Induced Ripening of Banana for Increased Marketability and Storage

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Summary

Banana ripening is a combination of physiological and biochemical processes resulting in changed color, sugar content, texture and aroma. Dessert bananas are most often harvested prematurely to reduce injury during transportation. Bananas may be artificially ripened using different chemical agents, most often ethylene gas. Commercial ripening chambers control temperature, humidity, and ethylene gas concentration. Catalytic generators are used to produce ethylene for induced ripening, with concentrations of 100 ppm for 12 hours having immediate effect. Acetylene serves as an ethylene analogue. Ethephon is a widely used compound that releases ethylene. Fruits artificially ripened have a similar yellow color and taste to those naturally ripened. This is not the case for bananas ripened by more traditional methods such as burning leaves or kerosene

Technical Description

Plantain and banana suffer major post-harvest losses due to poor damage during transportation. This is particularly the case for dessert banana that are generally purchased in a ripened state. Traditionally, bunches are ripened by wrapping green leaves around them, requiring up to two weeks and resulting in non-uniform results. Ripening of the fruit can be slowed down or accelerated by adjusting the temperature and humidity as well as by providing a targeted supply of ethylene gas and regulating the CO2 concentration. Artisanal and industrial chamber systems for ripening are available. This induced ripening reduces the protein content and increase sugar in most banana varieties.

Uses

The location of ripening chambers should be close to the target market, be easily accessible, and have reliable supply of key materials and energy. Fruit growers have the challenges of getting their produce ripened at the required time so that they can sell immediately. Fruit sellers want to serve a clientele of customers with ready-to-eat banana every day so that they do not move from stall to stall in search of their preferred fruits. For this reason, it is important that they devise ways and methods which will help them guarantee their customers of the fresh fruit as and when they want them.

Composition

Low-cost ripening chambers are constructed with metal or wood frame and covered with thick plastic sheet to make it airtight. As catalyst, avocados and passion fruit are added to bottom shelve of the chamber since these fruits release lots of ethylene. More advanced industrial ripening chambers are composed of insulating chambers, refrigeration system, humidifier, ethylene generator, gas analyzer and a control panel.

Means of application

Ethylene is introduced by generating chemicals such as Ethephon (Trade name Ethrel, 2000 ppm dip for 3 minutes). For best ripening results, humidity should be 90% to 95% to prevent moisture loss. In simple passive closed chambers, this is achieved using basins of water, and in industrial-scale rooms this is achieved using humidifiers. Quick ripening is requires temperatures of 18-20°C within 4 days, slower ripening lower happens at lower temperature (14-16°C) takes 8-10 days.

Agroecologies	Highlands, Humid forest, Moist savanna.
Regions	Africa South of Sahara.
Developed in Countries	Zambia, Uganda, Togo, Tanzania, Somalia, Sierra Leone, Rwanda, Nigeria, Malawi, Kenya, Ivory Coast, Guinea, Ghana, Ethiopia, Democratic Republic of the Congo, Cameroon, Burundi, Burkina Faso, Benin.
Available in	Zambia, Uganda, Togo, Tanzania, Somalia, Sierra Leone, Rwanda, Nigeria, Malawi, Kenya, Ivory Coast, Guinea, Ghana, Ethiopia, Democratic Republic of the Congo, Cameroon, Burundi, Burkina Faso, Benin.
Solution Forms	Equipment.
Solution Applications	Post-harvest handling, Agri-Food Processing.
Agricultural Commodities	Banana/Plantain.
Target Beneficiaries	Small-scale farmers, Commercial farmers, Agro-manufacturers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

First and foremost, you need to do a little market research. This allows you to see how the market is currently being served, the demand for banana ripening chambers, and which customers you are best suited to work with. Setting up a unit for a banana ripening chamber business involves a number of steps, including market research, developing a business plan, obtaining necessary licenses and permits, selecting a suitable location, purchasing or leasing equipment, securing raw materials, hiring personnel, and implementing quality control processes. It is important to carefully consider each step and plan accordingly in order to ensure the success of the business.

Production Costs

Constructing simple artisanal chambers that can produce 4,000-5,000 kg of ripe banana per week, together with bins and water tank for washing and electronic scale for weighing, requires an investment of about US $3,500. Industrial semi-automated ripening chambers with refrigeration and ethylene gassing system that can hold 5,000 kg of banana cost about US $17,000 excluding the warehouse, installation and taxes. Other costs to run ripening chambers include labour for filling, controlling and packaging, and industrial systems consume kWatt electricity per hour. Renting an industrial banana ripening chamber cost US $3.5 per ton per day in India.

Customer Segmentation

Low-cost techniques for hastened ripening are applicable for small-scale local resellers. High-end industrial cooling and gassing chambers serve large cooperative and commercial producers with a constant supply of fruit and market demand throughout the year.

Potential Profitability

Timed ripening can hugely increase profits but is a sensitive process that must be aligned with market offtake. With ripening chambers, there’s no need for anti-fungal treatments, chemicals or any kind of refrigeration. Chambers are safer than the previously used chemicals which are detrimental and in some cases deadly for the consumers. Use of chemicals like carbide is also kept in check with the use of ripening chambers. Also, ripening chambers help save farmers from risks that include spillage of the fruits, dust, breakage, under-over ripening and quality degradation. Sold green, a plantain or banana bunch of 80kg fetches US $9 to $12 whereas ripened its value shoots to US $27.

Licensing Requirements

Industrial ripening chambers are subject to licenses and regulation because of the ethylene compounds in use.

Innovation as Public Good

Building and operating plans for artisanal ripening chambers are available as Public Good. Industrial systems remain intellectual property rights of manufacturers.

Solution Images

Low-cost plastic covered ripening chamber (Credit: FarmBiz Africa)

Industrial ripening chamber with refrigeration and gas control (Credit: Nilkamal)

Institutions