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Fruit Ripening System

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ABSTRACT :

Climate change affects fruit crops' growth and development by delaying fruit ripening, reducing color development, and lowering fruit quality and yield. The irregular date palm fruit ripening in the past few years is assumed to be related to climatic change. The current study aimed to design and validate an automated sensor-based artificial ripening system (S-BARS) combined with ultrasound pretreatment for artificial ripening date fruits cv. Khalas. A sensorbased control system was constructed to allow continuous real-time recording and control over the process variables. The impact of processing variables, i.e., the artificial ripening temperature (ART-temp) and relative humidity (ART-RH) The system for controlling temperature & humidity automatically is achieved by using microcontroller system. Arduino Uno due to its increased popularity finds its varied range of applications. Temperature & Humidity sensor and Microcontroller are the hardware used interfaced with computer, and the temperature is controlled in the room. Temperature, humidity & other parameters are displayed on LCD display. We have designed temperature & Humidity control as an automatic system that has been not attempted before the way it has been implemented.

Keywords:RipeningChamber,Temperatureand Humidity Control.

Introduction :

A strong and dynamic food processing sector plays a vital role in reduction in the wastage of perishable agricultural produce, enhancing shelf life of food products, ensuring value addition to agricultural produce, diversification & commercialization of agriculture, generation of employment, enhancingincome of farmers and creating surplus for the export of agro & processed foods. In the era of economic liberalization, all segments including; private, public and cooperative sectors have defined roles to play and the Ministry promotes their active participation.The Ministry of Food Processing Industries in India has a clear goal of attaining these objectives by facilitating and acting as a catalyst to attract quality investments from withinIndia and abroad into this sector with the aim of making food processing a national initiative. With this overall objective, the Ministry aims to:

- Enhance farmer's income by better utilization and value addition of agricultural produce.
- Minimize wastage at all stages in the food processing chain by the development of infrastructure for storage, transportation and processing of agro-food produce.
- Introduce of moderntechnology into the food processing industries from bothdomestic and external sources.
- Encourage R&D in foodprocessing for product and process development andimproved packaging.
- Provide policy support, andsupport for creation of Infrastructure, capacity expansion/ Upgradation and other supportive measures formthe growth of thissectors
- . • Promote export of processed food products.

Structure.

1.1. Hardware Requirements:

- Arduino Uno Controller
- ESP8266-01 • DHT11
- Ammonia Sensor MQ137
- 16x2 LCD Display
- RelayModul
- Fan
- Light
- Valves
- Power Supply

1.2. Hardware Description:

1)Arduino Uno

The Arduino Uno is an open-source micro controller board based on the Micro chip A Tmega328P micro controller and developed by Arduino.cc. The board is equipped with sets of digitaland analog input/output (I/O) pins that may be interfaced to various expansion boards(shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and Is programmable with the Arduino IDE (Integrated Development Environment) , via a type B USB cable.It can be powered by the USB cable or by an external 9- volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-A like 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.escription:

2) ESP8266-01

What is ESP-01?

The ESP-01 WIFI Wireless Transceiver Module is a self-contained SOC with an integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network.

3)DHT11

DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers.The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if you are looking to measure in this range then this sensor might be the right choice for you..

4)AMMONIA SENSOR MQ137

Ammonia detector works on electrochemical principle. Electrochemical sensors are electrochemical measuring transducers for measuring the partial pressure of gases under atmospheric conditions. The ambient air being monitored diffuses through a membrane into the liquid electrolyte in the sensor Ammonia Sensor ranges of 0-50 ppm, 0-100 ppm and 0-500 ppm can be supplied. Some users prefer to use a few 0-500 ppm sensors, as levels at or above the IDLH (300 ppm) will be indicated, and appropriate clothing and respirators can be selected by the emergency response team. MQ-7 is a Carbon Monoxide (CO) sensor, suitable for sensing Carbon Monoxide concentrations(PPM) in the air. The MQ-7 sensor can measure CO concentrations ranging from 20 to 2000ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. MOS sensors can be used to detect ammonia from concentrations as low as 30 ppm, all the way up to flammable range concentrations. However, because the output signal is highly non-linear, they need to be calibrated and adjusted for use in the desired range. It is widely used in domestic NH3 gas alarm, industrial NH3 gas leakage alarm, portable NH3 gas detector.

5)16x2 LCD Display

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.

1.3. Literature Survey:

1) Introduction to Fruit Ripening: Begin with a general overview of fruit ripening processes, including the role of ethylene, climacteric vs. non-climacteric fruits, and factors influencing ripening.

2) Existing Ripening Techniques: Review traditional methods of fruit ripening, such as natural ripening, ethylene exposure, and use of ripening agents like calcium carbide. Highlight their advantages and limitations.

3)Controlled Atmosphere Storage (CAS): Explore research on CAS technologies for fruit ripening, including the use of specific gas compositions (e.g., oxygen, carbon dioxide) and their effects on ripening rate and quality.

4) Ethylene Control and Monitoring: Investigate methods for ethylene control and monitoring within ripening chambers, such as ethylene scrubbers, sensors, and feedback control systems.

5) Modified Atmosphere Packaging (MAP): Examine studies on MAP techniques for extending fruit shelf life and controlling ripening, focusing on packaging materials, gas permeability, and storage conditions.

6) Non-Chemical Ripening Approaches: Look into non-chemical methods for fruit ripening, such as heat treatment, irradiation, ultrasound, and bio-based approaches (e.g., edible coatings, nanoparticles).

2. Illustrations:

1) Harvesting: Illustrate farmers picking ripe fruits from trees or plants.
2)Sorting and Grading: Show fruits being sorted and graded based on size, shape, and ripeness.
3) Storage: Depict fruits being stored in controlled environments such as cold rooms or warehouses to maintain freshness**.**
4) Ripening Chambers: Illustrate fruits placed in ripening chambers where temperature, humidity, and gas levels are regulated to promote ripening.
5) Ripeness Monitoring: Show technology being used to monitor the ripening process, such as ethylene sensors or color meters.
6) Packaging: Illustrate the packaging process, with ripe fruits being packed into boxes or crates for transportation.
7) Distribution: Depict trucks or shipping containers transporting ripe fruits to markets or stores**.**
8) Consumption: Show consumers selecting ripe fruits from shelves or enjoying them at home.

3.Advantage:

1)Controlled Ripening: Allows for precise control over the ripening process, ensuring fruits reach optimal ripeness for flavor, texture, and shelf life.
2)Extended Shelf Life: Properly ripened fruits have a longer shelf life, reducing spoilage and food waste.
3)Uniform Ripening: Ensures uniform ripening across batches of fruits, leading to consistent quality and appearance.
4)Reduced Transportation Costs: Ripening fruits closer to their point of sale reduces transportation costs and minimizes damage during transit.
5)Market Timing: Enables producers to time fruit availability to meet market demand, maximizing profitability.
6)Increased Sales: Consistently ripe and high-quality fruits are more attractive to consumers, leading to increased sales and customer satisfaction.
7)Reduced Losses: Minimizes losses due to premature or over-ripening, optimizing yield and profitability for growers.
8)Environmentally Friendly: Efficient ripening systems can reduce energy consumption and greenhouse gas emissions compared to traditional ripening methods, contributing to environmental sustainability.

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