Seed Propagation Protocol Form

BOTANIC GARDENS CONSERVATION INTERNATIONAL

SEED PROPAGATION PROTOCOL

This form collates the information about the best method for seed propagation and growing up of the target species.

Authorship *(people that contributed propagation information)*: Tanzania Forest Service Agency

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Logo/s of the affiliated organisation(s):

This propagation protocol is subject to change and updates when new information on the propagation of the species becomes available. If there any comments or changes you would like to make, please send the information to africa@bgci.org

GENERAL INFORMATION

Taxon name	*Scientific name of the propagated species*	*Juniperus procera*	**Name/s of propagator/**	*Name(s) of the person or people that carried out the propagation*	
Family	*Plant family of the propagated species*	Cupressaceae	**Organisation**	*Organisation(s) where the propagation was carried out*	
Origin of seeds	*Site(s) and country where seeds were collected*	Highland regions of Tanzania, Mbeya, Songwe, and Iringa	**Site and country**	*Site(s) and country where the propagation took place*	Mbeya, Songwe, and Iringa

SEED DESCRIPTION & PROCESSING

Description of the seeds and the processing of the seeds before seed sowing.

Time of year for seed collection	*List month/s of the year when seed collection is best*	October–February
Fruit/seed transport	*Describe how fruit/seeds have been stored during transport from the field to the nursery*	• Fruits collected in breathable bags such as jute or mesh sacks • Transported in cool, shaded conditions to prevent overheating. • Avoid plastic bags unless well ventilated (to prevent fermentation). • Transport time: preferably within 1–3 days to nursery.
Processing of fruits/seeds	*Describe how the fruits/seeds are processed in situ or in the nursery (seed extraction methods, seed cleaning, handling of fruits/seeds…)*	• Fruits soaked in water for 1–2 days to soften pulp. • Macerate gently by hand or mortar. • Wash and separate seeds from pulp using sieves. • Viable seeds usually sink; floating seeds often discarded. • Air-dry cleaned seeds in shade for 2–3 days before storage or sowing.

Method to assess seed viability	*Describe method used to estimate seed viability (e.g. floating test, cut test, tetrazolium test, X-ray test)*	1. **Cut test:** • Cut seeds longitudinally. • Viable seeds have firm, white/cream embryos. • Empty or darkened seeds are non-viable. 2. **Floating test:** • Place seeds in clean water. • Viable seeds often sink; empty seeds float. *(Note: Less reliable due to winged structure.)* 3. **Tetrazolium red test (more accurate):** • Seeds soaked and treated with tetrazolium solution. • Living tissues stain red.
% Estimated seed viability	*(Number of viable seeds) x 100 / (Total number of seed for which viability was estimated)*	Typical viability: 40–70%
Type of seed	*Choose one of these options: Orthodox, Intermediate, Recalcitrant or Unknown*	Orthodox
Seed size	*Include a measuring unit (e.g. mm, cm…)*	• Length**:** 6 mm • Broad: 4 mm
Number of seeds per gram	*Count a reasonable number of seeds and weigh them. Then, divide the number of seeds by their weight (e.g. 100 seeds / 5 g = 20 seeds/g)*	Approximately 45000 seeds per kilogram
Seed storage	*If seeds have been stored before germination, mention storage facilities (seed bank, fridge, freezer), and describe conditions (humidity, temperature), type of container, and storage time length.*	• Storage facility: Seed bank or refrigerator • Temperature**:** 2–5°C • Relative humidity**:** 5–8% seed moisture content • Container: Airtight glass jar or moisture-proof foil packet • Storage duration: Up to 3–5 years under proper conditions

\+ ***Add photographs of the fruit and seeds. Make sure to include a detailed description of the photo, such as the growth stage, date, activity or process.***

SEED PROPAGATION PROTOCOL

GERMINATION

Description of procedures, materials for seed germination and the germination success.

Procedures	**Seed treatment**	*Describe treatment applied to the seed before sowing (e.g. mechanical scarification, chemical scarification, soaking, stratification, smoke treatment…). If applied, include the duration of the treatment.*	• Pretreatment is needed to overcome both embryo and seed coat dormancy • Seed should be soaked in concentrated sulphuric acid for 10 minutes to break seed coat dormancy • Embryo dormancy can be overcome by sequence of imbibition and stratification

			soaking in warm water for 24 hours. • Cold stratification at 4°C for 30–60 days (improves germination).
	Seed sowing media	*Media composition: include percentages/ratio for the different components*	Recommended mixture: Tree Seed Production-Morogoro • Top Black Forest soil – 63% (5) • Well decomposed Manure – 25% (2) • Rice husk – 12% (1) **Ratio is 5:2:1** Well-drained and sterilized if possible.
	Container	*Describe size and material of the container in which seeds are sown*	• Seed trays or nursery beds • Polythene tubes: 10–15 cm diameter, 15–20 cm depth
	Seed spacing	*Describe the recommended spacing between the seeds when sown. Include a measuring unit (e.g. mm, cm…)*	• In trays: 2–3 cm between seeds • In nursery beds: rows 10–15 cm apart
	Seed depth	*Describe how deep the seeds are sown. Include a measuring unit (e.g. mm, cm…)*	• Sow at 0.5–1 cm depth • Cover lightly with fine sand or soil
	Watering technique	*Describe watering tool, technique and frequency during sowing and germination*	• Watering can with fine rose. • Once daily. • Avoid excessive watering (risk of rotting).
	Germination facilities	*Describe the facilities where the germination of seeds took place (e.g. close case, outdoor shaded area, heated bench, covered/bagged container...)*	• Outdoor nursery under 50% shade net. • Raised beds or well-drained ground.
	Environmental conditions	*Describe the environmental conditions where germination took place (temperature, humidity, and photoperiod)*	• Temperature: 20–30°C • Moderate humidity • Natural daylight (~12 hours) • Good drainage and aeration.
Success	**Time of year for seed germination**	*List month/s of the year when seed germination is best*	1. **Northern & Eastern Zone** • October – December • March – May 2. **Central Zone** • November – April • May – October 3. **Southern & Western Zone** • November – April
	Duration until germination	*Average number of days/months/years until seeds germinated*	30-45 days after sowing
	% Germination success	*(Number of seeds germinated) x 100 / (Total number of seeds sowed)*	• Germination is fair, but slow and sporadic, even after pretreatment. • With untreated seeds, germination reaches 5% after two month and 40% after six

			months from sowing. • With treated seeds, germination may reach 50% after six weeks
Materials		*List the materials needed for seed germination to help with the planning of this activity. E.g. trays, sieves, dibbers, labels, ruler…*	• Seed trays • Sand and forest soil • Compost • Hot water container • Watering can • Labels and marker • Ruler Shade net

+ ***Add photographs of the germination process. Make sure to include a detailed description of the photo, such as the growth stage, date, activity or process.***

SEED PROPAGATION PROTOCOL

FIRST POTTING

Description of procedures and materials for the cultivation of the plants and the success of the growing of the plants.

Procedures	**Growing Media**	*Media composition: include percentages/ratio for the different components*	Recommended mixture: Tree Seed Production-Morogoro • Top Black Forest soil – 63% (5) • Well decomposed Manure – 25% (2) • Rice husk – 12% (1) **Ratio is 5:2:1**
	Container	*Describe size and material of the container in which plants are potted*	Black polyethylene bags of height 8–10 cm and diameter 101.4 mm or 4”
	Fertiliser	*If used, include: type (organic or inorganic); nutrient composition and its ratio; and application (added to soil, dissolved on water, foliar application)*	• Type: Organic (preferred at seedling stage) • Well-decomposed compost mixed in media After 6–8 weeks: • Inorganic NPK (e.g., 17:17:17) diluted in water • Apply lightly every 2–3 weeks
	Watering technique	*Describe watering tool, technique and frequency while growing the plants*	• Watering can with rose head • 2–3 times per week depending on weather • Avoid overwatering (junipers dislike waterlogging)
	Plant growing facilities	*Describe the facilities where the plant growing took place (e.g. glasshouse, outdoors, shaded area...)*	• Outdoor nursery under 30–50% shade • Later hardened in full sun before field planting
	Environmental conditions	*Describe the environmental conditions where the plant growing took place (temperature, humidity, light levels)*	• Temperature: 15–28°C • Moderate humidity • Good airflow • Gradual exposure to full sunlight
Success	**Number of days until first potting**	*Average number of days since the start of seeds sowing until first potting*	• 60–90 days after sowing • When seedlings reach 5–8 cm height
	Duration until established plants	*Average number of days/month/years for which the plant growth was monitored until the establishment of plants*	8–12 months in nursery before out-planting
	% Plants established	*(Number of plants established) x 100 / (Total number of plants potted)*	Typically, 60–80% survival under good nursery management

	Health observations	*Record any signs of pest or disease, nutrient deficiency, damage… and the stage when they were observed (e.g. during germination, growing of seedlings, growing of plants….)*	• **During germination:** • Damping-off (fungal disease) if overwatered • Growing **seedlings:** • Spider mites in dry conditions • Yellowing from nitrogen deficiency • **Mature nursery plants:** • Root rot if poorly drained
Materials		*List material needed for potting to help with the planning of this activity. E.g. pots, dibbers, labels…*	• Poly pots • Potting mix • Trowel or dibber • Labels • Watering can • Shade net • Wheelbarrow

+ ***Add photographs of the pricking out, potting, and the growing of plants. Make sure to include a detailed description of the photo, such as the growth stage, date, activity or process.***