

German utility model no. DE202021106758U1

Plant Protection Device Without the Use of Pesticides, Fungicides, Herbicides, Insecticides, and Rodenticides by Combining Various Physical Processes

Description:

Crop losses due to insects, animals, unwanted plants, etc., are a major problem worldwide. To combat this, a vast amount of herbicides (for weeds), insecticides, fungicides (e.g., for scab), rodenticides (against mice and rodents), etc., are used. In organic farming, some but not all pesticides are prohibited. In Germany alone, there are approximately 300 approved active ingredients. The harmful effects on humans from mixtures of pesticides are not well-researched.

Almost all of these agents do not remain solely on the fields but spread through wind and rain into the entire ecosystem. The biodiversity is suffering as a result of these plant protection products. In bodies of water and groundwater, these substances often exceed acceptable limits by several times.

Alternative countermeasures include buffer strips to water bodies, robots, and/or drones that destroy weeds. Beneficial insects are sometimes already being distributed by drones.

There are existing solutions for alternative plant protection, such as:

- CN00020598777U: Greenhouse with gas tanks.
- WO002019142159A1: Gas, liquid, solid, or UV disinfection of sieved soil.
- US020170215351A1: Stationary, closed system.

My invention is based on the further development of plant protection through the combination of various physical processes without using conventional plant protection agents.

The existing solutions fulfill their respective functions but do not have the capabilities of the aforementioned invention.

There is a need for an environmentally friendly, sustainable plant protection method, and the invention described in Claim 1 for a plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides by combining various physical processes meets these requirements.

An Example of Implementation:

Depending on the pest and/or unwanted plant growth and with special consideration for the crop plants and beneficial or protected animals, an "individual" combination of various physical processes is used (according to Claim 2):

- Environmentally friendly gases (4) (e.g., nitrogen N₂ and carbon dioxide CO₂, which should not be released into the atmosphere if possible).
- Smoke/fog/steam (4).
- Electricity in the form of low voltage (6), also through electrodes temporarily inserted into the soil.
- High voltage (6), also through moist air/gas and with conductive grids in the frame/cover.
- UV light, lasers, and/or other electromagnetic waves (7) (use also after image evaluation by a computer).
- Heat (4), also through microwaves (7), cold (e.g., from compressed gas) (4).

As shown in Claim 3, the devices/apparatuses for the various physical processes are installed on a vehicle, which can look like a kind of mobile "plastic tent" (1) (Fig. 1, side view).

According to Claim 4, as an alternative to continuous coverage, special plastic/silicone/rubber or other lamellae can be used to prevent gas leakage, microwave leaks, visual obstruction, etc. If the plant protection unit operates without gas or other volatile substances and there is no other risk to the surroundings (e.g., from UV light), the "plastic tent" can be omitted.

As outlined in Claim 5, whenever the plant protection unit reaches a new target area, it can be lowered and, after exposure of the plants, electrically raised again, e.g., using hydraulics (2), on gear racks, or with a lever/folding mechanism, so that the crops are not damaged. If the crops permit, the mobile unit can operate continuously at a slow pace without stopping. The height adjustability depends on the size of the plants. The wheels can (according to Claim 6) be rotated by 360 degrees on the spot, so any area of a field can be easily reached.

As indicated in Claim 7, the energy-consuming operations are powered either by externally charged batteries or by internally installed photovoltaic/solar cells (3) on the vehicle. The energy supply and control (5) form the core of the plant protection unit (battery, generator, fuel cells, electronics, possibly a compressor, computer, app control, GPS, etc.), as stated in Claim 8.

As mentioned in Claim 9, an optional fertilization can also be performed by the device using a corresponding container, so that no additional vehicle has to travel across the field. Instead of having its own drive, the plant protection unit(s) can also be moved or slowly towed by a tractor or robot (according to Claim 10). If the duration of the different physical processes exceeds the driving time of the tractor, multiple plant protection units can be used simultaneously; for example, with five "tents," the first is placed behind the last, etc. The timing depends on the necessary "exposure duration" of the mainly physical processes.

A crucial aspect is that every use of plant protection unfortunately results in the death of some beneficial insects and animals. The combination of predominantly physical processes aims to minimize this drawback. Therefore, as specified in Claim 11, an additional device to scare away protected animals (8) (loudspeaker, fan, light, etc.) is mounted on the plant protection unit.

Fundamentally, an ideal timing and combination of the various physical processes must be tested and optimized for each situation (crop/pest-weed/protected animals), as outlined in Claim 12.

Reference List:

- (1) Mobile vehicle for plant protection (plant protection device/unit)
- (2) Height-adjustable supports
- (3) Photovoltaics/solar cells
- (4) (Gas) tank with outlet
- (5) Control unit with power supply: battery, generator, fuel cells, electronics, computer, possibly a compressor, etc.
- (6) (High) voltage unit
- (7) UV light and/or laser emitter and/or microwave oscillator
- (8) "Scaring unit" (light, fan, loudspeaker, etc.)

Claims:

1. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides,
characterized by
combining various physical processes tailored to the unwanted plants and pests.
2. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to Claim 1,
characterized by
a combination of environmentally friendly gases, smoke, fog, steam, low voltage electricity (also through electrodes temporarily inserted into the ground), high voltage (also through moist air/gas and with conductive grids in the frame/cover), UV light, laser and/or other electromagnetic waves (use also after image evaluation by a computer), heat (also through microwaves), and cold, adapted to the circumstances.
3. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims,
characterized by
the devices/apparatuses for the various physical processes being installed on a vehicle or frame.
4. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims,
characterized by
continuous coverage or special plastic/silicone/rubber or other lamellae.
5. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims,
characterized by
the plant protection device/unit being height-adjustable electrically with hydraulics, on gear racks, or with a lever/folding mechanism.

6. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims, characterized by wheels that can rotate 360 degrees on the spot.

7. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims, characterized by the energy-consuming operations being powered by externally charged batteries or by internally installed photovoltaic/solar cells on the vehicle.

8. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims, characterized by the energy supply and control of the plant protection device/unit, including batteries, generator, fuel cells, electronics, compressor, computer, app control, GPS.

9. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims, characterized by a corresponding container with fertilizer installed on the plant protection device/unit.

10. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims, characterized by the plant protection device/unit having no own drive but a coupling to a tractor or robot.

11. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims, characterized by a scaring device like loudspeakers, fans, lights, etc., installed on the plant protection device/unit.

12. Plant protection device without the use of pesticides, fungicides, herbicides, insecticides, and rodenticides, according to any of the preceding claims, characterized by
an optimized timing and combination of the various physical processes for each situation (crop/pest-weed/protected animals).

Fig. 1

