




Trial guidelines for conducting the trial and efficient data collection

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS
CGIAR

Trial guidelines for conducting the trial and efficient data collection

Objective:

1. To raise an observation nursery for selection of the best millet genotypes
2. Efficient data collection for analysis and selections

Observation nursery

Keeping in view the small seed size and minimum quantity of seeds per genotype, trial management can be done by

a. Planting a seed production set under control conditions for seed increase prior to field trial or as a backup along with field trial.
b. Raising a seed nursery in control conditions followed by transplanting the seedlings to field.

A. Seed Production under controlled conditions:

Nursery preparation: Seed Production

- A potting mixture of soil: sand: peat is prepared in the ratio of 3:2:1.
- Plants can be raised in 50-well tray or 105-well tray placed on a mat/gunny bag or pots based on availability (Example: 2 plants for a 4-inch or 10cm diameter pot).
- The seeds are placed on the soil mixture by making a small hole of 2-3mm depth by a peg and covered by a thin layer of sand for better germination.
- The trays are irrigated immediately after sowing followed by alternate day or as needed to ensure germination.

105-well tray placed on a mat:

Pots:

50-well tray placed on a mat:

Seed production in trays and pots:

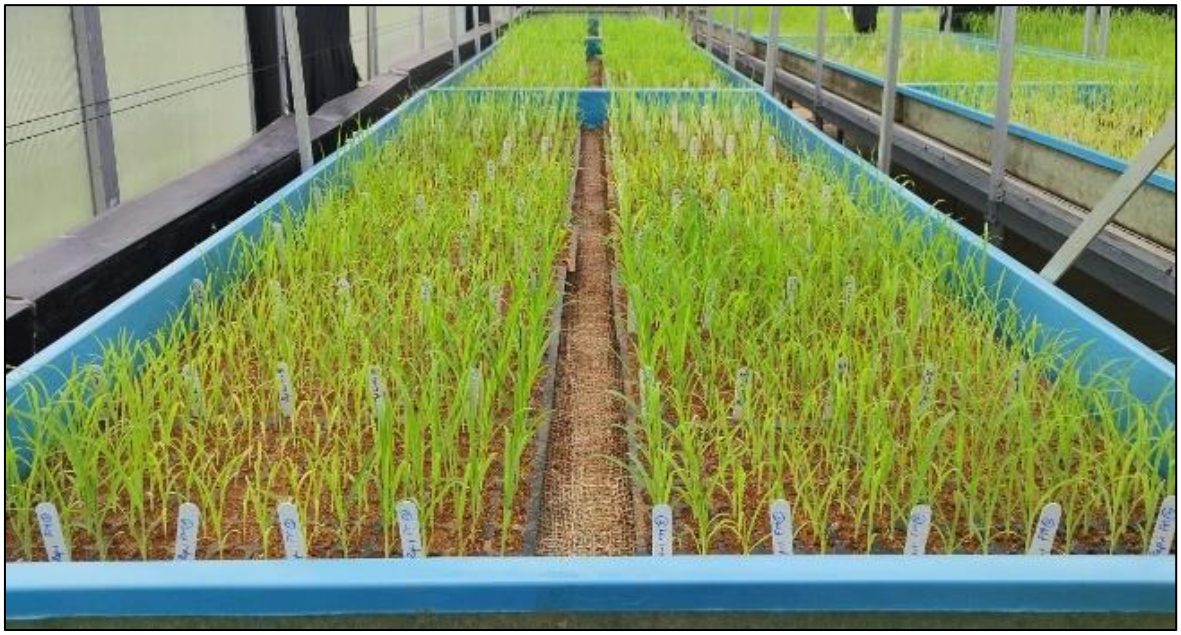
The multiplied seeds can be planted as an observation trial in the next season on field.

B. Seed nursery followed by transplanting:

Nursery preparation: Transplanting

- Transplanting is the preferred method so as to reduce the weed menace and reduce the seed rate almost to ½ (5-7kg/ha)
- Seeds are sown in trays with 50-well or 105-well filled with soil: sand: peat in a ratio of 1:1:1 or 1:2:1**.** Alternatively, 100 seeds of one genotype can be planted in a 7-inch pot.
- A minimum of 1-2 seeds are sown in each well and a thin layer of sand is used to cover the seeds for better germination.
- The trays are placed on mat to avoid root damage.
- A 20-25- day seedling is transplanted to the field post field preparation.

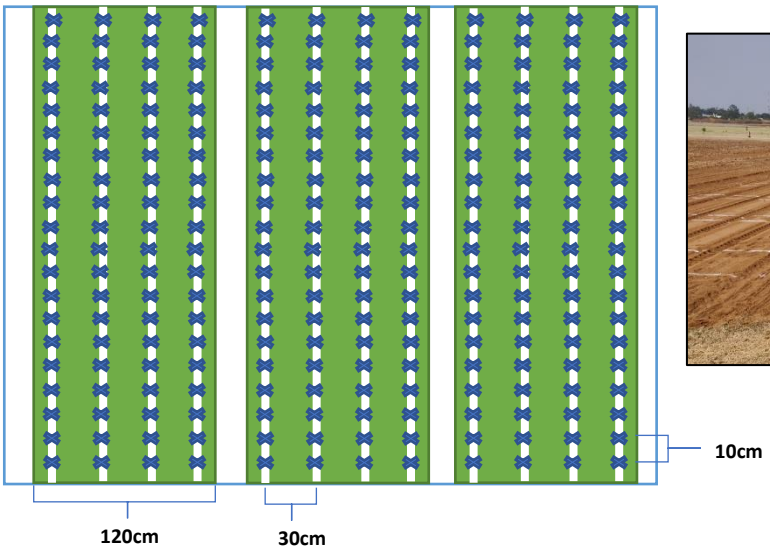
20-25- day seedlings:



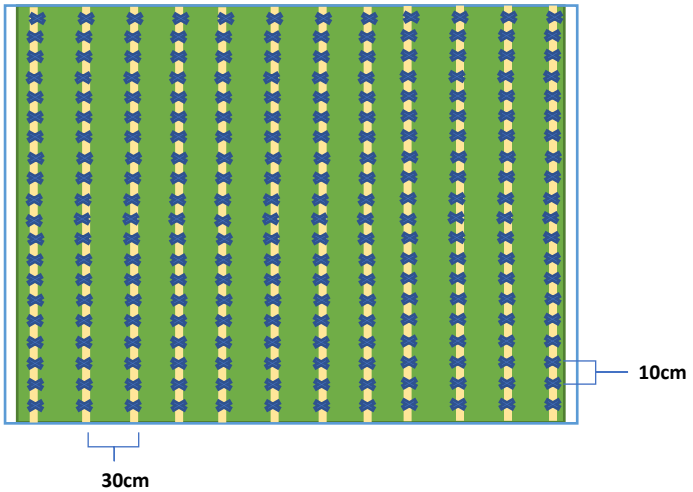
Land Preparation and layout:

- Primary cultivation done with Disc Harrow at a depth of 8 to 10 inches, 15 days prior to sowing.
- Secondary cultivation done with Rotavator at a depth of 8 to 10 inches, 7 days prior to sowing.
- Final preparation with ridges/ Broad bed shaper to form a ridges/ Broad bed and finally packing of Ridges.
- Ridge and furrow method/ broad bed and furrow method is preferred at a spacing of 30 (between the row) × 10cm (between the plants within row).
- A minimum row length of 2m is preferred for observation trial (20 plants per row).
- Pre-emergence herbicide- Glyphosate @ 7ml/lt of water is sprayed as a mat over the prepared field and irrigation for weed management
- A minimum gap of 3-4 days is maintained and sowing is done to minimize the phytotoxicity.

Broad bed and furrow:



Ridge and Furrow:



Sowing/Transplanting:

- In the case of transplanting, the 20-25-day seedlings are transferred to field. The field must be at field capacity to facilitate planting. With a stick of 1cm diameter, make a hole of 2-3-inch-deep and place one seedling in that. Make sure that the roots are adjusted in the hole and cover the hole with soil by using fingers.
- In case of dibbling method, sowing is done on the ridge with a recommended spacing of 30 × 10cm with a seed rate of 10-12kg per hectare.
- 2-3 seeds in each hill are planted considerating the germination losses. Thinning is done after 25-30 days to maintain 1 seedling/hill.

Field after thinning:

Nutrient management:

- A basal dose of DAP @ 100kgs/ha is applied followed by first top dressing with Urea @ 50g/ha after a period of 25-30 days after sowing.
- Second top dressing @ 50kg/ha after a period of 35-40 days after sowing.

Irrigation requirement:

- Drip, Sprinkler, furrow, perforated methods.
- Kharif wouldn’t majorly require any irrigation.
- Life-saving irrigation is must.
- Ensure proper drainage if excess water enters the field.

Drip Irrigation System to improve water use efficiency.

Post -emergence Weed management:

Inter-cultivation is done with a tractor or manually, once in initial 25-30 days and next around 40 days.

Harvesting:

- Done when 80% of panicles turn yellow in color. The produce should be allowed to dry in the field if conditions allow or on a drying floor to reduce the moisture content of the seed to around 12%.

Biotic constraints	Management
1. Pests	
White grubs /Termite/Click beetles (Wireworms)	Application of Regent Ultra (Fibronil 0.6 GR) (@ 12 kg ha^{-1}) as basal at the time of sowing in soil furrows.
Shoot fly	Spraying of Cypermethrin 25%EC (@ 2 ml L^{-1} of water based on ETL of pest.
Stem borer / Pink borer	Spraying of Coragen (Chlorantraniliprole 18.5% SC) @ 2 ml/lit **(OR)** of Acephate 75%SP @ 3 g/lit + Cypermethrin 25%EC @ 2 ml/lit **(OR)** Ekalux (Quinolphos 25%EC) @ 3 ml/lit of water based on leaf feeding damage symptoms.
Fall army worm	✓ Installation of pheromone traps @ 25 traps per ha for monitoring and mass trapping of male adult moth insects immediate after planting. ✓ Pest surveillance – Start pest scouting in diagonally in field ('W' manner) as soon as seedlings emerge from soil. Survey twice in a week till early maturity of crop. ✓ Hand picking and destruction of egg masses and neonate larvae in mass by crushing or immersing in insecticide solution. ✓ Spray decision – at ETL of 5% plants infested by FAW. ✓ Insecticides used – Alternate spray of chemicals Proclaim (Emamectin benzoate 5% SG) @ 0.8 g, Ampligo (Chlorantraniliprole 10% + Lambdacyhalothrin 5%) @ 0.6 ml, Delegate (Spinetoram 11.7% SC) @ 0.7 ml per lit of water soon after crossing ETL during early morning hrs or evening hrs. ✓ Due to hiding nature of FAW larvae inside leaf whorl and boot leaf of millet, insecticides are directly applied in leaf whorl by using empty water bottle or nozzle of hand knapsack sprayer directed in leaf whorls.
Aphids	Spraying of Acephate 75% SP @ 3 g/lit + Cypemethrin 25% EC @ 2 ml/lit **(OR)** Confidor (Imidacloprid 17.8 SL) @ 0.7 ml/lit **(OR)** Ekalux (Quinolphos) @ 3 ml/lit of water based on damage symptoms.
Mites	Spraying of Omite (Propargite 57% EC) @ 1.5 ml or Magister (Fenazaquin 10% EC) (@ 1.5 ml/lit of water.
Earhead caterpillar (Helicoverpa armigera)	Spraying of Proclaim (Emamectin benzoate 5% SG) @ 0.8 g **(OR)** Coragen (Chlorantraniliprole 18.5% SC) @ 0.5 ml **(OR)** Avaunt (Indoxacarb) @ 2 ml per lit of water.
2. Diseases	
Downy mildew	✓ Seed treatment with Apron XL(@ 5 ml kg^{-1} seed). ✓ Spraying of Ridomil Gold (Metalaxyl M 4%+Mancozeb 64%) @ 2.5 g/lit based on damage symptoms.
Foliar diseases (Blast/Rust)	Spray Nativo (Trifloxystrobin 25% w/w + tebuconazole 50%) or Saaf fungicide (Carbendazime 12% WP + Mancozeb 63%) at stage panicle initiation (35 DAS).
3. Weeds	
Monocot and dicot weeds	Application of tank mix combination of non-selective herbicides Roundup (Glyphosate 41% SL) @ 5 lit + Paraquat @ 3 lit per ha 1 week before planting in 500-600 lit of water per ha in standing live weeds.

Efficient data collection

Observation trial:

- An observation trial serves the purpose of first-hand information on the entries for selection.
- The entries are planted in rows with a minimum row length of 2m (20 plants per row)
- The data is collected on the phenological parameters (DF, DM) based on the entire row
- An average score is given from 1(low) to 10 (high) based on the performance of the genotype.
- Any additional data for agronomic parameters (plant height, tillers, panicles per plant, finger per panicle in finger millet, seeds per plant) by collecting data from 5 plants randomly.

Note: The data should not be collected from the border plants to reduce the errors.

Observation trial template

PLOT_NO	ENTRY_NO	DESIGNATION	Days to 50% flowering	Days to maturity	*Plant stand /Plot (1-4)	Average. Score (1: low to 10: high)	Remark (lodging/disease /pest/insect/other)
101							
102							
103							
104							
105							
106							

*Note:

1. 50% of the standard plant population
2. 75% of the standard plant population
3. 90% of the standard plant population
4. 100% (normal) of the standard plant population

Note: The selected entries (usually top 10%) could be tested in multi-environment trial (MET) or through mother trial as Participatory varietal selection.

ICRISAT
INTERNATIONAL CROPS RESEARCH INSTITUTE FOR THE SEMI-ARID TROPICS

About

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a pioneering non-profit organization focused on scientific research for development, committed to transforming dryland farming and agri-food systems. Working with global partners, ICRISAT develops innovative solutions to address hunger, poverty, and environmental degradation, benefiting 2.1 billion people across the drylands of Asia, Africa, and beyond.

ICRISAT was established under a Memorandum of Agreement between the Government of India and CGIAR, dated 28 March 1972. In accordance with the Headquarters Agreement, the Government of India has extended the status of a specified "International Organization" to ICRISAT under section 3 of the United Nations (Privileges and Immunities) Act, 1947 of the Republic of India through Extraordinary Gazette Notification No. UI/222(66)/71, dated 28 October 1972, issued by the Ministry of External Affairs, Government of India.

Asia

ICRISAT - India (Headquarters)
Patancheru 502 324, Hyderabad
Telangana, India
Phone: +91 8455683071
Fax: +91 8455683074
Email: icrisat-ind@icrisat.org

ICRISAT - India (Liaison Office)
CG Centers Block
NASC ComplexDev Prakash Shastri Marg, New Delhi 110012, India
Phone: +91-11-25840294
Fax: +91 1125841294
Email: icrisat-ind@icrisat.org

West and Central Africa

ICRISAT - Mali
(Regional hub WCA)
BP 320 Bamako, Mali
Phone: +223 20 709200
Fax: 223 20 709201
Email: icrisat-mli@icrisat.org

ICRISAT - Niger
BP 12404
Niamey, Niger
Phone: +(227) 20722725, 20722626
Fax: +227 20734329
Email: icrisat-ner@icrisat.org

ICRISAT - Nigeria
PMB 3491
Sabo Bakin Zuwo Road
Tarauni, Kano, Nigeria
Phone: +234 7034889836
Email: icrisat-nga@icrisat.org

ICRISAT - Senegal
c/o Africa Rice
Mamelles Aviation, Villa 18
BP 24365 Dakar, Senegal
Phone: +221 338600706
Email: icrisat-sen@icrisat.org

Eastern and Southern Africa

ICRISAT - Kenya
(Regional hub ESA)
PO Box: 39063, Nairobi, Kenya
Phone: +254 20 7224550
Fax: +254 20 7224001
Email: icrisat-ken@icrisat.org

ICRISAT - Ethiopia
C/o ILRI Campus
PO Box 5689, Addis Ababa, Ethiopia
Phone: +251-11 617 2541
Fax: +251-11 646 1252, +251 11 646 4645
Email: icrisat-eth@icrisat.org

ICRISAT - Malawi
Chitedze Agricultural Research Station
PO Box 1096, Lilongwe, Malawi
Phone: +265 1 707 297/071/067/057
Fax: +265 1 707 298
Email: icrisat-mwi@icrisat.org

ICRISAT - Zimbabwe
Matopos Research Station
PO Box 776, Bulawayo, Zimbabwe
Phone: +263 292 809314/315
Fax: +263 383 307
Email: icrisat-zwe@icrisat.org

ICRISAT - Mozambique
(c/o IIAM) nr 2698 1st Floor, AV. FPLM
Maputo, Mozambique
Phone: +258 1 461657
Fax: +258 1 461581
Email: icrisat-moz@icrisat.org

ICRISAT - Tanzania
Plot 25, Mikocheni Light Industrial Area
Mwenge Coca-Cola Road, Mikocheni B,
PO Box 34441, Dar es Salaam, Tanzania
Email: icrisat-tza@icrisat.org