



# **Advance Rotten Onion (*Allium Cepa*) Sniffer: Rottening Detection and Primary Prevention Using Sensors, Actuators & Transducers**

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**ABSTRACT:** India ranks second in onion production in the world. Onion acquired 6% share in the production of vegetable in India. It has a wide impact on national economy and financial status of growers/consumers. The stored onions in onion sheds are exposed to the hot, cold and humid air. Due to continue change in climate onions can rot. Once the process is initiated it grows drastically and rapidly resulting in unexpected losses (15% +). So, authors have studied the storage techniques and losses through visual observations and through field visits and referred the literature. Further a need based electronic circuitry has been designed, developed to avoid onion roting. Various Gas sensors are used to sense emitted gases. When onion starts roting developed system informs owner and provides three way alert (alarm, display and sms). Inbuilt wireless transmission system enables preserving record for analysis in the laboratory.

**KEYWORDS:** Harvest, Onion, Rotten onion, Visual observation, Gas sensors, Wireless transmission etc

## **I. INTRODUCTION**

Onion is very important & valuable crop for Indian farmers. It has a wide impact on national economy and financial status of growers/consumers [2]. After harvesting the onion it is necessary to store it properly. Rotten onion results in huge loss to the farmers. Onion is grown in all three crop seasons. According to ICAR - Directorate of Onion and Garlic Research, the cultivation in India is growing day-by-day[1]. Hence it has a wide impact on national economy and financial status of growers/consumers [6]. The Indian climate is becoming more erratic during various seasons causing unexpected fluctuations in temperature and humidity. This makes onions more susceptible to rotting. This leads to rotting due to growth of fungi leading to bacterial rot, sprouting, rooting. To prohibit these losses, the aimed was to design and develop an electronic device to avoid onion roting. We visited the storage sheds in markets and study the post harvest losses and tried to find remedy to prevent it. Knowing the storage techniques and losses, we designed and developed a need based electronic circuitry that can provide early warning and capable of sending messages to owner.

This paper suggests an integrated system which introduces a different and convenient option for preventing or reducing onion losses. This system works on the principle which involves sensing emitted gases by onions and processing them to obtain desired output. Emitted gases are sensed by their respective sensors & then, their signals are read & processed by microcontroller. According to programmed microcontroller Audio-visual alarm and text message will be sent to the owner. To control other parameters like temperature and humidity we use a green colored net and fan.

## **II. LITERATURE SURVEY**

According to ICAR - Directorate of Onion and Garlic Research, the cultivation in India is growing day-by-day [1]. Onion contributes a wide impact on national economy and financial status of growers/consumers[2], Altimately, of farmers! DR.P C. Tripathi stated that The year wise production pattern is observed about 60-65% in Rabi (Mar-Jun) seasons [5]. The post-harvest treatment involves selection, grading and curing of the bulbs [8]. J Food Sci Technol. in Jun 2012 given a view on onions that The Indian onion bulbs have higher water content[4] making them more



## International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

susceptible to rotting. In India, there is no such electronic system available yet, that will help us in a way to reduce/prohibit these losses. On this scenario a need based electronic circuitry has been designed, developed and tested.

### III. PROPOSED SYSTEM

This system consists of Sensors, Microcontroller and Actuators. Different gases are emitted by onions, which can be sensed by using different gas sensors. Gases sensed by these sensors are fed to microcontroller for further proceedings. A microcontroller is used as a heart of the system, having program build in it. It will work according to program designed. System consists of LCD display, Alarming Device (speaker) and a wireless data transmission device. Cooling agents i.e. fan and shed-net are used here. Automation of cooling agent device i.e. fan (in this model) is controlled at different levels of temperature set in the program.

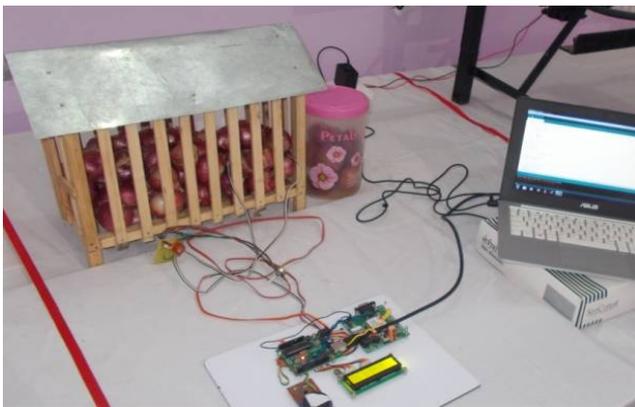


Fig 1: Model of Advance Rotten Onion Sniffer



Fig: Circuit for Rotten Onion Sniffer

Rotten Onions emit different gases & heat too. Ammonia and carbon di-oxide are few of those gases are emitted by onions & are mainly responsible for onion rotting. Detecting gases, we can sense the level of rotting onion. The device works on principal of sensing temperature, humidity and gasses emitted in rotting process using appropriate sensors interfaced to Microcontroller. At specified first level (also can be called as warning level) of gas sensed (in ppm) by sensors & controller, audio-visual alarming will be there using actuators & transducers. If detected gas exceeds second level (also can be called as hazardous level for onions to get rot), a wireless text message sending device with temperature controlling device (fan &/or AC &/or heater) will be switched as necessary.



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Vol. 5, Issue 10, October 2016

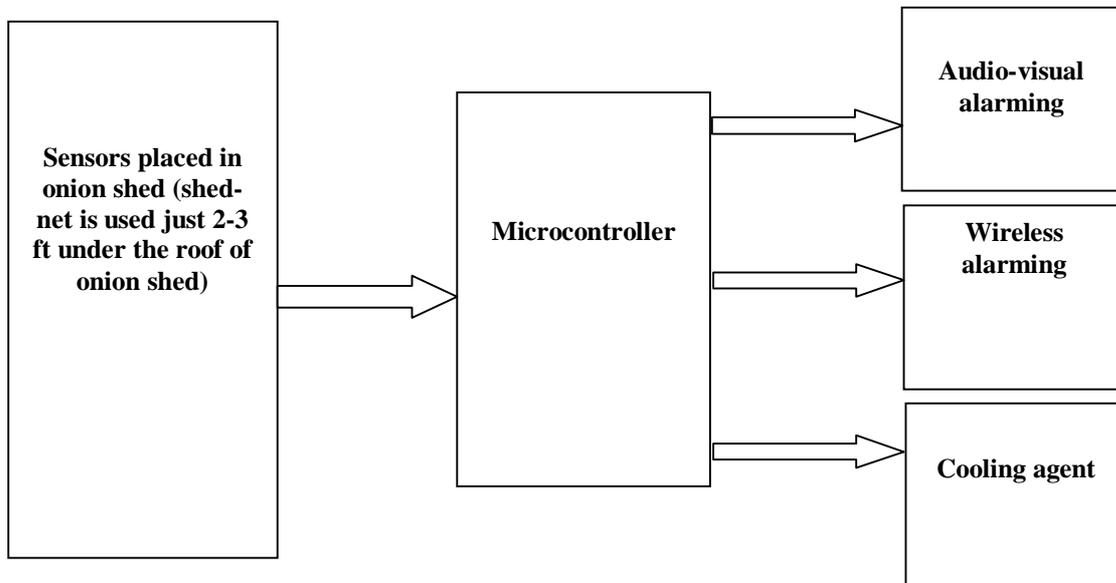


Fig 2: Block diagram of Advance Rotten onion (Allium cepa) sniffer

## IV. ALGORITHM AND FLOWCHART

### An algorithm of Advance Rotten onion sniffer:

1. Start
2. Initialize sensors to sense emitted gases by onions. Sensors used in this system are
  - a. Hydrogen sulfide [h2s-bh-23950050(118)]
  - b. Sulfur dioxide [so2-af]
  - c. Nitrous oxide [mics 2710]
  - d. Carbon dioxide &/or ammonia [mq-135]
  - e. Temperature [lm35]
3. Convert analog input into digital (used inbuilt ADC) using microcontroller(ATmega328)
4. Check whether sensed level of gases emitted by onions are less/greater than previously defined levels.
5. If it is less, then display the level and repeat step 2.
6. If it is greater, then switch four way alarm (GSM,LCD,BUZZER & COOLING AGENT) and repeat step 2



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Flowchart Advance Rotten onion sniffer:

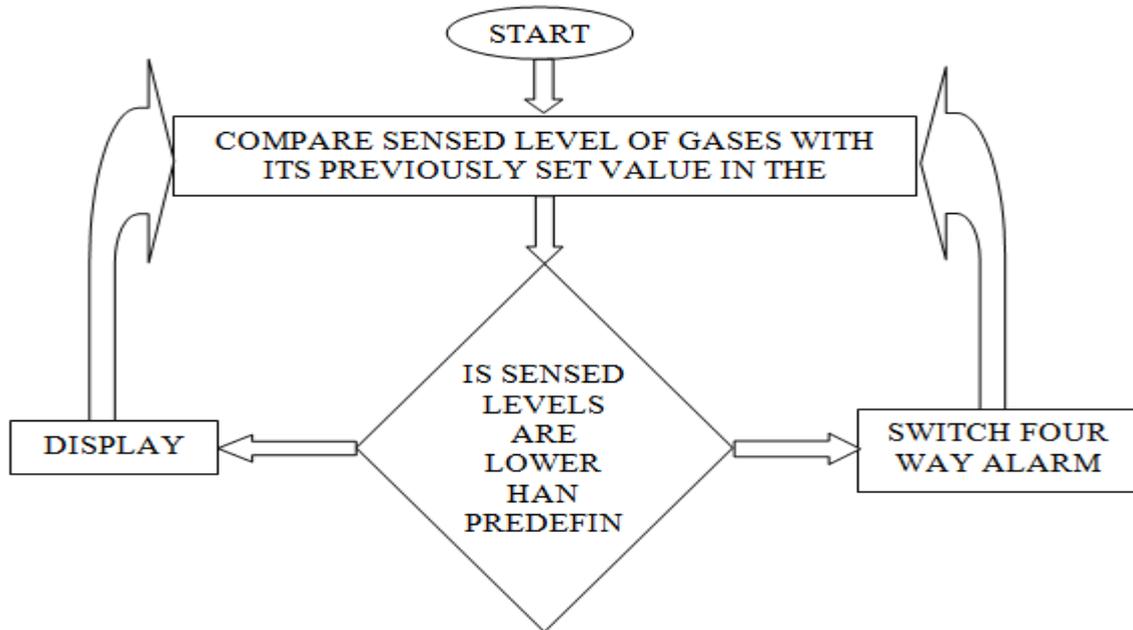


Fig: Flowchart of the system

## V. RESULT

	CO2 (%)	NH3 (%)	Shed-net Temp (d c)	Outside Temp. measured using mercury thermometer (dc)	Humidity (%)
Very min (@ 9am)	20-30	25-30	35-37	29	45-40
Min (+2 hours)	31-40	30-37	38-40	34	56-45
Medium (+4 hours)	41-55	38-52	41-47	39	47-57
Max (+6 hours)	56-74	55-84	47-49	43	40-46
Very max (+8 hours)	75-96	85-97	49+	36	32-39

Table: Observed %wise readings on Onions Stored in onion shed (model).



ISSN (Print) : 2320 – 3765  
ISSN (Online): 2278 – 8875

# International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 10, October 2016

It is important that for proper onion storage/harvesting temperature in specific range (37 to 45 degree celcius). Because of change in temperature, different losses &/or diseases can occurs. To avoid these losses we tried to control the temperature and moisture (or say, humidity 50 to 60%) as much as possible.

## VI. CONCLUSION

Developed advanced rotten onion sniffer system will be useful for long life of onions under harvesting. With the help of this system we can store onion for duration 8 to 10 months. If there is rotting problem because of water contact, temperature change system will immediately take action as well as it will inform owner.

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