MANUAL

DRYING OF SEED

A Unit Standard for the Seed Industry

Unit Standard New Draft
NQF Level 4
Credits: 13

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SAN S OR

Learner Name:
Learner Number:
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US: Drying of Seed

Unit Standard Specific Outcomes

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UNIT 1: DRYING OF SEED

1.1 Introduction

Seed drying is the reduction of seed moisture content to the required or recommended levels of storage for each seed kind. The moisture content is the amount of water in the seed and it is expressed as a percentage. Seed drying requires process techniques that will not be harmful to growth and seed viability. High moisture content of seeds is one of the main reasons why they loose their ability to germinate during storage. It is for this reason that it is important that seed is dried after harvesting or after conditioning when treatment with chemicals may cause moisture content to rise.

Why are seeds dried?

Seeds need to be dried to retain their viability (growth) when stored. In general it is recommended that seeds be dried as defined by standard workplace procedures.

When should seeds be dried?

Drying of seed should start immediately after harvest in order to stabilise the moisture content of a seed lot at ambient temperature and relative humidity.

The drying process should then continue at the seed processing plant after the receipt of the seeds to avoid unnecessary deterioration. It can take up to several weeks to lower the moisture content to the required levels for safe storage.

1.2 General seed drying methodology:

Several methods are available for drying seeds. Some are more suitable in certain environments and safer for the viability of the seeds than others. It is recommended that to dry seeds in an atmosphere of reduced relative humidity is recommended. The lower the humidity the faster the seeds will dry and the lower their final moisture content will be. Drying can be either natural or artificial. Natural drying is a process where there is a movement of air around the damp seed. For this process to be effective the air of the natural atmosphere must be drier that the seed itself. The air flow must be able to move between the seeds, i.e. layering of seed should be uniform and not too thick. Artificial drying is the process where the air movement and the moisture content of the air is controlled. This is done by heating the air and circulating it through the seed. However,
the methods used at a specific workplace will be predetermined by the work site procedures.

Good seed drying can be achieved if the following four steps are followed:

1.2.1 Step 1: Determine moisture content and drying period

Taking into account the different seeds applicable, the work area must be prepared according to work site and safety procedures. Instructions for drying and the current moisture level must be obtained and the appropriate PPE must be selected.

The initial moisture content and the drying instructions of each accession can be obtained from the appropriate personnel and from the prescribed work site procedure. Remember that seeds will dry more slowly as the moisture content decreases towards the equilibrium.
moisture content. At low moisture contents a difference of one or two days of drying will not have a large effect on seed moisture content.

1.2.2 Step 2: Prepare the seeds for drying

Seeds are placed in labelled paper bags or woven (polyprop) bags. The bags must be porous as seeds will not dry in solid plastic bags.

1. Place each accession in labelled paper bags or woven (polyprop) bags, or

2. Seed can be emptied out into labelled drying bins or trays.

3. Do not put too many seeds in the same bag. One accession can be split into several labelled bags to aid rapid drying.

1.2.3 Step 3: Dry the seeds

Several methods are available for drying seeds. The safest methods rely on leaving the seeds in an environment of low relative humidity and allowing the seed moisture content to reach equilibrium with this at relatively low temperatures. Seeds will equilibrate with the relative humidity at different rates, depending on species, seed size and conditions. The prescribed drying method for a specific seed lot can be obtained from the work site procedures.

1.2.4 Step 4: Accurately determine moisture content

Seed can be severely damaged by high temperature. It is therefore extremely important to follow and monitor the applicable work site procedures. Moisture content can be checked at regular intervals and corrective actions must be taken according to prescribed procedures. Recording of information and deviations must be done as stipulated in the work site procedures and statutory requirements.

A sub-sample from each accession is removed when seeds are thought to be dry enough and tested. If the moisture content is not low enough the seeds are dried further.

1. At time interval prescribed by the work site procedures, remove a sub-sample from each accession and carry out a moisture content determination, according to prescribed method (ISTA Rules).

2. When the moisture content is at the predetermined level the seed can go to packaging to wait for the packaging process and kept in hermetically sealed bulk containers.
Always remember to label a seed lot immediately after handling in order to prevent batches from getting mixed up.

Low moisture contents are detrimental to the viability of the seeds of some crops. These seeds should be treated with care and not dried to too low moisture levels.

3. If the moisture content is not low enough, continue to dry for a further period as described in the work site procedures. When the moisture content is found to be in the correct range for seed storage for that particular seed kind, proceed according to instructions obtained.

4. Make sure that seeds which have been dried are kept in the drying area in moisture-proof containers whilst tests are carried out to prevent absorption of moisture from the surroundings.

1.3 Seed drying methods and equipment

Seed drying should begin as soon as possible to avoid deterioration as it can take up to several weeks to lower the moisture content of the seeds to the required level. There are many methods of drying seeds; these methods depend on the type of seed that is being dried. Listed below are the most common drying methods:

1.3.1 Forced air drying

In this system air (either natural or heated) is forced into the seeds. The air passing through damp seeds picks up water. The air and the seed are both cooled by evaporation. The heat necessary for evaporating the water comes from the air, with consequent temperature drop of the air. These are the fundamental principles of forced air seed drying.
1.3.2 Sun drying

When forced air drying facilities are not available, the moisture content of seeds can be reduced in the field before harvest, and later by sun drying on the threshing floor. The system involves harvesting of crops when they are almost fully dried in the field, leaving the harvested produce in field for a couple of days to sun dry and later spreading the threshed and winnowed produce in thin layers on threshing floors to sun-dry. The main advantage of sun drying is that it requires no expenditures or special treatment. The disadvantages however are delayed harvest and risk of weather damage.

1.3.3 Dehumidifier dryer

A dehumidifier dryer is a machine that dries a small volume of air in a drying room or other limited space. Seeds packed in porous containers are placed in the drying area and are left there until the moisture content is found to be in the range of storage. The relative humidity and room temperature are checked daily.
1.3.4 Silica gel

Silica gel can be used to reduce the relative humidity of air used to remove moisture from seed. This silica gel can be reused by heating without damage.

Colour-indicating silica gel contains a moisture indicator. When silica gel is completely dry, it is deep blue in colour. As it picks up moisture from the air, the colour indicator changes from blue to pink. Silica gel may be re-dried by heating. Heating drives out the absorbed moisture and as it does so, the colour changes back to deep blue. When drying objects it is important to keep the container size small in relation to the object being dried. This helps to insure more rapid and thorough drying.
1.3.5 Personal Protective Equipment

Personal Protective Equipment (PPE) is specialised clothing or equipment worn by employees for protection against health and safety hazards. The equipment is designed to protect parts of the body, i.e., eyes, head, face, hands, feet, and ears. The different types of equipment used may differ from one company to the next. If you are responsible for drying seed, you must be familiarised with the appropriate equipment worn at your workplace and the location of this equipment. For the purpose of this manual the most frequently used PPE will be discussed.

Hard hat

If there is any danger of falling objects or head injury, a hard hat should always be worn.

Figure 5: Hard hat

Gloves

When working with wooden pallets or any type of material which can cause injury to your hands, protective gloves must be worn. There are many different types of gloves, but you will be provided with those appropriate to your workplace. A special kind of resistant glove is also necessary when working with dangerous chemicals.

Gloves must be:

- appropriate to the material handled
- worn whenever there is potential for contact with corrosive or toxic materials
- worn whenever there is a possibility of injury to your hands, e.g. when lifting loads manually
- cleaned after use
- replaced periodically depending upon use and type of material handled
Hearing protection

Noise is a common problem in many workplaces. High levels of noise can gradually damage your hearing and this is unfortunately a permanent handicap. The following types of hearing protection equipment are available:

- Foam Earplugs
- PVC Earplugs
- Earmuffs

Safety shoes

If you work in and around a fabrication workshop there is always a possibility of heavy objects falling on your feet or sharp objects puncturing your foot. Hazardous liquids such as chemicals can spill into your shoes and boots. These hazardous materials can cause chemical and other burns. Heavy machinery, equipment, and other objects can roll over your feet often resulting in broken or crushed bones. Safety shoes are compulsory for all lifting and transferring equipment operators.

Safety glasses

Safety glasses are usually made from shatter-resistant plastic lenses to protect the eyes from flying materials. Although safety lenses may be constructed from a variety of materials that vary in impact resistance, certain standards suggest that they maintain a minimum 1mm thickness at the thinnest point, regardless of material. If chemicals splash in your face or eyes, flush skin and eyes with water for at least 15 minutes and then get medical attention.

Respirators / Dust masks

A dust mask should always be worn when working with harmful gases and in areas with a lot of dust. Special masks protecting the respiratory (breathing) canal must be worn when working with extremely dangerous gases or in areas with a high carbon monoxide concentration.

1.3.6 Completing the process

Dried seed must be forwarded to the next process according to work site procedures. The work area should be cleaned and restored according to work site procedures and relevant parties must be informed.
Label seed before you forward!!!!

Complete Exercise 1, 2 and 3 in your workbook
ANNEXURE 1: REFERENCES

This document does not claim to be an original publication. Various sources of information and documents were used when compiling this document. Any neglect to make reference of any source, including an author, web site or publication is not through intent. Such omissions should be brought to the attention of SANSOR, who will gladly rectify the omission.

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### ANNEXURE 2: UNIT STANDARD

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### COMPILED BY STANDARD GENERATING BODY FOR SECONDARY AGRICULTURE PROCESSING

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### TITLE:

**DRYING OF SEED**

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PURPOSE STATEMENT
A learner who has achieved this unit standard will be competent in:
Perform, without supervision, the drying of seed to maintain quality.

LEARNING ASSUMED TO BE IN PLACE
To enter a learning programme for this unit standard or to be assessed against this unit standard, the learner is assumed to have:
- Literacy, numeracy and communication skills at or equivalent to NQF level 3.
- An understanding of safety in the work place at NQF level 3.
- An understanding of supplier and customer relationships.
- Introduction to seed industry and relevant workplace.
- Determine moisture levels using appropriate equipment.

SPECIFIC OUTCOMES
A learner assessed as competent against this standard will be able to:

OUTCOME A: PREPARE FOR THE DRYING PROCESS BY
- Preparing the work area and selecting appropriate equipment according to work site and safety procedures.
- Obtaining drying instructions and documentation according to work site procedures.
- Obtaining the initial moisture content of the relevant seed.
- Contributing to drying plan by determining a sequence of operation according to work-site procedures.
- Selecting appropriate personal protective equipment (PPE) according to statutory requirements.

OUTCOME B: DRY SEED BY
- Selecting and set appropriate equipment according to work site and safety procedures.
- Apply technology to dry seed according to work-site procedures and operational procedures.

OUTCOME C: MONITOR AND CONTROL THE DRYING PROCESS BY
- Checking moisture content of seed at regular intervals according to work-site procedures.
- Taking corrective actions (when applicable) according to work site procedures.
- Recording drying process according to work site procedures.
- Reporting of deviations to relevant parties according to work site procedures.
OUTCOME D: COMPLETE DRYING OF SEED BY

- Identifying dried seed according to work site procedures.
- Forwarding dried seed according to work site and safety procedures.
- Restoring work area according to work site procedures.
- Informing relevant parties according to work site procedures.

ASSESSMENT CRITERIA

Assessors will observe, confirm and evaluate evidence that will indicate that learners have demonstrated competence in each of the specific outcomes. In this unit standard the following specific criteria should be used:

- Job instructions, oral or written, are accurately followed and adhered to.
- Appropriate tools and equipment are identified and selected according to work site procedures.
- Purpose of determining a sequence of operation is explained.
- Consequences of not monitoring moisture content and taking corrective actions are explained.
- Purpose of reclaiming grain according to work site procedures is explained.
- Purpose of preparing the work area is explained.
- Reasons for adhering to safety and quality procedures.

ACCREDITATION AND MODERATION PROCESS AND CRITERIA: (Mechanisms and bodies for external moderation of learner achievements)

An individual wishing to be assessed against this unit standard may apply to an assessor accredited by SETASA.

Any training provider offering learning that will enable achievement of this unit standard must be registered and accredited by SETASA.

Moderation of assessment will be done by SETASA in its ETQA capacity at its discretion.

RANGE STATEMENT (General guide for scope, context and level)

The scope of this unit standard deals with the drying of seed from higher to acceptable moisture levels in order to maintain quality.

The specific outcomes as reflected in this unit standard are performed without direct supervision, but with access to work site procedures and operating instructions.

Identifying may include packaging and labelling.

NOTES (1)

CRITICAL CROSS FIELD OUTCOMES: (What abilities must I use)
Work effectively with others when receiving information and giving instructions during the drying process.

Organise and manage oneself when planning and performing the drying process.

Communicate with others during the process of giving and receiving instructions.

Identify and solve problems when monitoring the drying process and changing operational settings.

Collect, analyse, organise and critically evaluate information by identifying and selecting appropriate equipment.

Use science and technology when operating control panels and drying equipment.

NOTES (2)

ESSENTIAL EMBEDDED KNOWLEDGE (Knowledge that will help me understand and that I will be able to explain)

- Basic knowledge of the safe handling of equipment related to drying of seed.
- Basic knowledge of maintenance and caring for relevant equipment.
- Operating instructions of drying equipment.
- Knowledge of moisture determination in seed.
- Knowledge of moisture reduction theory and methods.
- Appropriate computer operational skills.
- Basic knowledge of relevant seed technology.

NOTES (3)

VALUES

All learners should demonstrate:

- An application of company ethics, values as well as general safety and customer care principles.
- An awareness of expectations and obligations of basic worker / management / customer relationships.