Study of chemical behavior and determination of some pesticide residues on grapes

Ehab Mohamed Hassan Abd-El-Raheem

Pesticides occupy a unique position among the many hazardous chemicals that man and animals encounter daily. Pesticides are intentionally introduced into the environment to enhance agricultural production, to reduce pest damage in crops and to control disease vectors. The greatly increased uses of pesticides in agriculture beside their vital role in public health, have introduced a serious and novel hazards to human and their environment.The present study aimed to investigate four principal points as follows:Persistence of lufenuron and penconazole residue on and in grape fruits and grape leaves in open field.Determine the dissipation rate, half-life values T1/2 and pre-harvest interval (PHI) for the tested pesticide.Investigate the impact of some environmental factor i.e., sun light and ultra-violet light on the persistence of tested pesticides.Effect of lufenuron and penconazole pesticides on the chemical constituents of grape leaves and fruits (i.e. protein, carbohydrate and elemental composition).The obtained results could be summarized as follows:Persistence of lufenuron and penconazole in and on grape leaves and fruits:Residue of Lufenuron:Grape FruitsThe initial deposit of Lufenuron on and in grape fruits as determined one hour after application was 1.85 mg kg-1.Residue of lufenuron decreased to 1.75, 1.61, 0.996, 0.695, and 0.23 mg kg-1 with a loss of 4.86, 12.97, 46.16, 62.43, and 87.57% loss of the initial deposits after 1, 2, 3, 7 and 10 days of application, respectively.Samples taken at 14 days after application were free from any detectable residues of lufenuron on and in grape fruits.The results showed that the t1/2 of lufenuron was 2.79 days.The results showed that, lufenuron residues reached a safe level for marketing and human consumption (below the MRL) after 3 days from application.Grape LeavesThe initial deposit of lufenuron on and in grape leaves as determined one hour after application was 4.42 mg kg-1.Residue of lufenuron decreased to 1.99, 1.55, 1.21, 1.14, 0.80, 0.37 and 0.02 mg kg-1 with a loss of 54.98, 64.93, 72.62, 74.21, 81.90, 91.63 and 99.55% of the initial deposits after 1, 2, 3, 7, 10, 14 and 17 days after application, respectively.Samples taken at 21 days after application were free from any detectable residues of lufenuron on and in grape leaves.The results showed that the t1/2 of lufenuron was 2.57 daysThe results showed that lufenuron residues reached a safe level for marketing and human consumption (below the MRL) after 17 days from application.Residue of Penconazole:Grape FruitsThe initial deposit of penconazole on and in grape fruits as determined one hour after application was 1.04 mg kg-1.Residue of penconazole decreased to 0.89, 0.59, 0.53, 0.35, 0.28 and

0.198 mg kg-1 with a loss of 14.42, 43.27, 49.04, 66.35, 73.08 and 80.96% of the initial deposits after 1, 2, 3, 7, 10 and 14 days after application, respectively.Samples taken at 17 days after application were free from any detectable residues of Penconazole on and in grape fruits.The results showed that the t1/2 of penconazole was 1.56 days.The results showed that penconazole residues reached a safe level for marketing and human consumption (below the MRL) after 14 days from application.Grape LeavesThe initial deposit of penconazole on and in grape leaves as determined one hour after application was 3.70 mg kg-1.Residue of penconazole decreased to 2.81, 2.49, 1.82, 1.36, 0.84, 0.47, 0.13 and 0.05 mg kg-1 with a loss of 24.05, 32.70, 50.81, 63.24, 77.30, 87.30, 96.49 and 98.65% of the initial deposits after 1, 2, 3, 7, 10, 14, 17 and 21 days after application, respectively.Samples taken at 21 days after application were free from any detectable residues of penconazole on and in grape leaves.The results showed that the t1/2 of penconazole was 2.34 days.Penconazole residues reached a safe level for marketing and human consumption (below the MRL) after 21 days from application.Effect of some environmental factors on the degradation of lufenuron and penconazole:Effect of UV-rays on the tested pesticidesThe obtained of data demonstrated that the rate of degradation of lufenuron and Penconazole varied according to their chemical structure as well as time of exposure to UV-light, The residues decreased slowly with elapse time of exposure.The percent of loss for -lufenuron and penconazole were 0.29 and 4.41% after one hour of exposure to UV rays. The decomposition percentages of lufenuron slowly increased to 0.67, 1.15, 1.66, 2.57 and 3.79% after 2, 4, 8, 16 and 24 hours of exposure to UV-rays, respectively. While these values were 8.41, 33.47, 42.36, 50.84 and 59.58% when penconazole was exposed to UV-rays for the same periods of exposure, respectively.The results showed that the t1/2 of lufenuron and penconazole were 455.92 and 18.58 hours, respectively.Effect of direct sunlight on the tested pesticidesResults showed that the photodecomposition rate of lufenuron was slower than that of penconazole. In addition, sun light was found to be more effective than UV-light in accelerating the photodecomposition of the tested pesticides.Data showed that the percent of loss for Lufenuron and Penconazole were 0.89 and 23.42 % after one hour of exposure to direct sunlight. The decomposition percentages of lufenuron were slightly increased to 3.46, 4.67, 6.73, 10.8 and 11.09 % after 2, 4, 8, 16 and 24 hours of exposure to direct sunlight. While these values were 38.29, 45.58, 67.82, 97.44 and 99.995 % when penconazole was exposed to direct sunlight for the same periods of exposure respectively.The results showed that the t1/2 of lufenuron and penconazole were 140.57 and 1.84 hours, respectively.The effect of tested pesticides on carbohydrate content in grape fruits and grape leavesData indicated that application of tested pesticides had no any significant effect on total carbohydrate content of grape leaves.Data indicated that the total carbohydrate content in grape fruits decreased significantly by lufenuron insecticide application increased significantly by Penconazole fungicide application.The effect of tested pesticides on total protein content in grape fruits and grape leavesTotal protein content generally was significantly decreased by tested pesticides treatment.