Physical and chemical behaviour of some pesticides applied to some soils

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Results obtained in the present invesUgatlQ1lwill be discussed from the followirlg view po1n.ts;adsorption, d01Ulwardmoveme.ut,1eachabll1t7, persistencean.d metabolism of D1methoate and Fenvaleratepesticides as well as some factors influencingtheir behaviour in differen.t sol1 t7pes.5.1. Adsorption. of Dimethoate an.d Fenva1erate on.cla7 minerals and soils.5.1.1. AdsorptiQll mechanismof D1methoate andFenva1erete:With regard to the effect of time on the adsorptiCll1of Dimethoate 011the different adsorbents IUlder investigation,results show that increas1n.g the time ofcontact between Dimeth08te in solutiQll an.d the adsorbentwas followed by the 1n.crease of the amount adsorbed ofDimeth08te IUlU1 it reached a maximumatter which itin.4icated an equilibrium; the t1llle required to reachequi1ibr~UIDcQlldit iQll was, 25, 25, 20, 15 an.44III1ntJtestor bentOll1te. attapulg1te, ca1careOll8 8011.sandy clay lo~ soil and kaolinite respectively.Concerning the adsorption mechanismof Fenvalerateon different adsorbents under investigation; it reachedits equilibrium conditions in few seconds after contactbetween Fenvalerate and different adsorbents.5·1.2. Effect of Dilllethoate and Fenvalerate concentrationson the rates of their adsorption on differentadsorbents:The amounts of Dimethoate and Fenvalerate adsorbedper gram adsorbent; i.e.; X/mwas increased by increasingthe concentration until it reached maximum.Langmuirequation was used to represent the adsorption ofDimethoate and Fenvalerate, a linear isotherms wereobtained except in case of adsorption of Fenvalerate onattapulgUe SlId sandy c lay loam soil.Freundlich equatiOll fitted the adsorption ofDimethoate and Fenvalerate on all the adsorbants used,i.e., bantonite, kaolinite, attapulgite, sandy clayloam soil and calcareous soil, except in case of highconcentratiQlls of Fenvalerate on attapulBite (morethan 0.004 molar).5.1.3. Effect of adsorbent types on adsorption ofDimet~te and Penyalerate.!rhe effect of adsorbent types on the adsorptiOllof the two pesticides showed that the amount ofadsorbed D1methoatewas as follows::Bentonite> calcareous soil> sendy clay loam soil >attapulgite> Kaol1.nite; while for Penvslerate itw••s: attapulgih > Kaol1.nite> bentonite> calcareoussoil > sandy clay loam soil’5.2. Effect of somefactors on the downwardmovementand leachi.B8 of D1methate and J.i’envslerate 1.nsoils:5.2.1. Dillletho-i1te:5.2.1.1. Effec; at soil tYpe on Dimethoate mobility-!rhe higher binding of Dimethoate was recorded withsandy clay loam soil followed by calcareous soil.!rhe rate at Dimethoate detected on soil wasincreased with depth. !rhe amounts of remained D1methoatein the third layer (10-15 cm) of both sandy clayloam and calcareous sOils>seCOAdlayer (5-10 em»top layer (0-5 cm)’the obtai.lledresults revealed that the greatestdownward movement of Dimethoete occurred withcalcareous soil followed by sandy clay loam soil.5.2.1.2. Effect of Dimethoate concentration on thei.Ilsecticidemobility.The higher the concentration of Dimethoate used,the higher the allloWltsremsined on soil surface andthe higher the downward movement and vice versa.The higher leachability of Dimethoate occurredwith the lowest concentration used.5.2.1.3. ~ffect of water volume on Dimethoate mobility:The higher the volume of water used.” i:he lower thebinding on soil surface occurred, and the higher theamoWlts of Dimethoate removed downward through soilcolumns.The higher the volume of water added.1the higherthe leaohability rate obtai.lled.5.2.2. Fenvalerate:5.2.2.1. Effect of soil type on Fenvalerate mobility:With Fenvalerate, it was completely adsorbed onthe top layer of both so~ clay loam and calcareoussol1s (100%),~ffect of Fenvalerate concentration on theinsecticide mobility.In the three used concen:trraions(0.1, 0.2 and 0.3g),the

binding on the surface of the top layer (0-5 Col)amounted 100%.5.2.2.3. Effect of water volume on Fenvalerste mobilityl iIncreasing the amount of leaching water hed noinfluence on the downward movement of Fenvalerate insoil columns, since 100% of the Fenvalerate remainedon the surface of the top layer.5.3. Persistence of Dimethoate and Fenvalerate in sandyclay loam and calcareous soils under laboratorycondi tions.Concerning the persistence of Dimethoate in thetwo tested soils, results indicated thst degradation incalcareous so11> sandy clay loam so11.The percentage of recovered Dimethoate amounted60.22 and 38.71% for sandy clay loam and calcareoussoils respectively after 120 days.The rate of fenvalerate degradation was higherin calcareous soil tbaa in sandy clay loam soil.IJ1creasing the time of exposure after treatmentincreased the rete of Fenvalerate degradation·5.4.Degradatian products of Dimethoate and Fenvaleratein soils.5.4.1. Preparation and identification of Dimethoatemetabolit es·5.4.1.1. HYdrolysis with aqueous sodium ~ydraxide.Concerning the hydrolysis of Dimethoate using NaOHt4 compounds were appeared in aLC chromatogram at Rt 120,216, 288 and 336 sec. The compound at Rt 336 sec.wasseperated using TIC technique and identified asfollows: the emperical formula was found to be C3H.r0SNtUV spectrum showed maximum absorption at 222 JUD, IRspectrum is involved. The mass spectrum showedmolecular ion at m/e 105, the GLC chromatogrem showedRt at 336 sec.5.4.1.2. Oxidation at room temperature:Cool oxidation product using acidic potassiumpermenganate was identified as follows: elementaryanalysis showed Ct 30.5% ;H, 6.3%; Nt 5.8%; 3,11.0%;Pt 14.4% and 0,32.0%. , UV spectrum showed maxilllUlDabsorption at 242 nm, IR spectrum was envolved andmass spectrum showed molecular ion at lII/e.214.Rt was at 120 sec.5.4.1.3. Hot oxidation:Hot oxidation product using acidic potassiumpermenganate was identified as follows: UV spectrumshowed maximum absorption at 320, 395 and 415 .om,IR spectrum was accomplished , mass spectrum showedmolecular ion (M+) at mle. 184 and GLC showed thatRt was at 288 sec.5.4.2.Degradation products of D1aethoate in sandyclay loam aAd calcareous soils:Dimethoste was metabolised in the two soils to 5compounds at Rt 36,60, 120,216 and 288 aec ,, anothersixth compound wss found in the extraction of thecalcareous soil at Rt 336 sec.4.4.3. Degradation products of Fenvalerate in sandyclay loam and calcareous soils:Fenvalerate was metabolised in sandy clay loam andcalcareous soils to two metabolites at Rt 168 and 456sec.