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Cost Effective Long-Time Preservation and Reporting of 'Onion Rottening and Onion Decay' with Online Feedback

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ABSTRACT: Onion production in India has wide impact on national economy and financial status of growers/consumers [1]. India ranks second in onion production in the world.Under ambient conditions the onions are stored at a temperature of 30-35OC with relative humidity i.e. RH of 65-70%[3]. That means temperature and humidity are two major parameters that should be controlled within desire range. But due to continue change in Indian climate onions can rot [6]. Once the process of rottening starts, it grows rapidly and causes huge amount of loss. Onion (Allium cepa L) is extremely important vegetable crop not only for internal consumption but also as highest foreign exchange earner among the fruits and vegetables. So it is important to prevent onion losses like weight loss, rooting, sprouting, decay and rottening. Hence,So, authors have studied different conventional storage techniques and different losses through online survey, visual observations and through field visits and intended to introduce a system to control onion losses. In this system authors have used basic sensing elements (sensors), controlling components (Microcontroller, Heating and Cooling agent) with online feedback and parameter controlling agents to control these parameter with an extra addition of onion shade covered by shade-net. In this system, major gases like ammonia (NH_3), carbon di-oxide (CO_2), temperature & humidity emitted by onions [6] will be detected and used for temperature control. For detection of gases emitted by onions authors have used multiple sensors hence system gives more accuracy, reliable adaptability and cost effectiveness.

KEYWORDS: Rottening, onion losses, shade-net, controlling components, reliable adaptability

I.INTRODUCTION

Losses in stored onion in Maharashtra and Madhya Pradesh are higher because of onion bulbs are having higher water content [2]. It is estimated that out of the total production of 41 lakh tonnes of onion, 40 to 50 % valued at more than Rs 600 crores are lost due to desiccation, decay and sprouting in storage(Kukanoor, 2005). This results in raise in their price to the tune of four to five times [4]. India produces all three varieties of onion viz. red, yellow and white. The production as well as market value of this potential vegetable is increasing day by day [7].This states that onion desiccation, rottening, rooting, decay & sprouting in onion storage sheds should be prohibited. Onion (Allium cepa L) is extremely important vegetable crop not only for internal consumption but also as highest foreign exchange earner among the fruits and vegetables. Onion farmers have demonstrated their capability to increase production year after year. However onion price have been highly volatile and more recently the price have been sluggish. This has resulted in Maharashtra State Agriculture Marketing Board (MSAMB) seeking price support [5]. The essentials for curing of onion storage are heat and good ventilation, preferably with low humidity. Sprouting in onion is controlled by temperature. The temperature between 10-25°C increases sprouting. More the relative humidity, more is rooting. Weight loss is more when temperature is above 35°C. Under ambient conditions the onions are stored at a temperature of 30^{O}C-35^{O}C with relative humidity i.e. RH of 75-80% [3]. That means, maximum approximate temperature range for onion storage is 25^{O}C to 40^{O}C.So, author have studied the parameters that affects the onion storage through field visits, visual observations and also referred the literature and concluded that all these losses arises due to continuous change in temperature.

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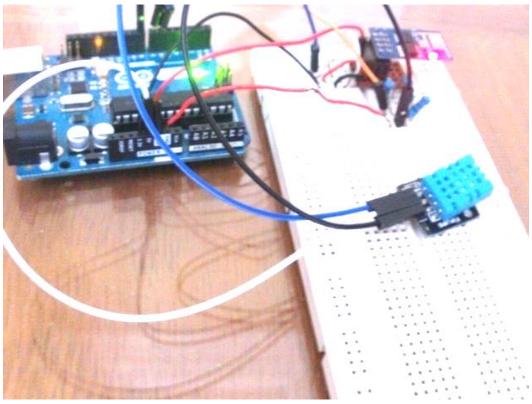
This paper introduces an advance system that will help user to control such parameters affecting positive feedback against different onion losses. Shed net is used here because it improves the thermal behavior significantly decreasing the inside temperature[10]. The system works on the principle of sensing emitted gases by onions and attempting to control them within desired parameter range of temperature and so, humidity and also gives online record observation facility.

II.LITERATURE SURVEY

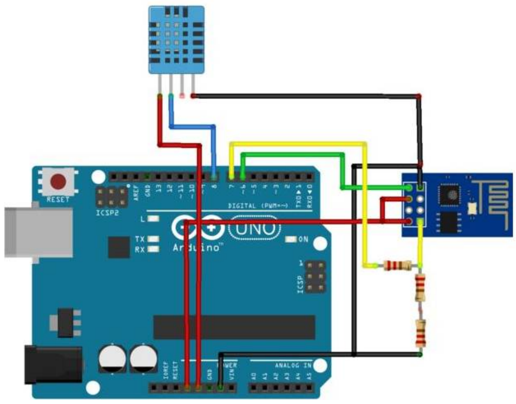
India is second largest producer in the world after china. Onion in India is grown across the country and also consumed in all parts of the country [5].J Food Sci Technol. in Jun 2012 given a view on onions that the Indian onion bulbs have higher water content [7] making them more susceptible to rotting. Damping off is a major threat to raising healthy onion seedlings during Khariff (October-December) season in all onion growing areas of the country. Generally 20-25% onion seedlings get damaged due to different disease. Storing onion for long period of time with low expenditure is a challenging thing. Dr. V. G. Wagh introduces a system [6] that tries to control the temperature within the conventional onion sheds. The low cost domestic onion storage structure may be beneficial to small growers. This may profitable to those growers who are growing onion at two or three year's interval due to shortage of irrigation water and inclusion of rotation of crops [8]. For such farmers, cost is a major issue. A special focus need to be made to create infrastructure for onion storage in India – as presently no such remarkable facility is established in India.[13]. On the view of this scenario, author proposes a low cost system which attempts to maintain the temperature range to store onions in shed for long time within desired temperature range i.e. 30^0C to 37^0C (say, approximately 40^0C).

III.PROPOSED SYSTEM

Following fig. 1.1, 1.2 and 1.3 shows data transmission assembly, circuit model and proposed onion storage (model) respectively. Model Design elements like ventilation and type of roofing sheets contributed significantly in the control of temperature and humidity within the structure of shed [9]. Ammonia (NH_3), carbon di-oxide (CO_2) and heat (ultimately temperature) are few parameters those are emitted by onions & are mainly responsible for onion rottening, weight loss, rooting and sprouting. These losses can be controlled by controlling temperature (within 30^OC to 40^OC) and humidity (approximately 75 to 80%). This system consist of sensors, actuators, microcontroller and router(for online wireless feedback).



Arrangement/assembly for wireless data transfer.



Part of PCB of circuit for wireless data transmission

Fig. 1.1: Assembly for wireless data transmission and the circuit

In the fig. 1.1, it shows assembly for wireless data transmission and circuit design with PCB for the same. It is possible to search for it or for its complementary design on internet.

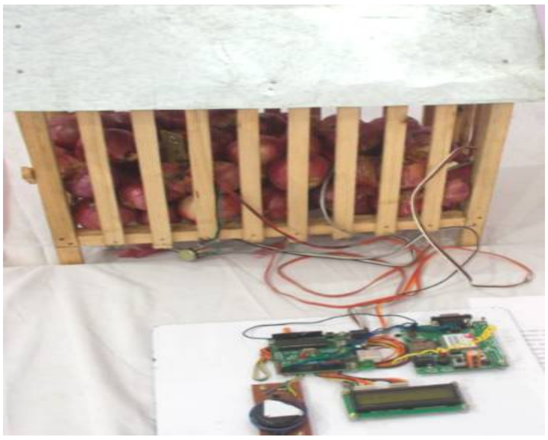


Fig. 1.2: Circuit with model

In the fig. 1.2, it shows an assembly for actual circuit with modeled onion storage shade. In following fig. 1.3, it shows a proposed onion storage shade instead f conventional onion storage shade.

conventional onion storage shade Proposed onion storage shade

Fig.. 1.3: Proposed onion storage shade with shade-net

We use multiple sensors for detecting same parameter hence we get more accurate value for comparison their detected value with desired (set) value. We can find the same or complementary assembly for wireless data transmission. Working principle of this system states that when any value of onion parameters like NH_3, CO_2, humidity and temperature is detected by their respective sensors other than desired value, active audio-visual and online feedback will be given to user. Since, we have used green net (shed net) around the onion shed and step upped roof of onion shed, the temperature inside the onion shed is $2^{O}C$ to $4^{O}C$ lesser than the outside temperature with good ventilation. Real time &/or one time wireless reporting is possible here.. Therefore an efficient and more accurate temperature control inside the onion shed can be achieved using this system. Wireless activation and deactivation of system is also possible if we use DTMF decoder in the system. This will may increase the cost of the system but it will also increase the adaptability and efficiency of the system.

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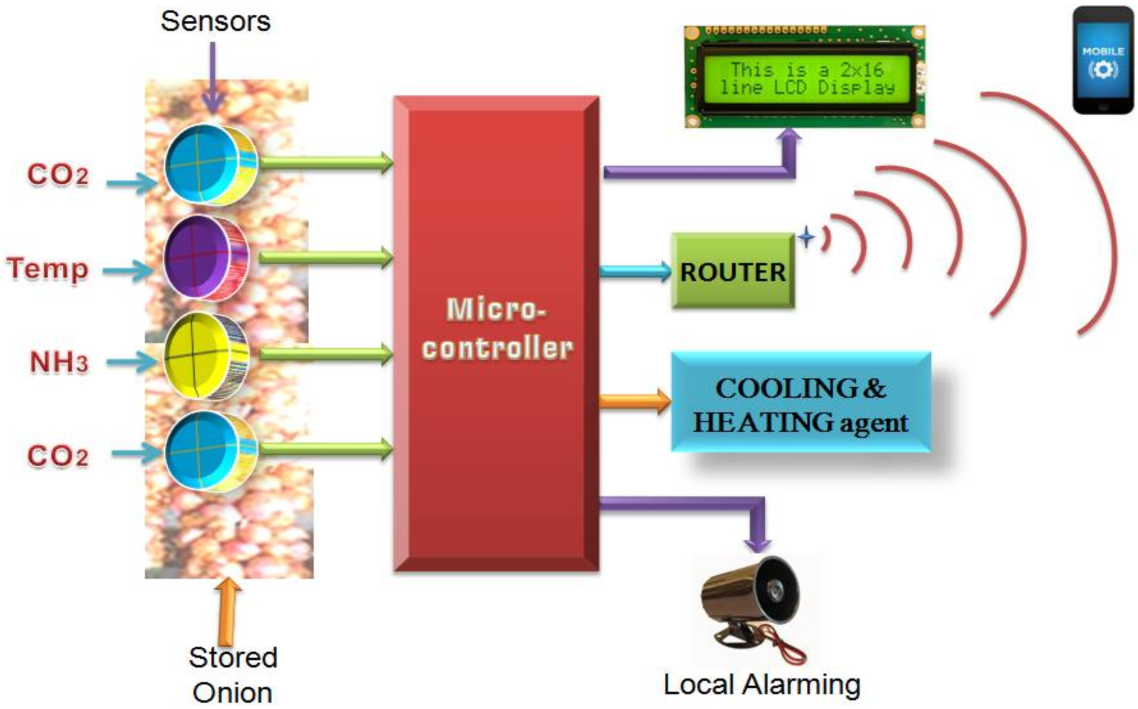

Fig. 2: Block diagram of the system

In the fig 1.2, it shows block diagram of Cost Effective Long-Time Preservation and Reporting of 'Onion Rottening and Onion Decay' With Online Feedback. At the input, there are different sensors used for detecting gases emitted by onions and at the output there is controlling agents which attempts to control the desired parameters. And we used a microcontroller to control these input and output devices. Using this, we can properly understand the working of the system.

IV. ALGORITHM AND FLOWCHART

A. An ALGORITHM of the system is:

1] Initialize.

2] Switch all respective sensors to sense ammonia, carbon di-oxide and temperature emitted by onions and read analog to digital converted signal at the o/p of sensors using microcontroller.

3] Sensors/components used are-

   a. LM 35 [temperature sensor(2)]
   b. MQ135 [Carbon di-oxide sensor]
   c. MQ137 [ammonia sensor(2)]
   d. Router / The Esp8266-01 module for wireless data transmission
   e. DHT11 Temperature Humidity Sensor Module complementary for (i)
   f. The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network.

4] Comparison of detected gases and temperature with their desired (set) levels.

5] If sensed levels are greater than desired levels, then switch cooler/heater on ON/OFF mode and repeat *step 2* again.

6] If external switch is pressed i.e. system is OFF manually then STOP functioning. Else repeat *step 2*

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B. A FLOWCHART of the system is:

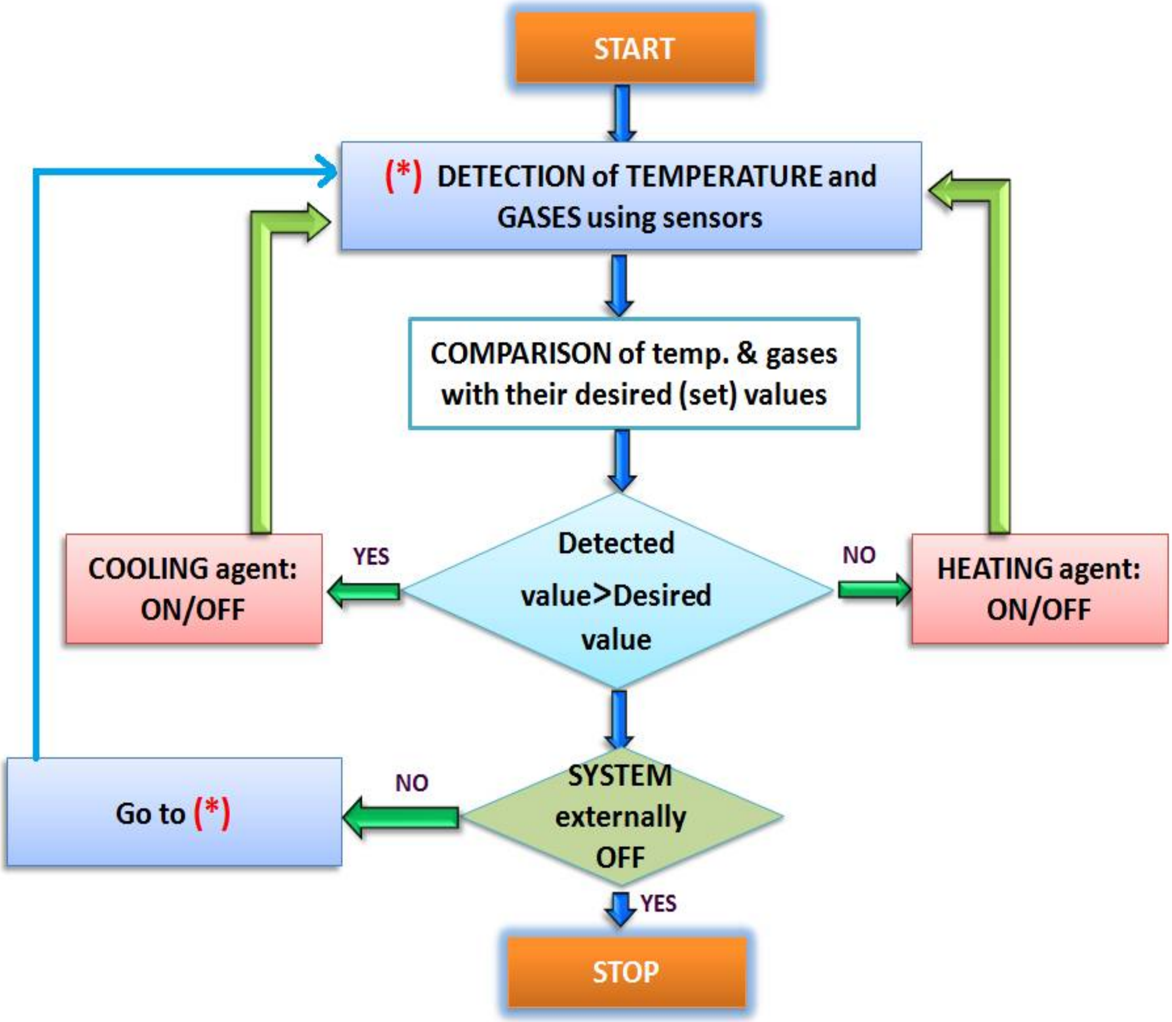

Fig. 3: Flowchart of the system

In Fig. 3, we can understand the way in which our system works.

V.RESULT

It is observed that, using parameter controlling agents such as heaters and coolers we can control the temperature. So, for actual shades where we need to control temperature and humidity, we can use these parameter controlling agents to control the temperature within desired temperature range (27^0C to 40^0C) inside the onion shade

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Obs. No	Measurement in/at	Without parameter controlling agents				With parameter controlling agents			
		PARAMETER				PARAMETER			
		Gases		Temperature		Gases		Temperature	
		CO_2	NH_3	Inside	Outside	CO_2	NH_3	Inside	Outside
1	Morning (10 am)	20-30	25-30	38	41	30-33	25-27	37	39
2	Afternoon (02 pm)	35-45	40-52	42	43	33-33	27-33	39	43
3	Evening (06 pm)	40-47	35-43	36	37	35-37	33-35	38	37
4	Night (10 pm)	42-49	45-47	25	28	37-41	35-37	36	28
5	Night (02 am)	45-50	47-50	25	27	41-43	37-38	35	27
6	Night (04 am)	50 -56	52-59	23	25	43 -45	38-39	34	28
7	Morning (08 am)	58 -62	Up to 67	28	30	45-54	Up to 42	33	30

Table1: Observation for different gases and temperature measurement

Here, we can observe that inside temperature range of onion shed is 33^0C to 39^0C (*which is within the desired range*) against outside temperature range from 28^0C to 47^0C(Fig. b) as shown below.

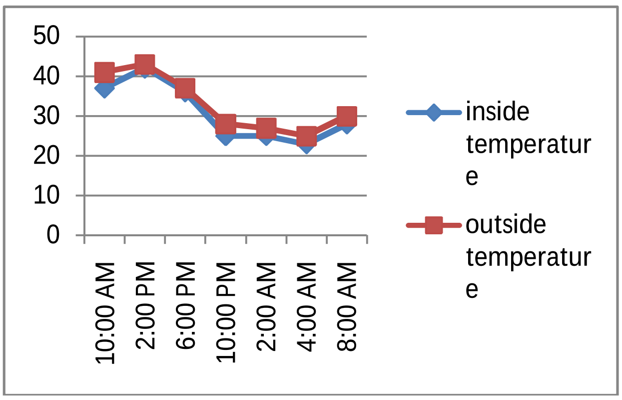

Fig. 4 a] Performance for gases and temperature *without parameter controlling agents*

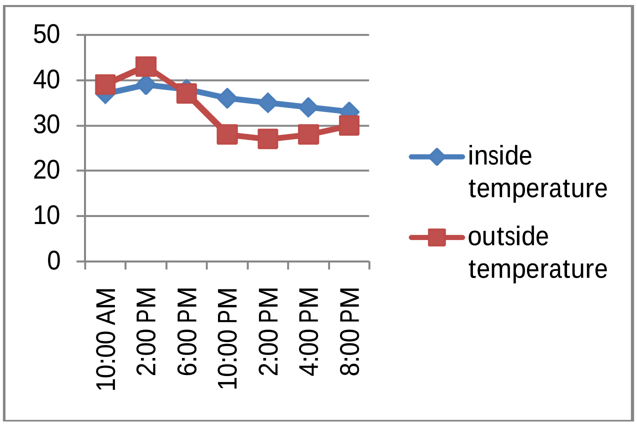

Fig. 4 b] Performance for gases and temperature *with parameter controlling agents*

Fig. 4a. shows Performance for gases and temperature without parameter controlling agents that tell us that inside and outside temperature of shade is nearly appears to be same. This temperature varies continuously. Whereas Fig. 4 b. shows performance for gases and temperature with parameter controlling agents where we can observe temperature difference between inside and outside the shade. Inside temperature appears to be controlled as compare to ouside temperature of shade.

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VI.CONCLUSION

Detection of different gases emitted by onions will be used to predict the health (i.e. Emitted Heat, Rottening, and Weight loss, Rooting, Sprouting and Onion Decay etc.) status of the onion. If there is any health issue observed, wireless reportingandimportant primary action i.e. attempt to control temperature (or say heat & ultimately humidity) will take place against it to prevent this loss.Using this system we can preserve onions for 11 to 13 months.

REFERENCES

1] Competitive Assessment of Onion Markets in India: Report Prepared for Competition Commission of India, Government of India
2] "State-wise analysis of Production, Storage, Market arrival and Price trends for Onion and Potato", Horticulture Statistics Division D/o Agriculture & Cooperation.
3] "Onion storage technology": http://www.onions-potatoes.com/storage/storage-onions.php
4] E.P. Banuu Priya, V.R. Sinja, "STORAGE OF ONIONS – A REVIEW", R.P.J.S. Alice,S. Shanmugasundaram and K. Alagusundaram, Indian Institute of Crop Processing Technology, Thanjavur-613 001, India
5] "MARKET INTELLIGANCE SYSTEM" Baseline Data for Potato & onion April 2012
6] Dr. V.G. Wagh, S. A. Pawar, "Advance Rotten Onion (Allium Cepa) Sniffer: Rottening Detection and Primary Prevention Using Sensors, Actuators & Transducers", Vol. 5, Issue 11, November 2016.
7] Jayeeta Mitra, "Onion dehydration: a review", NCBI
8] Seema T. Borole, "Comparative Losses and Economic Feasibility of the Improved Onion Storage with Low Cost of Onion Storage Structure', International Journal of Modern Engineering Research (IJMER), Vol. 3, Issue. 5, Sep - Oct. 2013 pp-2656-2661
9] Falayi F.R. and Yusuf H.A, " Performance Evaluation of a Modified Onion Storage Structure", Department of Agricultural Engineering, The Federal University of Technology, Akure, Ondo State, Nigeria.
10] Materials for shade nets- a guideline to select most performant materials to enhance the living conditions inside the emergency shelter
11] Post-harvest management of bulbs http://www.nhrdf.com/htmlfiles/Onion/oni_post.htm
12] DR.P C. Tripathi, "Post harvest handling ,storage and marketing of onion and garlic : Post harvest handling ,storage and marketing of onion and garlic", National Research Centre for Onion and Garlic, Rajgurunagar, Pune, India.
13] Anil Chopra's Blog "Onion storage-issues and solutions, India.