Pesticide Residue Deposits in Crop and Environmental Samples of Rice Field Sprayed using Unmanned Aerial Vehicle

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The application of pesticide using Unmandned Aerial Vehicle (UAV) is gaining impetus across the world and there is a need for assessing its efficacy and spray drift assessment. The study aims to address the knowledge gap in pesticide residue deposit in rice crop ecosystem with UAV application in comparison with conventional spray system. Field experiments were conducted in rice crop to study the initial deposits of the insecticide Fipronils % SC @ 50 g ai/ha applied through UAV in rice crop and also the residues that drift-deposited in field soil and water. Spray was taken during morning hours with the wind speed < 2.5 km/hr. The flight height was 3m, flight velocity was 4m/s and swath width was 3 m. The paddy leaf samples, soil and water were processed and analysed for quantifying the residue deposit of the pesticide using Liquid chromatography coupled with tandem quadrupole Mass spectrometry system. The deposition of Fipronil applied through UAV spray system (with atomizer or jet nozzle) was compared with high volume (knapsack sprayer) and low volume (power sprayer) application. The results revealed that initial deposits of the applied pesticide vary with different spray systems. Residue deposit was higher in UAV spray system than that of high volume spraying. Also, in UAV spray system, application through atomizer nozzle resulted in more initial deposit than with jet nozzle. Efficacy wise UAV performed comparatively better than high and low volume sprayers. Residue deposit was more in top leaves, followed by middle and lower leaves of rice crop. Residues of Fipronil were below detectable limit (0.01 μ g g⁻¹) in soil while detectable residues were found in paddy field water samples (0.01 to 0.033 μ g L^{-1}). The results revealed the suitability of unmanned aerial vehicles in application of pesticides in rice under the tested conditions while cautioning the direct drop-down and drift effect in paddy field water.

Keywords: Fipronil, Initial deposit, Residues, Rice, UAV