

SEED MIXTURES

Background information and progress on development of Rules for their testing

As yet ISTA has no specific section in its Rules dealing with seed mixtures and the testing of seed mixtures has to be conducted therefore in the context of the present Rules. The Sampling and Bulking, Purity and Germination Committees in conjunction with the Statistics Committee have been tasked with producing guidance for the testing of mixtures that will be used for an experiment designed to gather the necessary information that may allow Rules to be proposed.

The tools/procedures are in place for the initiation of this experiment and this paper gives an overview of where we are at the present time and what is still required.

Sampling

This is the most difficult area especially where the mixture contains seeds of different sizes and densities. Much of the plant used to produce mixtures does not produce homogeneous seeds lots and even if homogeneous seed lot is obtained movement of components within containers and this in itself leads to difficulties.

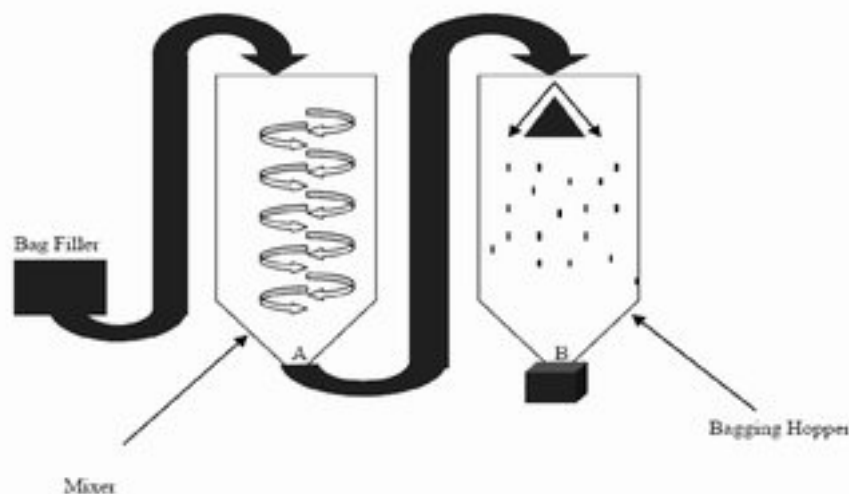


Figure 1 typical mixing plant containing a worm+or screw+device.

Figure 1 is a diagram showing the mixing plant of a typical grass seed merchant in the UK who produces grass seeds mixtures. The plant itself leads to heterogeneity within the lot produced. Seed for the mixtures is loaded via the bag filler into the mixing chamber A where a screw or worm blends the components with a constant movement of seed from the bottom to the top of the mixing chamber. Once all the seed is loaded into the mixing chamber the blending operation proceeds for about 30 minutes. Timing of this blending process is crucial: if insufficient time is allowed then there will be insufficient mixing of the bagged components; if it is allowed to proceed for too long there will be segregation of components with the less dense component

moving towards the top of the mixing chamber. Once the blending operation is completed the seed is transferred to a bagging hopper via a conveyer. The seed enters the bagging hopper B over an inverted cone. The cone helps to disperse the components in the mixture but also tends to set up a gradient within the bagging hopper based on seed size and density with a higher concentration of smaller denser seed towards the bottom of the hopper .

Using this equipment it is very difficult to produce inform homogeneous seed mixtures where component species have different sizes and densities. Containers filled at the beginning of the bagging process will tend to have a higher proportion of smaller denser seed.

The only certain way of producing a mixture where the components are homogeneous with respect to the containers is by weighing out the components parts of the mixtures, according to the mixture specification, for each container and then mixing these prior to filling individual containers. Plant that operates in this manner is available but it is extremely expensive and consequently uncommon. Only one seeds merchant in the UK operates such equipment.

Even if the components are homogenous with respect to containers and within containers when they are produced movements and transported leads to movement of components within the containers. Even the bagging process can lead to heterogeneity within a container (Figure 2).

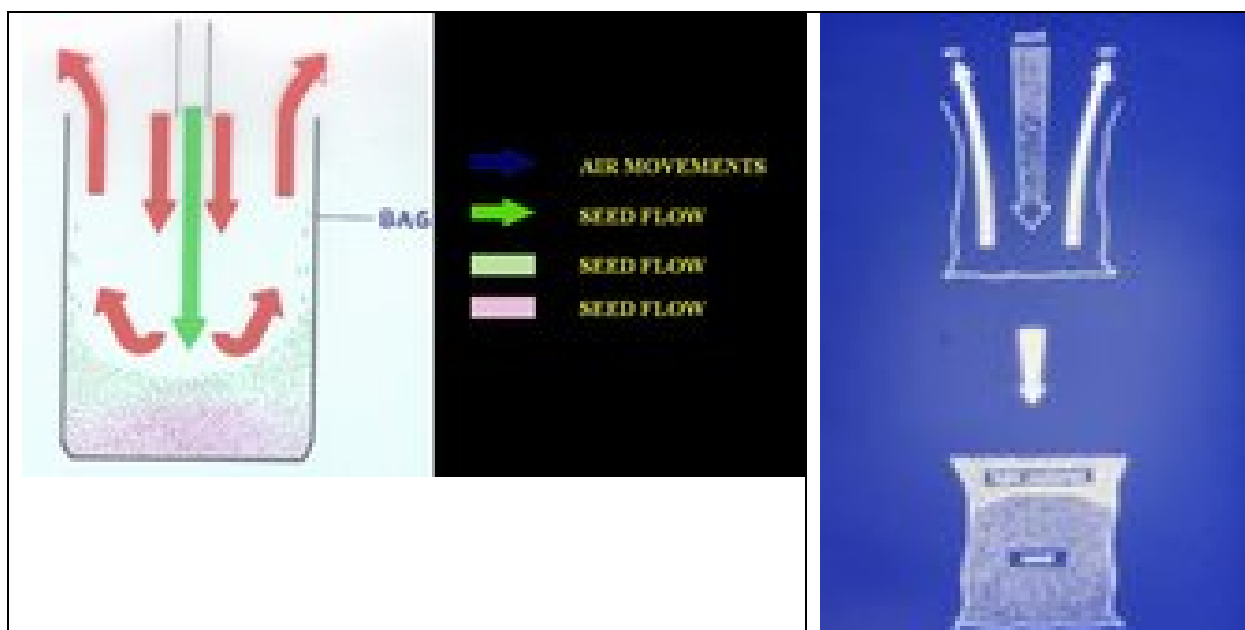


Figure 2 Heterogeneity within a container due to air movements during filling

Air movements will lead to a higher proportion of denser component at the bottom of containers and a higher proportion of lighter components towards the sides and top of containers.

Even when the components are homogeneous within a container movement of the container, during transportation can result in segregation of components (Figure 3).



Bag prior to Vibration **Bag after vibration applied to top of bag**

Figure 3 Effect of vibration from on the distribution of *Lolium* sp in a sample of wheat

It is therefore difficult to obtain a homogeneous seed lot of a mixture and this makes it extremely difficult to obtain a sample that is representative of the seed lot. ISTA sampling methods require the assumption of a homogeneous seed lot. If the mixture is homogenous with respect to containers (i.e. all the containers contain the same proportion of components) then ISTA sampling methods can be applied but if there is heterogeneity due to differences in the component distribution between containers current ISTA sampling methods are not appropriate. Michael Kruse has had a student looking at the problems of sampling mixtures and this student conducted a survey of mixture testing procedures employed by ISTA stations. A copy of a PowerPoint presentation of her findings is available from Dr Kruse.

Because of the difficulties of obtaining homogeneous seed mixtures some certifying authorities (e.g. Netherlands) do not test seed mixtures. They have a quality assurance system in place that certifies the mixing plant and certifies the components that are added to the mixture. Other measures that can be taken by certifying authorities in terms of consumer protection is ensuring that part lots of mixtures are not sold to different customers. Mixtures are made up to order for individual customers. If a customer orders 1 tonne then only 1 tonne is made up. This ensures that in terms of the complete lot purchased by the customer the components are in the specified proportion.

Statistical Analysis of results

The Stats Tool Box on the ISTA web site contains an excellent downloadable programme that can be used to check:

- Label by weight of seeds of the different components;
- Label by number of seeds of the different components;

- Whether the results from 2 samples are compatible by weight of seeds of the different components; and
- Whether the results from 2 samples are compatible by number of seeds of the different components.

This program is used by certification authorities in the EU to determine whether the results obtained on enforcement samples, taken from seed mixtures, are compatible with the label specification.

From the ISTA website:

http://www.seedtest.org/en/stats_tool_box_content---1--1143.html

Statistical tests for seed mixtures Sylvain Gregoire (FR), Julia Barabas (HU)
A PowerPoint® presentation introduces the work which resulted in an Excel® file with 4 types of χ^2 tests for seed mixtures. One can use buttons to navigate through the spreadsheet or use Excel® classically. Data can be directly typed in the cells. Cells with formulae are protected, but users are able to remove the sheet protection in order to adapt the tool to their needs.

ISTA Experiment on Seed Mixtures

The Bulking and Sampling Committee have proposed an experiment to collect information that may be used to determine the reliability of seed mixture test results and establish tolerances.

Laboratories taking part in the experiment should follow the sampling and testing guidance in the protocol of the experiment.