An Approach For Quality Determination Of Cassava Logs For Industrial Application

M.Madhan Mohan, A.Akshaya, E.Anjali, A.Dharshinidevi, V.Harish

Abstract: Cassava is an important tuber crop and it is very rich in starch. It is used as food, medicine animal feed, and even for laundry starch and so on. Currently in industries, cassava’s quality determination and the price fixing of cassava is difficult based on the quality and ingredients present in the cassava. The existing method uses Riemann scale in industry is not satisfied by the land farmers for price fixing of cassava logs. This paper mainly focus on the quality detection of cassava based on the parameters like moisture, pH, whiteness and spotness employs various sensors and a controller. Sensors like moisture sensor, color sensor and pH sensor are used for measuring moisture content, the color of the surface, usually in the RGB scale and the hydrogen-ion activity in water-based solutions to indicate the acidic or alkaline content. Hence the quality analysis of cassava is determined and implemented successfully which helps the farmers as well as the industrialist to fix the price.

Index Terms: cassava, moisture sensor, pH sensor, color sensor, Arduino.

1 INTRODUCTION
Cassava root shown in figure 1.1 is used as a staple food in many nations. The plant has been grown for years and known to exist under several climates, particularly it can withstand low nutrients and it can survive droughts. The swollen roots of this plant are very popular for consumption. Freshly harvested cassava root begin to deteriorate almost immediately after the harvest. This type of deterioration is due to its high moisture content. One of the best forms of preserving cassava root is dry them into pellets or making into chips or processing into flour.

![Figure 1.1 Cassava](image)

The traditional method of processing cassava roots into food types have been adapted to suit many attributes of the plant which include root yield, spoilage, cyanide content, nutrient content and process ability. With increase in population, indigenous method of cultivation and processing of cassava has been transferred by modern scientific knowledge for use in various industries.

According to FAO[ref.no.25], Table 1.1 shows the cassava production in India. Tamil Nadu is the leading producer of cassava.

<table>
<thead>
<tr>
<th>S. No</th>
<th>STATE (2017-18)</th>
<th>PRODUCTION (in tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tamil Nadu</td>
<td>2862.14</td>
</tr>
<tr>
<td>2</td>
<td>Kerala</td>
<td>1725.98</td>
</tr>
<tr>
<td>3</td>
<td>Andra Pradesh</td>
<td>192.15</td>
</tr>
<tr>
<td>4</td>
<td>Negland</td>
<td>79.32</td>
</tr>
<tr>
<td>5</td>
<td>Megalaya</td>
<td>36.24</td>
</tr>
<tr>
<td>6</td>
<td>Assam</td>
<td>28.87</td>
</tr>
<tr>
<td>7</td>
<td>Karnataka</td>
<td>13.99</td>
</tr>
<tr>
<td>8</td>
<td>Madhya pradesh</td>
<td>4.29</td>
</tr>
</tbody>
</table>

2 EXISTING METHOD
In Industries, the current method used for determining the weight and fixing the prices for cassava is Riemann scale method in figure 2.1. In this method, they mainly determine the starch content of the cassava by its weight. The Riemann scale consists of indicating device, Load Cell, Basket (load-receiving element), Water Bucket and Hydraulic Lift. Here, the clear bucket is first lifted until the clear basket is completely immersed in water and the baskets weight is recorded by indicating device. After this the bucket is moved to its original position, then 3-4Kg cassava is taken in the basket and it is immersed in bucked and its weight is recorded. The starch content of cassava is recorded by the microprocessor present the indicating devices.

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Equation stored in electronic balance to calculate starch content in cassava: [ref.no.24]

\[
\text{Starch content} = \left(\frac{\text{SG} - 1.00906}{0.004845}\right)\%
\]

\[
\text{SG} = \frac{W_o}{W_o - (W_u + BC)}
\]

\(W_o\) = weight of the cassava sample in air
\(W_u\) = weight of the sample under water
\(\text{SG}\) = specific gravity
\(\text{BC}\) = weight in air − weight under water

2.1 Disadvantage of this method
- The starch calculated from the specific gravity varies.
- The price fixing is also difficult.

2.2 Summary
The main objective of cassava is to pre-determine the quality of cassava and helps the Industries to maintain the end product quality and also it helps in fixing the price of the cassava based on its quality. So, in order to maintain the quality parameters like moisture, pH and color are considered.

3. PROPOSED METHOD

3.1 Block diagram
This block diagram consists of three sensors interfaced with Arduino. (Figure 3.1)

3.2 Description
Moisture sensor absorbs the amount moisture content in cassava with the help of capacitance based on the principle of dielectric permittivity, color sensor gives the whiteness of the cassava by the reflection of light on the principle of RGB ratio and pH sensor gives pH value equal to the voltage content of the liquid by the electrode on the principle of electric potential. These sensors are interfaced with Arduino board and their outputs are compared with the standard values [as shown in Table 4.1] dumped in the Arduino.

<table>
<thead>
<tr>
<th></th>
<th>Moisture sensor</th>
<th>Color sensor</th>
<th>pH sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Vin → 5V</td>
<td>VCC → 5V</td>
<td>+ → 5V</td>
</tr>
<tr>
<td>Output</td>
<td>A0 → A0</td>
<td>OUT → 8</td>
<td>- → A0</td>
</tr>
</tbody>
</table>

3.3 Circuit diagram

4. RESULT

Sample 1

![Figure 4.1 Sample-1 Testing](image-url)
Sample 2

Figure 4.2 Sample-2 Testing

Sample 3

Figure 4.3 Sample-2 Testing

From the figure 4.1, figure 4.2, figure 4.3 shows the cassava is taken and connections are given. The sensors like moisture, color and pH are interfaced with the Arduino is compared against standard values as per the Table 4.1. The respective outputs of various samples is tabulated in Table 4.2.

Table 4.1 Standard value

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Good</th>
<th>Moderate</th>
<th>Bad Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color Whitness</td>
<td>Greater than 90% R=255 G=255 B=255</td>
<td>88.1% to 69.9% R=255 G=255 B=255</td>
<td>Less than 88% R=200 G=200 B=200</td>
</tr>
<tr>
<td>Moisture</td>
<td>12 to 12.5</td>
<td>12.51 to 12.58%</td>
<td>Greater than 13%</td>
</tr>
<tr>
<td>pH</td>
<td>5 to 6.5</td>
<td>6.6 to 7.9</td>
<td>Greater than 8</td>
</tr>
</tbody>
</table>

Table 4.2 Result of the proposed method

<table>
<thead>
<tr>
<th></th>
<th>Moisture</th>
<th>Color</th>
<th>pH</th>
<th>Cassava condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1</td>
<td>33%</td>
<td>R=121</td>
<td>G=121</td>
<td>B=121</td>
</tr>
<tr>
<td>Sample 2</td>
<td>12%</td>
<td>R=255</td>
<td>G=255</td>
<td>B=255</td>
</tr>
<tr>
<td>Sample 3</td>
<td>25%</td>
<td>R=189</td>
<td>G=189</td>
<td>B=189</td>
</tr>
<tr>
<td>Sample 4</td>
<td>12%</td>
<td>R=255</td>
<td>G=255</td>
<td>B=255</td>
</tr>
<tr>
<td>Sample 5</td>
<td>17%</td>
<td>R=219</td>
<td>G=219</td>
<td>B=219</td>
</tr>
<tr>
<td>Sample 6</td>
<td>12%</td>
<td>R=255</td>
<td>G=255</td>
<td>B=255</td>
</tr>
<tr>
<td>Sample 7</td>
<td>23%</td>
<td>R=174</td>
<td>G=174</td>
<td>B=174</td>
</tr>
<tr>
<td>Sample 8</td>
<td>35%</td>
<td>R=221</td>
<td>G=221</td>
<td>B=221</td>
</tr>
<tr>
<td>Sample 9</td>
<td>26%</td>
<td>R=205</td>
<td>G=205</td>
<td>B=205</td>
</tr>
<tr>
<td>Sample 10</td>
<td>14%</td>
<td>R=255</td>
<td>G=255</td>
<td>B=255</td>
</tr>
</tbody>
</table>

Based on the Standard values [shown in Table 4.1] mentioned in Scholarly article [ref.no.23] an Industrial standards, the quality of the cassava is determined.

5. CONCLUSION
The quality detection is used to overcome the problems faced by Riemann scale and it helps the industries to segregate good quality cassava from lower grades and helps farmers to earn money according to their cassava’s quality. The accuracy of the cassava gets increased on detecting the quality of parameters such as moisture, pH and color(whiteness). The industries can get more benefit on the final product by predetermining the quality of cassava.

6. FUTURE SCOPE
The future scope of this project is to develop improved crop management practices which are within the means of resource poor farmers and to develop improved production practices and methods of storing, processing and utilizing cassava roots so as to improve the commercial value of the crop and to accelerate the transfer of improved cassava production and utilization of cassava through closer linkage. This also increase the industries end product with more accuracy and the end product obtained will be in a good quality.

REFERENCE


