NUMERIC MODEL TO ESTIMATE PESTICIDE DEPOSITION AND LOSSES FROM AERIAL SPRAYING

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ABSTRACT

Pesticides applications have been described by many researchers as a very inefficient process. In some cases, there are reports that only 0.02% of the applied products are used for the effective control of the problem.

The main factor that influences pesticides applications is the droplet size formed on spraying nozzles. Many parameters affects the dynamic of the droplets, like wind, temperature, relative humidity, and others. Small droplets are biologically more active, but they are affected by evaporation and drift. On the other hand, the great droplets don't promote a good distribution of the product on the target. In this sense, associated with the risk of non target areas contamination and with the high costs involved in applications, the knowledge of the droplet size is of fundamental importance in the application technology.

When sophisticated technology for droplets analysis is unavailable, is common the use of artificial targets like water-sensitive paper to sample droplets.

On field sampling, water-sensitive papers are placed on the trials where product will be applied. When droplets impinging on it, the yellow surface of this paper will be stained dark blue, making easy their recognition. Collected droplets on this papers have different kinds of sizes. In this sense, the determination of the droplet size distribution gives a mass distribution of the material and so, the efficience of the application of the product. The stains produced by droplets

shows a spread factor proportional to their respectives initial sizes.

One of methodologies to analysis the droplets is an counting and measure of the droplets made in microscope. The Porton N-GI2 graticule, that shows equaly spaces class intervals on geometric progression of square 2, are coupled to the lens of the microscope.

The droplet size parameters frequently used are the Volumetric Median Diameter (VMD) and the Numeric Median Diameter. On VMD value, a representative droplets sample is divided in two equal parts of volume, in such away one part contains droplets of sizes smaller than VMD and the other part contains droplets of sizes greater that VMD. The same process is done to obtaining the NMD, which divide the sample in two equal parts in relation to the droplets size. The ratio between VMD and NMD allows the droplets uniformity evaluation.

After that, the graphics of accumulated probability of the volume and size droplets are plotted on log scale paper (accumulated probability versus median diameter of each size class). The graphics provides the and the NMD on the x-axes point corresponding to the value of 50% founded on the y-axes. All this process is very slow and subjected to operator error.

So, in order to decrease the difficulty envolved with droplets measuring was developed a numeric model, implemented on easy and accessfull computational language, which allows approximate VMD and NMD values, with good precision. The inputs to this model are the frequences of the droplets sizes colecteds on the water-sensitive paper, observed on the Porton N-Gl2 graticule fitted on microscope. With these data, the accumulated distribution of the droplet medium volumes and sizes are evaluated. The graphics obtained by plotting this distributions allows to obtain the VMD and NMD using linear interpolation, seen that on the middle of the distributions the shape of the curves are linear. These values are essential to evaluate the uniformity of droplets and to estimate the volume deposited on the observed paper by the density (droplets/cm2). This methodology to estimate the droplets volume was developed by 11.0.94.224 Project of the

CNPMA/EMBRAPA. Observed data of herbicides aerial spraying samples, realized by Project on Pelotas/RS county, were used to compare values obtained with manual graphic method and with thouse obtained by numeric model. This model has shown, with great precision, the values of VMD and NMD on each sampled collector, allowing to estimate a quantities of deposited product and, by consequence, the quantities losses by drifty. The graphics of variability of VMD and NMD showed that the quantitie of droplets that reachs the collectors had a short dispersion, while the deposited volume shows a great interval of variation, probably because the strong action of air turbulence on the droplets distribution, enfasizing the necessity of a deeper study to verify this influences on drift.

KEY WORDS: numeric model; pesticides; aerial spraying;