



Estimation of the movement rate of insecticides three types in different soils.

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Abstract

Present study was carried out in laboratory for estimating movement of three insecticides (Dursban, Karate, DDVP) in three textural different soils there could be reach to ground water and contaminated it. The insecticides motion had been proved via hydraulic conductivity property basis on liquid and soil features. However the soil samples brought from three locations which were (najaf city, kufa city, alzarka village) there classified as:

1st orthids; 2th, 3th torifluents) respectively. Meanwhile soil columns prepared in three replicates to each soil. Then hydraulic conductivity measured with (head constant method) to sandy soil, (variable charge method) to others Dunnett's method to compare of means there were showed in results as:

1- DDVP 2.915 (cm.minut⁻¹) > Karate 2.443 (cm.minut⁻¹) > 1.394 Dursban (cm.minut⁻¹) through sandy soil.

2- Karate 2.801 (cm.minut⁻¹) > DDVP 1.442 (cm.minut⁻¹) > 1.207 (cm.minut⁻¹) Dursban through loamy soil.

3_ DDVP 0.386 (cm.minut⁻¹) > Karate 0.305 (cm.minut⁻¹) > 0.702 (cm.minut⁻¹) Dursban through clay soil.

The point is that DDVP, Karate can access to the ground water in sandy, loamy soils than Dursban but all of those cannot access it in clay soil.

Conclusion

*Using these insecticides is more suitable with heavy soil from soil and water management concept.

** There was no risky of Dursban apply as chemical chlorpyrifos group under recommended doses from plant protection side.

***Relying on first order equation as kinetic way discovered how much is insecticidal residues on soil surface with no additional do.

Key words: hydraulic conductivity, insecticides, kinetics, koc.

Introduction:

The usage of insecticides considers important part of new concept for integrated soil management and it can be used it for several times in the same season so that the soil might be good media to their accumulations with residues. In addition the insecticides potency affected with so many factors such as, insecticides persisting and their potential to reach the ground water might contaminate it related with insecticides chemical composition as active group, persistency duration, solubility beside some soil features which effects on the insecticides motion and stability with (soil texture, cation exchange capacity, organic matter) etc (1), (2).

whatever to estimating the potential of their movement via depending on Hydraulic conductivity(K) and itself depends on both features of soil plus liquid because there was no field method to measure Hydraulic conductivity directly of the insecticides so if it found it needs complex devices with continues spry system for long time (3).

Methods&Material:

The soil samples had been taken from (sandy soil of alnajaf city, loamy soil of alzarka, clay soil of alkufa) there classified as great group of soil(4):

1th orthids;2th,3th torifluents) respectively. in three replicates to each soil. Then Soil samples putted into glassy columns (30cm length*5cm radius)via funnel and rotated to get identical bulk density using filter paper beneath fibril membrane soil particles fall down. Then the samples wetted from down to save soil structure. insecticide conc. Prepared as range (1/4,1/2,1,2) of the recommended dose to through the soil media. Practically HC_1

measured with constant head method to sandy soil by Darcy's law:

$$HC_1 = VL/AT \Delta H$$

Where as:
 ΔH =Hydraulic gradient (cm).

T: time of penetrated water or insecticide solution volume through soil column (minutes).

L: column length (cm).

Meanwhile (K_2) of clay soil determined via variable gradient which as:

$$HC_2 = [2.3aL/A(t_2-t_1)(\log H_1 - \log H_2)]$$

H1, H2 : Hydraulic gradient (cm)values at t_2, t_1 respectively.

A: conductor pipe area, a: the clay soil section area. These methods provided from (5). Withal hydraulic conductivity(HC) into stages:

- i. The first stage should be (wet soils+ insecticides vs. control).
- ii. The second stage should be (dry soils+ insecticides vs. control).

As soon as the results analysis statically with C.R.D design.

In addition first order formula used (13) where as:

$$(\ln C_0 - C_t) = \ln C_0 - kdt$$

C_0 :insecticide conc. at zero time.

C_t : insecticide conc. for any time.

to get (kd)release coefficient that interred to calculate (kco)together into:

$$\text{Soil/sediement} = kco/kd$$

Kd:slope of linear regression of first order equation.

$$Kco = kd * 100 / \% \text{ organic matter}$$

Whenever chemical and physical soil properties determination

According to (5,6).as well as insecticides concentration via di66gitron elvi 675(spectrophotometer).

So as these tables(1,2,3) illustrated as studied features.

Table(1)Insecticides composition

Soils Pesticides	Pesticides conc. In soil sediments (ppm).			Solubility (ppm)	TOC%
	sandy	Loamy	Clay		
DDVP(Heterolicogamphosphate)	11.26	3.10	44.50	750	5
Dursban(chlorpyrifos)	11.73	5.50	95.50	30	1.31
Karate(pyrothriody)	2.96	5.10	5.10	720	15

Table(2) Release& insecticides coefficients

Pesticides Soils	DDVP		Dursban		Karate	
	Kd	Kco	Kd	Kco	Kd	Kco
Sandy	10	21	6	13	75	156
Loamy	5	7	5.5	.27	38.5	50
Clay	3.7	5.6	5	8	28	42

Table(3) soil properties

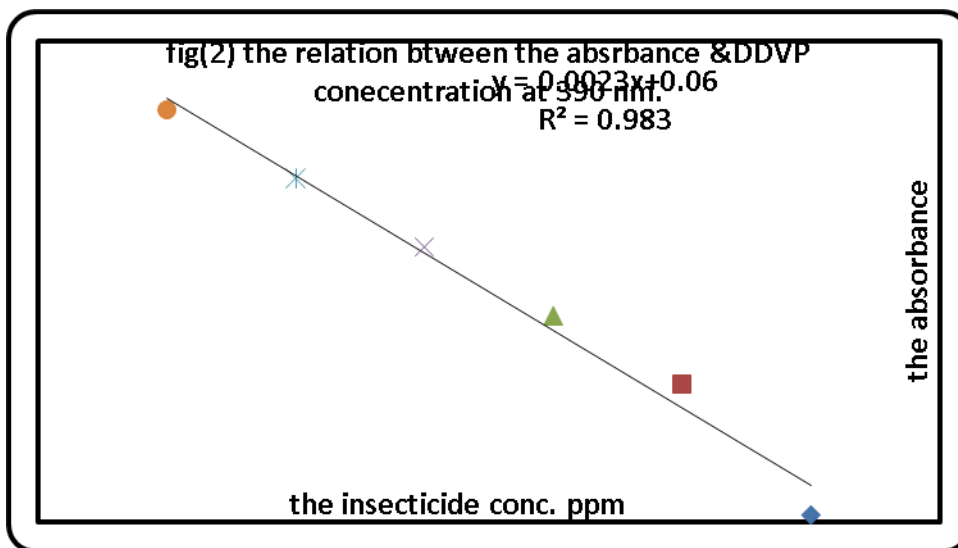
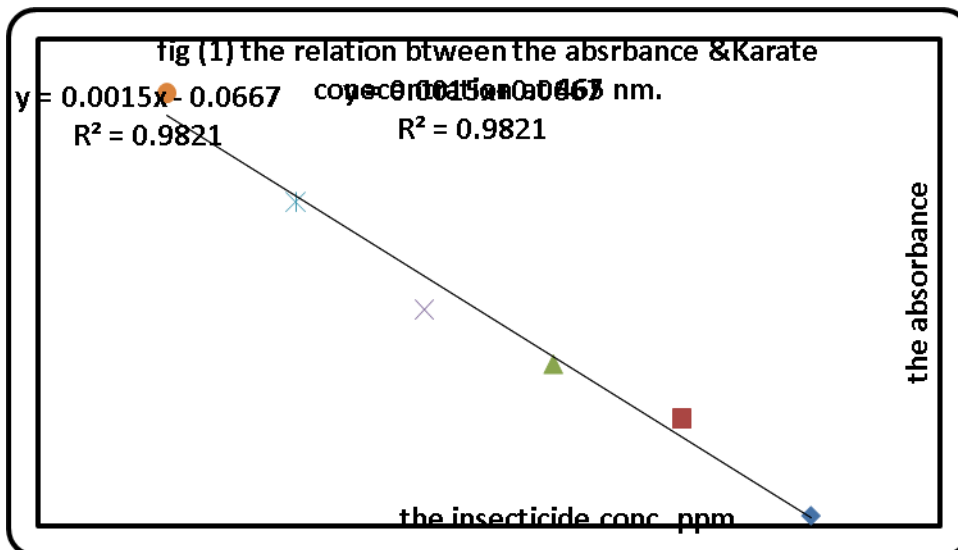
property	Soils types used in study			Units
	alnajaf	alzurkaa	alkufa	
PH	7.45	7.35	7.55	
EC	2.8	3.3	3.00	Dsm ⁻¹
Ca ⁺⁺	12.8	18	15	mmole.l ⁻¹
Mg ⁺⁺	5	16	8	mmole.l ⁻¹
K ⁺	9	0.48	5	mmole.l ⁻¹
Na ⁺	1.2	520.	750.	mmole.l ⁻¹
SO ₄ ⁼	17	17	18	mmole.l ⁻¹
HCO ₃ ⁻	7.5	13.5	9.5	mmole.l ⁻¹
CL ⁻	2.7	2.5	2.5	mmole.l ⁻¹
Sand	728	216	317	gm.kg soil ⁻¹
Silt	142	634	103	gm.kg soil ⁻¹
Clay	130	150	580	gm.kg soil ⁻¹
O.M	4.80	130	13.10	gm.kg soil ⁻¹
CEC	10	14	27.5	C mmole.l ⁻¹
HC	1.73	1.25	0.98	Minut.cm ⁻¹
PB	1.42	1.35	1.35	Mg.m ⁻³
texture	sandy	loamy	clay	

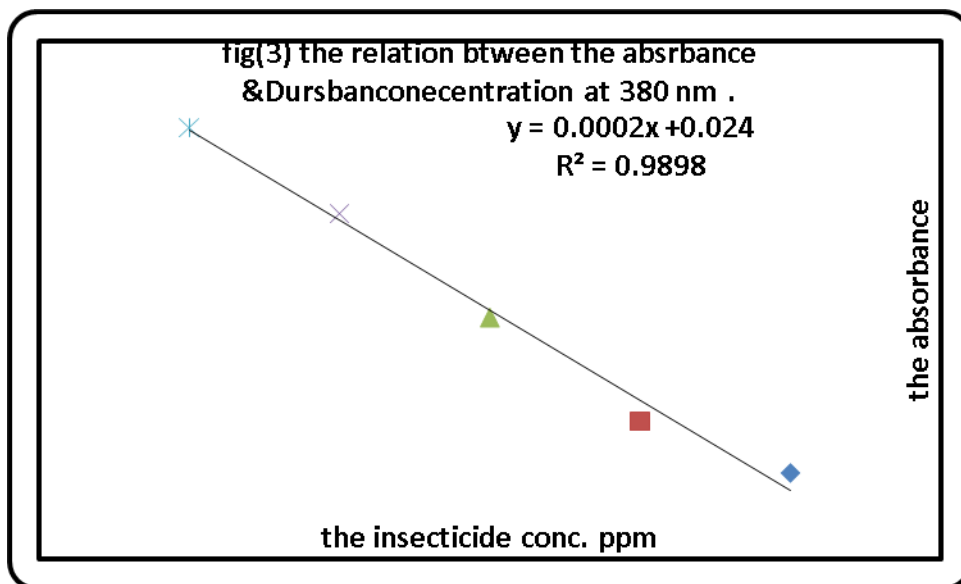
The control treatment included water only.

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Results and discussion

The figures(1,2,3)showed the relation between the absorbance and insecticides concentration with high correlation mean ($r=0.99$) to all of those insecticidal substances that should be subjected to Brent polio law under scanning with uv scale (460,390,380nm) (Karate, DDVP, Dursban)respectively. to attain the peaks of wavelength while treated these as unknown substances.



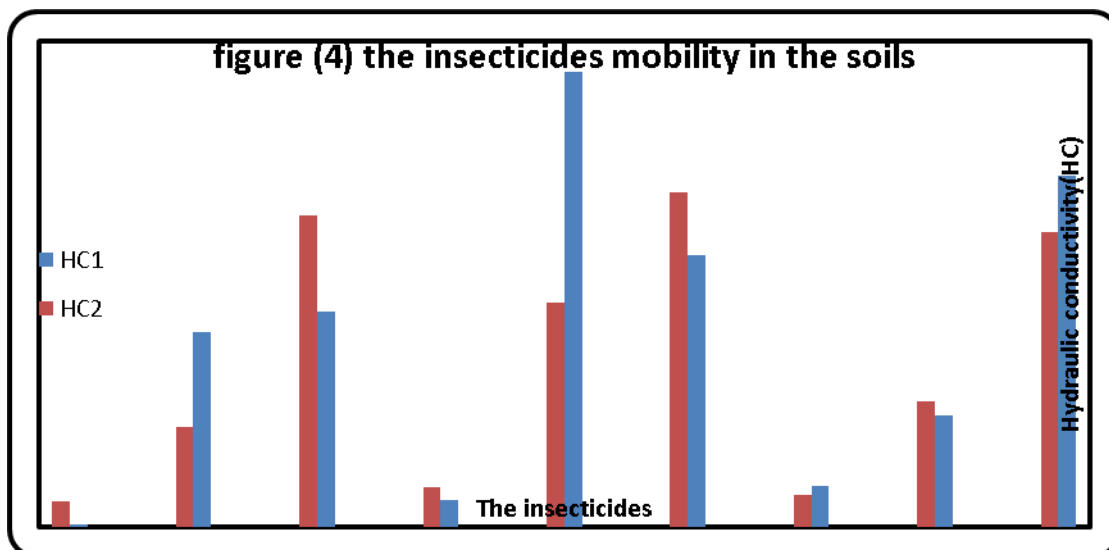


HC₁ registered high values (2.93, 2.24, 1.77) cm.minuts⁻¹ but the highest within HC₂ (2.98, 2.75, 2.65) cm. minuts⁻¹ for three insecticides (DDVP, Karate, Dursban) with significant difference ($D_{0.05}=0.04$) to arrange insecticides mobility as (DDVP > Karate > Dursban) so that conduct of insecticides mobility showed in fig (4).

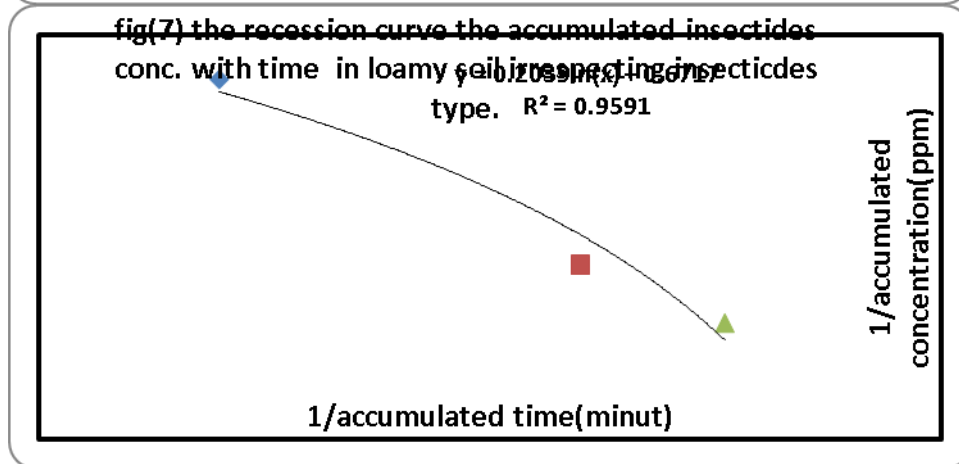
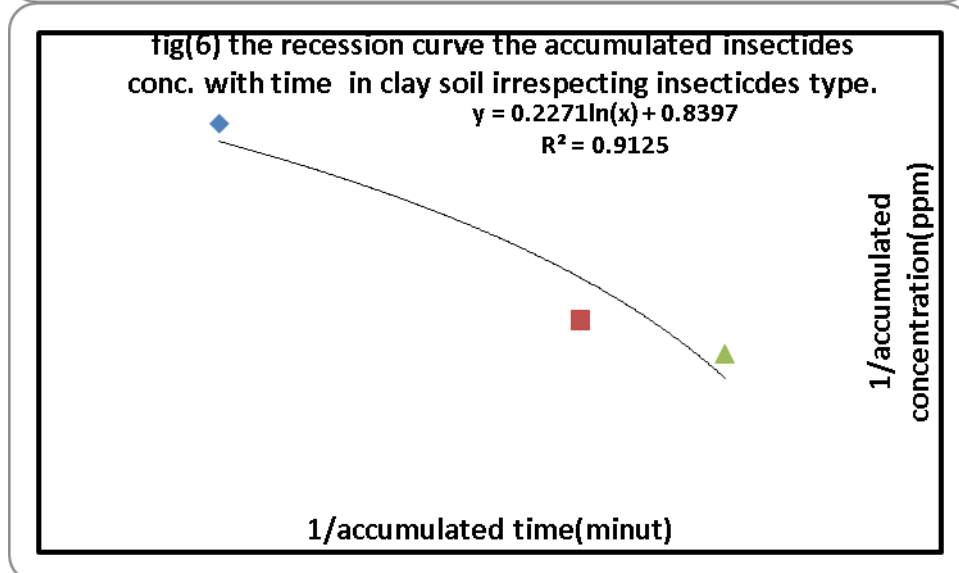
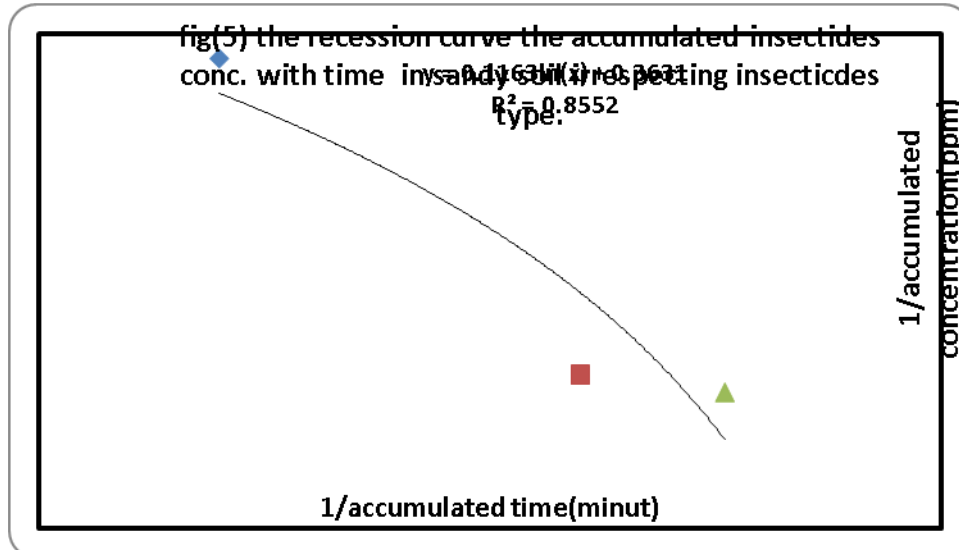
That means all of these insecticides can reach to the water table and contaminated it. whatever the reason related with sandy soil features such as (4.80 gm.kg⁻¹ Organic Matter, 130 gm.kg⁻¹ clay content, 10 c mole. kg⁻¹ soil of cationic exchange capacity) witch slightly absorbed the insecticides and paralyzed their movement as referred to (7) the fate of chemical into environment determinate by characters of soil (clay, sand, organic matter).

Beside the results showed that HC₁ (0.92, 3.75, 1.60) cm.minuts⁻¹ against HC₂ (1.04, 1.85, 0.82) cm.minuts⁻¹ for three insecticides (DDVP, Karate, Dursban) with significant difference ($D_{0.05}=0.06$) to arrange insecticides mobility as (DDVP > Karate > Dursban). otherwise there was no risky because that insecticides couldn't reach to the water ground. The major reason could be rely on features of loamy soil (130 gm.kg⁻¹ O.M, 150 gm.kg⁻¹ clay content, 14 c mole. kg⁻¹ soil) the point is that the high CEC and (ca⁺⁺, mg⁺⁺) cations ratio competed together with insecticides molecules on bonding sites of the exchange complex surface. In general the mobility affected by pesticides sorption, water solubility, vapor pressure, soil properties (organic matter, texture, structure) (8), (9).

So as the results showed in fig (4) that values of HC₁ at (0.344, 0.214, 0.022) cm.minuts⁻¹ compared with HC₂ (0.277, 0.330, 0.120) cm.minuts⁻¹ for three insecticides (DDVP, Karate, Dursban) with significant difference ($D_{0.05}=0.06$) to arrange insecticides mobility as formal frequently (DDVP > Karate > Dursban). Despite of proper features to clay soil (1.50 gm.kg⁻¹ O.M, 580 gm.kg⁻¹ clay content, 27.5 c mole. kg⁻¹ soil) but that wasn't prevent those insecticides to reach the water ground and pollute until lightly grade against other soils because many factors had been affected like chemical composing of insecticides (table 1) and the persistency, the high value of K_h, K_{co} coefficients (10), (11).



In last First order equation had been given clear description showed in figures (5,6,7) illustrated the relation between log of these concentration with total penetrated time to get the concentration at zero time in formula. The slope curves pathway represented the release coefficient (0.116ppm/sec sandy soil), (0.203 ppm/sec loamy soil), (0.227 ppm/sec in clay) In another speech the clay soil had high amount of residues than the others .especially kinetics way opens many horizons to understand this fact(the original = added _ residue) in case of addition chemical substances to the our environment as the modern studies confirm that new thoughts (12),(14).





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