

## **Report on the “Development of Sea Protocol for the Trial Sea Shipment of Traditional Nendran banana to Dubai**

India is the largest producer of the banana with an annual production of 30 million tons in an area of 0.8 million hectares. Though Cavendish bananas are ruling the banana export in the world trade, traditional bananas like Nendran, Ney Poovan and Red Banana find the place in the hyper malls especially in West Asia and South East Asia markets due to the settlement of ethnic population from India. Nendran the commercial plantain variety in Kerala, Tamil Nadu and parts of Karnataka occupies 50 % of the total area in these states and maximum quantity of the fruit is sold locally. Presently the fruits are being exported through air cargo which incurs much higher expenses and the scope for sustainability and profitability of the business is getting diminished. Therefore to set a new voyage by sea to Dubai with its ‘Made in India’ farm fresh Nendran Bananas, in a first of its kind attempt, ICAR-NRCB, Trichy and APEDA, New Delhi entered into a Memorandum of Understanding (MoU) for a consultancy project “**Development of Sea Protocol for the Trial Sea Shipment of Traditional Nendran banana to Dubai**” in partnership with M/s. Fair Exports India Pvt Ltd., Kochi, on 20<sup>th</sup> April 2017.

### **Experts Involved:**

Dr. Mrs. S. Uma, Director & Convener  
Dr. K.N. Shiva – Principal Scientist (PHT-Horticulture)  
Dr. R. Thangavelu- Principal Scientist (Plant Pathology)  
Dr. V. Kumar – Principal Scientist (Horticulture)  
Dr. P. Suresh Kumar-Senior Scientist (PHT-Horticulture)

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### **Rationale of the project:**

With the high cost, operational expenditure of exporting Nendran banana via sea became very high. As the demand for traditional varieties are getting sky rocketing with the introduction of good quality ethnic bananas of India to even the consumers who normally buys the Grand Naine, a Cavendish banana, the need for exporting the bananas in huge volume is getting increased. Development of the Sea protocol is pre-requisite to meet this increased demand.

### **Detailed objectives of the consultancy project:**

To provide technical advice/guidance for trial shipment of ‘Nendran’ banana for the export to Dubai from Kochi Seaport by providing technical guidance in harvesting, post-harvest handling operations, packing and cold storage.

### **Duration of the project:**

The project was initiated with the target of to be completed within five months from the date of approval/issue. Accordingly, the project was initiated by the last week of April and culminated with the supervision and survey in the Dubai market by the end of first week of August 2017. With the time line framed, the project ended one month ahead of its schedule.

The findings from the present consultancy work is listed in gist in this interim report.

### **Areas of the study:**

The process of exporting quality Nendran banana to Dubai began with the identification of suitable orchards for the selection of export quality bunches. The expert team from ICAR-NRCB, Trichy visited the Nendran fields in Valliyur (Nagarcoil), Cumbum (Theni), Mettupalayam (Coimbatore) and Sathymangalam in Tamil Nadu and Chamaraja Nagara in Karnataka. Good quality bunches were available in all these places. Chamraj Nagara, Karnataka was selected, farms were identified and suitable pre-harvest recommendations were given before harvest of bananas.

### **Maturity indices:**

For any market, the maturity index must consistently meet two requirements. It should ensure: Minimum acceptable eating quality and a long storage life. Therefore for the export market the hands of 80 – 85 % maturity were harvested.

### **Harvesting**

Bananas were harvested by hand using a two-person team. One person cuts and the other carried the bunch away. When cutting the bunch, a shallow cross cut was made with a cane knife in the stem facing the bunch. The weight of the bunch caused the stem to bend. At this point the bunch was then lowered onto the shoulder padding of the second person and the bunch stem was cut.

### **Postharvest handling, packing & storage**

**Dehanding:** Dehanding must be done with a sharp chisel type dehanding tool, by leaving maximum crown attached to the hand. Crown should be cut evenly, otherwise it's outer finger may be detached. The knife must be very sharp to give a clean, smooth cut in a single movement. The separated hands must be spread on a clean surface to drain the latex for 10 minutes. After removal of latex, the fruits were packed in 20 kg perforated boxes which were foamed in the bottom and sides to avoid the abrasion and compression injury during transport. Foams were also in between hands to avoid the bruises during the handling and transport.

**Quality Inspection at packing plant:** Well experience and trained personnel should be deputed to check for minimum finger length & caliper grade, as well as different types of damages, & marks the hands or whole bunches that have to be rejected. The selection procedure continues at the water tanks of the packing plant.

**Washing:** The boxes should be unloaded carefully and should not be exposed to sun or rain after unloading to avoid the physiological loss in weight and possible infection by microorganisms. Crown was removed after careful inspection if necessary before placing the fruits in wash tank. As soon the hands are drained from latex they are placed in the wash tank to remove the dirt & latex which exudes from the cut surface of the crown. All the damaged, undesirable size and shape fruits were removed using knife.

**Use of chlorine:** The second tank was filled with water containing alum (@10 gm / lit to remove the latex & destroy microorganisms. Dehanded fruit is washed for 4 minutes.

**Fungicide treatment on the dehanded bananas:** The most effective postharvest control of crown rot is provided by treatment with benzimidazole group of fungicides. Bavistin @ 1.5 g/lit for 10 minutes was used for arresting the fungal growth.

**Air Drying:** Once the hands are removed from the third tank which has fungicides, the hands were air dried by placing the hands in the cushioned drying tables through air drying. High capacity fans should be mounted on the wall or at the top to provide air for the faster removal of water from the skin.

**Packaging:** The air dried hands were weighed and packed in the 100 gauge polypropylene bags which was lined in the 5 ply corrugated fibre board boxes holding an average fruit weight of 10.5 to 12 kg to avoid the moisture loss. Two pouches of KMnO<sub>4</sub>, an ethylene absorbent/ oxidiser were used to control the ethylene release and to enhance the shelf life. The air was removed from the polyethylene bag using vacuum.

**Pre-cooling:** The packed boxes were stacked and loaded in the pre-cooling room to bring down the temperature of the fruit. The RH of 85-90 with the temperature of 13.5°C was maintained in the room.

**Transport:** For the trial shipment 40' insulated reefer container was used. These reefers are then transported to the ship by road. The containers are transported by sea to the Dubai port and then by road directly to the ripening chamber and cold storage room. Fruits were shipped under refrigeration to prevent the initiation of ripening before they arrive at their destination. Storage temperature 13°C & Humidity 90-95 % was maintained during Voyage.

**Ripening:** At destination, depending upon the demand, the fruits were ripened by keeping the boxes in the ripening chamber where the temperature was maintained at 20-24 °C & Relative Humidity at 90-95 %. Ethylene gas was applied at 100-150 ppm for 24 hours. After 24 hours ventilation should be done to remove the ethylene from the ripening chamber. The ripened fruits were displayed in the Hypermall for sales.

**Feedback from the market:** The consignment received through the trial shipment has received great attention from the consumer. Availability of blemish free Nendran enthused the banana lover to buy more fruits even with the premium prices. Contrastingly, through this venture, good quality fruits will be available to the consumer in affordable and cheaper rate in the days ahead with the success of this APEDA sponsored, ICAR-NRCB technology supported trial shipment.

## Appendix I

### Requirements for Banana export (10 tons)

| S.No | Particulars  | Specification  | Quantity (nos)   |
|------|--|--|------------------|
| 1    | Fibre tank   | 1000 lit rectangular   | 3                |
| 2    | Slanting trays   | Aluminium trays of 5x1.5 ft  | 3                |
| 3    | Pedestal fan   | High capacity  | 3                |
| 4    | Weighing Balance   |  | 3                |
| 5    | Plastic crates   | 58x39x31 cm  | 150              |
| 6    | U type; 5 ply CFB boxes  | 13-14 kg, 8% ventilation, 600 g bottom tare 450 g top lid, folding telescope carton          | 1000             |
| 7    | Polythene bags   | 100 gauge, transparent   | 1500-2000        |
| 8    | Foam sheets thick  | 6 mm thick black foam as a liner in plastic crate  |                  |
| 9    | Foam Sheets Thin   | 2 mm thick White foam: insert in hands; ventilated foams as a separate between cluster/hands |                  |
| 10   | Yellow sponge  |  | Required numbers |
| 11   | Vacuum sealer / Air remover  | Eureka/Forbes  | 2                |
| 12   | Treatment chemicals like sodium hypochlorite, Benomyl/ carbendazim |  | 2 kg each        |
| 13   | Ethylene absorber  | 2 per bag  | 2000 sockets     |
| 14   | Rubber bands   |  |                  |
| 15   | Colour tags  |  |                  |
| 16   | Stickers   |  |                  |
| 17   | Scissors   |  |                  |
| 18   | Finger remover   |  | 10 nos           |
| 19   | Hand Callipers   |  | 2 nos            |
| 20   | Shoulder Padding materials   |  | Enough quantity  |
| 21   | Cold storage unit  | 10 tons  | 3 nos            |
| 22   | Reefer van   |  |                  |

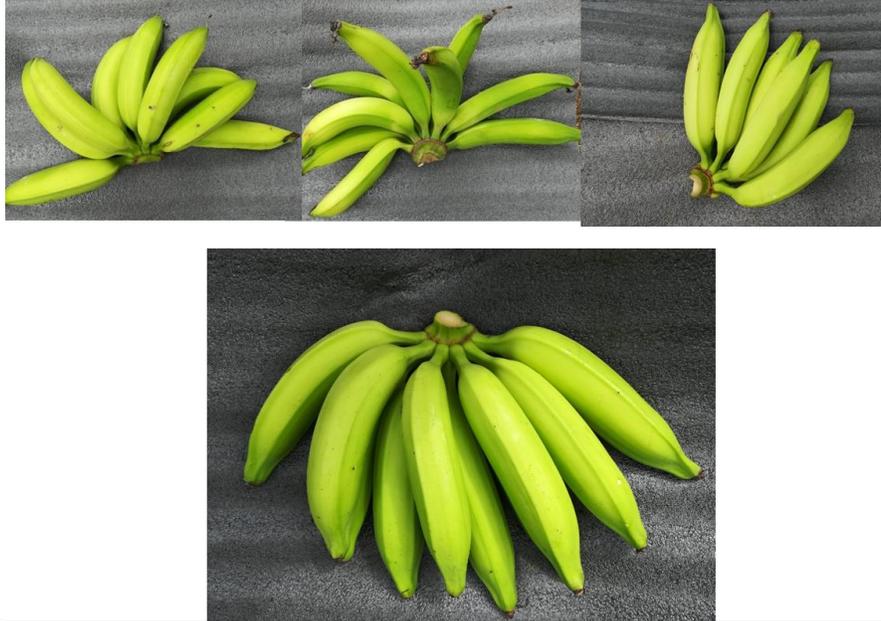


MoU signed with the APEDA for the Development of Sea Shipment Protocol for Nendran



**Field care**





**Top: rejected hands ; Bottom: Good quality hand for export**



**Post Harvest handling and packing under the supervision of the ICAR-NRCB Scientists**



**Team of scientists and officials with the refrigerated reefer container ready for voyage**



**ICAR-NRCB scientists and Fair Exports officials with the banana consignment at LuLu facility, Dubai**



**Nendran Banana sailed from the Cochin Port, India and received after 12 days at the Dubai Port**



**ICAR-NRCB Scientists (Drs. R. Thangavelu and K.N. Shiva ) with Mr. M.A. Salim, Director and officials of LuLu Group International with the ripened Nendran bananas at Dubai**





Ripened Nendran Banana in display at LuLu Hyper Mall, Dubai