

PRESENT STATUS AND *EX-SITU* CONSERVATION OF *MORINGA CONCANENSIS* IN INDIAN DESERT

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ABSTRACT

Moringa concanensis Nimmo. ex Dalz. & Gibs. is rare economic important plant distributed in Indian desert. Plant parts are used for different medicinal purposes. Present study was conducted to assess its status in nature as well as different seed germination treatment for its *ex-situ* conservation. Study revealed that germination was 100% in coco-peat media while, it was 97.56% in polythene bags. Seedling mortality was more (39.46%) in coco-peat media. After transplantation seedlings showed 82% survival in field.

Keywords: *Moringa concanensis*, *ex-situ* conservation, present status, germination, survival.

INTRODUCTION

Moringaceae, a monogeneric family, having genus *Moringa* is characterized by a number of species such as *Moringa peregrina* (*M. peregrina*), *M. oleifera*, *M. arabica*, *M. stenopetala*, *M. concanensis*, *M. ovalifolia*, *M. hildebrandtii*, *M. arborea*, *Moringa rivae* and *Moringa ruspoliana* etc. (Tsaknis *et al*, 1999; Olson, 2003). Almost all *Moringa* species, native to India are now distributed in many tropical and sub-tropical parts of the world like India, Pakistan, Asia Minor, Africa and Arabia (Mughal *et al*, 1999). The *Moringa* plant is an important food of high-value nutritious properties. Different parts of this plant: root, bark, gum, leaf, fruit (pods), flowers, seed and seed oil have been used for various ailments in the indigenous medicinal practices of south Asia, which included cure for inflammation, cardiovascular, gastrointestinal, hematological and hepatorenal disorders (Morimitsu *et al*, 2000; Siddhuraju and Becker, 2003). The seeds of the *Moringa* are considered to exhibit antipyretic and

antimicrobial activities, used for water purifying and are also a good source of non-desiccating oil, commercially known as 'Ben oil'.

Though taxonomy and economic value of this plant are intensively studied, information on its regeneration for its *ex-situ* conservation and its performance in the field is scanty. Hence this study was under taken to answer the issues related to germination and survival as well as its saplings growth to assess its *ex-situ* conservation in garden, arboreta and natural habitats.

TAXONOMY

Moringa concanensis Nimmo (in Gah. Cat. Bomb. Pl. 43, 1989, *nom. nud.*) ex Dalz. & Gibs. Bomb. Fl. 311, 1861; Hook.f. in FBI 2: 45, 1876; BH 26(1): 235, 1918.

Taxonomy Hierarchy (According to India Biodiversity Portal)

Kingdom: Plantae

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Phylum: Tracheophyta
 Class: Magnoliopsida
 Subclass: Dilleniidae
 Order: Capparales
 Family: Moringaceae
 Genus: *Moringa*
 Species: *M. concanensis*

A small tree with thick bark, glabrous. Stem glabrous. Leaves 2-pinnate, rarely 3-pinnate, 30 – 45 cm long, primary and secondary rachises thickened at base, articulated with a single gland at each articulation; leaflets 9 – 15, 1.5 – 3.4 × 1.2 – 2.5 cm, rounded at base, rounded or sometimes retuse at apex, rarely oblique sided, darker above, paler beneath petiolules 2 – 5 mm

long, jointed near the apex. Inflorescence lax, panicles 40 – 50 cm long, tomentose. Flowers small. Pedicels 8 – 13 mm long, deflexed thickened, articulated at the base. bracts 0.5 – 1 mm long, caducous. Calyx 5-lobed, lobes oblong, white, reflexed, 8 – 12 mm long, thinly-tomentose. Corolla yellowish-white with reddish near the base, oblong or oblong-spathulate, 1 – 1.5 cm long. Stamens 5 with alternating staminodes 4 – 5; filaments hairy at base. Pods linear, 30 – 45 cm long, sharply 3-angled, long pointed, valves hard, 10 – 18 seeded. Seeds 1.5 – 2 cm long, triangular with a very thin hyaline, wing at each angle, white or pale yellow [Fig. 1].

Local Name: Sarguro
 Fl. & Fr.: Feb. - May



Fig.1. *Moringa concanensis* A. Habit and Habitat, B. Fruiting, C. Bark removal by local for medicinal purpose, D. Close up of flower and E. Seed

EX-SITU CONSERVATION AND PROTOCOL SUGGESTED

Surveyed on reported localities for mapping and seed collection. Freshly collected seeds were shade dried and soaked in tap water overnight. Seeds kept in a petri-plate in a dark place. Germination was noted daily. On emergence of plumule, seedlings were exposed to sunlight. Although the tree is drought tolerant, its seedlings were watered daily, avoiding water logging. These were then transferred in two sets of polythene bags containing: (1) coconut peat (2) Soil + Farm Yard Manure mixture (Fig 3).

Young seedlings were protected by wire mesh cages for 2-3 months so that they grow better and stronger. Since its roots are very delicate, transplanting in soil

requires utmost care. Adequately hardened saplings (4-8 months old) were transplanted at 3m x 3m interval in pits treated with fungicide (Bavistin) and termiticide (Foret). These were regularly irrigated to see its survival and growth (Kumar *et al.*, 2009; Kumar *et al.*, 2010; Purohit *et al.*, 2010a, 2010b; Purohit, 2013).

CONSERVATION TECHNIQUE

1. Fruit and seed characteristics: Pods collected from Barmer, has average length 29.11 cm (27-31.5); average pod width 1.73 cm (1.3-1.9); average seed length 9.76 mm (6.6-12.1); average seed width 8.28 mm (7.7-8.6) and average seed weight 0.13 gm. Each pod contained 15-20 seeds (Kumar *et al.*, 2010).

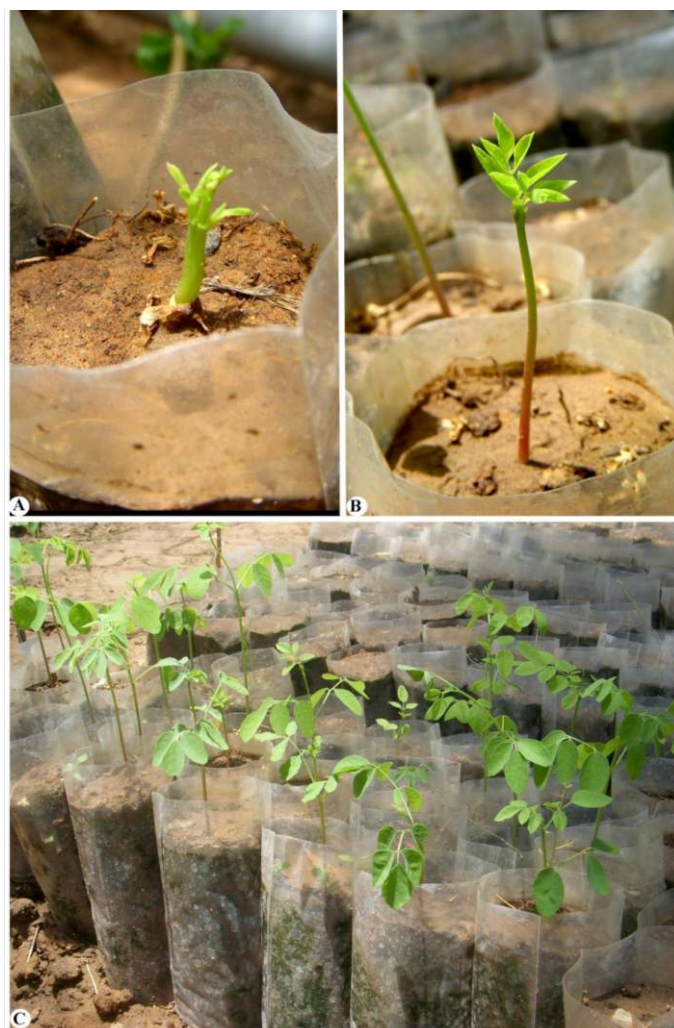


Fig. 3A to C Different stages of seedling growth in polythene bag.

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Table 1 : Comparative analysis between *M. oleifera* and *M. concanensis*.

Characters	<i>M. oleifera</i>	<i>M. concanensis</i>
Pod length (cm)	34.86 (29-41.1)	29.11 (27-31.5)
Pod width (cm)	1.82 (1.7-1.9)	1.73 (1.3-1.9)
No. of seeds in a pod	11-16	15-20
Seed length (mm)	11.43 (8.7-14.1)	9.76 (6.6-12.1)
Seed width (mm)	9.26 (7.4-10.8)	8.28 (7.7-8.6)
Seed weight (gm)	0.25	0.13

2. Germination: All (100%) seeds germinated within 7-8 days and showed no dormancy. Germination was faster in seeds kept on coconut peat than on garden soil, in polybags. This could be due to more easy availability of moisture in coconut peat than in garden soil (Fig. 4).

3. Seedling Growth: Seedling growth was also rapid in first 3 weeks in coco-peat medium while it took four weeks to attain same height in soil medium. However, seedling mortality was more (39.46) in coco-peat than in soil + FYM (9.76) (Fig. 5).

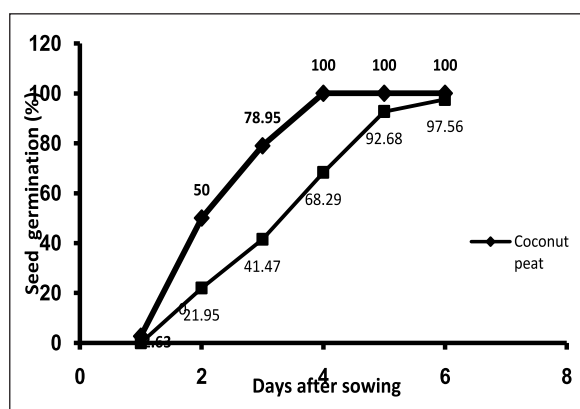


Fig. 4 Seed germination in Coconut peat and FYM + Soil mixture in Polybags (Kumar *et al.*, 2010).

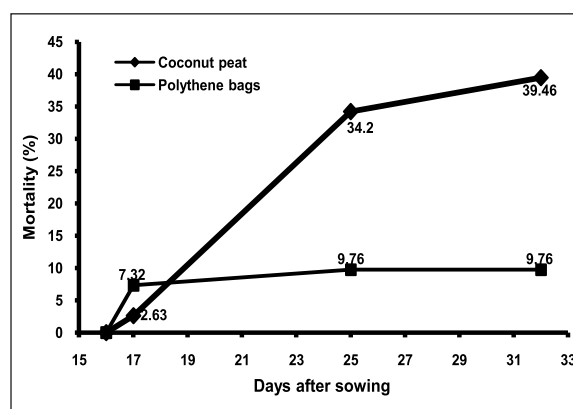


Fig. 5 Mortality in cocopeat peat and polybags (Kumar *et al.*, 2010).

Seedlings in both the media showed similar rate of growth in height (Fig.6) and number of leaves were

about same (Fig.7) in both medium (coca peat medium and in soil + FYM mixture).

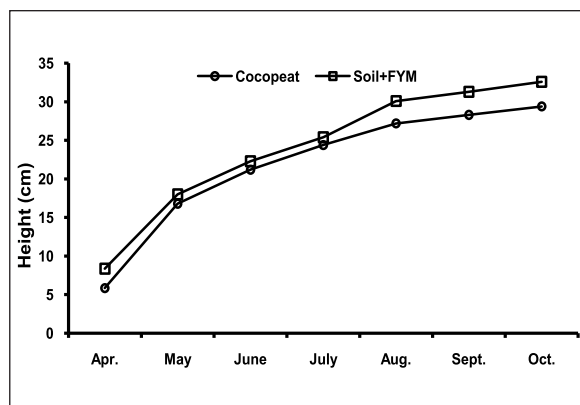


Fig. 6 Plant height in coca peat and soil + FYM mixture (Kumar *et al.*, 2010).

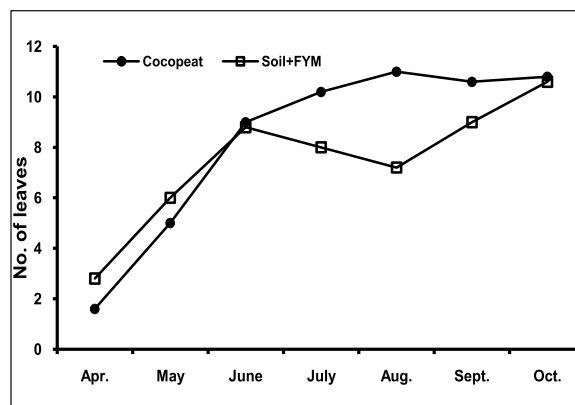


Fig. 7 Number of leaves in coca peat and soil + FYM mixture (Kumar *et al.*, 2010).

4. Transplantation and survival: When these saplings were 40 cm tall and eight months old and collar diameter up to 1.6 cm (Fig. 8) then these were transferred to field. At the time of transfer, care was taken to see that their root system was not disturbed. It was watered daily for 15-20 days and thereafter weekly. Of the 23 saplings transplanted, 19 are surviving showing 82% survival.

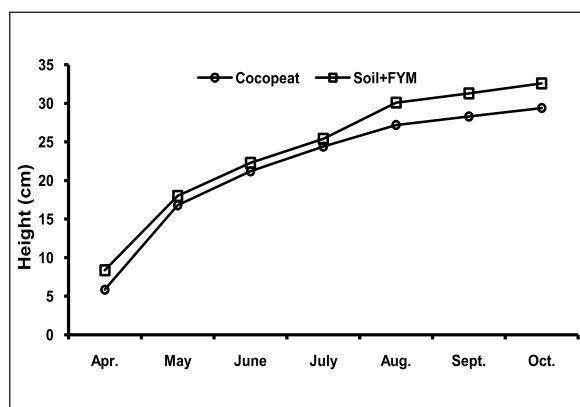


Fig. 8 Collar diameter of *M. concanensis* from first month to 15 months after germination

5. Threats to its Survival: Following threats are observed i.e.

- Most of the seeds are lost along slopes and as such do not reach proper niche for germination and seedling establishment.
- Predation of seeds by goats and sheep is most important threat. Human also eat it.

- Grazing and browsing of its young saplings by squirrels, birds especially peacocks endangers it most.
- Due to sudden increase in temperature in September and October, it sheds leaves and thereafter its re-growth depends on the availability of water in next rains, which on rocky surfaces may not be available. Thus all young saplings would die in the lack of water.
- Modification and destruction of the habitats through mining has declined its populations.
- The older trees may die due to scapping of its bark (Fig. 1C). Thus biotic pressure, inhospitable habitat and harsh climatic factors, all potentially limit its spread and result in making it a rarer, endangered species.

PROTOCOL FOR ITS *EX-SITU* CONSERVATION

a. Collection of seeds with pods: When the pods split scattering the seeds splash them on surface. These are liked by predator or get physically damaged when fall from such height. So seeds need to be collected as intact pods before split.

b. Shade drying: Seeds are removed from the pod and shade dried. When totally dried seeds may be stored in cotton bags in dry cool places.

c. Shade germination: Seeds are germinated in poly bags with Soil+Cocopeat / Soil+FYM mixture in shade condition. After 5 days seedlings can be partially exposed to sunlight.

d. Transplantation: When the plant reaches height up to 40 cm and above saplings can be transferred in the field in pits at 3×3 m interval. During the plantation, root system should not be disturbed or else plant will die. Termiticide and fungicide are mixed in the soil.

e. Pit specification: Soil should be worked up in 60×60×60 cm pit. It should be filled with FYM : Pond silt : Local silt in 1 : 1 : 1 and treated with termiticide and fungicide.

f. Post plantation care: Young seedlings are eaten by squirrels, birds and peacocks. Hence, it should be protected by wire mesh cages for 2-3 months. In summer, cages should be covered by cloth to protect plants from high temperature and are watered at one day interval.

g. Drying and re-sprout: After three months of transplantation, growth of plant stopped, leaf yellowing started and after one month all leaves fell and whole aerial part became a dry bulb in hibernating condition. During the rainy season, sprouting in the bulb starts re-growth of stem. During this period it should be duly protected.

Thus, above protocol can be followed for *ex-situ* conservation of *Moringa concanensis* (Kumar *et al.*, 2010).

ECONOMIC IMPORTANCE

1. Entire plant parts used to cure inflammation, cardiovascular, gastro-intestinal, hematological disorders.
2. Seed oil has good oxidative stability during frying.
3. The seed oil is high in oleic acid favored for replacing poly-unsaturated vegetable oils.
4. The seed protein can be utilized after value addition, used for water purifying and also a good source of non-desiccating oil, commonly known as Ben Oil.
5. The unripe fruits are eaten by natives.

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