Sorghum Seed Production

Manual

DIRECTED PROCEEDURE FOR GRAIN SORGHUM SEED PRODUCTION ON FARM

National University of Lesotho

Department of Agricultural Research

The investigator The light in the farming zone

CCARDESA

Centre for Coordination of Agricultural Research and Development for Southern Africa

THE WORLD BANK

Sorghum Seed Production Manual

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Meet our Team

DR M LIPHOTO
The team leader in Variety development and selection as well as seed development procedures and farmer training

TELLO MOTHIBELI
Research Assistant and Script compiler

MALIEHE MAQHAI

Research Assistant in Variety Evaluation and characterization

KHOTHATSO NKHABU
Research Assistant in variety development and variety evaluation, as well as data managemnet and analysis

Oscar Moris
I
ANGOLA

Co-Principal investigator in Angola. aided in compilation of the manual

IMELDA MPAHANE
Assistant in Seed development and variety demonstrations.

Seed Unit
Department of Agricultural Research

Inside

Execuitve Summary

This document delineates important aspects of seed production that a farmer must follow. It is a practical guide that leads the seed companies into getting the seed production technically and legally correct.

This manual is aimed at informing practicalities of producing grain sorghum seed from the recommended sorghum varieties By National University of Lesotho Under APPSA-project (Agricultural Productivity for Southern Africa) of Department of Agricultural research Lesotho.

The manual was developed under the sub-project: strengthening seed value chain in Lesotho and Angola- The case of Sorghum.

A well functioning seed system is that which uses appropriate combination of formal and informal channels to efficiently meet farmers demands for quality seed of suitable crop varieties. The seed sector in Lesotho relies on imports of seeds developed for and by other states.

The Local private sector participation is very minimal. seed production is mainly done by individual farmers focused on Maize and beans. There is no attention at all to other important crops such as grain sorghum and fodder sorghum.

Grain sorghum (sorghum bicolor) belongs to the family of poaceae. it is often a self pollinated. Sorghum is a warm season crop using C4 pathways. It can be photo-periodic sensitive (short day). However most of the cultivated genotypes in Sub-Saharan Africa are not photo-periodic sensitive. It is erect an annual plant with varying heights from dwarfs to tall genotypes. It has broad leaves similar to that of Maize

LIST OF RECOMMENDED VARIETIES

Sorghum varieties listed here were evaluated for adaptability and stability in different Agro ecological zones of Lesotho. The recommendations are based on statistically analysed data from the trials. Varieties are recommended for All Agro-ecological zones of Lesotho

Variety Name	Agronomic and consumer advantages
Seqhobane Sekhutsoanyane-se-secha (110 days)	White grain Good for samp making Good for popping
NUL 2000-E-ncha	Red grain Good brewing qualities
Seqhobane se-sesehla-se secha	White grain good fermentation traits good for porriage
Seqhobane se se khutsoanyane se secha (90 days)	White grain Good for samp making Good for popping
Seqhobane se sekhubelu	Tall variety Good brewing qualities Good for popping
AEX 1099-2-2	Red grain Low soil pH tolerant None tillering and none branching
AEX 2230 -2-2	Red grain Low soil pH tolerant None tillering and none branching
AEX 1096-2-2	Red grain Low soil pH tolerant None tillering and none branching
GADAM	White grain Low soil pH tolerant None tillering and none branching
AEX 2230-1-1	Red grain Low soil pH tolerant None tillering and none branching
IESX 2230-1-2	White grain Low soil pH tolerant

LAND AND SOIL PREPARATION

Grain sorghum grows in all agro ecological zones of Lesotho with poor soils, where maize can not yield well. however adequate soil fertility is necessary for optimum yield. Soil fertility testing and analysis is recommended prior to planting season.
Soil testing services are offered at the cost at the Department of Agricultural Research. And the soil sampling procedures are conducted with the assistance of the area extension staff.

The land prepared for sorghum seed crop should BE cleared of perennial plants that were previously growing on the Land. if the land was previously planted with fodder sorghum, such land should be avoided to avoid volunteer plants, or find means to eradicate the previous remaining seeds in the soil.

Lands can be cleared by use of herbicides and also agricultural machinery to remove tree stumps that might be on the land.
Burning of the crop residues is not necessary and therefore not recommended in the case of Lesotho.

preparation of the soil for sorghum planting generally includes, tilling the land with the mouldboard plough first. This can be ox-drawn or tractor driven. Primary tillage will cut the soil and break the clay pan and also burying the weeds on the surface. Harrowing or discing should follow so as to provide for a smooth- fine even seedbed that is essential for good soil seed contact thereby promoting good germination, and uniform crop stand..
As compared to grain sorghum crop where spacing is 25 cm between plants, seed crop spacing is recommended to be 15 cm between plants and 1 meter between rows. The seed drill is mandatory for sowing

Seasonal and Climatic requirements

GRAIN SORGHUM SEED IS BEST SUITED FOR WARM SEASON WITH ENOUGH FROST FREE DAYS IN LESOTHO

Grain sorghum grows well in warm climates. It often withstands drought and flooding compared to other grains. It is thus able to adapt to semi arid conditions and low inputs agricultural practices. It is recommended for cultivation through out all agro-ecological zones, including some selected micro-climates in the mountains.

Planting dates for grain sorghum begin from October to November. It is important that flooding time does not coincide with pollen shed period as this may wash away the pollen grain from the panicles. However warm moist conditions are required for pollen survival and pollination efficiency.
the warmer temperatures are preferred for proper seed setting.

Other agronomic practices

FERTILIZER REQUIREMENTS, WATER USE MANAGEMENT.

GRAIN SORGHUM HAS THE DEEP ROOTED AND FIBROUS ROOT SYSTEM. THIS DIRECTLY RELATES TO ITS EFFICIENT NUTRIENT AND WATER UPTAKE FROM THE SOIL SOLUTION. HOWEVER PROFITABLE YIELDS ARE OBTAINED WITH ADEQUATE FERTILIZATION WITH N:P:K COMPOUND FERTILIZERS AS A SIDE DRESSING AND BASAL TREATMENT; AND TOP DRESSING WITH NITROGENOUS FERTILIZER AT BOOTING STAGE. THE FERTILIZER RECOMMENDATIONS ARE CASE SPECIFIC AND ARE ALWAYS OBTAINED FROM SOIL FERTILITY SPECIALIST FOLLOWING REGULAR SOIL TESTING.

Sorghum will respond well to irrigation in as much as it is said to be water effeicient.. In any case grsin sorghum seed production can be successfully produced in Lesotho under drayland conditions.

Weeed and volunteeer plants control

The previous crop should not be the same with the one to be introduced (seed crop), to avoid occurrence of volunteer plants. The crop has to be certified and be accepted for certification. Remove the plant weed competition during early stages of development. Weeds often compete for light, water and nutrients with crops and hence reduce both seed quality and expected yields. Weed control can be done mechanically or chemically

Roughing

In order to maintain genetic purity; it is important to ensure that all plants in a seed field are uniform in appearance and morphology. Off-types can be identified through stem colour, plant structure, and number of leaves, auricles, nodal colour and grain colour. These off-type should henceforth be regularly removed once identified

Genetic Purity

The genetic purity of a variety or trueness to its type deteriorates due to several factors during production cycle. some of these factors include mutation, developmental variations, natural crossing and minor genetic variation. Adequate isolation helps maintain genetic purity, roughing as well assist in genetic purity maintenance. Finally, the use of new and clean threshing equipment and packaging material is fundamental to maintain genetic purity

Isolation and Isolation distance

seed crop should be isolated from the rest of the plants that can cross pollinate with the main seed crop. Also the seed field should be separated from other sorghum fields with the specified distances according to the national regulation. it also depends on the category of the seed the farmer is producing.
The isolation distance for:
Breeders seed is 400 m
Foundation Seed is 300 m
Certified seed is 150-200 m

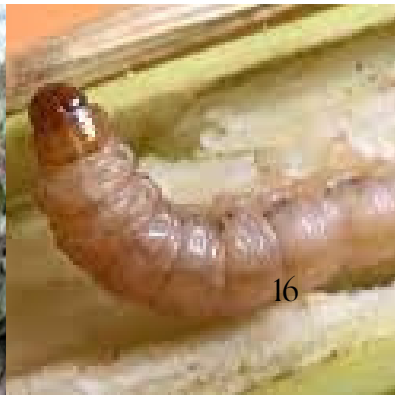
Physical Purity

Mechanical mixture determines the physical purity of the harvested seed. The seed should be free from weed seeds and rocks. Thus threshing of the crop should be done on clean concrete floors, free from soil contaminants. The soil contaminant may increase disease incidents on the grain seed, thus be avoided.
moreover a seed producer must ensure that there are not mechanically broken kernels, shrunken seeds and any other foreign matter.

Sorghum Pests and diseases

Disease and cause	Symptoms	Occurrence	Control
Viral diseases			
Maize dwarf mosaic virus * (MDMV-A) Sugarcane mosaic virus (MDMV-B) See Extension Bulletin L-481	Mosaic patterns (alternating light and dark green areas) on whorl leaves. Cool nights (below 60 F for Strain A, below 70 F for Strain B) may cause red and necrotic areas resembling a blight. Flowering may be delayed. Seed may be underdeveloped.	Virus is carried by insects, mostly greenbug and corn leaf aphid. MDMV overwinters in Johnson-grass.	Plant tolerant hybrids. Hybrids expressing only the mosaic reaction show less reduction in yield than plants with red leaf symptoms.
Small seed Primarily MDMV	Red to black lesions develop on panicle branches. Often damage is limited to point of seed attachment-appears as a black dot inside floret. As seed shrinks it becomes a dull color	Observed when the crop matures during soft dough. Most common during cool, wet weather.	Hybrids resistant to MDMV are not immune to small seed. No practical controls at present time.
Foliar diseases caused by fungi			
Sorghum ergot *Claviceps africana*	Ovary is converted to a white fungal mass visible between the glumes. Exudation of a sweet, sticky "honeydew" from the infected flowers occurs. Honeydew that drips onto leaves or soil produces a white, powdery mass during moist conditions.	Worldwide wherever sorghum is grown. Male-sterile forage sorghums and hybrid seed production fields are most susceptible.	Avoid planting male-sterile forages or hybrids with cold sterility problems. Avoid late planting. Later plantings should have increased plant populations to discourage secondary tillers.
Northern corn leaf blight *Exserohilum turcicum*	Large (2 inches or more) elliptical spots with gray centers and tan to reddish borders. Very similar to sooty stripe.	Most prevalent during prolonged periods of warm and humid weather.	Crop rotation. Resistant hybrids.



Harvesting and seed conditioning

Grain sorghum is harvested when it is physiologically mature and the panicles have dried up. This period is usually 40 to 55 days after flowering for most of our recommended varieties. At this stage the seed moisture content is at 25% t- 30% of the seed weight. The stage can be easily identified by formation of dun ken layer at the base of the attachment to the heads. The ear heads can be harvested commercially with machines when 80% of the heads are physiologically matured and the moisture content is around 20% The crop is harvested once over harvest as uniformity will be maintained with ear heads maturity.

Seed conditioning include seed threshing and winnowing, seed cleaning and seed treatment. seed certification and storage.

Threshing is separating the grain from the panicles and straws. It can be machine operated or accomplished manually. Small holder farmers in most terrains would opt for manual threshing. threshing here should always be done in protected back and on the concrete floors depending on the holding size.. A particular care should be put in ensuring that there is no contact of the seed with the soil or any other potential contaminant.
Mechanically, machines are used to strip the seed from the panicle. This method involves the use of petrol or diesel powered engines. There is also the use of stationery threshers or tractor operated threshers.

Winnowing follows threshing of the seed. This cleans the seed by separating it from the chaff. It uses wind to blow away the chaff and plant debris from the seed. The operation can also be manual or mechanical. Thorough seed cleaning involves the removal of inert matter, other crop seed (including weeds) and damaged seeds from the harvest. This cleaning increases the market value of the seed and also to ensure good seed quality.

SORGHUM SEED TREATMENT AND STORAGE

Sorghum seed should be chemically treated to enhance germination and to control seed borne diseases. Commonly the sorghum seed should be treated by soaking the seed in 2% Monopotassium phosphate and then dried back to original moisture content of 10 %. as an eco-friendly treatment, seeds are also fortified or hardened with 1% propolis for and dried back to their normal moisture contend of 10%. In addition, the seeds of sorghum must also be treated with carbonfuran 3G to protevt them from shoofy infections. Seed should also be sry dressed with bavistin to a solution ration of 2g/kg. this shall protect the from seed borne phytopathogens and soil borne pathogens.
Seed treatment with propolis reduces black mold attack, and may as well be given as folliar sprays at time of maturation.

Packaging of gran sorghum seeds should be of hygienic standards. it should also display clearly the brand name of the seed production company or association, bar codes, germination percentages and other important characteristics of the seed.

Storage house is where conditioned and packaged seed is kept for market. This house should be well build(both the walls and floors be cemented) to enable proper cleaning. The store should also be well ventilated to allow inn fresh air. Additionally, it must be disinfected to protect the seeds from storage pests and pathogens. The treated seed can be stored up-to 12 months ad more provided the seeds are not attacked by pests.

Seed Inspection and certification

seed inspection and certification is conducted by inspectors as assigned by the National seed authority. Seed certification process on its own is a legally suctioned system for quality control o and seed multiplication/production. It involves field inspection, pre and post control tests, and as well as seed quality tests.

For grain sorghum, the expected number of seed field inspections are three:

- The first inspection is conducted before flowering in order to verify isolation, absence of volunteer plants, plant diseases and pests and many other relevant factors
- The second inspection is conducted at flowering to check on isolation in time, absence of off-types and other relevant factors
- The third inspection is conducted at maturity and prior to harvesting to verify true nature of the crop variety and other relevant factors.

Contact Details:

Dr Mpho Liphoto
Department of Crop Science
National University of Lesotho

Phone Numers: + 266 52217093

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