

# THE ESTABLISHMENT OF AGRICULTURAL WEEDS FOR FIELD TRIALS AND DEMONSTRATIONS



## **OBJECTIVE:**

**The purpose of a field trial is to obtain adequate data using the minimum resources.**

In weed control trials this is best achieved by establishing pure populations of the required weed species in an otherwise weed-free area. This allows each species to develop free from competition with other, possibly more robust, species and greatly speeds up assessments in the later stages of the trial. Assessments are simple because they do not require the visual appearance of each species to be picked out from the overall appearance of a mixed weed population.

Large gains in efficiency can be made by sowing seed of as many species as are required in lines or bands within a single trial, rather than finding sites, establishing, spraying and assessing the many trials necessary to achieve data on the same number of species occurring as natural populations. This permits assessments to be carried out rapidly, accurately and reproducibly by less skilled personnel. Furthermore the deliberately established populations are uniform over the whole trial area thus it is easier to demonstrate statistical significance of the results than in trials carried out on natural weed populations, which inevitably have a high degree of variance.

## EARLY STAGE FIELD SCREENS; MINIMISE CHEMICAL REQUIREMENT, MAXIMISE DATA PRODUCED

Compact field screens permit the performance of a new herbicide to be characterised on a large number of species, using a small area and small amounts of chemical. Sow lines of each desired species 20 centimetres apart, thus producing a bed containing five species per metre of width. Make the lines as long as necessary to provide the desired number of treatment plots. To achieve a single line of densely spaced plants, you typically need 200g of seed per 100 metres of drill length (400g/100metres for large seeds such as *Galium aparine* and *Avena fatua*). Then apply each treatment across the width of the bed, at right angles to the rows of weeds.

## EVALUATION TRIALS AND DEMONSTRATIONS; MIMIC THE SPREAD OF SEEDLING EMERGENCE WHICH OCCURS IN PRACTICAL AGRICULTURE

A criticism of the sowing technique outlined above is that all seeds of a species are sown at the same depth, consequently seedling emergence is nearly simultaneous. This is an advantage in maximising the effect of a treatment but is not what occurs in practical agriculture. 'Natural' populations of weeds emerge from different depths in the soil over a longer period of time. For a greater similarity to agricultural practice the following procedure is effective in distributing the seeds at a range of depths throughout the upper 2 centimetres of soil:

1. Prepare the seedbed.
2. Mark out the trial area.
3. Scatter the weed seeds from a bucket by hand in 30cm. wide bands. Make one band of each species, 30cm. apart across all plots. Typically, 1kg of seed is sufficient for a band 30cm by 100 metres. (Some trialists use a modified seed drill with the coulters removed to scatter the seed in bands on the soil surface rather than doing it by hand)
4. If desired, plant the crop over the whole area at its normal depth.
5. power harrow to a depth of 2-5 cm. and roll.
6. Apply experimental treatments at 90° across the weed rows.

The harrowing operation distributes the seeds in the top 2-5cm. of the soil, resulting in the protracted seedling emergence characteristic of a natural weed population.

## GERMINATION REQUIREMENTS

Many spring weeds will germinate in early autumn but their seedlings are killed by the winter frost. However, these species can be sown after October, whereupon the seedlings emerge (as in nature) in early spring. Some species have evolved a requirement for a cold period to ensure that germination does not occur prematurely. Sowing in late autumn or winter is particularly valuable for seeds that require a cold period to achieve maximum germination. Alternatively, if a trial must be sown later than March, seeds of cold requiring species such as *Polygonum*, *Aethusa* and *Atriplex* should be artificially stratified prior to sowing.

Herbiseed Brief Weed Guide No. 2 gives more detailed information on alleviating dormancy in weed seeds.

**Stratification** involves mixing the seed with three times its volume of coarse sand or vermiculite, wetting to field capacity and storing in an open container at 0-4° Centigrade for 3 weeks to 3 months, depending upon the species.

**At certain times of year, Herbiseed can supply frozen packs of (wet) pre-stratified seed of certain species.**

**Scarification** is the thorough scratching of seed coats with abrasive such as sandpaper to permit water entry. 'Hard' seeds with thick coats such as those of vetches and clovers frequently require scarification.

**Herbiseed can scarify seeds for you on request.**

The following table describes the season at which seed of the most widely used temperate arable weeds can be sown, together with the optimum depth for establishment and provides additional comments which may be helpful in establishing a field trial.

In the table;

- A. = Autumn sowing
- W. = Winter sowing
- S. = Spring sowing
- Depth = depth in millimetres of soil cover
- SS = Surface Sow with no soil cover. This requires continued surface moisture until the seedlings are established.

### GRASS WEEDS

WEED NAME	SEASON	DEPTH	COMMENTS
<b><i>Agropyron (Elymus) repens</i></b> Couch grass	A.W.S.	5mm.	Is readily established from seed but grows slowly at first.
<b><i>Agrostis gigantea</i></b> Black bent	A.W.S.	SS	Germinates easily. Seedlings slow to establish.
<b><i>Agrostis stolonifera</i></b> Creeping bent	A.W.S.	SS	Fast germination but seedlings grow slowly.
<b><i>Alopecurus myosuroides</i></b> Blackgrass	A.W.S.	1-2mm.	Rapid germination and growth, but must not be sown too deep
<b><i>Apera spica-venti</i></b> Silky bent	A.W.S.	SS	Plants tend to be susceptible to mildew fungus.
<b><i>Avena fatua</i></b> Spring wild oat	W.S.	20mm.	Use genetically non-dormant seed to avoid seed germinating in following crops.
<b><i>Avena (sterilis) ludoviciana</i></b> Winter wild oat	A.W.S.	20mm.	More frost-tolerant than <i>A. fatua</i> . Both species can be susceptible to mildew.
<b><i>Bromus commutatus</i></b> Meadow brome	A.W.S.	5mm.	Can fail to flower if sown in late spring, so sow before early March if needed for a demonstration.
<b><i>Bromus sterilis</i></b> Sterile brome	A.W.S.	5mm.	Needs a cold period to stimulate flower initiation so sow before early March if needed in a demonstration.
<b><i>Bromus tectorum</i></b> Drooping brome	A.W.S.	2-5mm.	Much shorter and less competitive than the two <i>Bromus</i> species above.
<b><i>Festuca pratensis</i></b> Meadow fescue	A.W.S.	2-3mm.	Slow seedling growth.
<b><i>Festuca rubra</i></b> Red fescue	A.W.S.	2-3mm.	Slow seedling growth.
<b><i>Holcus lanatus</i></b> Yorkshire fog	A.W.S.	SS	Needs plenty of moisture to establish but growth is rapid..
<b><i>Lolium multiflorum</i></b> Annual ryegrass	A.W.S.	3mm.	Rapid germination and establishment.

<b><i>Lolium perenne</i></b> Perennial ryegrass	A.W.S.	3mm	A little slower than <i>L. multiflorum</i> but produces more tillers.
<b><i>Phalaris brachystachys</i></b> Awned canary grass	A.W.S.	2mm.	Frost susceptible if sown before October.
<b><i>Phalaris canariensis</i></b> Canary grass	S.	2-3mm	Frost susceptible.
<b><i>Phalaris paradoxa</i></b> Confused canary grass	A.W.S.	3mm.	Frost susceptible if sown before October.
<b><i>Poa annua</i></b> Annual meadow grass	A.W.S.	SS	Needs light and fluctuating temperatures to germinate.
<b><i>Poa trivialis</i></b> Rough stalked meadow grass	A.W.S.	SS	Germinates and establishes rapidly but not normally competitive with spring cereals.
<b><i>Sorghum halepense</i></b> Johnson grass	A,W.S.	3mm.	Seed for spring sowing should be soaked overnight in water at 60°C.
<b><i>Setaria species</i></b> Bristlegrasses	A.W.S.	3mm.	Spring germinating. Rapid germination and establishment.

### DICOTYLEDONS

WEED NAME	SEASON	DEPTH	COMMENTS
<b><i>Abutilon theophrasti</i></b> Velvetleaf	S.	5mm.	Emerges best if treated with boiling water for 3-5 seconds before sowing
<b><i>Aethusa cynapium</i></b> Fool's parsley	A.W.	3-5mm.	Emerges in spring from A.&W. sowing but sowing in spring unreliable.
<b><i>Amaranthus species</i></b> Pigweeds	S	3mm	Germinates and establishes easily but seedlings not frost hardy.
<b><i>Ambrosia species</i></b> ragweeds	A.W.S	5mm.	Requires cold treatment, so pre-stratify seed for late spring sowings.
<b><i>Anthemis arvensis</i></b> Corn camomile	A.W.S.	2mm.	Least common of the mayweeds but easy to germinate and establishes fast.
<b><i>Aphanes arvensis</i></b> Parsley piert	A.W.S.	SS	Slow to emerge and not competitive in spring cereals.
<b><i>Arabidopsis thaliana</i></b> Thale cress	A.W.S.	SS	Can flower prematurely if sown before October. Not a competitive weed.
<b><i>Atriplex patula</i></b> Common orache	A.W.	5mm.	Emerges in spring from A.&W. sowing but spring sowings unreliable.
<b><i>Capsella bursa-pastoris</i></b> Shepherd's purse	A.W.S.	SS	Can flower prematurely if sown before October.
<b><i>Centaurea cyanus</i></b> Cornflower	A.W.S.	2mm.	Susceptible to rust fungus from autumn sowings.
<b><i>Chamomilla (Matricaria) recutita</i></b> Scented mayweed	A.W.S.	SS	Less competitive than <i>C. perforata</i> but better adapted to dry soils.
<b><i>Chamomilla (Matricaria.) perforata</i></b> Scentless mayweed	A.W.S.	1mm.	Shallow sowing is critical. Disturb surface if no emergence in 3 weeks. The most common of the 'mayweeds'
<b><i>Chenopodium album</i></b> Fat hen	S.	2mm.	Needs warmth to germinate.
<b><i>Chrysanthemum segetum</i></b> Corn marigold	A.W.S.	2mm.	Can be frost sensitive if sown before October. Best in sandy soils.

<b>Datura stramonium</b> Thornapple	A.W.S	3mm.	Germination and establishment is easy and rapid. Seedlings not frost tolerant.
<b>Fumaria officinalis</b> Fumaria	W.S.	3mm.	Can be difficult to establish a dense population from late sowings.
<b>Galeopsis tetrahit</b> Hempnettle	A.W.S.	3-5mm	Scarification and stratification can improve germination, best sown in A.
<b>Galium aparine</b> Cleavers	A.W.S.	5-10mm.	Some European biotypes germinate better in late spring than British ones.
<b>Geranium dissectum</b> Cut leaved cranesbill	A.W.S.	2-3mm	Frost hardy but can die back considerably in a warm wet winter.
<b>Ipomoea species</b> Morning glories	A.W.S.	5mm	Scarify spring-sown seed. Rapid germination and establishment
<b>Kochia scoparia</b> Broom, Kochia	A.W.S.	3mm	Cold treatment advantageous, so pre-stratify late spring sowings.
<b>Lamium purpureum</b> Red deadnettle	A.W.S.	2mm.	Seed batches behave differently, it is an advantage to mix several batches.
<b>Myosotis arvensis</b> Forget me not	A.W.S.	2mm	Can be susceptible to mildew. Easy to establish
<b>Papaver dubium</b> Long headed poppy	A.W.S.	SS	Can be more reliable than <i>P. rhoeas</i> from late spring sowings outdoors.
<b>Papaver rhoeas</b> Common field poppy	A.W.S.	SS	Needs cool conditions for germination. Do not bury seed.
<b>Polygonum aviculare</b> Knotgrass	A.W.S.	2mm,	Needs at least 3 weeks stratification. Autumn sowings germinate in spring.
<b>Polygonum convolvulus</b> Black bindweed	A.W.S.	3mm.	Best with stratification but more reliable than <i>P. aviculare</i> for spring sowing.
<b>Polygonum lapathifolium</b> Redshank	A.W.S.	5mm.	Autumn sowings germinate the following spring. Mixing several batches is an insurance policy for spring sowing.
<b>Raphanus raphanistrum</b> Wild radish	A.W.S.	10mm	Spring sowings should be soaked in 3% potassium nitrate solution before sowing
<b>Rumex crispus</b> Curled dock	A.W.S.	2mm.	Seed can persist for years if buried too deeply.
<b>Senecio vulgaris</b> Groundsell	A.W.S.	SS	Sowing late in spring risks rust fungus infection. Do not bury seed!
<b>Sinapis arvensis</b> Charlock	A.W.S.	3mm.	If sowing in late spring mix several batches to ensure establishment.
<b>Solanum nigrum</b> Black nightshade	S.	1-2mm.	Seedlings can be frost sensitive.
<b>Sonchus asper</b> Prickly sowthistle	A.W.S.	SS	Susceptible to rabbit damage in winter.
<b>Stellaria media</b> Chickweed	A.W.S.	2mm.	The easiest possible weed to establish except in hot dry conditions.
<b>Urtica urens</b> Annual nettle	A.W.S.	2mm.	Severe winters can kill seedlings from early autumn sowings.
<b>Veronica hederifolia</b> Ivy leaved speedwell	A.W.S.	5mm.	Best from Autumn sowing, use European populations for late spring.
<b>Veronica persica</b> Common field speedwell	A.W.S.	2mm.	Batch variation means that mixed batches are a good insurance policy..

<b>Viola arvensis</b> Field pansy	A.W.S.	2mm.	Late spring sowings can be difficult in the absence of irrigation.
<b>Xanthium strumarium</b> Cocklebur	A. W. S.	10mm.	Germinates in spring. Spring sowings benefit from 24 hour soaking at 30°C

These suggestions do not attempt to be a comprehensive guide to weed establishment. They aim to provide the information most useful at the establishment phase of an arable weed trial in a readily accessible form. If information is required on other species or on other aspects of weed establishment, our 30 years trials experience is available to answer your questions.

**Herbiseed**  
NEW FARM  
MIRE LANE  
WEST END  
TWYFORD  
RG10 0NJ  
ENGLAND

Telephone: +44 (0) 118 934 9464  
Fax: +44 (0) 118 924 1996

e-mail: [technical@herbiseed.com](mailto:technical@herbiseed.com)  
e-mail: [sales@herbiseed.com](mailto:sales@herbiseed.com)

web site: [www.herbiseed.com](http://www.herbiseed.com)