

Quality Analysis of Indian Basmati Rice Grains Using Digital Image Processing- A Review

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Abstract— Quality of rice is defined from its physical and chemical characteristics. Quality of grains is required for protecting the consumers from substandard products because the samples of food materials are subjected to adulteration. This paper provides a solution to the problem of the rice industry for quality analysis. Computer Vision based Inspection provides one alternative for fast, accurate, convenient and harmless technique in comparison with traditional methods of Human based Inspection. This paper provides one method for Basmati rice grains Identification and Classification into Normal, Small and Long rice seeds.

Keywords— Digital Image Processing, Basmati Rice Grains, Computer Vision, Quality, Morphological features

I. INTRODUCTION

Basmati rice is one of the most important and popular cereal grain crops of India. Basmati is a variety of long grain rice famous for its fragrance and delicate flavour. They stay separate, non-sticky after cooking. The rice is different from other rice varieties mainly due to the aroma, its sweet taste and post cooking elongation of more than twice its original length. The Basmati rice is mainly cultivated in Punjab, Haryana, Jammu & Kashmir, Himachal Pradesh, Delhi, Uttar Pradesh and Bihar states of India. In India, Haryana is the major Basmati rice cultivating state, producing more than 60% of the total Basmati rice produced in India.

II. MATERIAL AND METHOD

A. SYSTEM SETUP

The images of Basmati rice grain samples are acquired with a color Digital Camera of Nikon D3200 as shown in figure 1. The black background was used. The acquired images were 4512*3000 pixels in size i.e. 4512 pixels Width and 3000 pixels Height as shown in figure 2. Images were captured and stored in JPG format. Through data cable these images has been transferred and then stored in hard disk and different parameters of rice were extracted from image for further analysis.

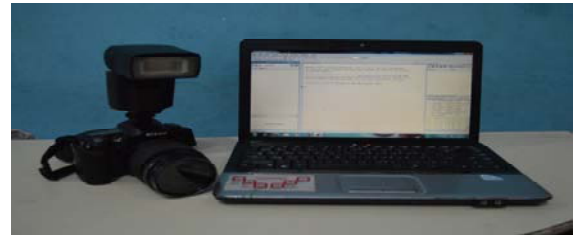


Fig 1.Camera, Computer



Fig 2.Basmati Rice Seeds

B. SYSTEM WORKFLOW

The system workflow for the quality analysis of Indian Basmati rice grains is shown in figure 3.

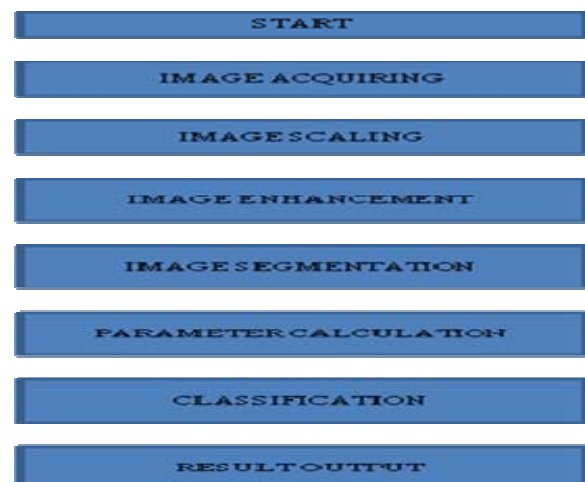


Fig 3.The Overall Workflow

As indicated in figure 3, image of rice sample is acquired by color Digital Camera of Nikon D3200 and processed by Digital Image Processing techniques such as Scaling, Enhancement and Segmentation. Then morphological features are extracted using Matlab tool and histogram diagram for the extracted parameters are drawn. From the histogram diagram, we can compute threshold values and thus by comparing the calculated parameter values with threshold values, we can easily classify the rice grains as Normal, Long and Small rice grains.

C. STANDARD PARAMETERS FOR QUALITY ANALYSIS

Quality of rice is defined from its physical and chemical characteristics. The various physical and chemical characteristics are described below:

1) *Damaged, Discoloured grains*: Damaged, discoloured grains include rice grains such as broken, fragments of whole that are internally damaged or discoloured and materially affecting the quality.

2) *Broken and Fragments*: Broken and fragments includes pieces of rice kernels which are less than three fourth of a whole kernel.

3) *Foreign matter*: Foreign matter includes dust, stones, chaff, stems or straw and any other impurity.

4) *Elongation ratio(ER)*: Elongation ratio means the ratio of the length of cooked rice to that of uncooked rice which measures the expansion length upon cooking.

5) *Chalky grains*: Chalky grains mean the grains at least half of which are milky in color and brittle in nature.

6) *Other grains*: Other grains include those which are not rice grain.

7) *Other varieties*: Other varieties means varieties of rice other than those notified as Basmati.

8) *Green grains*: Green grains means kernels, whole or broken, which are greenish in color.

9) *Under milled grain*: Under milled grain means grain whose bran portion is not completely removed during polishing or which has substantial bran streaks left on it.

III. RELATED WORK

Chetna V. Maheshwari, Kavindra R. Jain [1] provides Machine Vision quality analysis of rice grains to display the count for Normal, Long and Small rice seeds which achieves high degree of accuracy and quality as compared to Human Vision Inspection.

Harish S Gujjar, Dr. M. Siddappa [2] provides one method to test the purity of given samples of rice grains. It deals with the Pattern Classification technique based on Color, Morphological and Textural features for rejecting the Broken Basmati rice grains.

Bhavesh B. Prajapati, Sachin Patel [3] discusses the Digital Image Processing tool which measures the various parameters of rice samples and then compares the calculated parameters with existing standards as provided by Indian Government to classify the rice samples as Special, Grade A and Grade B samples.

Harpreet Kaur, Baljit Singh [4] provides one Machine algorithm to test the purity of rice grains, to analyse Head

rice, Broken rice and Brewers and to classify the rice grains as Premium, Grade A, Grade B and Grade C.

Sanjivani Shantaiya, Uzma Ansari [8] provides one algorithm to identify the broken rice grains and Normal rice grains based on Color, Morphological and Textural features using training and testing by Neural Network technique.

Neelamegam P, Abirami. S, Vishnu Priya. K, Rubalya Valantina. S. [6] performed analysis on Basmati rice granules to evaluate the performance using Image Processing and Neural Network based on the features extracted from rice granules for classification grades of granules as Normal, long and Small rice grains.

Bhupinder Verma [9] provides Watershed method for the grading of rice grains as Broken, Discolored, Damaged and Chalky grains. The calculated parameters are provided as input data to Neural Network for classification of rice grains.

Vinita Shah, Kavindra Jain, Chetna Maheshwari [5] presents a solution for quality evaluation and grading of Gujarat 17 rice using Image Processing and Soft Computing Technique. The proposed algorithm based on morphological features is developed for identification of unknown rice seed quality.

Liu Guang-rong [7] proposes one method to identify the color of rice grains based on Image Processing Technique and Color Models i.e. RGB color model and HIS color model.

IV. PROBLEM DEFINITION

In Rice industry, the researchers have worked to provide a solution to the problem of rice industry and thus provide Machine Vision based Inspection using Digital Image Processing for quality analysis of rice grains which is fast, accurate, convenient, harmless, non-destructive and cost-effective technique in comparison with traditional methods. It can achieve high degree of quality. It can classify the rice grains with greater speed and accuracy than Human Vision Inspection. But still there is a problem of Non-Uniform Illumination i.e. dark and light areas in an image which show their effects in the process of extracting objects from the background and also cause segmentation errors due to an uneven illumination of the image. Work needs to be done at the rice industry to build some method to correct the effects of Non-Uniform Illumination for the proper extraction of objects from the background and to remove segmentation errors.

V. CONCLUSION AND FUTURE WORK

In food handling industry, grading of granular food materials is the biggest issue because samples of material are subjected to adulteration. This paper attempted to highlight the basic problems of rice industry to analyse the quality of rice grains and also highlighted the related work of researchers to eradicate the problem related to quality analysis of rice grains. The future work will be to correct the effects of the Non-Uniform Illumination and apply Top-Hat Transformation on rice grains and thus calculates the various parameters for the quality analysis of Indian Basmati rice grains so as to classify them into Normal, Small and Long rice seeds.

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