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Biodiversity and Conservation of *Moringa* Species

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Biodiversity is the variety of living organisms considered at the genetic, species and ecosystem or landscape level. It includes not only plant and animal as we know them, but importantly micro-organism also[1]. Moringaceae are old-world perennial soft-wood trees that are distributed in tropical regions of the world. These trees indigenous to the western and sub-Himalayan tracts, including India, Pakistan, Asia Minor, Africa, and Arabia[2], but have now spread to other regions of the world, including the Philippines, Cambodia, Central America, North and South America, and the Caribbean Islands[3]. A total of 13 tropical and subtropical species of the *Moringa* genus are known, and of these, many are in danger of extinction, including *M. arborea, M. borziana, M. longituba, M. rivae, M. ruspoliana*, and *M. stenopetala*[4]. There is limited knowledge of available genetic diversity present in Moringa species in general and of *M. oleifera* in particular. However, substantial variation in quantitatively inherited traits has been documented in natural populations of Moringa in India[5]. Moreover, limited studies have been conducted using DNA-based markers to identify and assess diversity among various genotypes of *M. oleifera*. Muluviet al.[6]and Ulloa[7] used amplified fragment length polymorphism (AFLPs) to investigate *M. oliefera* populations present in Kenya, revealing significant differences between regions and populations.

Moringa oleifera Lam. (also known as the horseradish, drumstick, or oil tree) is the most widely cultivated species of an Old-World dry, tropical, monogeneric family, Moringaceae. t is a fast-growing perennial soft-wooded tree with a long history of traditional medicine and industrial uses that is native to the sub-Himalayan tracts of Northwestern India. *M.*

oleifera (syn. *M. pterygosperma* Gaertn.) is becoming an important crop in India, the Philippines and the Sudan. It is being cultivated in West, East and South Africa, tropical Asia, Latin America, the Caribbean, and in the Pacific islands[8,9,10,11].*M. stenopetala* Bak. f. Cuf. is an important crop in Kenya and Ethiopia[11]. *Moringa peregrine* was known to the ancient Egyptians who utilized its seed oil. All of the other 10 species of this genus enjoy attention based primarily on their pharmacologic properties[12], however some are in danger of extinction, and at least one (M. *hildebrandtii)* is now extinct in the wild[13].

Genetic diversity of *Moringa arborea, Moringaborziana, Moringa longituba, Moringa rivae, Moringa ruspoliana*, and *Moring astenopetala* is endangered[4,14,15]. *M. peregrina* is a scarce species with a low rate of regeneration following herbivorous animal browsing[16], *M. arborea* is listed in the 2006 IUCN Red List of Threatened Species[17] and *Moringa hildebrandtii* is extinct in the wild[18,19]. Out of the 13 *Moringa* species only *M. oleifera* has been concurred research and development. The rest remain almost unknown to science. Perhaps they could provide even better food ingredients, flocculants, antibiotics, oils, or wood. Perhaps they have their own unique qualities. No one knows at present. The Moringa species with their distribution are : *Moringa drouhardii* (Madagascar), *Moringa concanensis* (mostly India), *Moringa arborea* (northeastern Kenya), *Moringa hildebrandtii* (Madagascar), *Moringa oleifera* (India), *Moringa borziana* (Kenya and Somalia), *Moringa ovalifolia* (Namibia and extreme southwestern Angola), *Moringa peregrina* (Horn of Africa, Red Sea, Arabia), *Moringa longituba* (Kenya, Ethiopia, Somalia), *Moringa stenopetala* (Kenya and Ethiopia), *Moringa pygmaea* (northern Somalia), *Moringa rivae* (Kenya and Ethiopia), *Moringa ruspoliana* (Kenya).

The preservation of the *Moringa* species is thus of great concern from biodiversity, ethnobotanical, dietary and pharmacological perspectives. There are tremendous potential opportunities with *M. oleifera* for sustainable agriculture, and the development of cash crops in semiarid regions. Though less well studied, all of the *Moringa* species now in the wild have local medicinal uses (*M. Olson* pers. comm.) but could readily become casualties of the ongoing decline in biodiversity.

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