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DEVELOPMENT OF A NEW SOLAR LIGHT CUM GLUE TRAP MODEL AND ITS UTILIZATION IN AGRICULTURE

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ABSTRACT

A new model of solar light cum glue trap was developed which is an effective tool for the monitoring of insect pests in the field of agriculture. It is safe to the nature and also cost effective at farmer's level. Solar light glue trap box with iron structure was developed. It has components such as solar panel, charging unit, battery, LDR Control unit and UV LED bulb installed with the solar light glue trap box. Demonstrations were taken in different field crops for their effectiveness.

Keywords: Solar light glue trap, Solar panel, Light Dependent Resistors, UV LED bulb

1. INTRODUCTION

Agriculture is a principal occupation in India and more than 70 % peoples are involved in agriculture. Insect pests are the manure to the farmers greatly reducing their income by destroys the field crops. There are many preventions and exterminations for pest problems, such as physical, biological, chemical and mechanical methods are controlling the insect pests. For example, pests are chemical resistant which leads farmers using more and more pesticides. This causes plant residue which is dangerous for consumers and when consuming the fruits and vegetables gives us major problems to the health.

Nowadays, the consumers emphasize more in food resistance to insect pests for better health and environment on safe and non-chemical food. Moreover, researchers and farmers have still trying to find the suitable alternate method for controlling the insects pests to the farmers instead of chemical methods have been used so far. However, due to lack of electrical energy problems in rural and villages usage of renewable energy resources of solar energy will help the expense of farmers. Hence a model of solar light was developed which is low cost effective for various field crop pests to save the electrical energy.

2. METHODS AND MATERIALS

Most light traps are used in the field of agriculture for monitoring the insect pests of different crops is electrically operated and stationery in nature due to its dependence of electric connection. Besides, there is no possibility to avail the electric connection in the entire area of any field crops for smooth operation of the electrical light trap. Hence the solar light trap may be considered as the alternate solution that has several advantages over the electrical light trap. To fulfill the purpose of a suitable model of solar light trap was developed considering the following characteristics

- Portable in nature,
- Easily fixed at any place in the field by the help of two bamboo poles or one concrete pole as available in the locality.
- Can be shifted easily, if necessary,
- It has an iron body to provide necessary safety of the solar materials associated with the model,
- A standard solar light system is attached with the model which will supply a continuous light up to 24 hrs if the battery is charged fully,
- The solar light system includes a 12 Volt 7.5 Amp battery, 10 Watt-PC solar panel, solar charging unit, 12 Watt UV LED lamp.
- Wet-sticky glues to trap flying insects and are useful for indicating the presence of pests.
- A Smart Automatic Intelligence LDR control circuit is used to automatically control the UV light depends upon the nature of light

4.COST EFFECTIVE METHODOLOGY

The solar light glue trap research is an experimental research. The ultimate aim is, to produce and invent Solar Energy-Based Insect Pest Trap by using ultraviolet LED bulbs as light source. The ultraviolet is effective wavelength to tempt insects. Solar cells are used to change solar energy to electric energy and charge to battery for pest trap. After that, bring the trap to test the effectiveness and results of pest trap in Agro/horti ecosystems areas. The processes includes are

4.1. DESIGN

The Solar Energy-based Insect Pest Trapping has insects glue trap and acrylic boards. It is easy to make and not much complicated to use by the farmers. It consists of a) 10 watts Solar cell to change solar energy to electric energy for battery charging. b) 12 volt 7.5 Amps Sealed Lead Acid battery to save electric charge in daytime and give electric energy to LEDs at night time. c) Ultraviolet LED (315-400 nm for wavelength; the most appropriate wavelength for insect tempting) d) LDR control circuit, it is on/off switch for LED. If the sensor gets lights from the sun, it does not work yet. If the sun sets or the sensor cannot get any lights. The switch works by transfer of the electric energy from battery to LED. The LED bulbs will on at nighttime. e) Insect glue trap is used to stick insects which fly to LED, as shown in Figure 2.

The dimension of the above solar light glue trap box is as following

1. The solar glue light trap is made of stainless steel with 150cm height is installed which has the dimension of Solar Energy-Based Insect Pest Trap
2. On the top of Insect pest trap, 10 watts solar cells panel, 45x45 cm, 10-15 degrees of elevation angle for solar effectiveness.
3. The base of the trap has steel plates to mount on the ground easily
4. The insects tempt consists of 30x40x15 (width x length x thickness) clear acrylic square box which can let LED light out of the box
5. Ultraviolet LED has 315-400 nm wavelength for attracts insect pest.
6. At the bottom of the glue trap, the glue pad of trap line (yellow color) is fixed.
7. Also, it has 7.5 amps battery charger, 12 V sealed Lead Acid battery, LDR control unit are set in steel box to prevent from any damages.

Figure 1.Solar light cum glue trap

4.2. EFFECTIVENESS TEST AND RESULT:

The technical effectiveness of Solar Energy-Based Insect Pest Trap are; LED illumination, the amount of current supply to LED, the amount of current used to charge battery, and duration time of battery used. The measuring instruments are voltmeter, ammeter and luxmeter. The test is produced by set the trap in agricultural fields to find what types of insect and pest can be trapped.

The operation of the solar light glue trap is very easy. There is a switch above the LED bulb. A farmer has to switch-on the bulb every evening time and switch-off in the morning and the solar light trap will be charge during day time and provide light at night. This types of working is not in our trap it have an LDR control unit it automatically ON /OFF the system , This solar light attract the insect pests and the same will be collected in the glue trap which is placed under the UV LED.

5. RESULTS AND DISCUSSION

It can be concluded from the technical effectiveness test of Solar light glue trap as follows:

1. The model is very much suitable to the farmers by using new techniques of solar glue trap to be utilized easily at any portion of area of their single or multiple field crops in a village surroundings
2. As most of the crop areas in a village are lacking any electric connection, the use of this solar light trap model is the most suitable instrument for monitoring and partial control of insect pest population of all crops at the village surroundings
3. Solar light trap model may be utilized at field level learned from the expert farmers for demonstration in any type of field crops.
4. Solar light trap model is a alternate of chemical pesticides, so it will be considered as a importance for its eco-friendly nature and low cost involvement to both the farmers and agricultural experts,
5. Considering the safety of field crops, nature including beneficial insects and biodiversity as well as economy of chemical pesticide use, this instrument may be the best weapon in the hand of farming community and its low cost involvement, so the Govt,

NGOs and private sellers may also utilize this useful tool for successful implementation of green revolution technology in the field crops for providing necessary safeguard to the nature.

6. The result on illuminated effectiveness of UV LED shown that, the UV-LED bulbs produced 160 luxs at 0.5 meters and 25 luxs at 2 meters.
7. Amount of current supply to LED found that, the current supply was 1.1 amps; 13.2 watts, when connected 12 volts battery to UVLED bulbs.
8. Amount of current used to charge battery found that, the voltage at 11 am – 1 pm which the solar cells got the most solar energy was 17 volt. When connected solar cells to battery charger, the current 1.2 amps was transferred to battery.
9. By using electric energy from battery since battery was fully charged shown that, LED was light for 7-8 hours at 60% of discharge current. That duration was enough to light LED at nighttime for insect trapping.
10. The result of light sensor switch circuit test indicated that, when there was no sunlight on sensor, the sensors worked properly 100%. The sensitivity to light could be changed depends on the area. Moreover, we could set working time for 1-12 hours for the best insect trapped time. When there was sunlight on sensor, the switch also could work properly 100%.
11. Using glue pad all the insects stick in the pads, we can able to collect insects and change the pad in a weekly once and the glue is non – toxic mixture to human and his surroundings.

Fig. 2 Insect and pest trapped in Solar light cum glue trap

6. CONCLUSION

According to the study of Solar light cum glue trap, it can be concluded as follows

- Solar energy-based insect pest trap research chooses general materials to be adapted for insect pest trapping such as glue trap and clear acrylic board. The model was designed and developed in easy way to handle and use the farmers in the field.
- The Solar light glue trap can trap many common insect pests.
- LED bulbs with 12 volts were safer to use more than fluorescent bulbs with 220 volts.

8. SUGGESTION

The suggestions from this study are:

- This trap did not appropriate for tall and leafy trees because the sunlight could not shine on the trap, the solar cells could not produce electric energy to battery.
- The trap should be improved for lighter scattering as 360 degrees from the trap. The ways into LED should be provide more for more insects pests and effectively.

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