Risk Index Monitoring of Powdery Mildew on crops using Wireless Sensor Network and warning SMS through GSM

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Abstract- The main aim of this paper is to propose a state of art wireless sensor technology in agriculture, which can show the path to the rural farming community to replace some of the traditional techniques of decision making. INDIA an agriculture based highly populated country needs high yield from crops including grains, vegetables and fruits. It has been observed that most of rise in yield of crop is based on use of pesticides and fertilizers which are harmful to health of crops as well as human beings. To avoid that we need precision agriculture through early detection of diseases on crops based on theory prevention is better that treatment. In this paper we try to emphasize on early detection of one particular disease i.e. Powdery Mildew as a prototype which monitors Risk Index of powdery mildew.

A Wireless Sensor Network with THREE nodes and ONE Base station monitors Temperature, Relative Humidity, Wind Speed, Light intensity and Soil Moisture. ATmega168 Microcontroller based automated wireless sensor network system receives conditions of environmental parameters through Sensor Nodes and send it to Base station which is interfaced with a computer system inbuilt with a software tool called Risk Assessment which assesses environmental conditions and compare it with UC Davis Powdery Mildew Risk Index Model. When risk Index reaches above 60%, GSM based automated system warns to all registered farmers in the database through SMS once in a day for three consecutive days, stating that an index reaches above 60% means pathogen is reproducing every FIVE days. This will definitely helps the farmer to decide when to use pesticide, instead of going irrelevantly sprinkling pesticide with time interval. This methodology helps to avoid inappropriate use of pesticide which ultimately reduces cost as well labour along with that it helps to save Environment from hazardous pesticides.

Keywords- Powdery Mildew, Precision Agriculture, Relative Humidity, Temperature, Wind speed, Soil Moisture, light intensity, Wireless Sensor Network.

I.   INTRODUCTION

Agriculture plays a vital role in India's economy. 54.6% of the population is engaged in agriculture and allied activities (census 2011) and it contributes 17% to the country's Gross Value Added[1]. Key issues affecting agricultural productivity include the decreasing sizes of agricultural land holdings, continued dependence on the monsoon, inadequate access to irrigation, imbalanced use of soil nutrients resulting in loss of fertility of soil, uneven access to modern technology in different parts of the country, lack of access to formal agricultural credit, limited procurement of food grains by government agencies, and failure to provide remunerative prices to farmers[2]. Imbalance in the use of fertilizers in soil may also result in a loss of fertility. The consumption of chemical pesticides in the country has increased over the past few years, from 55,540 tonne in 2010-11 to 57,353 tonne in 2014-15[2]. Major reason is lack of knowledge about necessity of spraying pesticides. Here we are trying to develop a system which helps farmer an early detection of disease by monitoring environmental parameters with the help of wireless sensor network and GSM based communication system. This will help to avoid unnecessary usage of pesticides in farming.

II.   LITERATURE REVIEW

Most of the research papers are based on green house monitoring and control farming through WSN. Wireless Sensor Network in Precision Agriculture can be classified in to different schemes like network of scalar sensor, multimedia sensor network, Tag based network etc. [4]. The crop management system using Wireless Sensor Network (WSN) is a kind of an autonomous solution to enhance the agricultural technology. Precision agriculture could raise the crops yield, labour cost saving and environmental protection against over pesticide or fertilizing. Therefore in this project we would like to propose a wireless sensor system that will communicate each other with lower power consumption[6]. Powdery mildew, caused by the fungus Uncinula necator, has been a problem on many crops more than a century ago. It is, without a doubt, the most enduring and persistent disease problem faced by pulses, cereals and fruit producers [3].

III.   REQUIREMENT OF WSN BASED MONITORING

We have proposed an information and advisory system which collects information about environmental parameters namely Temperature, Wind Speed, Light intensity, Humidity and Soil moisture which affects growth and development of crops. Basic requirement of proposed system is

a. Real time environmental data collection.
b. Monitoring and analysis with Risk Index of Powdery Mildew and warning SMS if risk index reaches above 60%.
c. Cloud storage on server and real time view of different parameter online.
d. Open access to all to observe current weather conditions in real time.

For realization of the proposed system data is kept on web server with graphical user interface (GUI). Five environmental parameters along with battery status is uploaded through