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New Drive for Rural Development”

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A New Version of the Prototype for Mechanical Distribution of Beneficials

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Background and objectives

At present, in Italy the predators are released manually in the protected crops. On one hand this method of distribution allows to reduce the number of treatments effected with chemical products, and so the risks for environmental pollution and for workers' safety; on the other hand it requires long time and high costs and does not guarantee an uniform distribution.

In order to solve these difficulties it is necessary to mechanise the distribution of predators; with this aim a prototype was designed and built by the Mechanics Section of the Agricultural Engineering Department of the University of Catania. This prototype uses operating principles which are different from those of other equipment on the market.

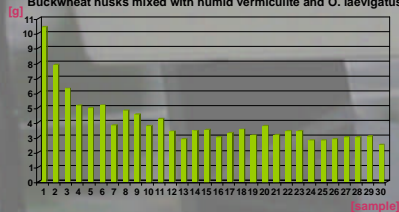
The Laboratory Tests

The tests were run with inert material commonly used for marketing bottles of predators (humid vermiculite and buckwheat husks mixed with humid vermiculite) to evaluate some machine parameters: the throw direction, the quantity distributed, the uniformity of throw in time, the vertical distribution of product at different distributor heights (90 and 130 cm) from the ground and at different distances (40 and 70 cm) from the test bench (150 cm high, 100 cm wide and made up of 10 vessels to recover product at 15 cm separation).

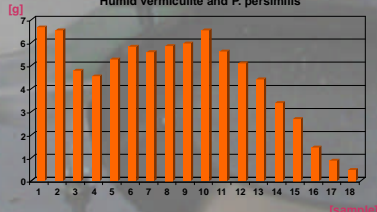
Moreover, experienced entomologists have evaluated throw effects on natural enemies vitality, with samples both from the hopper and from the rotating disc throw.

Results

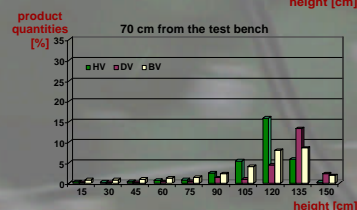
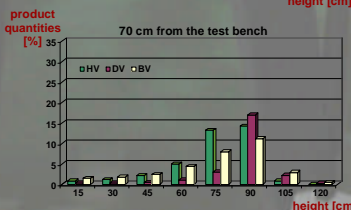
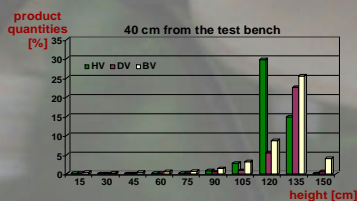
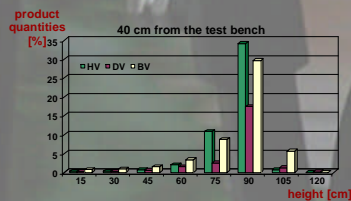
Buckwheat husks mixed with humid vermiculite and *O. laevigatus*



Humid vermiculite and *P. persimilis*



Mean values delivered [g] every 30 s



Product quantities collected [%] in the tests with the prototype 90 cm from the ground

Product quantities collected [%] in the tests with the prototype 130 cm from the ground

Conclusions

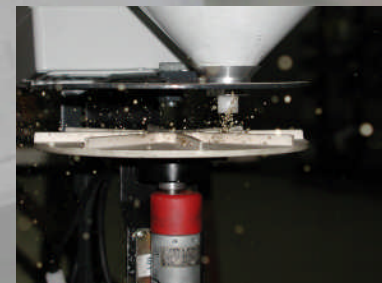
- The dosage and distribution mechanism seem well suited to biological pest control strategies: negligible or absent impact on natural enemies proves prototype efficacy and enables its usage both with technical and economic advantages on manual distribution.
- The vertical distribution of product at different distributor heights and at different distances from the test bench shows a good agreement between prototype and target height.
- With this new version, set on a handle directly carried by the operator, the device performance is improved in manoeuvrability: greater work capacity and higher work quality will be achieved in greenhouses and in field.

The Prototype

The modifies carried out on the new prototype do not have changed its working principle: by means of centrifugal force developed by the rotation of a finned distributor disc.

The arthropods, together with the substrate they are sold, are poured into a hopper placed above the distributor disc and are released down through a calibrated hole.

Both the distributor disc and the measuring device are moved by means two direct-drive electric motor each one connected to the corresponding device. The two devices are fixed to the same frame which can be attached to a portable structure, tractor driven or in greenhouses carried on mechanically driven frames over the crops.



The modifies on the previous prototype have involved:

- the installation of the prototype on a rod carried by a worker in order to improve its manoeuvrability along the inter-rows;
- a cylindrical articulation attached to the frame in order to regulate the inclination with respect to the portable structure and keep it parallel to the ground;
- the distributor disk built with aluminium and greater than the first version (300 mm diameter vs. 200 mm), in order to improve the centrifugal force at the same rotation velocity and the range of the action;
- the hopper has been built with aluminium too, but its volume has been reduced with respect to the first version (1.5 dm³ vs. 2 dm³) in order to lighten it and the exit hole has been increased in order to insert bush with different internal diameter (16÷25 mm) to regulate the amount of product released in the time;
- the measuring device now has a simplified shape to reduce the production costs;
- a shoulder-strap is applied to the rod in order to help the worker to support the prototype;
- an accumulator battery (6 V – 7.2 Ah) is applied at the same rod and a button to operate the electric motors which move the distributor disk and the measuring device.



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