CONTAMINATION PROBLEMS IN HERBAGE SEED PRODUCTION

N. L. SHILLITO

Advisory Division, M.A.F., Christchurch

Summary

The problems presented by weeds and contamination by other varieties of the crop in the production of pasture seeds is reviewed. Higher standards of purity required by importing countries threaten a valuable export trade. Within New Zealand the increase in numbers of cultivars, especially legumes, presents problems in maintaining type purity through contamination from seed carried over in the soil.

INTRODUCTION

The aim of this paper is to point out some of the problems encountered in seed production and to make a plea for increased research effort to provide the answers to them.

VALUE OF SEED INDUSTRY

The seed industry warrants a larger share of research effort than it currently enjoys since it is a major factor in our agricultural economy.

Its contributions come under several headings:

1. It provides a major source of income to those farmers situated in seed producing areas.
2. It supports a servicing industry which is responsible for the processing and marketing of seed.
3. Seed exports earn New Zealand a considerable amount of overseas funds as shown in the accompanying table.

HERBAGE SEED EXPORTS

Mean Annual Figures for 1966/67
to 1970/71

	<i>Quantity</i> (tonnes)	<i>f.o.b. value</i> (\$NZ, 000)
Grass seed	7904	2,104
Clover seed	2363	1,649

These are tangible things which can be measured in dollars. However, an effective seed industry has a much greater value. It benefits almost almost every type of agricultural enterprise and could be described as the basis for all farming production. The cropping farmer must have good quality seeds of proven varieties to ensure satisfactory yields, while dairy, beef and sheep farmers require seed for pasture establishment, renewal and for sowing supplementary feed crops.

A lot is heard about exotic breeds of cattle and sheep and how they are going to increase production, but hardly any mention of the seed necessary to supply the feed. Yet I am sure that there is a greater potential for increased production from improved pasture and crop plants than through new breeds of cattle and sheep.

THE PROBLEM OF PURITY IN SEED CROPS

New Zealand has a first class record in seed production both in quantity and quality. This country was one of the first to see the value of improved strains of plants and a supply of seed genetically pure and free from undesirable weeds.

The Grasslands and Crop Research Divisions of D.S.I.R. have produced locally bred strains of most of our crop and pasture species. A seed certification scheme ensures that a constant supply of high grade seed is available.

More recently there has been a growing awareness in other countries of the need for good quality seed on a world basis. This has resulted in the setting up of an O.E.C.D. scheme of seed certification which aims at assisting the flow of seed through international channels. New Zealand is a member of this organisation and must ensure that its seeds meet the standard set. The E.E.C. countries which have always been regular buyers of our seed are gradually setting up their own regulations which in many cases are stricter than O.E.C.D. This is particularly the case with weed seeds and if we wish to continue trading with E.E.C. countries we must be able to produce seed free from the weed species which are on their black list, notably wild oats (*Avena* spp) and dodder (*Cuscuta* spp). Apart from export problems, seed is a medium for the spread of weeds domestically and the seed industry has a responsibility to ensure that this danger is reduced to a minimum.

Weeds are not the only problem. It is almost as bad to have seed lines contaminated with seed of other crop cultivars. Maintaining varietal purity is becoming increasingly difficult as new local cultivars are released and the practice of growing overseas varieties for re-export increases. The situation will inevitably become more difficult the more varieties we grow.

Certification involves field inspection. Very high standards are set. For basic seed the area is rejected if one contaminant is found in any quadrat of 10 square metres. Sampling procedure requires inspection of not less than five quadrats for two hectares or less and not less than 20 quadrats for nine to ten hectares.

In machine dressed seed the tolerance for weed seed is not more than 0.2% and for other crops not more than 0.3%. For E.E.C. countries, a line will be rejected if search of 100 g sample reveals one wild oat or one dodder seed, with the proviso that if a further 200 g sample is found to be free of these seeds then the line will be accepted.

PROBLEMS CAUSING CONCERN IN NEW ZEALAND

The basic requirement is to prevent contaminants entering the crop during the growing period and being harvested with the crop.

The principal danger comes from seeds carried in the soil and germinating with the crop. Many weed contaminants can be dealt with in the growing crop but the period prior to and during establishment is the most important time for controlling crop variety contaminants. Unless volunteer crop seedlings can be eliminated from seed beds, ability to produce pure seed will be severely limited.

By far the most difficult contaminants at this stage are hard seeds of legume species. There is at present no proven method for dealing with them and this makes it impossible to undertake seed multiplication of overseas varieties of either white (*Trifolium repens*) or red clover (*T. pratense*) in those districts best suited to grow them. In addition the release of two new Grasslands cultivars has been approved; 'Grasslands Pitau' white clover and 'Grasslands Pawera' tetraploid red clover. We are likely to encounter all kinds of problems trying to produce uncon-

Small Seed Crops

taminated seed of these cultivars and incidentally not affect the growing of our current white clover 'Grasslands Huia' and the two red clovers 'Grasslands Turoa' and 'Grasslands Hamua'.

Although not presenting quite so much difficulty, contamination of grass seed crops by other cultivars of the same species is always a danger. In many cases it is difficult if not impossible to detect contaminants at field inspection. The elimination of viable seed in the soil would act as an insurance against this sort of contamination.

Some thought has been put into this problem and the following techniques have been proposed — the first aimed principally at weed control and the latter three, both weed and crop cultivar contamination.

1. A planned rotation with constant shallow cultivation and chemical sprays to kill weeds in the various crops and prevent reseeding to renew soil contamination.
2. Spray stubble of previous crop and after a withholding period drill seed without any cultivation.
3. Partial fallow with cultivation restricted to approximately 5 cm to obtain maximum germination of viable seeds, followed by a period to allow remaining weeds to grow and then spray seedlings. Seed to be drilled after a suitable withholding period on a stale seed bed with minimum disturbance of top soil.
4. Sowing in wide rows to permit inter-cultivation of inter-row spraying. There is a need for basic research into a number of aspects.

For example —

How long do seeds of the various species remain viable in the soil?
From what depth are seeds capable of emerging?

The availability of water is another important factor. Dry to drought conditions frequently occur at periods when seed beds are being prepared. Unless weeds and volunteers germinate and grow during the time available for treatment elimination is not possible. If the use of water is necessary to produce clean seed, what are the economics of irrigation in preparation for a seed crop?

Contaminants whether they be weeds or other crops can have a detrimental competitive effect on the growing crop. Wild oats and Californian thistle (*Cirsium arvense*) are notable in this respect while a heavy crop of ryegrass can seriously retard white clover establishment. Once harvested cleaning by machine is costly and can lead to loss of crop seed in attempting to reach purity standards.

To cope with weeds in the growing crop we require chemicals highly specific against certain weeds. Some are already available but many problems remain. The question of separate growing of clovers and grasses for seed production arises here.

Though it is unrealistic to expect research into every aspect of the problems mentioned, I do feel that there is an excellent case to have the sterilisation or cleaning of seed beds for herbage seed crops accorded high priority in research programming. Maintenance of varietal purity is a fundamental requirement for continued enjoyment of the benefits of plant improvement programmes and a profitable export trade.