Design Farming Robot for Weed Detection and Herbicides Applications Using Image Processing

Vijay S. Bhong, Dhanashri L. Waghmare, Akshay A. Jadhav, Nilesh B. Bahadure, Husain K. Bhaldar, and Anup S. Vibhute

Keywords Agriculture image processing · PIC microcontroller · Weed detection

1 Introduction

Agriculture is a field which requires automation in its various applications. New advanced technology is used in the agricultural operation due to the labour shortage. Increased use of herbicide affects the health of human beings and animals, etc. Agriculture operation needs automation, among this one is weed control. In older days weed control system, i.e. herbicide is sprayed uniformly over the field which may damage crops condition [1]. Apart from that, there is a negative impact on the plant and soil a large number of herbicides are wasted, and it is sprayed only in some part of the weed in the field [2]. In this paper, our main aim is to detect the weed in the crop by using an image processing technique. Then we will give the inputs of the weed areas to an automatic spray system the pesticide only in weed immediate areas with the help of the Robot [3]. For this, we need to take a photograph of the field with good clarity to detect the weeds with good accuracy. Capturing the Image with the help of the camera. Then we will apply image processing to that image using MATLAB to detect the weed [4].

After that divide the whole image using image segmentation technique. After that, we will use the image processing various techniques for separation of weed and plant [5]. Spray the herbicides on the weed. Based recent research of the weed science, mostly 33% of the losses in the on the agricultural field can be caused by the unwanted weeds only [6].

V. S. Bhong (✉) · A. A. Jadhav · N. B. Bahadure · H. K. Bhaldar · A. S. Vibhute
SVERI's College of Engineering Pandharpur, Pandharpur, Maharashtra, India
e-mail: jadhavaa@coe.sveri.ac.in; nbbahadure@coe.sveri.ac.in; hkbhaldar@coe.sveri.ac.in; asvibhute@coe.sveri.ac.in

D. L. Waghmare
Quality Assurance & Testing Engineer, HR Industry, Pune, Maharashtra, India

P. M. Pawar et al. (eds.), *Techno-Societal 2018*,
https://doi.org/10.1007/978-3-030-16848-3_38

2 Proposed System

2.1 Methodology

This method proposes a system which is capable of detecting weed from colour base segmentation. This system creates awareness in the automation system [7]. It consists of RF Trans receiver based control system that transmits the wireless signals according to the input being selected based on colour detected by the MATLAB section. The system consists of the following basic systems:

(i) MATLAB section
(ii) Robotic section
(iii) wireless transmission system
(iv) Weed detection
(v) Herbicide spraying System.

2.2 Block Diagram Description

(a) Figure 1 shows the block diagram of the proposed system. The camera is used to taking an image of crops; USB camera directly connected to the Laptop or desktop. Weed detection is the first step by using a camera. The image

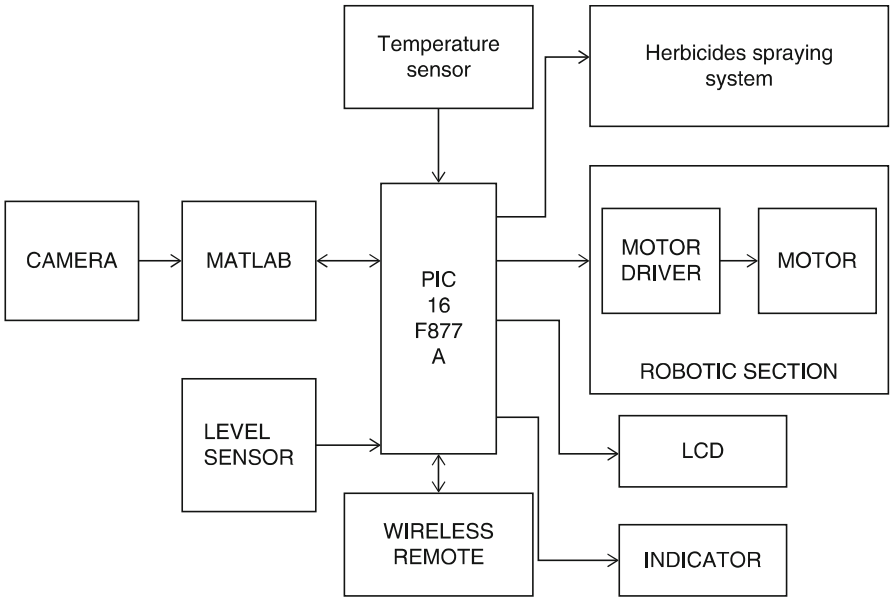

Fig. 1 Block diagram of proposed system

acquisition is the first step that takes place in MATLAB. The acquisition can be made by a digital camera such as normal webcams.

(b) The webcam should be installed perpendicular to the ground. The output images of the webcam are in RGB format with a size depending upon the camera such as 640 × 480, 1024 × 768, 1536 × 1024, 1600 × 1200 pixels. After that, the acquired images are processed in MATLAB. Colour segmentation is done here [4].

(c) MATLAB Section:

There are various types of MATLAB. The version is present nowadays. MATLAB 10, 11, 13, 14, 16 etc. We have used R MATLAB 14a. for image processing purpose. Firstly we have capture videos by using USB camera from that we have taken present weed snap. After that some processes technique done by using MATLAB [8].

2.3 Robotic Section

To achieve the goal of spraying the herbicide on the weed affected areas. The sprayer used for the herbicide spraying is the robotic hand or the sprinkler etc. Depending upon the requirement the sprayer is designed either to operate manually or automatically [9]. The major difference between the existing and the proposed model is the extreme classification accuracy and the amount of the herbicide spraying in the field areas [2].

For classifying the weeds and crops in the agricultural field, many algorithms are used in the existing model [5]. A lot of algorithm techniques are available to detect the presence of weeds from the crops [10]. The various designed implemented earlier are using the image processing method. To reduce the usage of herbicide and the correct identification of the weed this system is implemented since it is a user-friendly technique.

The robotic system consists of a motor driver, DC motor, level sensor, LED or for indication, RF Trans receiver. PIC16F877A is used for controlling part.

(d) Temperature Sensor Temperature sensor is utilised to sense the environment temperature. We have used a Temperature sensor called LM35.

(e) LCD Display Lampex, 16∗2, Backlit facility LCD is used in a project to visualise the output of the application. We have used 16 × 2 LCD which indicates 16 columns and two rows. Total 32 characters we can display on 16 × 2 LCD. It can also use in a project to display the herbicides name to be spray on the weed. LCD plays a vital role in a project to see the output and it also displays the status of fertiliser tank that is the tank is empty or not.

(f) Motor Diver: L293d motor driver IC is used to control motors in robotics. Motor driver act as an interface between the controller and the motors in the robotics. The motor driver is primarily used in robotics only as, the controller operates at low voltages and requires a small amount of current to operate, while the motors

require a relatively higher voltage and current. This current cannot be supplied to the motors from the controller.

(g) Herbicides spraying system: Fertilizer spraying system is used to spray the herbicides on weeds. By using this system, we cover a large area in less herbicide. When the herbicide tank is empty, then these systems activate the indicator or buzzer and also show the status of the tank on display [2].

(h) Wireless Remote: A wireless radio frequency (RF) transmitter and receiver can be easily made using HT12D Decoder, HT12E Encoder and ASK RF Module [11]. Radio Frequency (RF) transmission is stronger and reliable than Infrared (IR) transmission due to following reasons:

  (a) Radio Frequency signals can travel longer distances than Infrared.
  (b) The only line of sight communication is possible through Infrared while radiofrequency signals can be transmitted even when there are obstacles.

2.4 Algorithm

The following Fig. 2 shows the working flow of the proposed system.

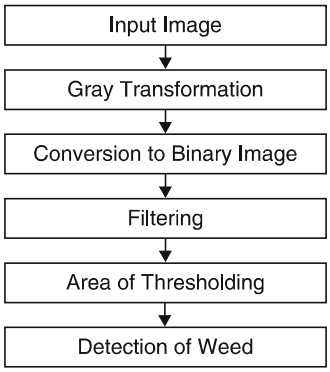

Fig. 2 Algorithm for proposed system

2.5 Experimental Setup

The following Fig. 3 shows that experimental setup for controlling part. Here 12 v battery was used for giving supply to the motor driver and controller.

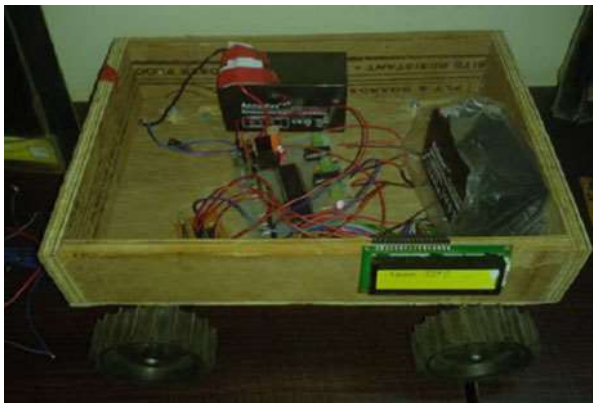

Fig. 3 Experimental setup of controlling part

3 Result

3.1 Video

Continuous images frame was taken from the camera. Figure 4 video from Camera [10].

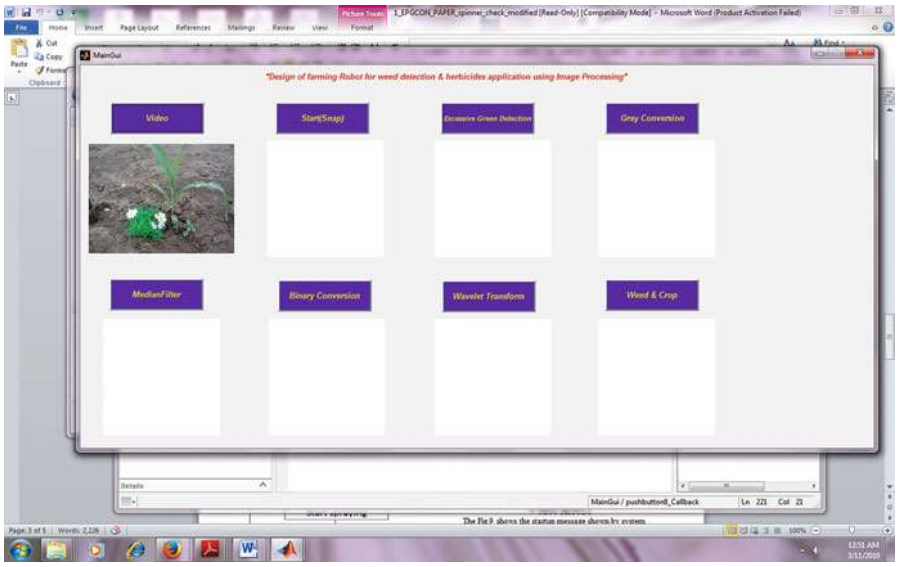

Fig. 4 Video from camera

3.2 Capture Image

The image was captured from camera. Figure 5 captured image.

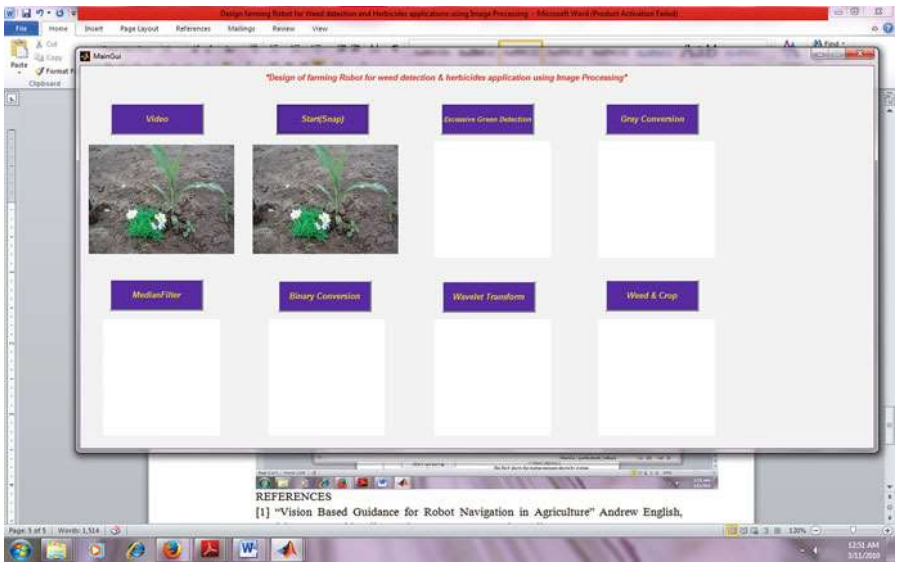

Fig. 5 Captured image

3.3 Excessive Green Detection

In this step, we are increasing the brightness level of Image and also find another colour present in Image shown in Fig. 6.

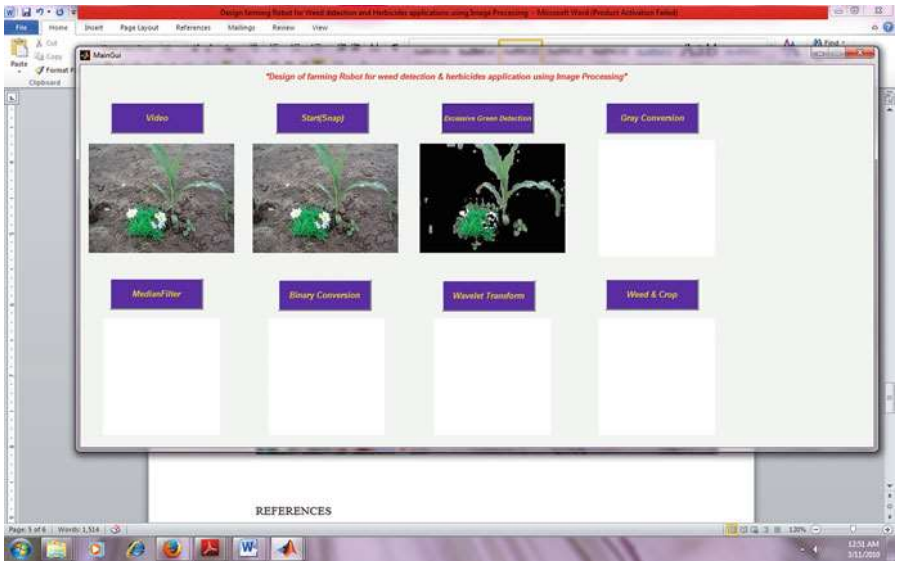

Fig. 6 Excessive green detection

3.4 Gray Conversion

The Following Fig. 7 shows that conversion of a colour image into a grey level image.

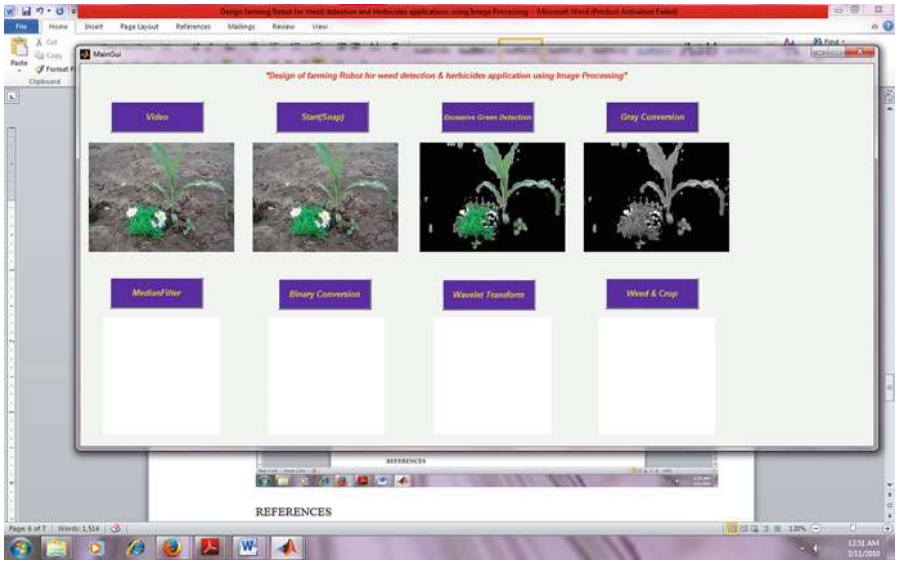

Fig. 7 Color to gray conversion

3.5 Median Filter

Figure 8 shows that filtered image here median filter is used for the enhancing the image.

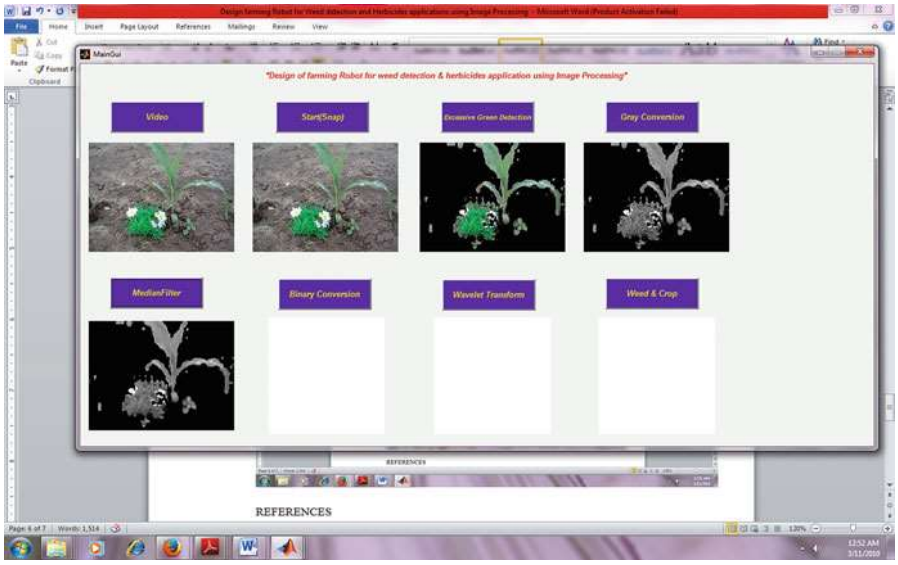

Fig. 8 Filtered image (median)

3.6 Binary Conversion

The below Fig. 9 shows that conversion on the enhanced image into a binary image.

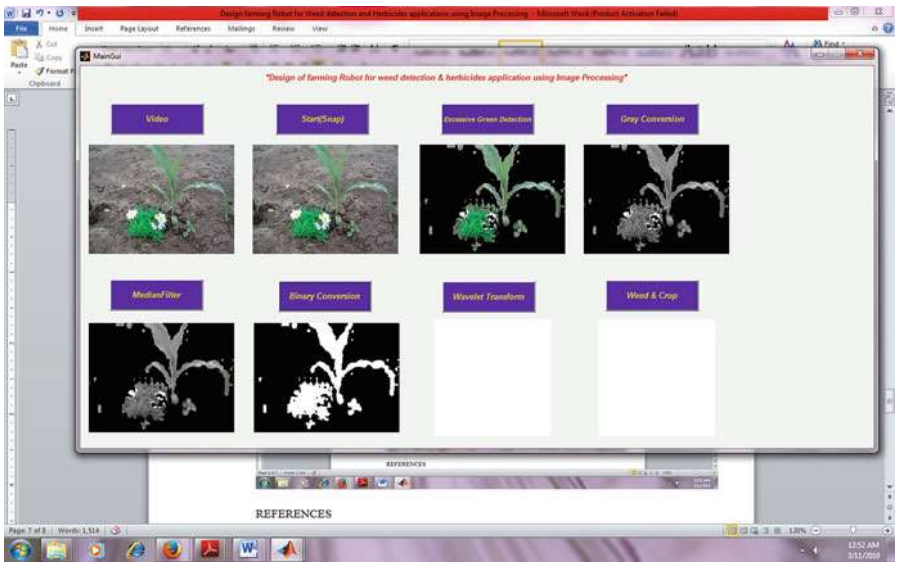

Fig. 9 Binary conversion image

3.7 Wavelet Transform

The wavelet transform was applied for the finding the weed and Plant. Figure 10 shows that wavelet transformed image.

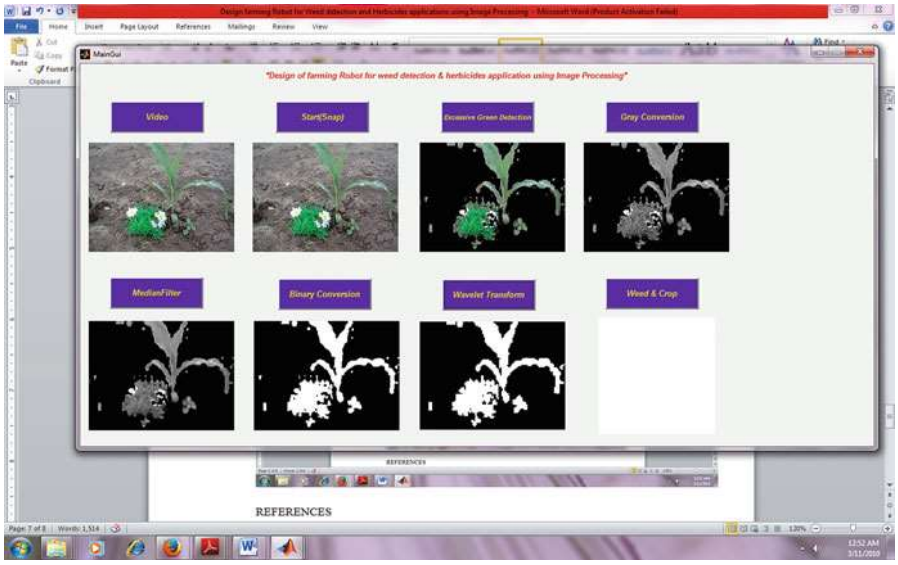

Fig. 10 Wavelet transform

3.8 *Weed and Crop*

Figure 11 shows that separation of weed and crop or plant.

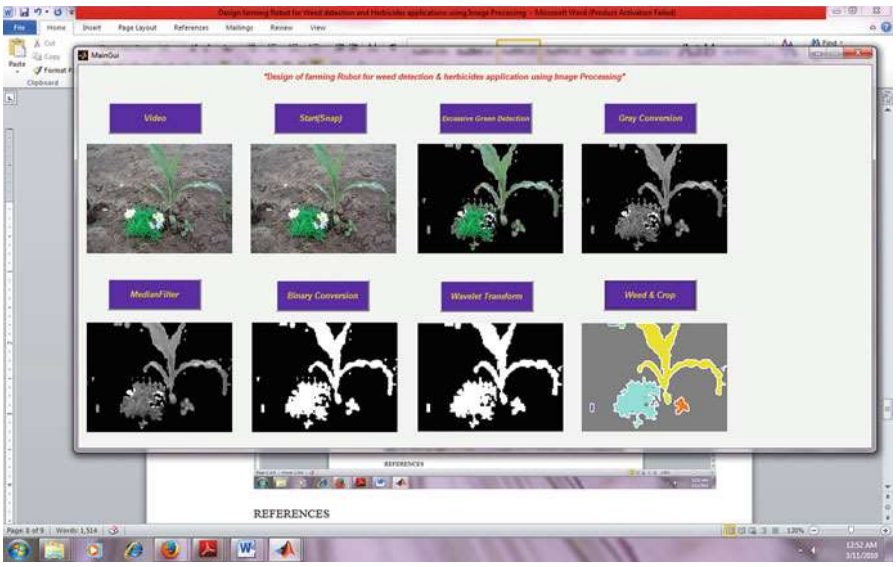

Fig. 11 Separated weed and crop

4 Conclusion

Due to Change in weather condition, the weed plants will grow along the crop. So it becomes difficult to identify the Crop and weed. The Proposed will give an easy solution to Distinguish the weed and crop. The Proposed system make the identification easier and allows the farmer to use the weed affected area for the future weed control, and yield of the crop is more. The Designed Farming robot will for removing the weed for the farm. The main advantage of the farming robot is to save the labour cost.

References

1. Pedersen SM, Fountas S, Blackmore S. Agricultural robots – applications and the economic perspectives. University of Copenhagen, IFRS
2. Yaghoubi S, AkbarZadeh NA, Bazargani SS (2013) Autonomous robots for agricultural tasks and farm assignment and future trends in agro robots. Int J Mech Mechatron Eng IJMME-IJENS 13(3):1–6
3. Quinlin, Liming XU (2010) Autonomous agricultural robot and its row guidance. IEEE

4. Bhong VS, Pawar BV (2016) Study and analysis of cotton leaf disease detection using image processing. Int J Adv Res Sci Eng Technol 3(2):1447
5. Revathi P, Hemalatha M (2012) Classification of cotton leaf spot diseases using image processing edge detection techniques. ISBN:978-1-4673-5144-7/12/$31.00 © IEEE
6. Patil SB (2011) Leaf disease severity measurement using image processing. Int J Eng Technol 3 (5):297–301
7. Bhong VS, Pawar BV (2016) Implementation of farming robot for various agricultural applications. Int J Innov Res Electr Electron Instrum Control Eng 4(7):115
8. Liu X, Zhang Q, Luan R, Yu F (2013) Applications of perceptual hash algorithm in agriculture images. IEEE
9. English A, Ross P, Ball D (2014) Vision-based guidance for robot navigation in agriculture. Member, IEEE, Peter Corke, Fellow, IEEE
10. Gulhane VA, Gurjar AA (2011) Detection of diseases on cotton leaves and its possible diagnosis. Int J Image Process 5(5):590
11. Chang CL, Senior Member, IEEE, Jhu JH (2013) Zigbee-assisted mobile robot gardener. IEEE

Use of Nahar Biodiesel and Its Blends as an Alternative Fuel in CI Diesel Engine

R. G. Biradar, C. L. Prabhune, and Supriya N. Bobade

Keywords Nahar · Biodiesel · Performance characteristics · Emission characteristics

1 Introduction

The requirements for alternative fuel sources include being environmentally friendly, economically feasible and renewable while being compatible with present day diesel engine infrastructure [1]. In the context of diesel engines, biodiesel found as the front runner for main stream adoption. This has led to various experimental studies of to improve biodiesel usage in diesel engines, such as improving cold flow properties [2], additives [3] and preheating [4]. Many researchers has worked with biofuel by considering alternative fuel. An experimental study was conducted to determine the feasibility of using flash pyrolysis oil of wood in diesel power plants [5]. Biodiesel extracted form Jatropha oil was investigated for emission characteristics analysis on a single cylinder VCR engine with various loads and blends. Blends (biodiesel + diesel) of JB00, JB10, JB20, JB30, andJB100 were prepared at 40 °C. The emission parameters, such as nitrogen oxides (NO_x), carbon monoxide (CO), and hydrocarbon (HC), were studied and compared to diesel fuel. Results showed that, among the blends prepared from methyl ester of Jatropha, JB30 shows a reduction in emissions [6]. Experiments were carried out with common karanja derived biodiesel. Both commonly agreed on a reduction of HC emission, with contradictory results reported for NO_x and CO emissions [7, 8]. This research work reports on the use of nahar oil, as a potential source of biodiesel.

R. G. Biradar (✉)
JJTU, Jhunjhunu, Rajasthan, India

C. L. Prabhune
Zeal College of Engineering, Pune, Maharashtra, India
e-mail: chandrakant.prabhune@zealeducation.com

S. N. Bobade
Indian Biodiesel Corporation, Baramati, Maharashtra, India

P. M. Pawar et al. (eds.), *Techno-Societal 2018*,
https://doi.org/10.1007/978-3-030-16848-3_39