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EVALUATION OF AN IMPROVED ELECTRONIC GRAIN PROBE TRAP MODEL IN STORED GRAINS

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ABSTRACT

Whether the food grains are stored in farm, home or warehouses, insects continue to create problems by causing qualitative and quantitative damage in storage. This warrants the use of tool/ gadgets for monitoring for early detection and control of insects using probe trap. But the probe trap efficiency is improved by combining this trap with electronics and we got a good result. For thispurpose firstly a model of electronic grain probe trap with an acrylic structure was developed, then a solar light system including solar panel, charging unit, batteryunit and UV LED bulb installed and this trap attracts the insects in seven different wavelengths and this is control by a variable resistor and these things are with this electronic grain probe trap so that thiselectronic grain probe trap can monitor and control the insect pests of different storage areas effectively. And some demonstration are taken in differentstorage bins revealed that the newly developedelectronic grain probe trap is very much effective for the monitoring and controlling of insect pests and their mechanical control in the field of agriculture and as it has low cost involvement so it can be utilized by most of the farmers. Lastly it is the most effective tool which provide better safeguard to the nature in comparison to the other method of pest control in the field of storage.

Keywords: Solar light glue trap; Solar panel; LDR; variable resistance

1. INTRODUCTION

Agriculture is a principal occupation in India. Every year farmers face pest problems which seriously destroy crops. There are many preventions and exterminations of pest problems, such as mechanical method, physical method, biological method, and chemical method. Using pesticides and chemical method directly affects on agriculturists and consumers, for example, pests are chemical resistant which leads farmers using more and

However, that way is still lack of electric energy for bulbs because the farm is far away, and trap is also expensive. From this point, the researcher has developed Solar Energy-Based Insect Probe Trap for different storage areas.

residue which is dangerous for consumers, and also affects on environment and ecology.

Nowadays, the consumers emphasize on safe and non-chemical food. The producers should be aware of this matter and reduce pesticide to decreasefarmers' and consumers' health problems by creating non-chemical and pesticide measures. Moreover, agriculturalists has tried to find other ways instead of chemical used such as using lights to tempt pests which is popular way for farmers.

2. METHODS AND MATERIALS

Most electronic probe traps used in the field of storage for monitoring andcontrolling the insect pests of different storage areas 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 storage field for smooth operation of the electrical probe trap. Hence the solar light trap may be considered as the alternate solution that has several advantages over the electrical light probe trap. To fulfill the purpose of development of a suitable model of a solar light probe trap research studies has been made and the first solar light glue trap is developed considering the following characteristics

- Portable in nature,
- May be easily fixed at any place of the stored field,
- May be shifted easily, if required,
- The model is an acrylic 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 4 volt 1 amp battery, 3watt-pc solar panel, solar charging unit, 3watt UV LED lamp (dc).
- A 5V variable resistance is used to control the UV LED light wavelengths in seven different lengths
- A Smart Automatic Intelligence LDR control circuit is used to automatically control the UV light depends upon the nature of light

3. COST EFFECTIVE METHODOLOGY

The solar light probe trap research is an experimental research. The purpose 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

3.1. DESIGN

The concept idea of Solar Energy-Based Insect Pest Trap design is using general stuffs; insect probe trap, acrylic boards. The trap has to easily produce, not complicate for teaching to agriculturalist. The Solar Energy-Based Insect Probe Trap consists of a) 3 watts Solar cell to change solar energy to electric energy for battery charging. b) 4 volt 7.5 Amps Sealed Lead Acid battery to save electric charge in daytime and give electric energy to LEDs at nighttime. c) Ultraviolet LED. They have 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 electric energy from battery to LED. The LED bulbs will on at nighttime. e) Insect probe trap is used to collectinsects which attract to LED, asshown in

Fig:1Solar light glue trap

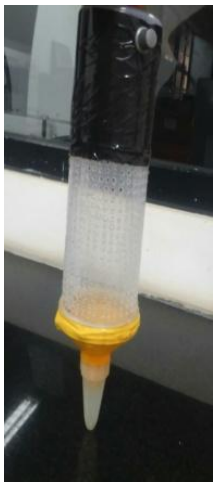
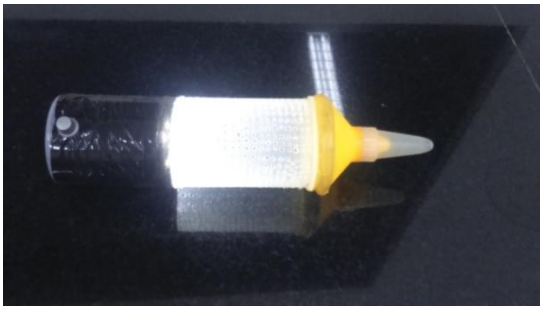


Fig. 2 Solar light glue Trap



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

1. The main structure of Solar Energy-Based Insect probe Trap is made from acrylic for durable using in storage fields. Its height is 60 centimeters

2. On the top of Insect Pest Trap, install the 3 watts solar cells panel, size , 10-15 degrees of elevation angle for solar effective

3. The base of the trap is steel plates to mount the ground
4. The insects tempt consists of 30x40x15 (width x length x thickness) clear acrylic cylindrical box with 2.5 mm holes which can let LED light out of the box
5. Ultraviolet LED. They have 315-400 nm for wavelength is used to attract the insect.

Other stuffs are 1 amps battery charger, 4V Sealed Lead Acid battery, LDR control unit are set in steel box to prevent from any damages.

3.2 EFFECTIVENESS TEST AND RESULT

The technical effectiveness of Solar Energy-Based Insect Probe 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 storage fields to find what types of insect and pest can be trapped.

The operation of the solar light probe trap is very easy. There is a switch above the LED bulb. A person 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 probe trap which is placed under the UV LED.

4.RESULTS AND DISCUSSION

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

The model is very much suitable to the farmers by using new techniques of solar probe trap to be utilized easily at any portion of area of their single or multiple field grains in storage surroundings

[1] 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

[2] Solar light trap model may be utilized at field level learned from the expert farmers for demonstration in any type of field crops.

[3] 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,

[4] 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.

[5] 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.

[6] Amount of current supply to LED found that, the current supply was 1.1 amps; 3 watts, when connected 4 volts battery to UVLED bulbs.

[7] 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 3 volt. When connected solar cells to battery charger, the current 1.2 amps was transferred to battery.

[8]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.

[9] 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%.

[10] 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. 3 Insect and pest trapped in Solar light glue trap

5. CONCLUSION

According to the study of Solar light cum probe 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 probe trap and clear acrylic cylindrical tube with 2.5mm holes. The model was designed and developed in easy way to handle and use the farmers in the storage areas.

- The Solar light probe trap can trap many common insect pests.

- LED bulbs with 4 volts were safer to use more than fluorescent bulbs with 220 volts.

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