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Monitoring retardation influence on mycoplasma transport in silty formation udi niger delta of Nigeria

Abstract

Retardation phase in transport process was observed to influences the migration process of Mycoplasma in silty deposited formation, the deposition of this contaminant in silty formation experienced higher concentration due to deposited lower porosity and void ratio in the study area, such condition experienced variations in formation characteristics, the deposition of other minerals that will definitely increase Mycoplasma population was considered in the system, the rate of velocity at various strata were also observed as significant parameters in the system, the derived model base on these factors integrated these conditions on the derived solutions, this implies that the system will be monitored in several condition at different phase of the transport system, condition were the microbes may experienced uncomfortable environment were also considered, these are were Mycoplasma may generates degradation, the study is imperative because the behaviour of Mycoplasma has been thoroughly observed, it is through these process that the rate of Mycoplasma can be predicted, experts will definitely produces results applying these concept.

Keywords: monitoring, mycoplasma, retardation transport, silty formation

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Introduction

Grain size, shape, and packing are characteristics of granular porous media that have a significant effect on groundwater flow, affecting both porosity and permeability. Hubbert[1] determined that if uniform spheres are uniformly packed, porosity is not a function of grain diameter but permeability is a function of the square of the grain diameter. However, natural sediment does not consist of uniform grains and packing; it contains mixtures of finer and coarser grains of irregular shapes and complex packing arrangements. Nevertheless, the effects on porosity and permeability when sediment is not uniform in size and packing have been extensively explored but the effects on porosity and permeability when sediment is not uniform in shape needs to be explored further. Laboratory and field experiments have verified that grain size and packing affect porosity and permeability in unconsolidated clastic sediment.[2–4] Research has also been conducted on estimating hydraulic parameters, porosity and permeability, and the sediment parameters, grain size and packing[5] worked to improve the knowledge of these relationships by modifying previous petro physical models to more accurately predict the permeability of sediment mixtures. Kamann[6] expanded on the work of[5] to account for five possible types of packing rather than the two types of packing upon which their fractional packing model was based. He took porosity and permeability.

Measurements on model bimodal sediment mixtures that varied in the volume fraction of finer grains, which he compared with predicted values. In keeping with,[7] Kamann[6] also modeled the porosity and permeability of bimodal sediment mixtures to address the effect of the volume fraction of fines. As the volume fraction of fines increases within a sediment mixture, porosity changes as the packing of the mixture changes. A porosity minimum occurs when the volume of the finer component equals the pore volume of the coarser component. Kamann[6] used spherical grains to model poorly-sorted sands and sandy gravels. Spherical glass beads and marbles were used to represent fine sand, medium sand, coarse sand and pebble grain sizes[7] chose to use spherical grains to eliminate variations in shape. He assumed that the bimodal sediment mixtures of spherical glass beads and marbles provided an approximation of natural sediment. Conrad[8] focused specifically on measurements taken at small support scales using the air-based method of determining permeability on mixtures of spherical grains. He revised the permeability procedures, improved the air-based permeameter correction model developed by Kamann,[7] replicated and improved upon the permeability measurements taken by Kamann,[7] and further confirmed the applicability of the petro physical model for permeability. The research conducted by Koltermann and Gorelick[9,10] explored the effect of grain size and packing on porosity and permeability. The focus of this research will explore the effect of grain size, shape, and packing on porosity and permeability by using bimodal mixtures of natural sediment This study will continue the work of Conrad[8] by replacing spherical glass beads and marbles with natural sand grains and pebbles to reexamine the effect of the volume fraction of fines on porosity and permeability. The goals of this study are to (1) measure porosity and permeability for mixtures of natural sediment that vary by percentages of the volume fraction of finer grains, (2) to evaluate if the model created by Kamann based on spherical grains is accurate for natural sediment grains and (3) to improve the confidence of estimating porosity and permeability.[11]

Soil and groundwater contamination remains a threat to public health and the environment despite decades of research. Numerous remediation technologies including bioremediation, thermal treatment, soil vapor extraction (SVE), zero-valent iron (ZVI), and in situ chemical oxidation (ISCO) have been developed over the past 30 years. Bioremediation is a cost-effective and simple remediation process for the degradation of contaminants such as benzene, toluene, ethylbenzene, and xylenes (BTEX).[12,13] However, bioremediation is constrained by the available microbial community and by its degradation capacity in a given environment.[14] Due to the complexities of extending laboratory results to the field, the actual rate of degradation as a result of bioremediation is slow relative to other treatments and often relies on natural attenuation, where no treatment is applied and the contaminant degrades naturally.[15] Bioremediation, SVE, and ZVI degrade or constrain a narrow range of contaminants and are generally unable to treat sorbed contaminants and dense nonaqueous phase liquids (DNAPLs) due to mass transfer limitations.[16,17] Persulfate is typically activated to promote contaminant degradation.[18,19] The activating agents include: iron-chelated activation,[17] base activation,[15] and organic activation.[19]

Theoretical background

Retardation phase take place in different condition on the monitoring of transport process of contaminant , the study express various rate of retardations from initial concentration at various sources of contaminant in transport process on soil at different depositions, these condition has been the sources to determined various rates of contaminant concentration soil and water environment, such condition were monitored in various strata through other sources of determining concentration in soils, but the retardations factor of soil in different environment generated different concentration , these are base on the rates of depositions including stratifications of the lithology structure in different size that may examined homogeneous or heterogeneous formation in soil, therefore it depends on these characteristics which includes variation of porosity permeability and void ratio deposition, these parameters are significant in the system that will always determined the retardation rates of Mycoplasma in soil formations. The effect of retardation factors depend on these parameters as expressed in the system through the governing equation stated below.

Governing equation

$$R\frac{\partial C}{\partial t} = D\varphi\frac{\partial^2 C}{\partial x^2} - V\frac{\partial C}{\partial x} - \frac{\partial C\mu C}{\partial t} \qquad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The governing equation generated through developed system monitored the effect of retardations on migration rate of Mycoplasma in silty soil formation, the parameter that developed the governing equation express relationship within the stated parameters , these variables were be subjected to derivation considering different condition that the contaminant may experience on the transport process at different phase.

Nomenclature

R = Retardation factor

C = Mycoplasma concentration

D = Hydrodynamic Dispersion (cm^2/m)

V = Steady state ground water velocity (cm^2/mm)

μ = Removal rate of coefficient (c/mm)

T = Time [T]

X = Distance [M]

φ = Porosity [-]

$$R\frac{\partial^2 C_1}{\partial t} = D\varphi\frac{\partial^2 C_1}{\partial x^2} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$t = 0$

$x = 0$

$$C_{(o)} = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$\left.\frac{\partial C}{\partial t}\right|_{t\,=\,0,B} = 0$$

$$R\frac{\partial C_2}{\partial t} = V\frac{\partial C^2}{\partial x} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

$t = 0$

$x = 0$

$$C_{(o)} = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$$\left.\frac{\partial C}{\partial t}\right|_{t\,=\,0,\,B}$$

$$R\frac{\partial C_3}{\partial t} = -\frac{\partial C_3\mu c}{\partial t} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

$t = 0$

$$C_{(o)} = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

$$\left.\frac{\partial C_3}{\partial t}\right|_{t\,=\,0,\,B} = 0$$

$$V\frac{\partial C_4}{\partial x} - \frac{\partial C_4\mu c}{\partial t} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

$x = 0$

$t = 0$

$$C_{(o)} = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

$$\left.\frac{\partial C_4}{\partial x}\right|_{x\,=\,0,\,B} = 0$$

$$D\varphi\frac{\partial^2 C_5}{\partial x^2} - V\frac{\partial C_5}{\partial x} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$x = 0$

$$C_{(o)} = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots (11)$$

$$\left.\frac{\partial C_5}{\partial x}\right|_{x\,=\,0,\,B}$$

Applying direct integration on (2)

$$R\frac{\partial C_1}{\partial t} = D\varphi C + K_1 \qquad \ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Again, integrate equation (12) directly yield

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$$RC = D\varphi Ct + Kt + K_2 \qquad \ldots\ldots\ldots\ldots (13)$$

Subject to equation (3), we have

$$RC_o = K_2 \qquad \ldots\ldots\ldots\ldots (14)$$

And subjecting equation (12) to (3) we have

$$\left.\frac{\partial C_1}{\partial t}\right|_{t=0} = 0 \quad C(o) = Co$$

At Yield

$$0 = D\varphi C_o + K_2$$

$$\Rightarrow R_1 = D\varphi C_o = K_2 \qquad \ldots\ldots\ldots\ldots (15)$$

So that we put (13) and (14) into (13), we have

$$RC_1 = D\varphi C_{1t} - D\varphi Cox\, RCo \qquad \ldots\ldots\ldots\ldots (16)$$

$$RC_1 - D\varphi C_{1x} = RC_o - D\varphi Cox \qquad \ldots\ldots\ldots\ldots (17)$$

$$C_1 = C_o \qquad \ldots\ldots\ldots\ldots (18)$$

Hence equation (18) entails that at any given distance x, we have constant concentration of the contaminant in the system.

$$R\frac{\partial C_2}{\partial t} = -V\frac{\partial C^2}{\partial x} \qquad \ldots\ldots\ldots\ldots (4)$$

We approach the system, by using the Bernoulli's method of separation of variables

$$C_2 = XT \qquad \ldots\ldots\ldots\ldots (19)$$

i.e. $$R\frac{\partial C_2}{\partial t} = XT^1 \qquad \ldots\ldots\ldots\ldots (20)$$

$$V\frac{\partial C_2}{\partial x} = X^1T \qquad \ldots\ldots\ldots\ldots (21)$$

Put (20) and (21) into (19), so that we have

$$RXT^1 = -VX^1T \qquad \ldots\ldots\ldots\ldots (22)$$

i.e. $$R\frac{T^1}{T} = V\frac{X^1}{X} = -\lambda^2 \qquad \ldots\ldots\ldots\ldots (23)$$

Hence $$R\frac{T^1}{T} + \lambda^2 = 0 \qquad \ldots\ldots\ldots\ldots (24)$$

i.e. $$X^1 + \frac{\lambda}{R}x = 0 \qquad \ldots\ldots\ldots\ldots (25)$$

$$VX^1 + \lambda^2 X = 0 \qquad \ldots\ldots\ldots\ldots (26)$$

From(25),

$$X = ACos\frac{\lambda}{R}X + BSin\frac{\lambda}{\sqrt{R}}X \qquad \ldots\ldots\ldots\ldots (27)$$

And (20) gives

$$T = C\ell^{\frac{-\lambda^2}{V}t} \qquad \ldots\ldots\ldots\ldots (28)$$

And (20) gives

$$C_2 = \left(ACos\frac{\lambda}{\sqrt{R}}t + BSin\frac{\lambda}{\sqrt{R}}t\right)C\ell^{\frac{-\lambda^2}{V}x} \qquad \ldots\ldots\ldots (29)$$

The derived model consider retardation factor monitoring it in various rates of concentration at various at different depth in silty formation, the derived model at this stage monitored the system in terms of time through the influences of velocity of flow, this condition establish relationship between both parameter stated in the system, therefore derived model at (29) are developed to monitor the system for such condition.

Subject to equation (29) to conditions in (5), so that we have

$$C_o = AC \qquad \ldots\ldots\ldots\ldots (30)$$

Equation (30) becomes

$$C_2 = C_o\ell^{\frac{-\lambda^2}{V}x}\, Cos\frac{\lambda}{\sqrt{R}}t \qquad \ldots\ldots\ldots\ldots (31)$$

Again, at

$$\left.\frac{\partial C_2}{\partial t}\right|_{t=0,\,B} = 0,\ x = 0$$

Equation (31) becomes

$$\frac{\partial C_2}{\partial t} = \frac{\lambda}{\sqrt{R}}C_o\ell^{\frac{-\lambda}{V}x}\, Sin\frac{\lambda}{\sqrt{R}}t \qquad \ldots\ldots\ldots\ldots (32)$$

i.e. $$0 = -\frac{Co\lambda}{\sqrt{R}}Sin\frac{\lambda}{\sqrt{R}}0$$

$Co\frac{\lambda}{\sqrt{R}} \neq 0$ Considering NKP

Which is the substrate utilization for microbial growth (population) so that

$$0 = Co\frac{\lambda}{\sqrt{R}}\, Sin\frac{\lambda}{\sqrt{R}}B \qquad \ldots\ldots\ldots\ldots (30)$$

$$\Rightarrow \frac{\lambda}{R} = \frac{n\pi}{2}n,1,2,3 \qquad \ldots\ldots\ldots\ldots (34)$$

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$$\Rightarrow \lambda = \frac{\lambda}{R} = \frac{n\pi\sqrt{R}}{2} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(35)$$

So that equation (31) becomes

$$\Rightarrow C_2 = Co\,\ell\,\frac{-n^2\pi^2R}{2}t\,Cos\frac{n\pi\sqrt{R}}{2\sqrt{R}}x \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (36)$$

$$\Rightarrow C_2 = Co\,\ell\,\frac{-n^2\pi^2R}{2}t\,Cos\frac{n\pi}{2}x \qquad \ldots\ldots\ldots\ldots\ldots\ldots (37)$$

The derived model expression at this stage monitored the system considering the deposition of micronutrients that may increase Mycoplasma deposition in silty formation, there is the tendency that the formation characteristics may deposit in very lower condition thus developing accumulation of Mycoplasma in silty deposition, this implies that micronutrients considered in the system will definitely take advantage by increasing its population, the system consider these condition at this stage of the derived model at (37).

Now, we consider equation (7), we have the same similar condition with respect to the behaviour

$$R\frac{\partial C_3}{\partial t} = -\frac{\partial C_3\mu C}{\partial t} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

$$C_3 = XT^1 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (38)$$

$$\frac{\partial C_3}{\partial t} = XT^1 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (39)$$

i.e. $R\frac{\partial C_3}{\partial t} = XT^1$ $\qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (40)$

Put (20) and (21) into (19), so that we have

$$RXT^1 = -XT^1\mu C \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(41)$$

i.e. $R\frac{T^1}{T} = -\frac{T^1}{T}\mu C - \lambda^2$ $\qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (42)$

$$R\frac{T^1}{T} + \lambda^2 = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (43)$$

$$X^1 + -\frac{\lambda}{R}\phi = 0 \qquad \ldots\ldots\ldots\ldots\ldots\ldots(44)$$

And $RT^1 + \lambda^2 t = 0$ $\qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(45)$

From (44), $t = ACos\frac{\lambda}{R}t + BSin\frac{\lambda}{\sqrt{R}}t$ $\qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (46)$

and (39) give

$$T = C\ell\frac{-\lambda^2}{\mu C}t \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (47)$$

By substituting (46) and (47) into (38), we get

$$C_3 = \left(ACos\frac{\lambda}{R}t + BSin\frac{\lambda}{\sqrt{R}}t\right)C\ell\frac{-\lambda^2}{\mu C}t \qquad \ldots\ldots\ldots\ldots\ldots\ldots (48)$$

Similar condition are observed more in derived solution on (48) were retardation factor with respect to time on migration process, thus removal coefficient are considered in the system to determined the rate influences from flow dynamics through the porous medium, the rate migration under the pressure of time through the porous medium were monitored, this expression considered the removal coefficient through the rate of degradation of the contaminant in silty deposition, though some deposition may be considered to accumulate the contaminant due to low void ratio and porosity, therefore these parameters are reflected on the deposition of Mycoplasma in the derived model at (48).

Subject equation (48) to conditions in (7), so that we have

$$Co = AC \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (49)$$

Equation (49) becomes

$$C_3 = Co\,\ell\frac{-\lambda^2}{\mu C}t\,Cos\frac{\lambda}{R}t \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (49)$$

Again, at $\left.\frac{\partial C_3}{\partial t}\right|_{t\,=\,0,B} = 0 \quad t = 0$

Equation (50) becomes

$$\frac{\partial C_3}{\partial t} = \frac{\lambda}{R}Co\,\ell\frac{-\lambda}{\mu C}t\,Sin\frac{\lambda}{R}t \qquad \ldots\ldots\ldots\ldots\ldots\ldots(51)$$

i.e. $0 = Co\frac{\lambda}{R}\,Sin\frac{\lambda}{R}0$

$Co\frac{\lambda}{R} \neq 0$ Considering NKP again

Due to the rate of growth, which is known to be the substrate utilization of the microbes we have

$$0 = -Co\frac{\lambda}{\sqrt{R}}\,Sin\frac{\lambda}{\sqrt{R}}B \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (52)$$

$$\Rightarrow \frac{\lambda}{R} = \frac{n\pi}{2}n,1,2,3 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (53)$$

$$\Rightarrow \lambda = \frac{n\pi\sqrt{R}}{2} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (54)$$

So that equation (50) becomes

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$$C_3 = Co\,\ell\,\frac{-n^2\pi^2 R}{2\mu C}\,t\;Cos\,\frac{n\pi}{2}\,t \qquad \ldots\ldots\ldots\ldots (55)$$

The derived solution continue to see the increase at a serious threat to phreatic beds, therefore the deposition of micronutrient continue to developed significant pressure in the derive solutions, base on this factors, the developed model continue to check the effect from the deposited microelement in silty deposition as it considered more in (55).

Now, we consider equation (8), we have

$$V\,\frac{\partial C_4}{\partial x} - \frac{\partial C_4 \mu C}{\partial t} \qquad \ldots\ldots\ldots\ldots (8)$$

Using Bernoulli's method, we have

$$C_4 = XT \qquad \ldots\ldots\ldots\ldots (56)$$

$$\frac{\partial C_4}{\partial x} = X^1 T \qquad \ldots\ldots\ldots\ldots (57)$$

$$\frac{\partial C_4}{\partial t} = XT^1 \qquad \ldots\ldots\ldots\ldots (58)$$

Put (57) and (58) into (56), so that we have

$$VX^1T = -\,XT^1\mu C \qquad \ldots\ldots\ldots\ldots (59)$$

i.e. $V\,\dfrac{X^1}{X} = -\,\dfrac{T^1}{T}\,\mu C$ ……………………. (60)

$$V\,\frac{X^1}{X} = \phi \qquad \ldots\ldots\ldots\ldots (61)$$

$$\frac{T^1}{T}\,\mu C = \phi \qquad \ldots\ldots\ldots\ldots (62)$$

$$X = A\,\ell\,\frac{\phi}{V}\,t \qquad \ldots\ldots\ldots\ldots (63)$$

Put (62) and (63) into (56), gives

$$C_4 = A\,\ell\,\frac{\phi}{\mu C}\bullet B\,\ell\,\frac{-\phi}{\mu C}\,x \qquad \ldots\ldots\ldots\ldots (64)$$

$$C_4 = AB\,\ell^{(t-x)}\,\frac{\phi}{\mu C} \qquad \ldots\ldots\ldots\ldots (65)$$

Subject equation (66) to (8)

$$C_4\;(o) = Co \qquad \ldots\ldots\ldots\ldots (66)$$

So that equation (67) becomes

$$C_4 = Co\,\ell^{(t-x)}\,\frac{\phi}{\mu C} \qquad \ldots\ldots\ldots\ldots (67)$$

The deposition of Mycoplasma in silty deposition were observed to be exponential phase, therefore the reflection of micronutrient including the lower void ratio and porosity express the exponential rate through the rate of Mycoplasma in silty thus developing exponential concentration in some strata, the derived solution considered the system base on this condition thus develop the derived model considering this phase of the transport system in silty formation

Considering equation (10), we have

$$D\varphi\,\frac{\partial^2 C_5}{\partial x^2} - V\,\frac{\partial C_5}{\partial x} \qquad \ldots\ldots\ldots\ldots (10)$$

$$C_5 = XT \qquad \ldots\ldots\ldots\ldots (68)$$

$$\frac{\partial^2 C_5}{\partial x^2} + X^{11}T \qquad \ldots\ldots\ldots\ldots (69)$$

$$\frac{\partial C_5}{\partial x} + X^1 T \qquad \ldots\ldots\ldots\ldots (70)$$

Put (69) and (70), so that we have

$$D\varphi X^{11}T - VX^1T \qquad \ldots\ldots\ldots\ldots (71)$$

$$D\varphi\,\frac{X^{11}}{X}\,T - V\,\frac{X^1}{X} \qquad \ldots\ldots\ldots\ldots (72)$$

$$D\varphi\,\frac{X^{11}}{X} = \phi \qquad \ldots\ldots\ldots\ldots (73)$$

$$V\frac{X^1}{X} = \varphi \qquad \ldots\ldots\ldots\ldots (74)$$

$$X^1 = A\,\ell\,\frac{\phi}{D\varphi}\,x \qquad \ldots\ldots\ldots\ldots (75)$$

Put (74) and (75) into (68), gives

$$C_5 = A\,\ell\,\frac{\phi}{V}\bullet B\,\ell\,\frac{-\phi}{V}\,x \qquad \ldots\ldots\ldots\ldots (76)$$

$$C_5 = AB\,\ell^{(x-x)}\,\frac{\phi}{V} \qquad \ldots\ldots\ldots\ldots (77)$$

Subject (76) to (10)

$$C_5\;(o) = Co \qquad \ldots\ldots\ldots\ldots (78)$$

So that equation (78) becomes

$$C_5 = Co\,\ell^{(x-x)}\,\frac{\phi}{V} \qquad \ldots\ldots\ldots\ldots (79)$$

The derived model solution at (79) continue to monitor the deposition of the contaminant in exponential phase, this condition are base on the fact that the microbes are found in porous medium where the velocity increase more than other that developed predominant lower porosity and void ratio, the derived model in (79) maintained this condition base on this factors, such expression streamlined the behaviour Mycoplasma in silty deposition thus reflection on the stratification of the formation.

Now, assuming that at the steady flow, there is no NKP for substrate utilization, our concentration here is zero, so that equation (79) becomes

$$C_5 = 0 \qquad \text{..............................(80)}$$

There are some strata that the depositions of substrate are zero, this implies the deposition are Mycoplasma may not increase in population , the microbes may decrease in population through other inhibitions that deposit in the strata, these condition are considered in the study of Mycoplasma in silty deposition as these condition are observed in (80)

$$\text{Therefore; } C_1 + C_2 + C_3 + C_4 + C_5 \qquad \text{......................(81)}$$

We now substitute (18), (37), (55), (67) into (81) so that we have the model of the form

$$C = Co + Co\,\ell\,\frac{-n^2\pi^2 R}{2V}\,x\,Cos\frac{n\pi}{2}\,t \bullet Co\,\ell\,\frac{-n^2\pi^2 R}{2\mu C}\,t\,Cos\frac{n\pi}{2}\,t +$$

$$Co\,\ell^{(t-x)}\frac{\phi}{\mu C} \qquad \text{.......................... (82)}$$

$$\Rightarrow C = Co + 1 + \ell\,\frac{n^2\pi^2 R}{2V}\,x\,Cos\frac{n\pi}{2} \bullet Co\,\ell\,\frac{-n^2\pi^2 R}{2\mu C}\,t\,Cos\frac{n\pi}{2}\,t +$$

$$Co\,\ell^{(t-x)}\frac{\phi}{\mu C} \qquad \text{........................ (83)}$$

The developed governing equation has been derived considering several conditions that were observed to be significant in the system, these condition were expressed on the derived solution in stages, the derived model monitored the deposition of Mycoplasma base on these factors, to ensure that the behaviour of the transport process of the contaminant are thoroughly represented in the derived model solutions, these condition are experiences in all the stages of the derived model in the derived solution. The study has streamlined the transport system through these applications.

Conclusion

The behaviour of Mycoplasma has been monitored through the application of derived model, the study monitor the behaviour of Mycoplasma in silty deposition, retardation factor was significant parameter that were observed to influences the concentration rate of the contaminant in silty deposition, the study monitored the behaviour of Mycoplasma in different strata base on change in depth, but the formation were homogeneous in structure, the system developed to generate the derived solution considered various phase of migration reflection on the formation characteristics such as soil porosity and void ratio, the rate of retardation were monitored base on the influences, micronutrient were considered on the process of the derived expression base on stages where the microbes may experiences increase in population, accumulation of the contaminant were monitored base on lower porosity and void ratio that may be experienced in silty deposition, these implies that the behaviour of Mycoplasma are thoroughly investigated to be monitored in the system, these condition will definitely produced thorough results base on these conceptual application.

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Conflict of interest

The author declares no conflict of interest.

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