

Floristic Diversity of Potential Horticultural Plants in Bay Islands

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Andaman and Nicobar Islands have 2,574 known species of plant and out of which, 162 genera and 381 species belonging to 13 families are wild relatives of horticultural crops. Among these, 39 species which are most important are discussed here for their possible horticultural exploitation including 12 species which are indigenous to these islands. Conservation methodology, research to be carried out, potential domestication, pest and disease resistant sources for breeding programs have been discussed. Studies on the intraspecific and interspecific variability should be carried out for their exploitation in crop improvement programmes. Screening for biotic reaction should be studied and potential uses of these in breeding programs with biotechnological tools can be planned.

Key Words: Wild species, Horticultural importance, Diversity, Conservation, Utilization

Introduction

Andaman and Nicobar Islands consist of a fragile ecosystem and need special attention to conserve the biodiversity. These islands are included in the list of worldwide biodiversity hot spots. The geographical area of this Union Territory is 8,293 km² and 86 per cent of it is under reserve and protected forests. Geographically, these islands form one of the most interesting region of India.

In India, there are four known hotspots of biodiversity which are Western ghats, North-east, Trans-Himalayas and Andaman and Nicobar Islands. These hot spots have their presence not only in India but also in the neighbouring countries, for example, Western Ghats are extended to Sri Lanka, North-east to Myanmar, Trans-Himalaya to Bhutan, Tibet, Sikkim and China, and Andaman and Nicobar Islands are extended to Malaysia and Thailand. Therefore, the spectrum of biodiversity present in our country is also present in the contiguous areas of the other countries as well within hot spots. Hot spots are declared for their richness in biodiversity but this diversity is being lost at an alarming rate. Therefore, conservation, digitalization and utilization of this gene pool is very important.

Extensive damage was caused in Andaman and Nicobar Islands due to a severe earthquake measuring about 9.3 in Richter scale followed by Tsunami (high tidal waves) in the morning of 26th December, 2004. Almost entire population and habitat of this territory have been directly or indirectly affected. Out of 54,000 ha of cultivable land in Andaman and Nicobar Islands, about 11,000 ha was damaged and due to ingress of

seawater about 4,500 ha of land is still under submergence and needs reclamation for cultivation. Coastal lands are badly affected due to tsunami, which lead to the destruction of flora of this area.

Apart from this sudden catastrophe, the other main causes for genetic erosion are improper conservation practices, encroachment in the forest areas and imbalance of population density of species in the habitat with special reference to heterozygous flora and fauna.

As per the latest record, botanists have identified 2,574 species with 1,752 Dicots, 672 Monocots, 8 Gymnosperms, and 142 Pteridophytes (Thothatri, 1962; Pandey and Diwakar, 2008). However, there might be lot of other useful flora, which might have been recorded by botanists from time to time and published. An example is the latest addition of an economically important species of *Vanilla* named as *Vanilla sanjappae* from Little Andaman.

Materials and Methods

The literature that is available in different journals has been thoroughly screened for horticulturally important families, genera and species. All the literature has been pooled and digitalized for further utilization. During this course of work many important wild relatives of horticultural plants have been noticed. Even though all horticulturally relevant literature has been collected, in this paper discussion has been restricted to few important species. Some of them can be readily domesticated and many of them can be used in breeding program, upon locating useful genes which are given in the Table 1 with their possible horticultural uses.

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Table 1. Some of the wild species with horticultural importance in A & N Islands

S.No.	Scientific name	Family	Habit	Uses	Horticultural uses	Distribution		
						A	N	O
1	<i>Mangifera andamanica</i> (Andaman-Jungli am)	Anacardiaceae	Tree	Wood may be used for fuel and agricultural implements. Fruit is small and eaten sometimes by local people and tribals, for mango.	Worth investigating as a rootstock for mango.	✓(E)	-	-
2	<i>Mangifera camptosperma</i>	Anacardiaceae	Large tree	Wood may be used for agricultural implements. Fruits are consumed by the Shompens.	Can be used as a good rootstock.	✓	-	✓
3	<i>Mangifera griffithii</i>	Anacardiaceae	Tree	Fruits edible. Wood is used for agricultural implements.	Can be used as a good rootstock and have to be domesticated.	✓	-	✓
4	<i>Mangifera nicobarica</i>	Anacardiaceae	Tree	Fruits are edible. Wood is used for agricultural implements.	Can be used as a good rootstock.	-	✓(E)	-
5	<i>Mangifera sylvatica</i>	Anacardiaceae	Large tree	Poultice of young leaves is used in swelling of joints. Leaf decoction is ingested to treat dysentery, leucorrhoea, and blennorrhoea. A decoction of the root with <i>Tectaria crenata</i> Cav. is a cure for gonorrhoea. Sap from the leaves, mixed with grated coconut is smeared on the head to make the hair long and pliant.	The trees should be conserved and multiplied for further use.	✓	✓	✓
7	<i>Spondias pinnata</i> (Andamans-Gue, Wild mango)	Anacardiaceae	Large tree	Fruits are eaten as a vegetable when raw and as a fruit when ripe. Young leaves are cooked and eaten as a vegetable by the settlers. Flowers are eaten as such, made into curry or used as for flavoring. Wood is soft and perishable employed for packing cases, canoes or boats.	Can be domesticated.	✓	✓	✓
8	<i>Annona glabra</i> (Alligator's apple; Jangli sitaphall)	Annonaceae	Small tree	The fruit is edible. Wood and roots are used for making floats and corks. Pulp can be made into jelly.	Can be used as a rootstock for custard apple for adapting to saline conditions.	✓	-	✓
9	<i>Colocasia esculenta</i> (Taro, Dashheen, Eddo, Nicobarese-Tahangen, Kamum)	Araceae	Herb	Rhizomes are consumed as a vegetable. Rhizome is boiled and eaten by the Shompens of the Great Nicobar Islands. Rhizomes may be used for production of industrial alcohol and taro mucilage may be used as a size for impermeable paper. Seeds, although considered somewhat poisonous, are recommended as a remedy for indigestion, flatulence and disorders of parturient women.	Can be domesticated after proper selection from available variability.	✓	✓	✓
10	<i>Areca triandra</i> (Nicobarese-Kahkoh; Onge-Tikane)	Areaceae	Tall tree	Ruminate endosperm is chewed by the tribals with wild betel leaf. It is used as a substitute for <i>A. catechu</i> . An Ayurvedic drug Puga extracted from <i>A. catechu</i> is used in distaste, diarrhoea and rheumatism, which can be tried from this species also.	Can be domesticated.	✓	✓	-
11	<i>Garcinia andamanica</i>	Clusiaceae	Tree	Poles and pillars are made from the trunks for construction of huts by the tribals. Fruits are primarily consumed fresh but are also canned and used to make juices and jellies.	Can be domesticated after selection from available variability.	✓(E)	-	-

Contd.

Table 1 Contd.

S.No.	Scientific name	Family	Habit	Uses	Horticultural uses	Distribution				
						A	N	M	O	
12	<i>Garcinia cowa</i> (Cowa fruit; <i>Cowa mangosteem</i>)	Clusiaceae	Tree	Fruits are edible and consumed by the Jarawas and the Great Andamanese. Fruits are acidic and can be made into jam or preserve. Dried slice of the fruit are used in dysentery. Young leaves are cooked and eaten as vegetable by the Burmese.	Can be domesticated as a fruit cum spice.	✓	✓	✓	✓	✓
13	<i>Momordica cochinchinensis</i>	Cucurbitaceae	Perennial climber	Tender fruits are valued as a vegetable. Young leafy shoots are cooked and eaten. Root is expectorant and used in treatment of edema of the legs.	Can be readily domesticated to be used as a vegetable. Variability should be studied.	✓	✓	✓	✓	✓
14	<i>Dioscorea alata</i> (Greater yam)	Dioscoreaceae	Vine	A widely cultivated yam bearing tubers and can be ground into a meal and area also used as a vegetable. These are considered anthelmintic and used in leprosy, piles and gonorrhoea. These are eaten during convalescence from phthisis, kidney and spleen disorders and used by some tribals when a person is spitting blood and also as a maturative poultice on boils.	Should be checked for its dosage content and can be domesticated.	✓	✓	✓	✓	✓
15	<i>Dioscorea pentaphylla</i> (Onge – Titorev; Great Andamanese – Tole; Jarawas – Amina)	Dioscoreaceae	Vine Forb/ herb	Tubers are edible. These are consumed only after repeated boiling and washing. Leaves are eaten in times of scarcity. Flowers are consumed as a vegetable. Tubers and roots are consumed by all the tribals of the Bay Islands. Tubers are considered tonic and also used for swellings.	Should be checked for its dosage content.	✓	-	✓	✓	✓
16	<i>Alyosia scarabaeoides</i>	Fabaceae	Trailing or climbing herb	A decoction of the roots is given to treat inflammation of the mouth, nose and throat. Root or the entire plant is made into a paste and mixed with coconut oil and then applied on the head for fifteen days to check falling hair or to cure baldness by some tribals. A decoction of the leaves is given in dysentery and is given to women after childbirth.	Can be tested for treatment of hair fall and products can be developed.	-	✓	✓	✓	✓
17	<i>Canavalia ensiformis</i> (Jack bean, Horse bean)	Fabaceae	Annual legume	Vine is cultivated for forage and greens. Very young pods are eaten as snap-beans but these are said to create abdominal complaints, hernia and colic.	-	✓	✓	✓	✓	✓
18	<i>Tephrosia purpurea</i> (Wild indigo)	Fabaceae	Herb	Used as a green manure. It is used in bronchitis and bilious febrile attacks and also for boils, pimples and bleeding piles. The roots and seeds are reported to be insecticidal and pesticidal. Pulverized roots are smoked for relief from asthma and cough.	-	-	✓	✓	✓	✓

Table 1 Contd.

S.No.	Scientific name	Family	Habit	Uses	Horticultural uses	Distribution				
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19	<i>Artocarpus altilis</i> (Bread-fruit; Onge-Baluong; Nicobarese-Pomp)	Moraceae	Tall tree	Wood is used for beams, posts, rafters etc. Nicobarese make small canoes from the trunk. Bark yields a fibre which is used for painting canoes and caulking boats. Leaves are relished by cattle. Onge consume the fruit after roasting. Seeds are supposed to aid parturition and are also used to treat typhoid or other fevers.	Selection can be made for better yielding promising types.	✓	✓	✓	✓	✓
20	<i>Musa acuminata</i>	Musaceae	Perennial herb	Wild banana plant bearing edible fruits. Both seeded and seedless varieties occur.	Can possess resistant genes for diseases.	✓	✓	-	-	-
21	<i>Musa balbisiana</i> var. <i>andamanica</i>	Musaceae	Perennial herb	Ancestral wild banana are considered inedible because of the seeds they contain. Can be used in breeding programmes.	Can possess discrete resistant genes.	✓(E)	-	-	-	-
22	<i>Myristica andamanica</i> (Wild nutmeg; Nicobarese-Kinhammo)	Myristicaceae	Slender handsome tree	Fruits are reported to be used like cultivated nutmeg. The aqueous extract of the nuts is used by the Nicobarese for stomach trouble. The powder of roasted fruit is taken by them in malarial fever.	Checked as a root stock. The quality should be checked for fragrance. Variability found should be exploited.	✓(E)	✓(E)	-	-	-
23	<i>Horsfieldia glabra</i> (Onge- Jugane)	Myristicaceae	Moderate sized tree	It is a source of an Ayurvedic drug <i>Jatiphalam</i> which is used in indigestion and diarrhoea. Bark and leaves are aromatic and used to treat intestinal infections. Bark is also a remedy for sores and pimples. Onge eat the raw fruit during abdominal pains.	Checked as a rootstock for nutmeg.	✓	✓	✓	✓	✓
24	<i>Knema andamanica</i>	Myristicaceae	Moderate sized tree	It yields a wood which may be used for house building purposes. A decoction of the scarping of the bark is utilized to treat abdominal illness and diarrhoea.	Checked as a rootstock.	✓(E)	-	-	-	-
25	<i>Syzygium claviflora</i> (Wild jamun)	Myrtaceae	Moderate sized tree	Fruits are edible. Seeds are used as astringent in bilious diarrhoea and in diabetes. Fermented fruit juice acts as stomachic, carminative and diuretic. Nicobarese women consume its fruits during pregnancy to improve their haemoglobin percentage.	-	✓	-	-	✓	✓
26	<i>Syzygium samarangense</i> (Wild rose apple)	Myrtaceae	Tree	Fruit is edible and also used in liver complaints.	-	✓	✓	-	-	✓
27	<i>Vanilla andamanica</i>	Orchidaceae	Climber	Said to be used for extraction of <i>Vanilla</i> drug	Can be used in breeding programmes.	✓	✓	✓(E)	-	-
28	<i>Vanilla sanjappae</i>	Orchidaceae	Climber	Fruits may be used as a flavouring agent.	Can be used in breeding programmes.	✓(E)	-	-	-	-

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S.No.	Scientific name	Family	Habit	Uses	Horticultural uses	Distribution				
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29	<i>Piper betle</i> (Betel; Nicobarese– Humo, Hiyo, Takoocho)	Piperaceae	A shade loving vine	Leaves are widely used as masticatory with areca nuts. Leaf paste mixed in coconut oil and sea water is tied on fractured bones as a plaster by the Nicobarese. Leaf decoction is used for healing wounds. In other preparation these are used on ulcers, boils, bruises, ulcerated nose and to cleanse wounds.	Can be domesticated and flowering types can be used in breeding programmes.	✓	✓	✓	✓	✓
30	<i>Piper clypeatum</i>	Piperaceae	Vine	Leaf decoction used for healing wounds.	–	–	✓(E)	–	–	–
31	<i>Piper ribesioides</i> (Choi jal)	Piperaceae	Woody climber	Powdered stem is used as a spice in curries, especially non-vegetarian cookery. Sold in market and are having high market value.	Can be cultivated for commercial exploitation.	✓	–	–	–	✓
32	<i>Rubus moluccanus</i> (Nicobarese–Voknutto)	Rosaceae	Large shrub or small tree	Fruits are edible and eaten by the Shompens. The Juice of roots is used for fistula. Leaf paste is boiled in coconut oil and applied by the Nicobarese to cure the pain in joints. Fruits are given to children to prevent night-micturition.	Nutritional potential has to be studied.	✓	–	–	✓	✓
33	<i>Atalantia spinosa</i> (Wild lime)	Rutaceae	Small tree	Fruits are edible. Oil from berries is used externally in chronic rheumatism and paralysis.	Domestication potential for nutritive value.	✓	✓	✓	✓	✓
34	<i>Citrus medica</i> (Citron, Acid lime, Nicobarese- Limong)	Rutaceae	Small tree	Wood is used for agricultural implements and walking sticks. Fruits are used mainly for pickle. Roots are, useful in vomiting, constipation and urinary calculus. An infusion of the fresh shoots is used as a appetitive and vermifuge and is a remedy for stomachache. The preserved rind is used as a remedy for dysentery.	Can be a resistant root stock and may possess genes against citrus diseases.	✓	✓	✓	✓	✓
35	<i>Nephelium longana</i> (Longan; Nicobarese– Cham-rev.)	Sapindaceae	Tree	Fruits resembles litchi, but with less succulent aril. These are eaten fresh, dried and canned. Wood is used for furniture and agricultural implements. The fleshy part of the fruit is considered to be nutritive, roborant and benefiting spleen, heart, kidney, lungs and mental faculties. Seed oil is applied to snake bite to absorb venom.	Should be checked for variability and selection may improve the edible portion.	✓	–	–	–	✓
36	<i>Camellia drupifera</i> (Let-pet Tea of Burma)	Theaceae	Evergreen shrub	Leaves are used as a substitute for the tea and the seed oil may be used as a lubricant for soap making and after refining for edible purposes.	Can be domesticated and produce can be sold to curious tourists.	✓	–	–	✓	✓
37	<i>Corchorus capsularis</i> (White jute)	Tiliaceae	Annual/ perennial	Plant is a source of jute fibre, used for gunny bags, coarse cloth, twine and carpets. Leaves are considered medicinal and consumed along with food as a tonic.	Can be used for making eco-friendly substitute for polythene bags.	✓	–	–	✓	✓

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S.No.	Scientific name	Family	Habit	Uses	Horticultural uses	Distribution				
						A	N	M	O	
38	<i>Alpinia manii</i> (Great Andamanese- Jini, Jilli)	Zingiberaceae	Herb	Plant is considered to be used by aborigines of Andaman as a bee repellent.	Good for gardening purposes.	✓	✓(E)	-	-	-
39	<i>Amomum aculeatum</i>	Zingiberaceae	Shrub	Ripe fruits are sore in taste and consumed by Nicobarese.	Good for gardening purposes.	✓(R)	-	-	-	-
40	<i>Amomum fenziitii</i>	Zingiberaceae	Shrub	Ripe fruits are sore in taste and consumed by Nicobarese. Juice of the plant parts is used by the shompens of Great Nicobar as a bee repellent.	Good for gardening purposes.	-	✓(E)	-	-	-
41	<i>Zingiber odoriferum</i>	Zingiberaceae	Herb	Stem juice is being used as a tranquiliser for honeybee.	Good for gardening purposes.	✓	-	✓	✓	✓
42	<i>Zingiber spectabile</i>	Zingiberaceae	Robust aromatic herb	It could be grown as an ornamental.	Good for gardening purposes.	✓	✓	✓	✓	-
43	<i>Zingiber squarrosus</i>	Zingiberaceae	Robust herb	Petioles are chewed when thirsty by the 'Onges'.	Good for gardening purposes.	✓(E)	-	-	-	-
44	<i>Zingiber zerumbet</i>	Zingiberaceae	Perennial herb	Rhizome is used as a hot remedy for cough, asthma, worms, leprosy and other skin diseases. Boiled rhizome is given in pulmonary infection.	Good for gardening purposes.	✓	✓	✓	✓	✓

Results and Discussion

The floristic diversity of horticulturally important families in Bay Islands is given below. In Malvaceae, there are 9 genera with 20 species. Malvaceae is one of the important families which represent okra and many vegetables and ornamental plants. In Rutaceae, there are 13 genera with 29 species. The family is of great economic importance under tropical climates for its numerous edible fruits of the *Citrus* genus. The non-citrus fruits include the white sapote (*Casimiroa edulis*) and the bael (*Aegle marmelos*). In Vitaceae, there are 4 genera with 16 species. The wild relatives can be screened for resistance for powdery mildew and anthracnose. In Myristicaceae, there are 4 genera with 11 species. The family has been recognised by most taxonomists best known for fragrant and spicy seeds of nutmeg (*Myristica fragrans*). Wild nutmeg (*Myristica andamanica*) may be useful as a rootstock for *Myristica fragrans* to overcome the dioecious nature. Female plants of nutmeg can be grafted on rootstocks thus increasing the percentage of bearing trees in an orchard. In Anacardiaceae, there are 13 genera with 26 species. This family includes several economically important species. Notable plants include cashew (type genus *Anacardium*), mango, poison ivy and smoke tree. Wild mango and wild cashew may become good rootstock with competitive root as they are adapted to forest competition. In Cucurbitaceae, there are 12 genera with 22 species. This family commonly known for melons and gourds includes crops like cucumbers, squashes (including pumpkins), luffas, melons and watermelons. The family is predominantly distributed around the tropics, whose edible fruits were amongst the earliest cultivated plants in both the Old and New Worlds. In Poaceae, there are 79 genera with 207 species. It includes casual crops grown around the world, lawn and forage grasses and bamboo widely used for construction. In Orchidaceae, there are 60 genera with 142 species. Orchidaceae is the largest family of the flowering plants (Singh and Medhi, 2006). Wild species of *Vanilla* like *V. andamanica* & *V. sanjappae* can be crossed with cultivated species to get good segregation. In Arecaceae, there are 18 genera with 45 species. Palms are one of the most well-known and extensively cultivated plant families. Arecaceae family has great economic importance which include coconut, dates and rattan cane. In Zingiberaceae, there are 8 genera with 22 species. The wild relatives are having ornamental value as well as

possess genes for disease resistance with special reference to root rots. The bee tranquilizer *Amomum aculeatum* used by Onge tribes is a giant ginger which can be a green bush in planted gardens. In Amaranthaceae, there are 7 genera with 11 species. Some of the genes include *Alternanthera*, *Amaranthus* and *Celosia*. Wild species may possess more nutrients than the cultivated one and have to be worked out for their utilization in breeding programmes. In Solanaceae, there are 7 genera with 18 species. It is an important source of food, spice and medicine. Wild brinjal is resistant to bacterial wilt which can be used in breeding programmes. In Musaceae, there is 1 genus with 5 species. The largest and most economically important is *Musa*, which is reported to contain AA, 1 ABB, 4 AAB and 21 BB genome, useful in breeding programmes (Uma *et al.*, 2005). Such research finding about other wild varieties of horticulturally important species are of great help to the researchers, breeders and conservationists. The research and conservation should be more focused on indigenous species with special reference to the rare and endangered species. Biotechnological techniques have broken the barriers of genetic incompatibility facilitating transfer of useful genes found in wild relatives in to cultivated crops. Potential species which are used as fruits, vegetables and for medicinal purposes have to be checked for their nutritional values. Some of the fruits like cowa mangosteen (*Garcinia cowa*), Burmese grape (*Vitis* sp.) can be brought under domestication for niche marketing. Geographical isolation, environmental and genotypic interactions may show some phenotypic characters which may be useful to breeders. Even though, some of these genotypes are present elsewhere in the world, geographical isolation,

micro- and macro-mutations might have brought in some heritable differences which may be selected carefully and studied. More research work is necessary in these crops to consolidate the information and these should be conserved before they become rare and endangered. There is a need for concerted action to make better use of these species to improve the biotic stress and nutritional availability in cultivated crops by screening and gene transfer for more stability. The urgent need to properly characterize, evaluate and documentation of these species is equally very important. Field gene banks can be developed which may be of interest to tourist, botanist and breeders.

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