

## RAINFALL DAMAGE PROTECTION SYSTEM & PREVENTION FROM THE PLANT DISEASE

Vikramsinh Kadam

M.Tech. (E&TC)

Symbiosis institute of Technology, Pune, Maharashtra, India

### ABSTRACT

Rainfall is a major threat to the Grape field; also it leads to create Downey mildew Disease in Grape field. Due to rainfall, the Grape quality is affected in such an amount that farmer can't sell Grapes in to market. So it is very necessary to control the damage of Grape field due to rainfall & prevent it from Downey mildew Disease & other diseases. The root cause of most plant diseases is Fungus; fungus is created because of moisture on the leaf. In night time dew falls on the leaf, it creates moisture on the leaf; obviously it leads to disease creation. A system mentioned in this paper will protect Grape field from rainfall & from disease. This system is electromechanical, in which we have used microcontroller, motors, protection paper, metal chips. When rainfall is done, sensors will detect it & automatically protection paper will be covered above the entire Grape field canopy. This will give complete protection against rainfall. For disease protection, we cover the Grape field canopy with protection paper in night time period to avoid dew deposition on the leaf of Grape field. Definitely it will resist the other diseases of Grape field. The electromechanical system is used, it consist of microcontroller, Relays, DC motors, sensors. This system can be used for rainfall protection in Grape field & for disease prevention for all the other plants. In this paper, rainfall protection system is used for Grape field, because huge destruction is done in Grape field. If Grape field is protected from rainfall & diseases, farmer can get good amount of profit. Farmer can export the quality Grapes.

**KEYWORDS:** Embedded system, sensors, electromechanical system.

### I. INTRODUCTION

#### a) Need of Rainfall Damage protection system

When harvesting of grapes are done in rainy season, if rain comes at the time of harvesting of Grape field. It will lead to total destruction of Grape field. It leads to degraded quality of Grapes. This type of Grapes can't be exported. Even fifteen minutes of rain can destroy whole Grape field.

Because of rain fall in the Grape field, it increases the Humidity. And Downey mildew Disease comes in the two temperature ranges as follows:

1) 10 to 23 degree temperature.

2) 23 to 27 degree temperature with greater than 80% relative humidity.

In the second condition, it is shown that humidity greater than 80% lead to creation of Downey mildew Disease. When rainfall comes, it creates humidity & moisture on the leaf of Grape field. As soon as moisture comes on surface of leaf, fungus starts developing on it. Dew in the night time period is also responsible for moisture development on surface of leaf.

#### b) Disease development:

Let us see how Downey mildew disease develops in Grape field. If moisture comes on leaf, then pathogen attacks on the leaf. These pathogen creates color changes in the leaf. It burns the tissue of plant & automatically it affects the photosynthesis process.



**Figure 1:** white spot on the backside of leaf



**Figure 2:** Yellow spots on the upper side of leaf

Downey mildew disease comes in the first 40 to 65 days. *Plasmopara viticola* is the pathogen responsible for Downey mildew disease. It creates white spots on back side of leaf & yellow spots are on the upper side of the leaf. Once a white spot comes on white spot, then it will spread quickly in grape field. It reduces photosynthesis process.

## II. METHODOLOGY

The rainfall protection is used for two applications. In first part, we can use this system for rainfall protection. In second part, we can use this system in night time period. The plant disease is prevented from dew, moisture deposition on surface of leaf.

**1) Part a):** The system shown in fig.no.1 will give complete damage protection system against rainfall & Downey Mildew Disease. In our system we have placed number of sensors in entire Grape field. Two motors we are using named as motor1 & motor 2. There is long shaft provided for each motor. On the shaft of motor1, the rainfall protection paper is present. The shaft of motor2 is an open shaft. There is central microcontroller system which has inputs from sensors & output to motors. The shafts of motor 1 & motor 2 are connected by strong wires. These wires are placed above the Grape canopy. With the output of microcontroller we can't switch on & off the motor directly. Therefore 12 volt relay we are using to turn on & off the motor. At first rainfall protection paper is on shaft 1.

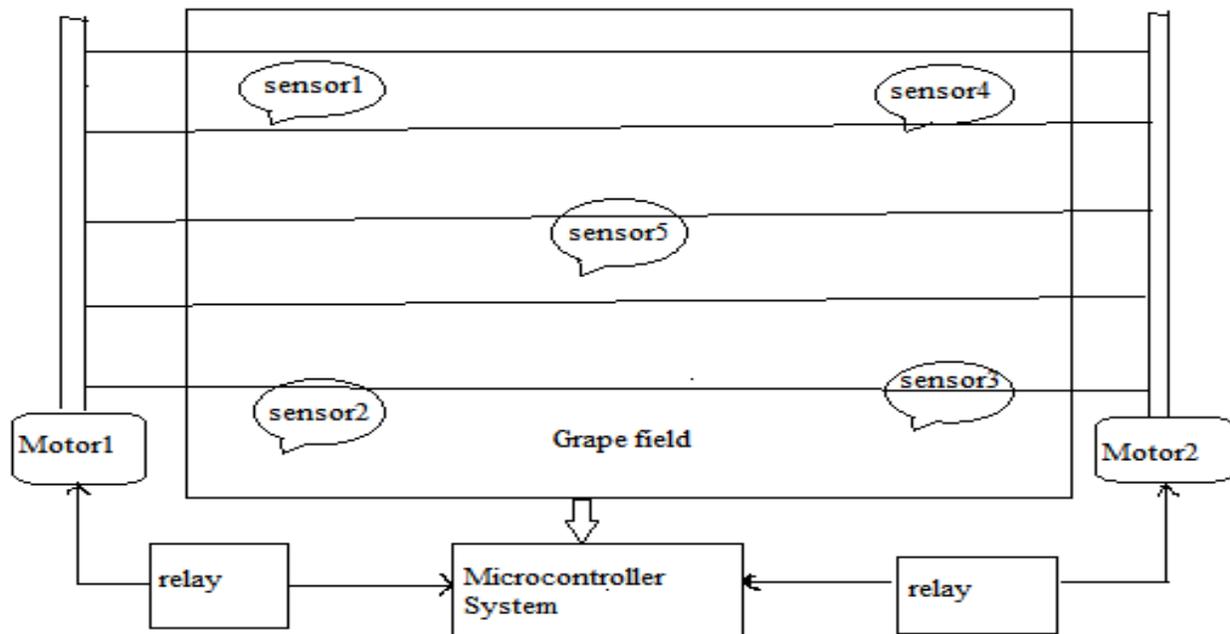


Figure 3: Rainfall damage & disease protection system

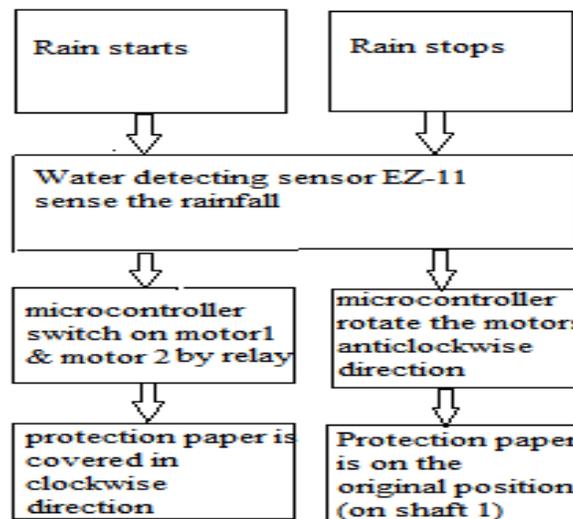


Figure 4: Operation flow of system

When there is a rainfall occurred, our water detection sensors will sense it. We use Panasonic water detection sensor EZ-11. Its sensing range is 5 meters. It sense 0.472 mm liquid. It operates on 12 volt DC supply. It gives signal to the Microcontroller system. Figure 4 shows the operation of system. Microcontroller system will on motor1 & motor2 in clockwise direction through relay. Then protection paper will be shift from motor1 shaft to Grape field canopy. When rainfall stops, it is also detected by our sensors. Then our protection paper will return back on the shaft of motor1 from Grape field canopy. In

this system, we have attached small metal chips on the protection paper, it will give some weight to paper & gives protection against strong wind flow.

2) Part b): We use the same system to prevent the diseases. As we know that dew comes in night time period. It gets deposited on leaf. It leads to create fungus on leaf, and then disease gets created. So we can cover Grape field canopy in night time by protection paper with system shown in figure 3. In day time period, we don't cover the canopy. We cover it only in night time period. Definitely this system will resist If we implement above system, then we can prevent the Downey mildew Disease.

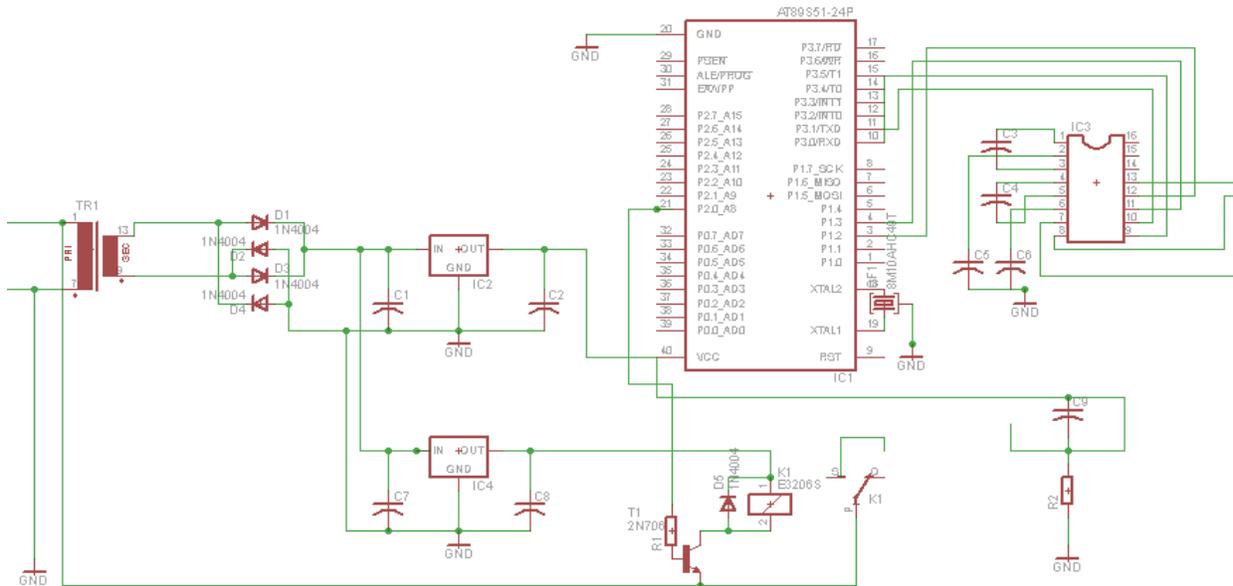


Figure 5: Circuit diagram

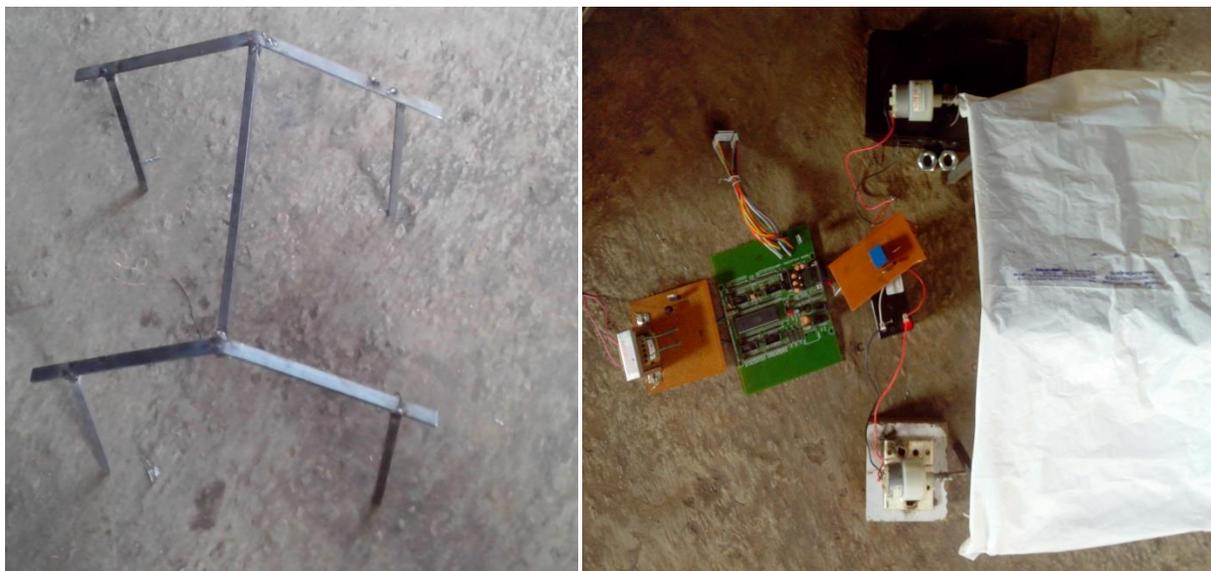


Figure 6: Prototype rainfall protection system

The circuit diagram is shown in figure 5. The circuit design is done in EAGLE software. Here step down transformer is used. The output of step down transformer is given to bridge rectifier. The output of bridge rectifier is given to 7805 & 7812 IC. 7805 gives 5 volt DC supply to microcontroller. 7812 IC gives 12 volt DC supply. We have used 12 volt relay, the output of 7812 goes to relay. Relay has five terminals. In

between first & third terminal, we have used freewheeling diode to avoid damage due to back EMF. The normally open terminal of relay connected to the motor. In my system, I have used 12 volt motors. So I have connected 12 volt supply to the second terminal of relay. The MAX 232 IC is used for the programming purpose. It converts TTL logic level in to RS 232 logic level & vice versa.

In figure 6, The roof like structure is there, which is used to support the paper in strong wind conditions. This is a prototype model, in which two small DC motors are used. The paper is on shaft of motor 1. As soon as rainfall comes, these motors will rotate in clock wise direction. Protection paper will be covered on entire canopy. When rainfall stops, these motors will rotate in anticlockwise direction & paper will return to original position.

### **III. ECONOMICAL FEASIBILITY OF SYSTEM**

If we want to commercialize this system, we should know the profit from Grape Production. Then we visited the farm which is owned by farmer named as Yogesh Kate at post: Katewadi, Taluka: Baramati, District: Pune, State: Maharashtra, India. We come to know that in India Grapes get exported mostly in between august to December. They get 80 to 100 Rs for 1 Kg. In a one acre they produce 8000 Kg Grapes. So they earn 8 to 10 lakh Rupees per acre. But in between august to December there is threat of rainfall. If rainfall comes, farmer gets only 40k to 50 k Rupees, instead of 8 to 10 lakh rupees per acre. His expenditure on Grape field is 1.5 to 2 lakh per acre. Thus he earns 6 to 8 lakh rupees profit from one acre of Grape field. But due to rainfall & diseases; he can't produce the export quality Grapes. Therefore farmers harvest the grapes after December to reduce the threat of Rainfall & disease.

If we want to implement this system, it will take 4 lakh rupees per acre including protection paper, motors, and Electronic components. But it is one time investment & gives profit for multiple years. By using this system farmer can take risk to produce Grapes & export it in rainfall affected days.

### **IV. ADVANTAGES**

- 1) No labor is required to cover a protection paper on the Grape field.
- 2) It will give protection for any time
- 3) Rainfall Risk factor reduced to 0%
- 4) Export quality grapes can be harvested

### **V. FUTURE SCOPE**

By using this protection system, we can cover any farm field. In our system, we used protection paper in night time period for disease protection. But there are some plants; high temperature is a serious threat to them. So according to temperature changes in atmosphere we can cover that field in day time period. We can switch on & off the system remotely, by using GSM service. With the help of GSM service we can send the temperature & humidity data on mobile phone. The farmer can switch on & off the whole system from remote place. For this system, we have to use GSM kit, number of temperature sensors & humidity sensors.

### **VI. RESULT & CONCLUSION**

The technology we have used here can be installed in every Grape field, as it requires only one time investment. Thus by implementation of above automatic system we can prevent our Grape field from Heavy rainfall & from Downey mildew Disease. This system has only one time investment & it will give fruitful results for several years. Farmers can take risks & can have more profit. There are four free wheels used on the canopy. With the help of those free wheels protection paper will be moved across the canopy with the help of strong wires.

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## **AUTHOR'S BIOGRAPHY**

**Vikramsinh Kadam** pursuing the Mtech degree in Electronics & Telecommunication Engineering from Symbiosis International University, Pune. He has Bachelor of engineering degree from University of Pune, India. He has Diploma degree from Maharashtra state board of technical education. His research interests include Technology in agriculture, Image processing, Robotics, Embedded systems.

