# Detection of freshness of fruits using electrical method

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*Abstract*— **Moisture content of fruit is an important quality factor to detect the freshness of the fruit. Moisture Content of fruits has effective influence on the density of fruit. Electrical method is used to detect the freshness of fruit. This work will estimate the freshness of variety of fruits with the electrical based approach.**

*Keywords*-**freshness, moisture content, LED-light emitting diode.**

## I. INTRODUCTION

Checking the moisture content of fruits is obvious and higher the moisture contents in the fruit gives better in the quality of fruit. Moisture content of all variety of fruit has 80-95% of its whole weight. This implies that fruit is fresh if it has moisture content in greater quantity. In addition, moisture loss during day's cause's loss in its weight. Electrical method is simpler than that of regular method to detect the freshness of fruits.

## II. LITERATURE REVIEW

The Moisture content of fruit is one of the important features that have certain effect on their quality for checking the freshness. There are lot of researches have been done relating to it.Image processing methods is used to analyse defects in the fruit. Line–scan x–ray imagingand Artificial neural network[1] to distinguish the bruise damages of two variety of Red delicious and Golden Delicious apples, by separating damaged apples from each other's. Regularly the destructive methods are used for finding the firmness and soluble solid content of fruit. A new method is used for predicting the firmness of fruits by scattering images with different light wave lengths in near infrared [2].In this light, acquired reflectance and fluorescence scattering images [3] using a hyper spectral image system for assessing apple maturity. To validate their own methods, they performed a distractive test for measuring multiple maturity parameters. Tested laser light backscattering imaging technique as a tool for monitoring moisture content [4], during drying of banana slicesin three temperatures of 53, 58 and 63 centigrade. Resistance – type

moisture sensor [5]used for measuring rice moisture content during drying process. In another research tried to measure cotton moisture [6] by examining some sensors with a standard silicon-chip, charge coupled device, infrared-sensitive, black-and-white video camera.

## III. PROPOSED WORK

Detecting the freshness of fruits using electrical method is simpler than that of other methods. Regular method uses complicated procedures to estimate the moisture content of fruits as well as that consumes more time to detect fruits freshness. In this proposed system, freshness can be detected by electrical method with the use of power supply, LED, fruit and wires to connect it.This work detect the moisture content present in the fruit with voltages applied in the electrical circuit. In turn, shows the freshness of fruit with days.

## IV. METHODS

There are two methods are analysed to compare the freshness of the fruit .First one is regular method which is used to measure the moisture content of fruits using hot oven test method. Second method is proposed method to detect the freshness of fruits using electrical method.

REGULAR METHOD TO OBTAIN MOISTURE CONTENT OF FRUITS

For measuring the Moisture Content of fruits, Standard Hot Air Oven test method is conducted. Procedures are as follows:

1. Cut the fruit vertically into 8 equal slices with peel.

2. One slice is taken and then cut into many small pieces.

3. Take empty dish (M) and weigh it.

4. Spread that one slice of fruit equally on the bottom of dish and weigh it (M1).

5. Keep this dish with sample in hot air oven at 100 Degree Celsius for 2 hours.

6. After 2 hours take dish out from hot air oven and cool it.

7. Determine weight of dish with dried material (M2).

8. Calculate Moisture Content (%) by weight as,

**Moisture Content%=$[(M1 - M2) \div (M1 - M)] \times 100$%**

Where, M=Weight of empty dish (gram).

M1= Weight of dish with fruit before drying.

M2= Weight of dish with fruit after drying.

With refer to the above said procedure; experiment has been done on sample (apple) in hot air oven test method.

TABLE I
Experiment on hot oven test method

| Material | Weights in gram |
|---|---|
| Apple fruit | 132 |
| Empty dish(M) | 128 |
| Dish with apple before drying(M1) | 260 |
| dish with apple after drying(M2) | 152 |
| Moisture content % | $[(M1 - M2) \div (M1 - M)] \times 100$%<br>=[(260-152)÷(260-128)]×100%<br>=81.8% |

TABLE II
 FRUITS MOISTURE CONTENT RANGE

ELECTRICAL METHOD TO DETECT THE FRESHNESS OF FRUITS.

Moisture content can be analysed by current flowing through the fruits. With the idea of water conducts the current. Electrical method is experimented as follows,

1. Take the apparatus as DC power supply (0-12v), LED, single stand wires and fruit as an example, apple as shown in figure 1.

2. Connect wires as per the figure 1 with the correct polarities.

3. Connect the fruit directly by inserting wire into the fruit.

4. Observe the current conducts in the fruit by LED glow in the electrical circuit.

5. Record the voltage values when current conducts in

| Item | Fruit weight (grams) | Water weight (grams) | Water % (Freshness %) |
|---|---|---|---|
| Apple | 138 | 116 | 84 |
| Apricot | 106 | 92 | 86 |
| Banana | 114 | 85 | 74 |
| Blueberries | 145 | 123 | 85 |
| Cherries | 68 | 55 | 81 |
| Grapes | 92 | 75 | 81 |
| Orange | 140 | 122 | 87 |
| Peach | 87 | 76 | 88 |
| Pear | 166 | 139 | 84 |
| Pineapple | 155 | 135 | 87 |
| Plum | 66 | 56 | 85 |
| Raspberries | 123 | 106 | 87 |
| Strawberries | 149 | 136 | 92 |
| Watermelon | 160 | 146 | 92 |

the fruit apple.

Figure1
Electrical circuit to verify freshness of the fruit.
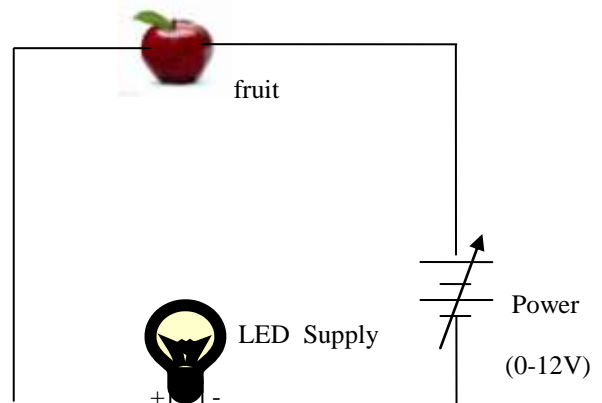


V. EXPERIMENTAL RESULTS

All values of the fruit from day1 to day 28 are observed. Voltage values are recorded by electrical approach.Verify the LED glow (ON state) by applying the voltages from 0-12 Voltages to detect current flowing through the fruit apple. It means that if LED gets ON then current flowing through the fruit by potential apply then it shows moisture content present

in the fruit indirectly to analyse the freshness of the fruits with days.

TABLE III
APPLE CONDUCTS CURRENT AT VOLTAGES
WITH DAYS

| Days | Voltages (0-12V) | Weight (grams) |
|---|---|---|
| Day 1 | 2v | 139 |
| Day 2 | 3v | 135 |
| Day 4 | 3v | 131 |
| Day 6 | 4v | 128 |
| Day 8 | 4v | 122 |
| Day 10 | 5v | 117 |
| Day 12 | 5v | 110 |
| Day 14 | 6v | 114 |
| Day 16 | 7v | 107 |
| Day 18 | 8v | 98 |
| Day 20 | 8v | 90 |
| Day 22 | 10v | 81 |
| Day 24 | 10v | 70 |
| Day 26 | 11v | 55 |
| Day 28 | 12v | 43 |

TABLE III shows the voltage records at which current conducts in the specified apple fruit.Current conducts in the fruit apple with days by applying voltages. These voltages are increasing with days to conduct current in the fruit because as the days moves, more potential pressure is required to flow current in the fruit at low moisture content. Fruit at Day 1 conducts current at 2V and the same fruit at day 28 conducts current at 12V.Implies that fruit(apple) losing its moisture content day by day. Weight of the fruit also decreasing from day 1 to day 28 which analyses loss of moisture content as well as loss of freshness in the fruit indirectly. Therefore moisture content of fruit is inversely proportional to the voltages applying to the circuit with days.

## VI.CONCLUSION

Experimented results shows clear idea that fruits moisture content gets loss with days using electrical method. As the days goes, there is a loss of moisture content in the fruits. This proposed work detects the freshness of fruits with voltages. Measured voltages from day 1 to day 28 gives that freshness is decreasing with days by this approach. Freshness can be analysed easily through the electrical method.

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