MECHANISING BURIED SEED SAMPLING

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Abstract. The seed bank is an important component in the dynamics of plant populations and the need to understand its role has become increasingly evident for weed management purposes. Recovery of seeds from the soil presents a variety of problems, but the most important constraint is that the procedures are labour intensive. This has been a limitation to studying seed banks in field experiments involving a range of treatments. Efforts to do so have often lead to inadequate sampling, from which inaccurate and misleading conclusions have resulted. This abstract briefly describes sampling devices developed to rapidly obtain and process soil samples from the field. Improved accuracy in estimating buried seed populations has resulted from using these devices.

Modified tractor and hydraulic soil corer. To obtain large numbers of samples it was necessary to design and construct a tractor mounted hydraulically powered soil corer. Axles on the tractor were extended to give 2.4m clearance, avoiding soil compaction, and damage to experimental plots. Two movable hydraulic rams were mounted vertically at the rear on a frame attached integrally to the tractor chassis. These force a coring tube, fitted to the ram via a quick release bayonet mount, into the soil. The tube is coated with dry lubricant to facilitate removal of soil. The equipment requires three operators and 1000 cores can easily be taken per day.

Homogenisation and subsampling v's wet sieve washing. Two alternatives for preparing samples for seed extraction were developed. Both were conceived to reduce the field samples to a size that could be handled feasibly and rapidly in the laboratory.

The first involved mixing, using a rotary mill designed to homogenise the sample, followed by reduction using a rotary subsampler. The rotary mill consists of a drum made from perforated steel which is rotated by a 0.6 kW electric motor at 30 rpm (speed reduced via pulleys). An entire sample of approximately 16 kg is placed inside the drum along with two 4.6 kg steel rollers. As the drum rotates the soil is mixed and crushed by the rollers until it falls through the 5 mm perforations. This results in a thoroughly mixed free flowing soil sample for passing through the subsampler. The rotary subsampler has a geared 0.2 kW electric motor which drives a collecting tray on a turntable at 60 rpm through a 90° reduction gearbox. The collecting tray houses two removable sector shaped subsample pots which collect, on each revolution, a portion of the crushed soil flowing from an overhead hopper. The percentage size of the subsamples can be varied by using different sized sample pots.

The crushing and subsampling method was not suitable for large soft coated seeds such as wild oats, *Avena* spp., so a rotary washer was designed. A 4.0 m^3 tank supported by steel legs and braces, internally houses a cradle (designed to hold 6 demountable canisters) on a shaft rotating at 6 rpm. The shaft is powered by a 1 kW electric motor driving through a worm-gear reduction gearbox. The canisters made from 1 mm perforated steel are plunged into the water bath, washing out the soil and leaving seeds and other large particles trapped inside. Up to 12 soil samples, each of 25 kg, can be washed per day.

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