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Wild Species in Fruit Crop Improvement

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Introduction

- From the past, edible wild fruits have played a very vital part in supplementing the diet of the people. They are edible and having nutritional food value, which provides the mineralslike sodium, potassium, magnesium, iron, calcium, phosphorus etc.
- Apart from this, wild fruits are source of different resistant genes. Crop wild relatives are wild plant species that are genetically related to cultivated crops. They are a critical source of genes for resistance to diseases, pests and stresses such as drought and extreme temperatures.
- The potential of wild species as a source for genetic variation to bring about crop improvement was recognized early in the twentieth century
- Wild ancestors of most crop plants can still be found in their natural habitats and germplasm centres have been established to collect and conserve these resources

Wild species:

- Typical form of an organism, strain, gene, or characteristics as it occurs in nature, asdistinguished from mutant forms that may result from selective breeding.
- A crop wild relative (CWR) is a wild plant closely related to a domesticated plant, It maybe a wild ancestor of the domesticated plant.
- CWRs have contributed many useful genes to crop plants, and modern varieties of mostmajor crops now contain genes from their wild relatives.

Significances of wild species for crop improvement

1. Wild species represent a vital source of untapped genetic diversity.
2. Crop wild relative (CWR) have traits allowing them to be successful at the current extremes of a crop's range and beyond, wild relatives can be extremely important in adapting crops to climate change.
3. Display characteristics - such as heat and drought tolerance, pest and disease resistance

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and the ability to thrive in saline soils which would allow crops to cope with a wider rangeof environments and stresses.

1. Mango

- The genus Mangifera contains several species that bear edible fruit. The other edible Mangifera species generally have lower quality fruit and are commonly referred to as wildmangos.
- In mango, screening of 80 accessions for their reactions to anthracnose using virulent isolates of *C. gloeosporioides* over the past four seasons (2006 to 2009) resulted in the identification of source of resistance in *M. laurina* accession 'Lomboc' (artificial inoculation) which could be used for interspecific hybridization.

Species of mango resistant to different traits

Species	Traits
Mangifera laurina	Resistance to anthracnose
Mangifera mangifica	Fibreless
Mangifera rufocostata and mangifera swintonioides	Off season bearing habit
Mangifera pajang and mangifera foetida	Good quality fruits
Mangifera casturi	A prolific bearer , small black sweet fruits
Mangifera altissima	Resistance to hoppers, Tip and seed borers
Mangifera zeylanica	Salinity Tolerance

2. Banana

- Cultivated banana are derived from intra or interspecific hybridisations between two wild diploid species, Musa acuminata and Musa balbisiana.
- Banana is infected by different Diseases like Sigatoka leaf spot (*Mycosphaerella musicola*), Black leaf streak (*Mycosphaerella fijiensis*), Fusarium wilt (*Fusarium oxysporum f. sp. cubense*), Banana bunchy top virus (BBTV) and pest like Black weevil of banana (*Cosmopolites sordidus*). Aphids (*Pentalonia nigronervosa*), Nematodes (*Radopholus similis and Pratylenchus sp.*).

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- So to increase production, the first goal of banana breeding is to confer resistance to diseases and pests.
- Development of sigatoka leaf spot resistant banana hybrids with improved fruit quality using diploid wild accessions 'Malaccensis', 'IDN110/AAcv Rose' and Musa balbisiana

with 'Kunnan 4X' resulted in the development of new superior hybrids with sigatoka leaf spot resistance at Guadeloupe.

Species of banana resistant to different traits

Species	Traits
Musa acuminata ssp. Malaccensis	Resistance to sigatoka leaf spot
Musa acuminata ssp. Burmannica	Resistance to black leaf streak
Musa haekkinenii	Dwarf plants (1 to 1.5 m high)
Musa ornata and Musa veluntina	Ornamental plants
Musa textilis	Fiber
Ensete superbum	Medicinal and ornamental plant

3. Papaya

- India stands first in the production of papaya in the world. Diseases are the major problem. Among all, viral diseases are the limiting factors of papaya cultivation particularly papaya leaf curl and papaya ring spot virus. Papaya ring spot cause heavy loss of 40–90 percent.
- Evaluation of F2 intergeneric population of the combination from *Carica papaya* (var. Pusa Nanha, CP 50 and CO7 as female parents) and *Vasconcellea cauliflora* for Papaya Ring Spot Virus (PRSV) resistance under laboratory (challenge inoculation) as well as field condition resulted in the identification of eighteen plants from the cross *Pusa Nanha*

× *V. cauliflora*, five plants from the cross CP 50 × *V. cauliflora* and one plant from the cross CO 7 × *V. cauliflora*.

- These were found to be promising based on the disease intensity score, reaction to the papaya ring spot virus and mean performance for morphological, yield and quality attributes.

Possible Sources of Resistance in different wild species of Papaya

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Diseases	Resistant / tolerant Species
PRSV – P	*V. cundinamarencis, V.cauliflora, V.quercifolia and V. stipulate*
Phytophthora	*V. goudotiana*
Paw paw die back (Mycoplasma) Blackspot	*V.parviflora cundinamarencis (syn. V. pubescens)*
Bacterial Canker (Erwinia papayae)	*V. goudotiana and V.cauliflora*

4. Grape

- *Vitis venifera* variety - susceptible against a wide range of fungus among which Powdery mildew and downy mildew has highest economical impact.
- Main goal - development of new varieties with combined quality and resistance characteristics by using wild species.
- Recent success in grapevine research - development of various genetic maps, genome sequencing raise hopes for more efficient use of the genetic resources of wild species within breeding programme.
- The wild Vitis germplasm, including Chinese and American wild Vitis and *Vitis vinifera* cultivars, to powdery mildew (*Uncinula necator* Burr.) resistance was evaluated for two consecutive years under natural conditions where most of the Chinese and North American species displayed a resistant phenotype, while all of the European species were highly susceptible.

Possible Sources of Resistance in different wild species of Grapes

Resistant / tolerant Species	Traits
V. aestivalis, V. champinii, V. cinerea, V.rupestris and Muscadinia rotundifolia	Resistance to Meloidogyne incognita
V. arizonica, V. candicans, and M. rotundifolia	Resistance to Xiphinema spp.
Vitis berlandieri	Adaptation to limestone soils.
V.rotundifolia, V.aestivalis, V. cordata	Powdery mildew resistance
V.munsoniana,V.rotundifolia,V.candicans	Downy mildew resistant

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5. CITRUS

- Citrus is one of the most important fruit crop grown throughout tropic and sub - tropic on the world. Citrus production is affected by both biotic and abiotic stresses, including drought, extreme temperature, salinity, citrus canker, citrus tristeza virus and citrusgreening, among others.
- Therefore exploiting the wild crop relative is the only way to combat the problems.
- Twelve combinations of citrus rootstocks and interstocks were chosen for potential use against citrus greening disease. It was reported that symptoms were not observed on the scion with *C. grandis* as rootstock and *C. hystrix* as interstock and on (*C. hystrix* as the rootstock and *C. grandis* as the interstock) while there was higher rate of citrus greening disease severity when *C. aurantium* was used as rootstock with *C. aurantifolia* as the interstock or vice versa.

Possible Sources of Resistance in different wild species of Grapes

Species	**Traits**
Poncirus	Resistant to citrus tristeza virus (CTV), Phytophthora-induced diseases & nematode
Microcitrus	Resistance to drought, flooding
Severinia	Cold resistance, salt and boron tolerance, resistance to Phytophthora and nematodes
Atalantia	Wet soils, Phytophthora resistance, and exhibits good cold hardiness
Citropsis	Resistance to Phytophthora induced diseases And burrowing nematode.
Feronia	Drought tolerant
Feroniella lucida	Dwarf, resistant to CTV.
Fortunella	Cold hardy

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List of Wild Relative Species in Pineapple, Sapota & Custard Apple

Species	**Traits**
Pineapple	
A.comosus var. annanasoides	Tolerant to wilt, crown rot and nematodes
A.comosus var. erectifolius	Resistant to heart rot and root rot
A. macrodontes	Source of fibre, resistant to drought
A.comosus var. bracteatus	Vigorous, resistant to heart rot &root rot
Sapota	
Manilkara hexandra (Rayon)	Vigorous rootstock
Manilkara kauki	Rootstock
Custard apple	
Annona crysophella	Medicinal
Annona glabra	Drought tolerance
Annona puprea	Insect tolerance
Annona atemoya	Frost tolerance

Conclusion

Thus, it is concluded that the wild species of the fruit crops constitute an increasingly important resources for improving horticultural production and for maintaining sustainable agro-ecosystems.

Therefore, conservation, exploration, and use of the wild genetic diversity underlying horticultural production represent a critical piece of collective global potential for sustainable productivity and increased crop quality

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