

## CLONES

### VTLCC-1 (Vittal Cocoa Clone- 1) :

This variety is a clonal selection from Nigerian collection, EC 631558. The pods are green to yellow in colour having smooth surface and shallow furrows. The trees with a height of 3.3 m and small to medium canopy (12 m<sup>2</sup>) yield an average of 55 pods/tree/year at the age of 6 to 12 years as clones, both under arecanut and coconut in two locations. Pods are of 350 g weight with 35 beans/pod. With a single dry bean weight of 0.9 to 1.05 g this clone recorded the highest yield of 1.3 kg/tree/year and the yield/ha is 890 kg. Having industrial value with 12% shell 88% nib recovery and 50% fat content. Heavy and early bearer with small to medium canopy, suitable for high density planting both under arecanut and coconut, self compatible line performing well in North Eastern zones.



### VTLCS-1 (Vittal Cocoa Selection- 1) :

This variety is a selection (IC 0597837) from VTLC-1. The pods are red to orange in colour having smooth surface and shallow furrows. The trees with a height of 3.7 m and medium canopy (12 m<sup>2</sup>) yield an average of 55 pods/tree/year at the age of 14 years as clones, both under arecanut and coconut in two locations. Pods are of 360 g weight with 42 beans/pod. With a single dry bean weight of 1.13 g this clone recorded the highest yield of 2.52 kg/tree/year and the yield/ha is 1700 kg. Having industrial value with 11% shell, 88% nib recovery and 52% fat content. This variety has attractive pods, stable, high yielder, withstands both biotic (black pod rot and tea mosquito bug) and abiotic stress (low moisture). It is suitable as a parental line for hybrid development.



### VTLCS-2 (Vittal Cocoa Selection- 2) :

This variety is a selection (IC 0597838) from VTLC-57. The pods are green to yellow in colour. The trees with a height of 3.9 m and an optimum canopy (15 m<sup>2</sup>) yield an average of 55 pods/tree/year as clones both under arecanut and coconut in two locations. Pods are of 400 g weight with 41 beans/pod. Beans are very bold and big with 3 cm length, 1.5 cm width, 1.21 g weight, 15% shell, 85% nib recovery and 53% fat content. The dry bean yield is 2.7 kg/tree/year and the yield/ha is 1840 kg.



This variety is having high cropping efficiency, best bean traits, high yielding behaviour with tolerance to pests (tea mosquito bug) and diseases (black pod rot).

These varieties are suitable for coconut and arecanut growing tracts in Western Ghats Hills and Plains of Karnataka and Kerala as well as the coconut growing tracts of Tamil Nadu, Andhra Pradesh, Maharashtra and Goa under irrigated conditions. Optimal height and canopy area should be maintained with systematic annual pruning in the intercropping system. With recommended package of practices; 100:40:140 g NPK/tree/year in two splits and 20 litres of water/day/tree with drip irrigation during rainless periods, potential of the crop will be enhanced.

Cost of cultivation with drip system (500 trees)- Rs.35,000/ha (BC ratio 1:3).

#### Cost of planting materials at CPCRI :

Seed pod- Rs. 25/-, Seedling- Rs.10/- Graft- Rs. 30/-

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## COCOA VARIETIES OF ICAR - CPCRI



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## COCOA VARIETIES OF ICAR - CPCRI

Cocoa in India is cultivated as a mixed crop in palm based cropping systems. The current area under cocoa is 78 thousand ha covering Kerala, Karnataka, Tamil Nadu and Andhra Pradesh states with 16 thousand tonnes production. The average productivity is 380 kg dry beans per hectare. To increase the productivity per unit area and to meet the demand of 45,000 tonnes estimated by the chocolate industry, it is important to utilize multiple elite clones and hybrids in the area expansion programmes recommended by National Horticulture Mission.

The Central Plantation Crops Research Institute (ICAR- CPCRI) initiated cocoa research at its Regional Station, Vittal in Karnataka state in the year 1969 with introduction of few germplasm from Malaysia. From then on cocoa improvement programmes were intensified in a systematic manner with the following breeding strategies viz., germplasm collection from primary and secondary centres of origin and distribution, conservation as field gene banks, characterization, evaluation and breeding for desirable traits. Methodologies followed in varietal improvement over 40 years and details on varieties developed with high yield and specific characters are given here.

### BREEDING METHODS

#### Selection :

An easy approach in cocoa improvement is selection breeding, which is possible with genetically variable populations. As a cross pollinated crop and with existence of self- incompatibility, the variability in cocoa is so high that in a seedling population, about 75% yield is obtained from 25% of the trees. CPCRI, Regional Station is conserving 400 germplasm collections which comprises of basic types of cocoa, the Criollo, Forastero, Trinitario groups and clones of different genetic and geographical origins. Evaluation trials are mainly focussed at assessing the cocoa genotypes for vegetative vigour, precocity in bearing, stability in yield, potential in production, compatibility behaviour, quality attributes and their reaction to biotic and abiotic stress.

#### Clonal selection :

In the beginning of this century, clonal selection programmes were initiated with pod index, bean size and disease resistance as criteria. Individual tree selections were made from seedling populations and land races, utilised in development of hybrids and further evaluated in clonal trials to fix the genetic potential. Production of cultivars as clones is crucial in perennial crop breeding to reduce the period of breeding cycle, to get true to type plants, maximum yield from minimal canopy and to combine desirable traits. At CPCRI, cocoa collections were originally imported as seeds, evaluated under local conditions, individual performers were selected, clonally multiplied and further evaluated for performance as multiple clones. Later, imports were made as bud sticks, conserved as clones, evaluated and clonal selections were made from their performance over years.

#### Hybridization :

Developing hybrids between two distant genotypes is another method commonly adopted, which are based on heterosis and hybrid vigour and mainly for resistance breeding programs. Availability of self-incompatible but cross-compatible parents became advantageous in production of hybrids in cocoa. At

CPCRI, five progeny trials involving 80 cross combinations with specific objectives were tried from 1980 onwards and best hybrids were developed as varieties. After effective testing of hybrid progenies as seedlings, clonal evaluation and selection or ortet selection is recommended in cocoa. It will boost mother trees for wider distribution instead of going for individual crosses of selective hybrid combination every time.

### HYBRIDS

#### VTLCH-1 (Vittal Cocoa Hybrid- 1) :

This variety has been derived from a cross between Malaysian collections, EC 631540 x EC 631534. The pods are green to yellow in colour having smooth surface and shallow furrows. The trees with a height of 4 m and medium canopy (16 m<sup>2</sup>) yield an average of 50 pods/tree/year at the age of 6 to 12 years as hybrids and clones, both under arecanut and coconut. Pods are of 350 g weight with 40 beans/pod. With a single dry bean weight of 1 to 1.1 g this hybrid recorded the highest yield of 1.4 kg/tree/year and the yield/ha is 959 kg.



This variety is suitable for chocolate industry with a shelling percentage of 13%, nib recovery of 87% and 54% fat content. It is a stable, high yielder, withstands both biotic (black pod rot and tea mosquito bug) and abiotic stress (low moisture).

#### VTLCH- 2 (Vittal Cocoa Hybrid- 2) :

This variety has been derived from a cross between Lalbaugh collections, IC 565551 x IC 565556. The pods are green to yellow in colour having smooth surface and shallow furrows. The trees with a height of 3.9 m and medium canopy (15 m<sup>2</sup>) yield an average of 50 pods/tree/year at the age of 6 to 12 years as hybrids and clones, both under arecanut and coconut. Pods are of 350 g weight with 40 beans/pod. With a single dry bean weight of 1 to 1.5 g this hybrid recorded the highest yield of



1.5 kg/tree/year and the yield/ha is 1030 kg. This is suitable for chocolate industry with a shelling percentage of 11%, nib recovery of 89% and 54% fat content. This variety is a stable, high yielder with medium sized tree, both parents and progenies are tolerant to black pod rot.

#### VTLCH- 3 (Vittal Cocoa Hybrid- 3) :

This variety has been derived from a cross between Malaysian x Nigerian collections, EC 631534 x EC 631546. The pods are green to yellow in colour having smooth surface and shallow furrows. The trees with a height of 3.7 m and optimal canopy (18m<sup>2</sup>) yield an average of 41 pods/tree/year at the age of 6 to 12

years as hybrids and clones, both under arecanut and coconut in two locations. Pods are of 440 g weight with 41 beans/pod. With a single dry bean weight of 1 to 1.05 g this hybrid recorded the highest yield of 1.7 kg/tree/year and the yield/ha is 1150 kg. This is suitable for chocolate industry with a shelling percentage of 15%, nib recovery of 87% and 51% fat content. This variety is found to be suitable for water limited conditions with favourable physiological parameters.



#### VTLCH- 4 (Vittal Cocoa Hybrid- 4) :

This variety has been derived from a cross between Malaysian x Nigerian collections, EC 631534 x EC 631556. The pods are red to orange in colour having smooth surface and shallow furrows. The trees with a height of 3.6 m and medium canopy (18m<sup>2</sup>) yield an average of 40 pods/tree/year at the age of 6 to 12 years as hybrids and clones, both under arecanut and coconut in two locations. Pods are of 440 g weight with 40 beans/pod. With a single dry bean weight of 1 to 1.07 g this hybrid recorded the highest yield of 1.6 kg/tree/year and the yield/ha is 1090 kg. This is suitable for chocolate industry with a shelling percentage of 15%, nib recovery of 87% and 51% fat content. Suitable for water limited conditions, parents and progenies are tolerant to water deficit stress along with high yield.



#### VTLCH-5 (Vittal Cocoa Hybrid- 5) : NETRA CENTURA

This variety has been derived from a cross between IC 565554 x IC 565559 and evaluated as VTLC-1 and named as Netra Centura. The pods are green to yellow in colour. The trees with a height of 3.5-4m and an optimum canopy (16.3-17m<sup>2</sup>) yield an average of 66 pods/tree/year at the age of 6 to 13 years as hybrids and clones both under arecanut and coconut. Pods are of 400-450 g weight with 43 beans/pod. With a single dry bean weight of 1 to 1.11 g this variety recorded the highest yield of 2.5 to 3.0 kg/tree/year and the yield/ha is 1500- 1800 kg. This is suitable for chocolate industry with a shelling percentage of 11%, nib recovery of 88% and 52% fat content. Early, high yielder, moderately tolerant to black pod rot, tea mosquito bug and low moisture stress. Suitable for high density planting.

