Enhancing Capacity for Coconut Hybridization

Empowering
Planting Material Production

Introduction

- The coconut is not indigenous to Jamaica, but over the past century or more several varieties have been introduced from coconut growing countries all over the world – mainly from the Pacific Region
- Introductions were fueled by destruction of coconuts by windstorms and lethal yellowing disease
- The coconut breeding program in Jamaica began in 1959, with the launch of the Research Department of the Coconut Industry Board.

To Hybridize Or Not? Major considerations

- If all desired traits are present in one mother palm candidate cultivar then self or sib pollination can be employed to reproduce such cultivar.

- If desired traits are spread across more than one cultivar, then hybridization is a better option.

The Advantage of Hybridization

- Coconut hybridization represents one of the main approaches for increasing coconut populations in the Caribbean Region
- It also affords the opportunity for producing planting material better suited to local conditions
- One such example is the Maypan, a cross between the Malayan Dwarf and the Panama Tall

COCONUT HYBRIDIZATION: THE JAMAICAN EXPERIENCE

The Search For Lethal Yellowing Resistance

- In response to the lethal yellowing outbreak beginning in the late 1950's, several introductions were made from the Pacific Region
- Several inter-origin crosses were made and assessed, and in 1974 the Maypan was released for commercial production
- The Malayan Dwarf was resistant to lethal yellowing and had high yields, but the fruits were relatively small
- Hybridzation with the Panama Tall resulted in fruits that were larger in size, giving the 'best of both worlds'

Further Hybridization

- In the 1980's the Malayan Dwarf was crossed with several tall varieties from the Pacific
- In the 1990's The Chowgat Green Dwarf, Sri Lanka Green Dwarf and Sri Lanka Yellow Dwarf were crossed respectively with the Panama Tall
- In the 2000's the newly introduced Brazil Green Dwarf was crossed respectively with the Panama Tall and the Malayan Yellow Dwarf
- The resulting hybrids (Brapan and Maybraz) are being assessed, and the Brapan shows performance comparable to the Maypan

Present Work

- The favourable agronomic characteristics of the Brapan and its performance in various field conditions is being assessed
- Varieties introduced from the Ivory Coast Genebank in 2009 and 2012 are being assessed to identify in each unique traits favourable to respective sections of the market
- F1 populations of the above varieties is also being assessed

The Making of a Hybrid

The story of the MayPan

Mode of Hybridization

- The MASCOPOL (mass controlled pollination) system (Harries, 1976) was employed at local Hybrid Seed Farms
- In this system the entire Seed Garden is isolated, by locating same outside of main coconut growing areas
- This eliminates the need for isolation of individual female flowers (POLICAPS, Harries, 1976) or inflorescences

The Female Parent

- The Malayan Dwarf is selected, usually in an isolated Seed Farm.

The Male Parent

- The Panama Tall is selected.

Pollen Collection

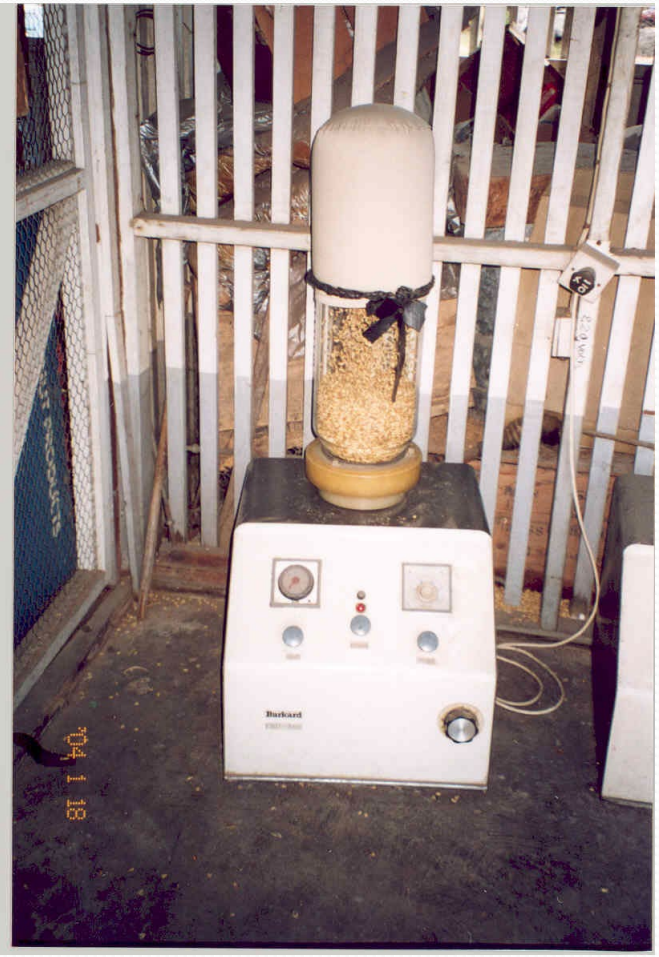
- The male flowers are collected by cutting the spikes from the open Panama Tall inflorescences.

Pollen Processing

- Male flowers on the spikes are brought to the laboratory for processing.

Drying of Pollen

- The male flowers are stripped from the spikes, cracked open, and dried for 4 hours at 40 degrees Celsius in a Fluid Bed Dryer.
- The dried flowers are sifted, and the pollen obtained is stored at 4 degrees Celsius.



Emasculation

- The male flowers on the spikes are removed from the Malayan Dwarf inflorescences at the Seed Farm.

- This is done just before they open naturally, to prevent ‘contamination’ of the Farm by Malayan Dwarf pollen.

Pollination

- The pollen is diluted with carbonate filler (at a ratio of 1:4), and applied to female flowers of the Malayan Dwarf, when they enter the ‘receptive’ phase.

At The Nursery

- The seed nuts obtained a year later are set in seedbeds in the nursery.
- Seedlings adjudged to be true hybrids are supplied to farmers when they are about five months old.

The ‘Finished Product’

- The Hybrid seedlings grow into Maypan trees.

The Advantages of Hybridization

- STRENGTHS
  - Utilization of cultivars already adapted to local conditions
  - Cost-effectiveness - material is already present
- OPPORTUNITIES
  - Maximization of potential of local germplasm
  - New cultivars having 'best of both worlds' traits of parents through hybridization

Constraints of Hybridization

- WEAKNESSES
  - Lack of diversity of local germplasm may prevent achievement of planting material having best traits
- THREATS
  - Damage of parental germplasm and candidate offspring through windstorms or local pests and diseases

RECOMMENDATIONS

- If promising candidates for mother palms and pollen parents are present and easily accessible, the framework for hybridization can be established
- If germplasm introductions are being done, it is highly advisable to retain about 50 per cent of material obtained and conserved in a National collection.
- From this material candidates for hybridization can be identified, paving the way for the establishment of the relevant Hybrid Seed Farms

THE IMPORTANCE OF PLANT BREEDING AND PLANT VARIETY RIGHTS SYSTEMS

THE JAMAICEN EXPERIENCE

The Case of The Maypan

- The Maypan was developed in Jamaica and released in 1974
- It has enjoyed international success
- There was no system of rights applied to this hybrid
- Jamaica loses the rights to this successful hybrid

REFERENCES

- Harries, H. C., 1976. Coconut Hybridization by the Policaps and Mascopol Systems. Principes Vol 20, 136-147.

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THANK YOU