuss the implications in terms of separation efficiency and potential financial loss of producing and cleaning white clover seed.

Materials and Methods

Ten seed lots of white clover cv. Merwi grown for the Canterbury Seed Co. Ltd. in the 1998/99 season were selected at random. All had been grown in Canterbury, with region of production ranging from Lincoln to Timaru. Samples of both field dressed (FD = as received for cleaning) and machine dressed (MD = after cleaning) seed were obtained for each of the ten seed lots and subjected to a purity analysis using internationally agreed methodology (ISTA, 1999). Following the separation of pure white clover seed, other seed and inert matter from the 2g purity working sample (ISTA, 1999), the weed seeds present were identified and the number of each species counted.

Data for FD and MD seed lot weights were obtained from Canterbury Seed Co. Ltd. records, and using the purity results, the weight of pure white clover seed in the FD and MD seed lots was calculated, as was the loss of white clover seed which occurred during cleaning.

Results

Weed seeds and their number recorded from the purity working sample differed among seed lots, but seeds of 28 different weed species were detected from the FD samples (Table 1). Suckling clover (*Trifolium dubium*) occurred in eight of the FD seed lots; hawksbeard (*Crepis capillaris*) and sowthistle (*Sonchus oleraceus*) occurred in seven of the FD seed lots, field madder (*Sherardia arvensis*) and yarrow (*Achillea*

Table 1. Weed species found in 10 field dressed (FD) and 10 machine dressed (MD) white clover seed lots and percentage removed following dressing (cleaning).

	Common Name	Botanical Name	Total seeds in 10 FD lots	Total seeds in 10 MD lots	% remaining after cleaning
1	Catchfly	*Silene gallica*	3*	0	0
2	Clustered clover	*Trifolium glomeratum*	312	4	1.3
3	Cocksfoot	*Dactylis glomerata*	3*	0	0
4	Cornbind	*Polygonum convulvulus*	2*	0	0
5	Fathen	*Chenopodium album*	13	15	100
6	Field madder	*Sherardia arvensis*	10	2	20
7	Field Pansy	*Viola* spp	38	2	5.3
8	Hairgrass	*Vulpia* spp	10	0	0
9	Hawksbeard	*Crepis capillaris*	537	0	0
10	Hedge Mustard	*Sisymbrium officinale*	19	3	15.8
11	Nipplewort	*Lapsana communis*	18	0	0
12	Rayless Chamomile	*Matricama matricariodes*	2*	0	0
13	Ryegrass	*Lolium* spp	114*	0	0
14	Scarlet pimpernel	*Anagallis arvensis*	12	4	33.3
15	Scentless Chamomile	*Matricaria perforata*	1000*	0	0
16	Scotch Thistle	*Cirsium vulgare*	1	0	0
17	Sheep's Sorrel	*Rumex acetosella*	7*	0	0
18	Shepherds Purse	*Capsella bursa-pastoris*	9*	0	0
19	Speedwell	*Veronica arvensis*	>1000	0	0
20	Sowthistle	*Sonchus arvensis*	26	0	0
21	Spurry	*Spergula arvensis*	9	0	0
22	Stinking Mayweed	*Anthemis cotula*	52*	0	0
23	Striated clover	*Trifolium striatum*	10	0	0
24	Suckling clover	*Trifolium dubium*	103	66	64.0
25	Vetch	*Vicia* spp	17	0	0
26	Willow weed	*Polygonum persicaria*	1*	0	0
27	Wireweed	*Polygonum aviculare*	106	0	0
28	Yarrow	*Achillea millefolium*	131	0	0

* Only occurred in 1 or 2 of the 10 seed lots examined.

millefolium) occurred in four of the FD seed lots, and scarlet pimpernel (*Anagallis arvensis*), fathen (*Chenopodium album*), hedge mustard (*Sisymbrium officinale*), wire weed (*Polygonum aviculare*), speedwell (*Veronica* spp), and viola (*Viola* spp) occurred in three of the FD seed lots. Many of the weed species occurred in only one or two seed lots. One contained a large number of speedwell seeds. Another had a large number of scentless chamomile (*Matricaria inodora*) seeds.

Seed cleaning completely removed the seeds of 21 of the 28 weed species (Tables 1 and 2). Species still present after cleaning were suckling clover (4 seed lots), fathen, scarlet pimpernel, clustered clover (*Trifolium glomeratum*), and field pansy (two seed lots each), and hedge mustard, field madder and scentless chamomile (one seed lot each) (Table 2). The ability of the cleaning process to remove weed seeds depended on the species present, with all weed seeds removed in lots 5 and 8, but only around 70% in lots 7 and 10 (Table 2).

White clover seed losses during the cleaning process ranged from around 8% to nearly 30% of the white clover seed present in the FD sample (Table 3). In weight these losses ranged from 325 kg to 2.6 tonnes, so that potential income loss ranged from around $1,000 to nearly $10,000 (Table 3).

Table 2. Purity analysis of the working sample for ten field dressed (FD) and machine dressed (MD) lots of white clover cv. Merwi.

Seed lot	Total number of weed seeds FD	Total number of weed seeds MD	No of weed species FD	No of weed species MD	Weed seeds removed in cleaning (%)	Weed species not removed in cleaning
1	212	16	14	4	92.5	Fathen, field madder, scarlet pimpernell
2	82	3	8	1	96.3	Suckling clover
3	1170	26	7	1	97.7	Suckling clover
4	309	19	11	2	93.8	Clustered clover, Suckling clover
5	115	0	5	0	100.0	-
6	306	6	7	3	98.0	Clustered clover, Hedge mustard
7	10	3	5	2	70.0	Field pansy, Scarlet pimpernel
8	190	0	6	0	100.0	-
9	1095	1	4	1	99.9	Scentless chamomile
10	87	24	13	33	72.4	Fathen, Field pansy, Suckling clover

Table 3. Losses of pure white clover seed during cleaning for ten seed lots of cv. Merwi.

Seed lot	Pure white clover seed (kg) FD	Pure white clover seed (kg) MD	Loss of pure white clover seed in cleaning kg	%	value ($)
1	7606	6150	1456	19.1	5533
2	4425	3966	459	10.4	1744
3	7390	6234	1156	15.6	4393
4	3607	2936	671	18.6	2549
5	4190	3865	325	7.8	1235
6	9280	7225	2055	22.1	7809
7	7420	6831	589	7.9	2238
8	6580	4874	1706	25.9	6483
9	8400	6427	1973	23.4	7497
10	8810	6200	2610	29.6	9918

[1]At a price of $3.80/kg

Discussion

Depending on seed lot, from five to 14 different weed species were recorded from FD seed, with the number of weed seeds found in the 2g purity working sample ranging from 10 to over 1000. The weed spectrum differed among paddocks, but as data for previous paddock history, cultivation and crop establishment method, and herbicide regimes are not available, any comment would be speculative. It seems however, that some growers relied heavily on the seed cleaning process to achieve a seed lot purity capable of meeting contractual and seed certification standards.

Of the 28 weed species recorded, cleaning successfully removed seeds of all but seven of them. These were suckling clover, fathen, field madder, scarlet pimpernel, hedge mustard, clustered clover and field pansy. All but suckling clover have previously been reported to be common contaminants of New Zealand white clover seed lots (Dingwall, 1969; Rowarth *et al.*, 1990; 1995); suckling clover has been previously classified as an 'other crop' species rather than a weed (Scott and Hampton, 1985), and is a common reason for the down grading or rejection of white clover seed lots from certification (Young and Hampton, 1987).

In seed cleaning the objective is to select machines and machine settings which will remove the contaminating material with the smallest loss of crop seed. Efficient seed cleaning requires skilled operators (Hartley, 1990) but even the most skilled operator has trouble in removing weed seeds which resemble white clover seeds closely in shape, length and weight (e.g., suckling clover, field madder and sheep's sorrel; Young and Hampton, 1987). All ten seed lots examined in this study had MD purities which met the weed seed requirements of seed certification. However, to achieve these purities, from 8 to 30% of the white clover seed was removed from the seed lots along with the weed seed, and the reason for this range of losses can mostly be explained by the weed seed content of the FD lots. Lots 2, 5, 7 and 10 had the least number (<120) of weed seeds in the purity analysis sample, and for the first three, the bulk of these weeds were removed readily so that crop seed dressing losses were 10% or less. The

exception in this group was seed lot 10, where presumably the seed cleaning operator tried unsuccessfully to remove the high levels of suckling clover, resulting in a crop seed dressing loss of 30%. It is therefore not only the number of seeds in the lot, but also the species which can have a major effect on seed cleaning efficiency. The other six seed lots all had >200 weed seeds per purity analysis sample, and because of this greater weed load, more crop seed (16 to 26%) was lost in the process.

A dressing loss of 20% or more (O'Neill, 1990) may be acceptable to growers, particularly if it means that the seed lot will then meet purity standards. However, it can also be a significant financial loss because of the quantity of crop seed lost during cleaning.

Conclusions

White clover seed growers should not expect seed cleaning operators to solve their weed seed problems. Weeds which cannot be controlled in clover (such as yarrow, docks and field madder) should be eradicated in the preceding five year crop rotation (Clifford *et al.*, 1996). Problem establishment weeds (such as suckling clover and sheep's sorrel) can now be controlled by registered herbicides (Allen, 1996).

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