WATER HARDNESS EFFECT ON THE PHYSICAL CHEMICAL CHARACTERISTICS OF WETTABLE POWDER FUNGICIDE

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Introduction: The water withdrawn for preparation of mixture of pesticides used in agriculture in Brazil may have dissolved salts from natural rock and soil or from the application of lime or fertilizer in agriculture. Thus, water hardness may interfere with the effectiveness of the application of some pesticides. In Brazil, the standard water used for physical-chemical tests has a hardness of 20 ppm but this is far from the values registered in different parts of the land. Therefore we compared in this study, the test done with a 20 ppm water (soft water) with a 342 ppm water (hard water). We evaluated the velocity of the wetting of wettable powder formulation. The velocity of wetting can be increased by the choice of the wetting agents which reduces interfacial tension between the particles and water. On the other hand a good suspensibility is obtained by reducing the particle size. Therefore surfactants of the class dispersant are added to the wettable powder formulations to prevent agglomeration of the particles and consequently it decreases the speed of sedimentation, which is a function of particle size. The objective of this study was to evaluate the effect of water hardness in suspensibility, wetting and persistent foaming tests in copper fungicide formulated as a wettable powder.

Material and Methods: The pesticide used was a fungicide copper oxychloride typ, formulated as a wettable powder. Assays were performed according to the methods of the Brazilian Association of Technical Standards (ABNT). The suspensibility (ABNT NBR 13313) is conducted with 2.5 g of the humidified product in water of 20 and 342 ppm at (30 ± 2)°C, homogenized and transferred to a 250 mL beaker. After completing the volume, the capped test tube is inverted 30 times, once every 2 s, and kept immersed until the 250 mL mark in a thermostatic bath (30 ± 1)°C for 30 minutes,. Then, by means of vacuum, the suspension is suctioned until the 25 mL mark and the tenth remained is quantitatively transferred to a porcelain cup previously weighed. The residue is dried in an oven at (40 ± 2)°C to constant weight. The suspensibility is expressed as percentage weight/weight, being the minimum value for fungicides 60% w/w. For the wetting test (ABNT NBR 13245) a 250 mL beaker is filled with standard water (20 and 342 ppm) at (30 ± 2)°C, leaving a space of 2 cm from the top. Without agitation, (1 ± 0.1) grams of sample is added at once to the beaker and the timer is immediately started. The wetting is expressed in seconds, being 1 minute, the maximum allowable limit for complete wetting process of the sample under the absence of lumps on the surface. The presence of a film on their surface is accepted. The assay of persistent foam (NBR ABNT 13451) is carried out in a 250 mL beaker using the recommended maximum dosage for the application of product. The quantity is weighed directly into the cylinder which already contains 200 mL of standard water (20 and 342 ppm), at (30 ± 2)°C. The volume is completed to 250 mL and the capped cylinder is inverted 30 times, once every 2 s, and kept immersed for 5 minutes, to 250 mL mark in a thermostatic bath at (30 ± 1)°C. The result is expressed in centimeters using only whole numbers.

Results: Results indicates the averaged suspensibility carried out with water of 20 ppm $CaCO_3$ being 82% w/w, and that using 342 ppm water was 66% w/w. The variation of the values between 20 ppm and 342 ppm water was significant since according to the law Brazilian the minimum suspensibility for fungicides is 60% w / w.

Conclusion: The results revealed similarity in wetting and persistent foam assays performed with water of 20 and 342 ppm of $CaCO_3$, but the difference was pronounced in suspensibility test between test results obtained with the use of soft water and hard water. Thus, we can make sure about the influence of water hardness on spray application of pesticides and should always observe the physical and chemical characteristics of pesticides and water used in the preparation of spray liquid.