

Seed Propagation Protocol Form

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	<i>Scientific name of the propagated species</i>	<i>Cordia africana Lam. (Syn. Cordia abyssinica R. Br.)</i>	Name/s of propagator/	<i>Name(s) of the person or people that carried out the propagation</i>	
Family	<i>Plant family of the propagated species</i>	Boraginaceae	Organisation	<i>Organisation(s) where the propagation was carried out</i>	
Origin of seeds	<i>Site(s) and country where seeds were collected</i>	Singida, Simiyu and Dodoma	Site and country	<i>Site(s) and country where the propagation took place</i>	Singida, Simiyu and Dodoma-Tanzania

SEED DESCRIPTION & PROCESSING

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

Time of year for seed collection	<i>List month/s of the year when seed collection is best</i>	October–January, depending on local rainfall patterns and altitude. Collect fruits when they are fully mature, yellow in colour, either directly from the tree or immediately after natural dispersal before deterioration occurs.
Fruit/seed transport	<i>Describe how fruit/seeds have been stored during transport from the field to the nursery</i>	<ul style="list-style-type: none"> • Harvest mature yellow fruits from healthy, disease-free mother trees. • Collect directly from the tree or freshly fallen fruits free from insect damage. • Store fruits in woven baskets, jute sacks or cloth bags that allow adequate ventilation.

		<ul style="list-style-type: none"> • Avoid plastic bags, which encourage fermentation and fungal growth. • Keep fruits cool and shaded during transport. <ul style="list-style-type: none"> • Transport to the nursery within 24–48 hours after collection to maintain seed quality.
Processing of fruits/seeds	<i>Describe how the fruits/seeds are processed in situ or in the nursery (seed extraction methods, seed cleaning, handling of fruits/seeds...)</i>	<p>Manual extraction</p> <ul style="list-style-type: none"> • Fruits are fleshy drupes containing hard nutlets. • Soak fruits in clean water for 24–48 hours to soften the pulp. • Remove pulp manually by rubbing fruits over a sieve or wire mesh. • Wash thoroughly to remove the mucilaginous flesh. • Shade-dry the clean nutlets for 2–3 days under good ventilation. • Discard damaged, insect-infested or malformed nutlets. <p>Mechanical extraction (large-scale)</p> <ul style="list-style-type: none"> • Mix ripe fruits with clean sand and pound gently in a mortar to separate the pulp and nutlets. • Alternatively, use a flailing thresher with plenty of water for bulk processing. • Approximately 10 kg of ripe fruits produce about 1 kg of clean nutlets (seed).
Method to assess seed viability	<i>Describe method used to estimate seed viability (e.g. floating test, cut test, tetrazolium test, X-ray test)</i>	<ol style="list-style-type: none"> 1. Cut test <ul style="list-style-type: none"> • Cut nutlets longitudinally using a sharp blade. • Viable seeds contain firm, white to cream embryos. • Empty, shrivelled or dark embryos indicate non-viable seeds. 2. Floating test <ul style="list-style-type: none"> • Immerse nutlets in clean water for several minutes. • Filled seeds generally sink, while empty or damaged seeds often float. • This method should only be used as a preliminary assessment. 3. Tetrazolium (TZ) test <ul style="list-style-type: none"> • Crack the nut carefully and soak the seed before staining with 1% tetrazolium chloride solution. • Living tissues stain bright red, indicating viability. 4. Germination test (recommended) <ul style="list-style-type: none"> • Sow a representative sample after pre-treatment and determine germination percentage under nursery conditions.
% Estimated seed viability	<i>(Number of viable seeds) x 100 / (Total number of seed for which viability was estimated)</i>	Fresh, properly processed seed lots typically exhibit 70–90% viability, although actual germination may be slower and somewhat sporadic.
Type of seed	<i>Choose one of these options: Orthodox, Intermediate, Recalcitrant or Unknown</i>	Orthodox. Properly dried nutlets can be stored for up to two years with little loss of viability under suitable storage conditions.
Seed size	<i>Include a measuring unit (e.g. mm, cm...)</i>	Hard nutlets are approximately 8 mm in diameter, rounded with blunt tips and covered by a thin mucilaginous layer when fresh. Each nut usually contains 1–4 seeds enclosed by thin membranous seed coats.

Number of seeds per gram	<i>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)</i>	Approximately 5 seeds per gram, equivalent to about 5,000 nutlets per kilogram.
Seed storage	<i>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.</i>	Properly cleaned and shade-dried nutlets can be stored under dry conditions for up to two years without significant loss of viability. Recommended storage conditions: <ul style="list-style-type: none"> • Temperature: 15°C (or cooler where available). • Moisture content: 5–7%. • Relative humidity: below 15%. • Containers: Airtight glass jars, sealed laminated foil packets or moisture-proof plastic containers. • Store in a cool, dry, well-ventilated seed store protected from insects and rodents. • For best nursery performance, sow within 12 months of collection.

+ *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	<i>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.</i>	<ul style="list-style-type: none"> • Soak clean nutlets in cold water for three (3) days, changing the water every 12 hours to improve water uptake and soften the fruit wall. • Light mechanical scarification (carefully cracking or nicking the hard nutlet without injuring the seed) may further improve the speed and uniformity of germination. • Sow immediately after pre-treatment while seeds remain fully hydrated.
	Seed sowing media	<i>Media composition: include percentages/ratio for the different components</i>	Recommended nursery medium (Tree Seed Production Station – Morogoro): <ul style="list-style-type: none"> • Top black forest soil – 63% (5 parts) • Well-decomposed manure – 25% (2 parts) • Rice husk – 12% (1 part)Ratio: 5:2:1The medium should be fertile, friable, well-drained, free from weeds and pathogens, and preferably sterilized before use.
	Container	<i>Describe size and material of the container in which seeds are sown</i>	<ul style="list-style-type: none"> • Seed germination trays, seedbeds or direct sowing in nursery tubes. • Nursery tubes: 15–20 cm deep × 8–10 cm diameter. <ul style="list-style-type: none"> • Material: UV-stabilized black polyethylene nursery tubes with adequate drainage holes.

	Seed spacing	<i>Describe the recommended spacing between the seeds when sown. Include a measuring unit (e.g. mm, cm...)</i>	<ul style="list-style-type: none"> • In seed trays or seedbeds: 3–5 cm between seeds and 5–10 cm between rows. • In nursery tubes: one nutlet per tube.
	Seed depth	<i>Describe how deep the seeds are sown. Include a measuring unit (e.g. mm, cm...)</i>	<ul style="list-style-type: none"> • Sow nutlets 1–2 cm deep. • Cover lightly with fine soil or sand while leaving the surface loose to facilitate emergence. • Avoid deep sowing as it delays seedling emergence.
	Watering technique	<i>Describe watering tool, technique and frequency during sowing and germination</i>	<ul style="list-style-type: none"> • Water using a fine-rose watering can or mist sprinkler. • Water lightly once daily, or twice during hot, dry weather. • Maintain uniform moisture without saturating the medium. • Avoid waterlogging to minimize fungal diseases and seed decay.
	Germination facilities	<i>Describe the facilities where the germination of seeds took place (e.g. close case, outdoor shaded area, heated bench, covered/bagged container...)</i>	<ul style="list-style-type: none"> • Nursery shade house providing approximately 50% shade. • Raised germination benches or well-drained seedbeds. • Protected from heavy rainfall, direct sunlight and domestic animals. • • Good air circulation should be maintained throughout the germination period.
	Environmental conditions	<i>Describe the environmental conditions where germination took place (temperature, humidity, and photoperiod)</i>	<p>Temperature: 20–30°C (optimum approximately 25°C).</p> <p>Relative humidity: 50–70%.</p> <p>Light: Bright indirect light or partial shade.</p> <ul style="list-style-type: none"> • Maintain consistently moist, but not waterlogged, growing media throughout germination.
Success	Time of year for seed germination	<i>List month/s of the year when seed germination is best</i>	Northern & Eastern Tanzania: October–December and March–May. Central Tanzania: November–April and May–October where irrigation is available. Southern & Western Tanzania: November–April, coinciding with the rainy season.
	Duration until germination	<i>Average number of days/months/years until seeds germinated</i>	Germination begins approximately 14 days after sowing and continues progressively for up to 35–43 days. Seedlings emerge sporadically because individual nutlets may contain 1–4 seeds, and a single nutlet may occasionally produce more than one seedling. During germination, the cotyledons expand, causing the nutlet to split at the scar end, while the hypocotyl lifts the cotyledons above the soil surface and the empty nutlet remains partially buried.
	% Germination success	<i>(Number of seeds germinated) x 100 / (Total number of seeds sowed)</i>	Germination is good but naturally sporadic, averaging 30% after two weeks and reaching approximately 70% after five weeks under proper nursery management and recommended pre-treatment.

Materials	<i>List the materials needed for seed germination to help with the planning of this activity. E.g. trays, sieves, dibbers, labels, ruler...</i>	Seed trays Potting media Hot water container Watering can Labels and marker Shade net Ruler
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- + ***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	<i>Media composition: include percentages/ratio for the different components</i>	<p>Recommended mixture: Tree Seed Production-Morogoro</p> <ul style="list-style-type: none"> • Top Black Forest soil – 63% (5) • Well decomposed Manure – 25% (2) • Rice husk – 12% (1) <p>Ratio is 5:2:1</p>
	Container	<i>Describe size and material of the container in which plants are potted</i>	Black polyethylene bags of height 8–10 cm and diameter 101.4 mm or 4”
	Fertiliser	<i>If used, include: type (organic or inorganic); nutrient composition and its ratio; and application (added to soil, dissolved on water, foliar application)</i>	<ul style="list-style-type: none"> • Organic compost preferred. • Optional inorganic fertilizer: NPK 10:10:10. <p>Application: Mixed into soil before planting or applied as diluted solution after 3–4 weeks.</p>
	Watering technique	<i>Describe watering tool, technique and frequency while growing the plants</i>	<ul style="list-style-type: none"> • Watering can or hose with fine nozzle • 2–3 times per week <p>Reduce watering during hardening stage</p>
	Plant growing facilities	<i>Describe the facilities where the plant growing took place (e.g. glasshouse, outdoors, shaded area...)</i>	<ul style="list-style-type: none"> • Shade nursery during early stage • Gradual exposure to full sunlight
	Environmental conditions	<i>Describe the environmental conditions where the plant growing took place (temperature, humidity, light levels)</i>	<ul style="list-style-type: none"> • Temperature: 20–32°C • Moderate humidity • Full sunlight after hardening stage.
Success	Number of days until first potting	<i>Average number of days since the start of seeds sowing until first potting</i>	If started in trays: 30–45 days after germination (2–3 true leaves stage).
	Duration until established plants	<i>Average number of days/month/years for which the plant growth was monitored until the establishment of plants</i>	6–8 months in nursery before field transplanting.
	% Plants established	<i>(Number of plants established) x 100 / (Total number of plants potted)</i>	Typical survival rate: 75–90%

	<p>Health observations</p>	<p><i>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....)</i></p>	<ul style="list-style-type: none"> • Damping-off during early germination. • Leaf-eating insects during seedling stage. • Yellowing leaves if nutrient deficiency occurs. • Root rot if overwatered.
<p>Materials</p>	<p><i>List material needed for potting to help with the planning of this activity. E.g. pots, dibbers, labels...</i></p>	<ul style="list-style-type: none"> • Poly pots (20 cm depth recommended) • Potting mix • Trowel • Labels • Watering can • Shade net 	

+ *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.*

