International Journal of Emerging Engineering Research and Technology
Volume 8, Issue 5, 2020, PP 27-38
ISSN 2349-4395 (Print) & ISSN 2349-4409 (Online)

Predicting the Transport of Coxella Influenced by Variation of Dispersion and Velocity in Chokocho River

Eluozo, S. N[1*], Ikebude C.F[2]

[1]*Department of Civil Engineering, College of Engineering, Gregory University Uturu Abia, State of Nigeria.*

[2]*Department of Civil Engineering, Faculty of Engineering, University of Port Harcourt, Choba Port Harcourt*

***Corresponding Author:** Eluozo, S. N, Department of Civil Engineering, College of Engineering, Gregory University Uturu Abia, State of Nigeria.*

ABSTRACT

Dispersion and velocity influence were monitored to determine there various rate of impact on the transport process of coxella in Chokocho River. The study examined the influence from these two parameters on the transport process of the contaminant, the velocity of flow were monitored at different conditions that were examined in the River, the study predict the behaviour of the contaminant based on the reflection of the river velocity at various station point of Discharge, this condition were considered in the simulation to determined various rate of velocity impact in the study environment, similar condition were observed in dispersion of the contaminant in the initial concentration of the coxella in the River, the transport process were observed to predominantly influence the variation rates of the contaminant in the River, the system expressed linear increase but comparing at different locations, decrease in concentration were experienced on the rates of concentration, the evaluation of this deposition of coxella at different station point shows the various decrease at different station point, this expression from the simulation predicted various level of predominant pressure at different station of the monitoring transport, the predictive values monitored were compared with experimental data and both parameters developed best fit correlation, the study is imperative because it has predicted various rate of the predominant parameters in the study. The rate of these two parameters in there transport system has thoroughly been evaluated; experts will definitely applied these concept to monitor various predominant parameters effect on the transport of any contaminant in the River environment.

Keywords: *Predicting Transport Coxella, Dispersion, Velocity and River*

INTRODUCTION

Vibrio Cholera from pathogens group of this type of species such causescholera hasinfects several millions of people eachyear (Nelson et al., 2009 Eluozo Afiibor 2018).This was the first instance on recordof the implementation of an appropriate measure to prevent the transmission of water borne pathogens (Colwell, 1996; Okun, 1996Eluozo and Oba 2018). Year past there is an earlystudies carried out, this was applied ageographic techniques to show the spread and epicenter of cholera, this concept resulted in locating acontaminated water body, it was observed to be responsible for spreading the disease.

Water borne diseases such as (i.e., diarrhea, gastro- intestinal illness) are caused by various bacteria, viruses, and protozoa, it is noted that it has various reasons for many of the outbreaks (Craun et al., 2006 Eluozo and Ezeilo 2018). In developing countries like Nigeria such as other Africa nations, waterborne diseases infect millions of people (Fenwick, 2006).Cryptosporadium, E. coli O157:H7, V. cholera, and Salmonella were observed to be the basis for several outbreaks (Craun et al., 2006, Eluozo and Ezeilo 2018a, Eluozo and Ezeilo 2018b, Eluozo and Ezeilo 2018c).

While inthe mid and late 18th century; diseases such as cholera, infectedmillions of people all over the world (Colwell, 1996).In another development, comparatively, there are newer studies carriedout such as Diffey (1991), Brookes et al. (2004Eluozo and Ezeilo 2018d, Jamieson et al.(2004), Gerba and Smith (2005), Gerba and McLeod (1976), John and Rose (2005), Hipseyet al. (2008 Eluozo and Afiibor 2018b,Eluozo and Afiibor 2018a), and Pachepsky and Shelton (2011)] these experts carried out comprehensive reviewed on the present state of art andadvancement in this field, precisely, freshwater and estuarine sediments. However, these reviewed studies developed some knowledge gap in the studies. Besides this, several of the latest reviews are on specific water bodies, examples of these are studies carried out by, John and Rose (2005) focuses on ground water, Brookes (2004), other works carried out focuses on reservoirs and lakes, and Jamieson et al. (2004, Eluozo and Amadi 2019a, Amadi and Eluozo 2019b)while others focuses on agriculture watershed.

Governing Equation

$$Kc\frac{d^2c}{dx^2} + P_bV_s\frac{dc}{dx} - D_sC = 0 \quad (1)$$

$$\frac{d^2c}{dx^2} + \frac{P_bV_s}{Kc} - \frac{dc}{dx} - \frac{D_sC}{Kc} = 0$$

Let $\frac{P_bV_s}{Ks} = R_o$ and $\frac{D_s}{Kc} = A_0$

$$\frac{d^2c}{dx^2} + R_o\frac{dc}{dx} - A_0c = 0 \quad (2)$$

$$C = \ell^{Tx}$$

Such that $\left.\begin{array}{l}\frac{dc}{dx} = T\ell^{Tx} = 0\\ \frac{d^2c}{dx^2} = T^2\ell^{Tx}\end{array}\right\}$ (3)

Substituting equation (3) into (2)

$$T^2\ell^{Tx} + R_0T\ell^{Tx} - A_0\ell^{Tx} = 0 \quad (4)$$

$$\ell^{Tx} \neq 0,\ T^2 + R_0T - A_0 = 0 \quad (5)$$

$$T = \frac{(-R_0) \pm \sqrt{(R_0)^2 - 4x_1 \times -A_0}}{2\times 1}$$

$$T = \frac{-R_0 \pm \sqrt{R_0^{\ 2} + 4A_0}}{2} \quad (6)$$

Where $Ru = \frac{R_bV_s}{Kc}$ and $A_0 = \frac{D_s}{Kc}$

$$T = \frac{-\frac{P_bV_s}{Ks} \pm \sqrt{\left(\frac{P_bV_s}{Kc}\right)^2 + 4\frac{D_s}{Kc}}}{2}$$

From equation (6)

$$T_1 = \frac{-R_0 + \sqrt{R^2 + 4A_0}}{2}$$

$$T_2 = \frac{-R_0 - \sqrt{R_0^{\ 2} + 4A_0}}{2}$$

$$T_2 = \left(\frac{-R_0 - \sqrt{R_0^{\ 2} + 4A_0}}{2}\right)$$

Hence,

$$C[xT] = A\ell^{T_1x} + B\ell^{-T_2x}$$

$$\Rightarrow C[x,T] = A\ell^{T_1x} + B\ell^{-T_2x}$$

Given the initial condition

$$2 = A + B \quad \Rightarrow \quad C = 2 \quad X = 0 \quad (7)$$

$$0 = A \quad \Rightarrow \quad C - 0 \quad X - \infty$$

$$\therefore\ B = 2$$

$$C[x] = 2\ell^{T_2x} \quad (8)$$

Material and Method

Standard laboratory experiment where performed to monitor Coxellausing the standard method for the experiment at different sample at different station, the water sample were collected in sequences base on specification stipulated at different locations, this samples collected at different location generated variations at different distance producing different Coxella concentration through physiochemical analysis, the experimental result were compared with the theoretical values for the validation of the model.

Results and Discussion

Results and discussion are presented in tables including graphical representation for Coxella concentration

Table1.*predictive and Experimental Values of Coxella Concentration at Different Distance*

Distance [M]	Predictive Coxella Conc. [Mg/L]	Experimental Coxella [Conc.] [Mg/L]
2	0.746790879	0.7468
4	1.493581758	1.4936
6	2.240372636	2.3404
8	2.987163515	2.9872

10	3.733954394	3.7343
12	4.480745273	4.4808
14	5.227536152	5.3276
16	5.97432703	5.9744
18	6.721117909	6.7212
20	7.467908788	7.4682
22	8.214699667	8.4148
24	8.961490546	8.9616
26	9.708281424	9.7084
28	10.4550723	10.4552
30	11.20186318	11.2022
32	11.94865406	11.9488
34	12.69544494	12.6956
36	13.44223582	13.4424
38	14.1890267	14.2892
40	14.93581758	14.9361
42	15.68260845	15.6828
44	16.42939933	16.4296
46	17.17619021	17.3764
48	17.92298109	17.9232
50	18.66977197	18.6712
52	19.41656285	19.4168
54	20.16335373	20.3636
56	20.91014461	20.9204
58	21.65693549	21.6572
60	22.40372636	22.4241
62	23.15051724	23.3508
64	23.89730812	23.8976
66	24.644099	24.6444
68	25.39088988	25.4912
70	26.13768076	26.2382
72	26.88447164	26.8848
74	27.63126252	27.6316
78	29.12484427	29.1252
80	29.87163515	29.872
82	30.61842603	30.6188
86	32.11200779	32.1124
88	32.85879867	32.8592
90	33.60558955	33.6063

Table2.*predictive and Experimental Values of Coxella Concentration at Different Distance*

Distance [M]	Predictive Coxella Conc. [Mg/L]	Experimental Coxella [Conc.] [Mg/L]
2	0.45362961	0.4636
4	0.90725922	0.9472
6	1.36088883	1.3708
8	1.81451844	1.8344
10	2.26814805	2.2685
12	2.72177766	2.7416
14	3.17540727	3.1852
16	3.62903688	3.6388
18	4.08266649	4.2824
20	4.5362961	4.536
22	4.98992571	4.9896
24	5.44355532	5.4432
26	5.89718493	5.8968
28	6.35081454	6.3504
30	6.80444415	6.804
32	7.25807376	7.2576
34	7.71170337	7.7112
36	8.16533298	8.1648

38	8.61896259	8.6184
40	9.0725922	9.2272
42	9.52622181	9.5256
44	9.97985142	9.97922
46	10.43348103	10.4328
48	10.88711064	10.8864
50	11.34074025	11.3445
52	11.79436986	11.7936
54	12.24799947	12.2472
56	12.70162908	12.7008
58	13.15525869	13.3544
60	13.6088883	13.6085
62	14.06251791	14.2616
64	14.51614752	14.5152
66	14.96977713	14.9688
68	15.42340674	15.4224
70	15.87703635	15.8763
72	16.33066596	16.3296
74	16.78429557	16.7832
78	17.69155479	17.6904
80	18.1451844	18.144
82	18.59881401	18.5976
86	19.50607323	19.5048
88	19.95970284	19.9584
90	20.41333245	20.412

Table3.*predictive and Experimental Values of Coxella Concentration at Different Distance*

Distance [M]	Predictive Coxella Conc. [Mg/L]	Experimental Coxella [Conc.] [Mg/L]
2	0.275140266	0.2752
4	0.550280532	0.5504
6	0.825420798	0.8256
8	1.100561064	1.2238
10	1.37570133	1.3762
12	1.650841596	1.6512
14	1.925981862	1.9264
16	2.201122128	2.2016
18	2.476262394	2.4768
20	2.75140266	2.7524
22	3.026542926	3.0272
24	3.301683192	3.3024
26	3.576823458	3.5776
28	3.851963724	3.8528
30	4.12710399	4.1283
32	4.402244256	4.4032
34	4.677384522	4.6784
36	4.952524788	4.9536
38	5.227665054	5.2288
40	5.50280532	5.5243
42	5.777945586	5.7792
44	6.053085852	6.0544
46	6.328226118	6.3296
48	6.603366384	6.6048
50	6.87850665	6.8834
52	7.153646916	7.1552
54	7.428787182	7.4304
56	7.703927448	7.7056
58	7.979067714	7.9808
60	8.25420798	8.2562
62	8.529348246	8.5312
64	8.804488512	8.8064

66	9.079628778	9.0816
68	9.354769044	9.3568
70	9.62990931	9.6323
72	9.905049576	9.92722
74	10.18018984	10.1824
78	10.73047037	10.7328
80	11.00561064	11.1182
82	11.28075091	11.2832
86	11.83103144	11.8336
88	12.1061717	12.1088
90	12.38131197	12.384

Table4.*predictive and Experimental Values of Coxella Concentration at Different Distance*

Distance [M]	Predictive Coxella Conc. [Mg/L]	Experimental Coxella [Conc.] [Mg/L]
2	0.16689006	0.1668
4	0.33378012	0.3336
6	0.50067018	0.5004
8	0.66756024	0.6672
10	0.8344503	0.834
12	1.00134036	1.0008
14	1.16823042	1.1676
16	1.33512048	1.3344
18	1.50201054	1.5012
20	1.6689006	1.668
22	1.83579066	1.8348
24	2.00268072	2.0016
26	2.16957078	2.1684
28	2.33646084	2.3352
30	2.5033509	2.502
32	2.67024096	2.6688
34	2.83713102	2.8356
36	3.00402108	3.0024
38	3.17091114	3.1692
40	3.3378012	3.336
42	3.50469126	3.5028
44	3.67158132	3.6696
46	3.83847138	3.8364
48	4.00536144	4.0032
50	4.1722515	4.1734
52	4.33914156	4.3368
54	4.50603162	4.5036
56	4.67292168	4.6704
58	4.83981174	4.8372
60	5.0067018	5.004
62	5.17359186	5.1708
64	5.34048192	5.3376
66	5.50737198	5.5044
68	5.67426204	5.6712
70	5.8411521	5.8382
72	6.00804216	6.0048
74	6.17493222	6.1716
78	6.50871234	6.5052
80	6.6756024	6.6722
82	6.84249246	6.8388
86	7.17627258	7.1724
88	7.34316264	7.3392
90	7.5100527	7.5063

Table5.*predictive and Experimental Values of Coxella Concentration at Different Distance*

Distance [M]	Predictive Coxella Conc. [Mg/L]	Experimental Coxella [Conc.] [Mg/L]
2	0.101218446	0.1012
4	0.202436892	0.2024

6	0.303655338	0.3036
8	0.404873784	0.4048
10	0.50609223	0.506
12	0.607310676	0.6072
14	0.708529122	0.7084
16	0.809747568	0.8096
18	0.910966014	0.9108
20	1.01218446	1.012
22	1.113402906	1.1132
24	1.214621352	1.2144
26	1.315839798	1.3156
28	1.417058244	1.4168
30	1.51827669	1.518
32	1.619495136	1.6192
34	1.720713582	1.7204
36	1.821932028	1.8216
38	1.923150474	1.9228
40	2.02436892	2.024
42	2.125587366	2.1252
44	2.226805812	2.2264
46	2.328024258	2.3276
48	2.429242704	2.4288
50	2.53046115	2.53
52	2.631679596	2.6312
54	2.732898042	2.7324
56	2.834116488	2.8336
58	2.935334934	2.9348
60	3.03655338	3.036
62	3.137771826	3.1372
64	3.238990272	3.2384
66	3.340208718	3.3396
68	3.441427164	3.4408
70	3.54264561	3.542
72	3.643864056	3.6432
74	3.745082502	3.7444
78	3.947519394	3.9468
80	4.04873784	4.048
82	4.149956286	4.1492
86	4.352393178	4.3516
88	4.453611624	4.4528
90	4.55483007	4.554

Table6. *Variation of Predictive Values of Coxella Concentration Values at Different Distance*

Distance [M]	0.02	0.025	0.03	0.035	0.04
2m	0.746790879	0.45362961	0.275140266	0.16689006	0.101218446
4m	1.493581758	0.90725922	0.550280532	0.33378012	0.202436892
6m	2.240372636	1.36088883	0.825420798	0.50067018	0.303655338
8m	2.987163515	1.81451844	1.100561064	0.66756024	0.404873784
10m	3.733954394	2.26814805	1.37570133	0.8344503	0.50609223
12m	4.480745273	2.72177766	1.650841596	1.00134036	0.607310676
14m	5.227536152	3.17540727	1.925981862	1.16823042	0.708529122
16m	5.97432703	3.62903688	2.201122128	1.33512048	0.809747568
18m	6.721117909	4.08266649	2.476262394	1.50201054	0.910966014
20m	7.467908788	4.5362961	2.75140266	1.6689006	1.01218446
22m	8.214699667	4.98992571	3.026542926	1.83579066	1.113402906
24m	8.961490546	5.44355532	3.301683192	2.00268072	1.214621352
26m	9.708281424	5.89718493	3.576823458	2.16957078	1.315839798
28m	10.4550723	6.35081454	3.851963724	2.33646084	1.417058244
30m	11.20186318	6.80444415	4.12710399	2.5033509	1.51827669
32m	11.94865406	7.25807376	4.402244256	2.67024096	1.619495136

34m	12.69544494	7.71170337	4.677384522	2.83713102	1.720713582
36m	13.44223582	8.16533298	4.952524788	3.00402108	1.821932028
38m	14.1890267	8.61896259	5.227665054	3.17091114	1.923150474
40m	14.93581758	9.0725922	5.50280532	3.3378012	2.02436892
42m	15.68260845	9.52622181	5.777945586	3.50469126	2.125587366
44m	16.42939933	9.97985142	6.053085852	3.67158132	2.226805812
46m	17.17619021	10.43348103	6.328226118	3.83847138	2.328024258
48m	17.92298109	10.88711064	6.603366384	4.00536144	2.429242704
50m	18.66977197	11.34074025	6.87850665	4.1722515	2.53046115
52m	19.41656285	11.79436986	7.153646916	4.33914156	2.631679596
54m	20.16335373	12.24799947	7.428787182	4.50603162	2.732898042
56m	20.91014461	12.70162908	7.703927448	4.67292168	2.834116488
58m	21.65693549	13.15525869	7.979067714	4.83981174	2.935334934
60m	22.40372636	13.6088883	8.25420798	5.0067018	3.03655338
62m	23.15051724	14.06251791	8.529348246	5.17359186	3.137771826
64m	23.89730812	14.51614752	8.804488512	5.34048192	3.238990272
66m	24.644099	14.96977713	9.079628778	5.50737198	3.340208718
68m	25.39088988	15.42340674	9.354769044	5.67426204	3.441427164
70m	26.13768076	15.87703635	9.62990931	5.8411521	3.54264561
72m	26.88447164	16.33066596	9.905049576	6.00804216	3.643864056
74m	27.63126252	16.78429557	10.18018984	6.17493222	3.745082502
78m	29.12484427	17.69155479	10.73047037	6.50871234	3.947519394
80m	29.87163515	18.1451844	11.00561064	6.6756024	4.04873784
82m	30.61842603	18.59881401	11.28075091	6.84249246	4.149956286
86m	32.11200779	19.50607323	11.83103144	7.17627258	4.352393178
88m	32.85879867	19.95970284	12.1061717	7.34316264	4.453611624
90m	33.60558955	20.41333245	12.38131197	7.5100527	4.55483007

Table7. *Variation of Predictive Values of Coxella Concentration Values at Different Distance*

Distance [M]	0.02	0.025	0.03	0.035	0.04
2m	0.7468	0.4636	0.2752	0.1668	0.1012
4m	1.4936	0.9472	0.5504	0.3336	0.2024
6m	2.3404	1.3708	0.8256	0.5004	0.3036
8m	2.9872	1.8344	1.2238	0.6672	0.4048
10m	3.7343	2.2685	1.3762	0.834	0.506
12m	4.4808	2.7416	1.6512	1.0008	0.6072
14m	5.3276	3.1852	1.9264	1.1676	0.7084
16m	5.9744	3.6388	2.2016	1.3344	0.8096
18m	6.7212	4.2824	2.4768	1.5012	0.9108
20m	7.4682	4.536	2.7524	1.668	1.012
22m	8.4148	4.9896	3.0272	1.8348	1.1132
24m	8.9616	5.4432	3.3024	2.0016	1.2144
26m	9.7084	5.8968	3.5776	2.1684	1.3156
28m	10.4552	6.3504	3.8528	2.3352	1.4168
30m	11.2022	6.804	4.1283	2.502	1.518
32m	11.9488	7.2576	4.4032	2.6688	1.6192
34m	12.6956	7.7112	4.6784	2.8356	1.7204
36m	13.4424	8.1648	4.9536	3.0024	1.8216
38m	14.2892	8.6184	5.2288	3.1692	1.9228
40m	14.9361	9.2272	5.5243	3.336	2.024
42m	15.6828	9.5256	5.7792	3.5028	2.1252
44m	16.4296	9.97922	6.0544	3.6696	2.2264
46m	17.3764	10.4328	6.3296	3.8364	2.3276
48m	17.9232	10.8864	6.6048	4.0032	2.4288
50m	18.6712	11.3445	6.8834	4.1734	2.53
52m	19.4168	11.7936	7.1552	4.3368	2.6312
54m	20.3636	12.2472	7.4304	4.5036	2.7324
56m	20.9204	12.7008	7.7056	4.6704	2.8336
58m	21.6572	13.3544	7.9808	4.8372	2.9348
60m	22.4241	13.6085	8.2562	5.004	3.036

62m	23.3508	14.2616	8.5312	5.1708	3.1372
64m	23.8976	14.5152	8.8064	5.3376	3.2384
66m	24.6444	14.9688	9.0816	5.5044	3.3396
68m	25.4912	15.4224	9.3568	5.6712	3.4408
70m	26.2382	15.8763	9.6323	5.8382	3.542
72m	26.8848	16.3296	9.92722	6.0048	3.6432
74m	27.6316	16.7832	10.1824	6.1716	3.7444
78m	29.1252	17.6904	10.7328	6.5052	3.9468
80m	29.872	18.144	11.1182	6.6722	4.048
82m	30.6188	18.5976	11.2832	6.8388	4.1492
86m	32.1124	19.5048	11.8336	7.1724	4.3516
88m	32.8592	19.9584	12.1088	7.3392	4.4528
90m	33.6063	20.412	12.384	7.5063	4.554

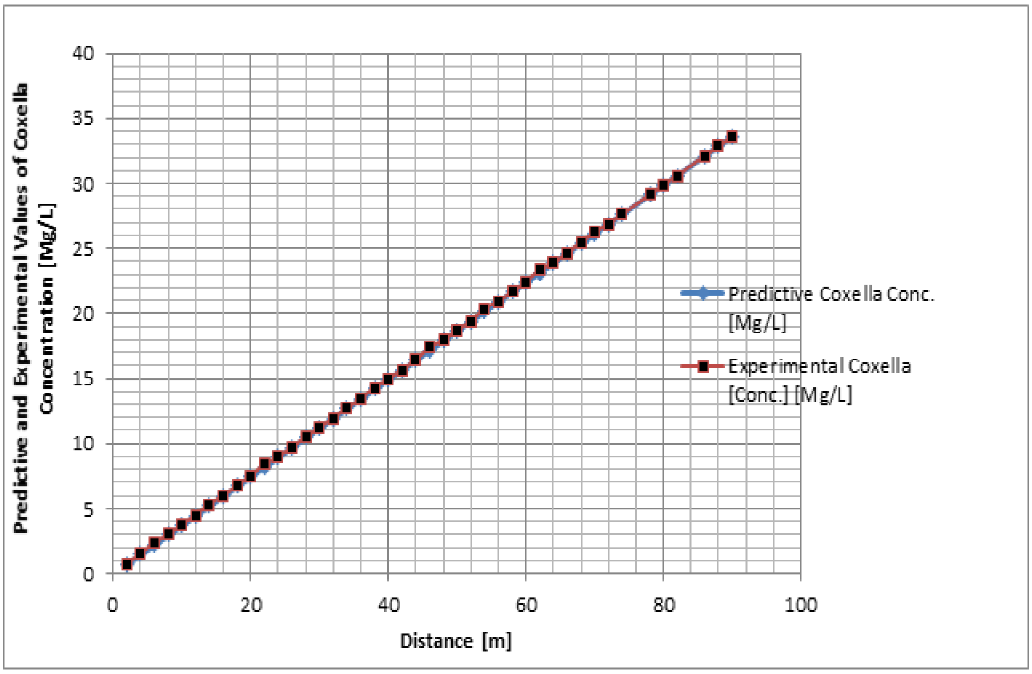

Figure1. *predictive and Experimental Values of Coxella Concentration at Different Distance*

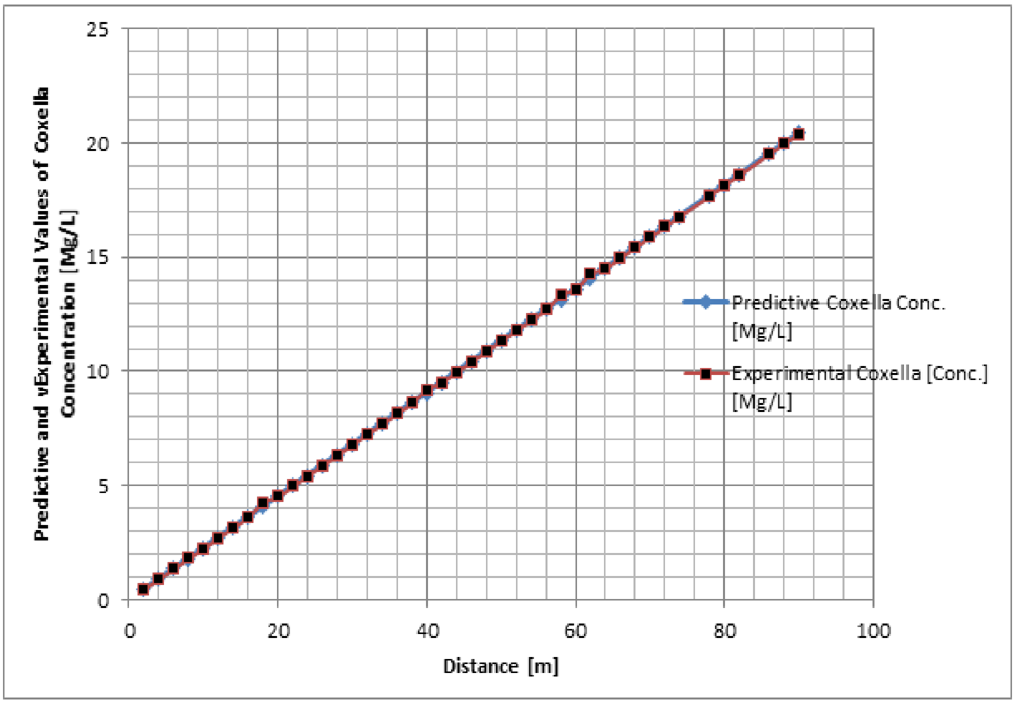

Figure2. *predictive and Experimental Values of Coxella Concentration at Different Distance*

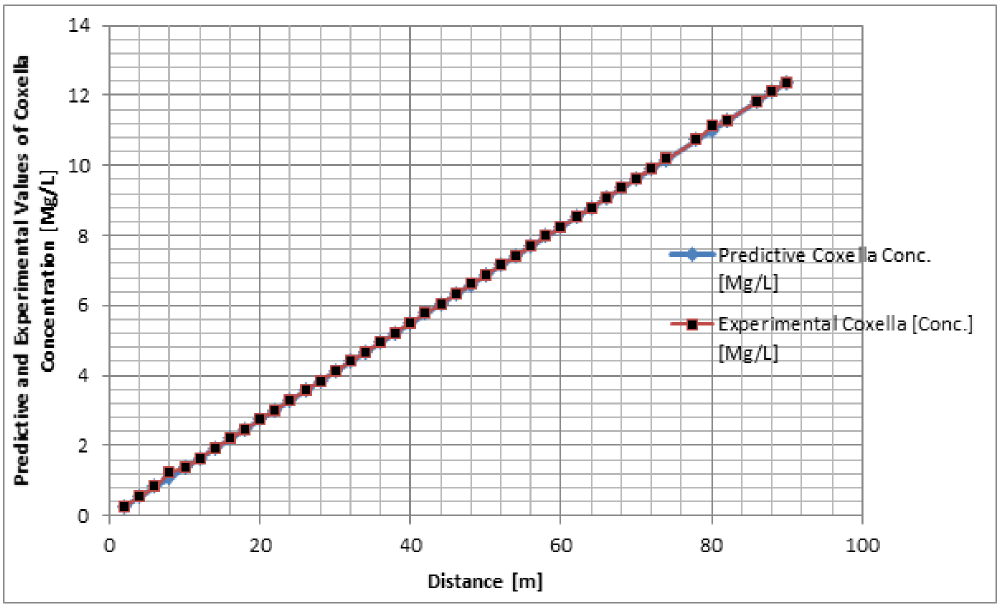

Figure3. *predictive and Experimental Values of Coxella Concentration at Different Distance*

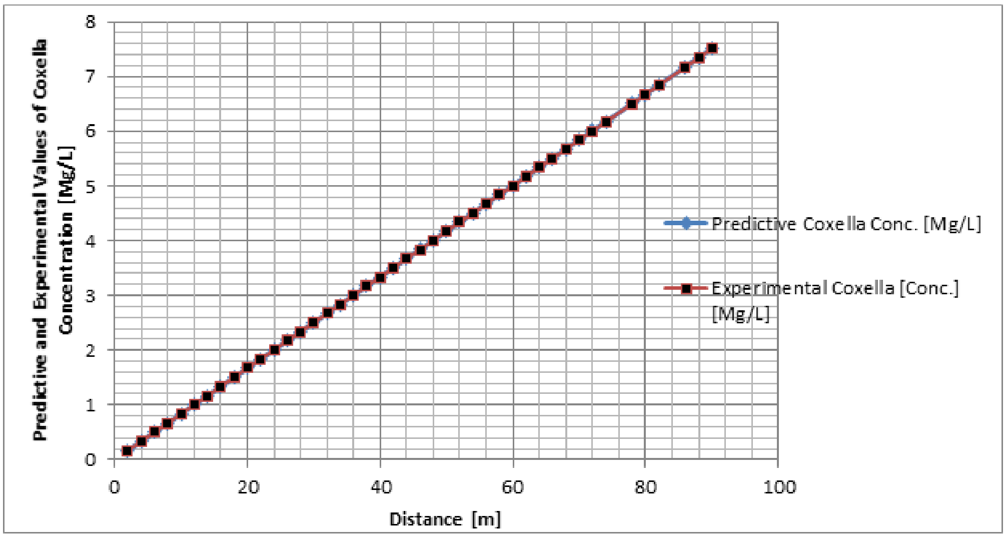

Figure4.*predictive and Experimental Values of Coxella Concentration at Different Distance*

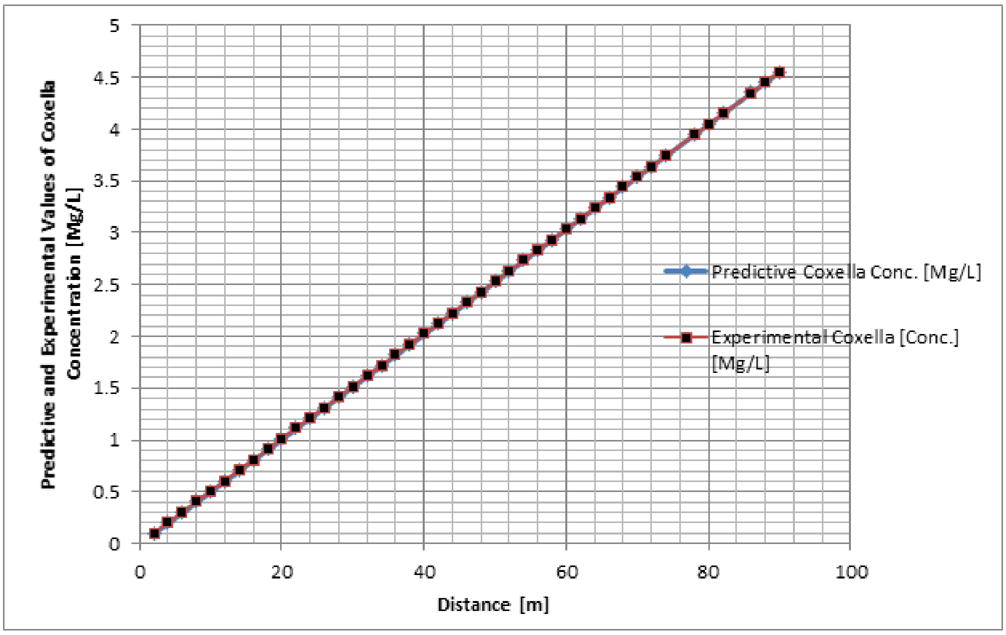

Figure5. *predictive and Experimental Values of Coxella Concentration at Different Distance*

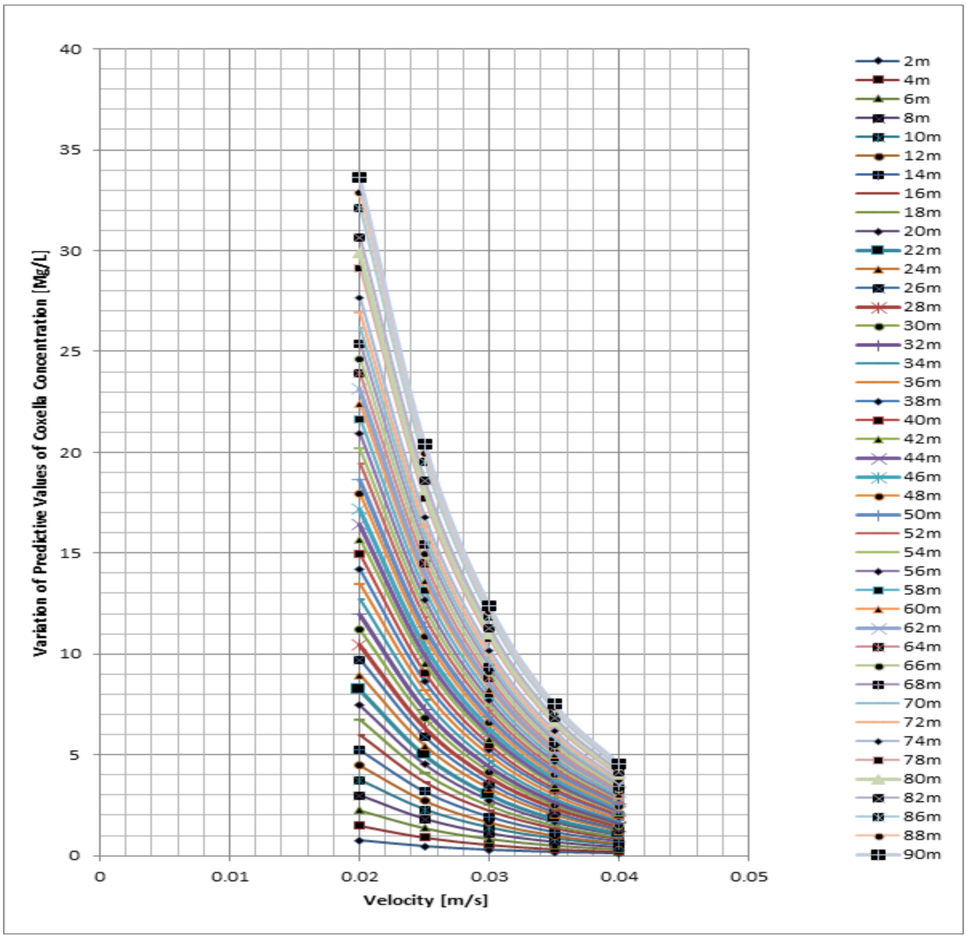

Figure6. *Variation of Predictive Values of Coxella Concentration Values at Different Distance*

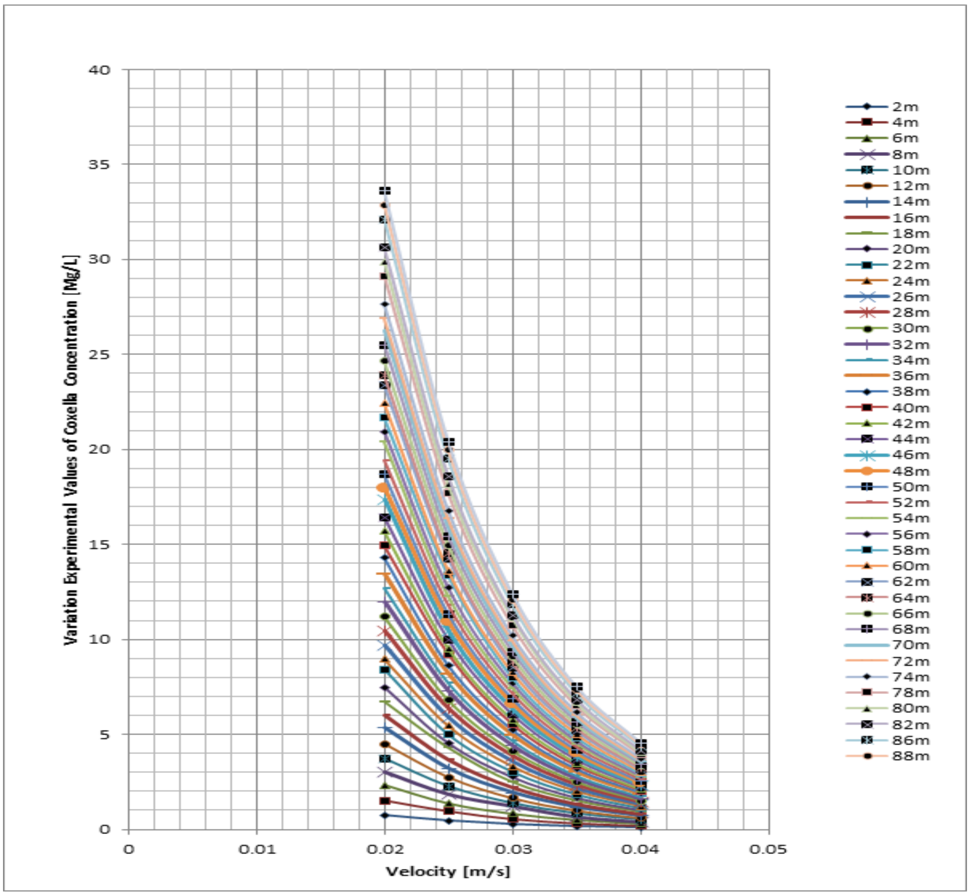

Figure7. *Variation of Predictive Values of Coxella Concentration Values at Different Distance*

Figure one to five explained linear growth rate of the concentration to the optimum values recorded at ninety metres, the transport of the contaminant maintained homogeneous migration to optimum rate recorded at ninety metre distance. The velocity of flow from initial point of discharge expressed the reflection of homogeneous velocity impact on the transport of the contaminant, the linear migration of the contaminant experienced the impact of the velocity deposition of the River, such condition were monitored on the dispersion rate of the contaminant in terms of its rate of spreads at the initial point of discharge, the study monitor the behaviour of the contaminant in that direction, it was observed from the trend that the transport system reflected the dispersion rates at different station point on the validated parameter, these in the same vein reflected on the predictive values, the trend from the graphical representation shows the total reflection of both parameters influencing the migration of the microbes in the River, exponential growth rate were experienced in different figures based on the variation of these parameters considered in the simulation, but figure six and seven that combined the figures displayed the decrease in concentration with respect to its variations at different stations, this implies that the concentration experienced decrease at different stations point of discharge, although linear increase were observed at individual monitoring point, while the graphical representation experienced exponential growth rate, but the combination of the parameters against variation of velocities impact of on the concentration has expresses the total behaviour of the contaminant in the transport process of the microbes, the predictive values from figure one to five were subjected to validation, and both parameters developed best fits correlation, the study has expressed variations of its monitoring of two influential parameters that were observed to pressure the behaviour of coxella in the study area.

CONCLUSION

The study has monitor the transport system of the contaminant in the rivers based on two factors, these two condition were observed to determined the migration rate of the contaminant in the study environment, the dispersion of the contaminant considered in the transport process were to determined the level of spread at initial point of discharge in different station within the study area. while similar conditions observed were carried out in the velocity of flow at the River, this two parameters was monitored at various station point,the impact of these two parameters were imperative, because the study predicted the two parameters to influence the rate of concentration at different station point of the River Variation of concentration were observed that experienced linear increase at different station, the concentration experienced declined at the observed distance, the observation between the concentration and the variation of velocity at different simulation in various station, experienced the decrease in concentration, these implies the contaminant at various station predominantly experienced decrease with respect to different station within the River, the impact of dispersions and velocity of flows has been expressed from the study, there variation impact on the migration rates of the contaminant has been determined, the derived modeling simulation has explained the relevant of the two parameters thus the impact on the transport process in the River.

REFERENCE

[1] Brookes, J.D., Antenucci, J., Hipsey, M., Burch, M.D., Ashbolt, N.J. and Ferguson, C. (2004) Fate and transport of pathogens in lakes and reservoirs. Environment International 30(5), 741-759.

[2] Colwell, R.R. (1996) Global climate and infectious disease: The Cholera Paradigm. Science 274 (5295), 2025-2031.

[3] Craun, G.F., Fraun, M.F., Calderon, R.L. and Beach, M.J. (2006) Waterborne outbreaks reported in the United States. Journal of Water and Health 4, 19-30.

[4] Diffey, B.L. (1991) Solar Ultraviolet-Radiation Effects on Biological-Systems. Physics in Medicine and Biology 36(3), 299-328.

[5] Eluozo S.N, Ezeilo F. E. Numerical Modeling of Nocardia Migration Influenced Transport Pressured by Dispersion and Velocity in Fine Sand Formation in Wetland Environment, *Journal of Water Resources Engineering and Management 2018 Vol. 5 Issue 1 Pp,25-32*

[6] Eluozo S.N, Ezeilo F. E. Modeling Heterogeneous Porosity in Alluvia Plain Deposition in Deltaic Formation; *Recent Trend in Civil Engineering & Technology 2018.Vol, 8 Issues (2): Pp1-10.*

[7] Ezeilo F.E, Eluozo S.N. Dispersion and Storage Coefficient Influences on Accumulation of Frankia Transport in Heterogeneous Silty and Fine Sand Formation, Warri Delta State of Nigeria*; International Journal of Mechanical and Civil Engineering Vol. 4 Issue 4 April 2018Pp. 1-16.*

[8] Eluozo S.N, Amadi C.P, Modeling and Simulation of Legionella Transport Influenced by Heterogeneous Velocity in Stream. *Journal of Water Resource Engineering and Management. 2019; 6 (2):25– 31P*

[9] Eluozo S.N, Amadi C.P, velocity and Oxygen Deficit Influence on the TransportofFrancisela in Eleme Creek. *Journal of Water Resource Engineering and Management*. 2019; 6(2):43–48p

[10] Eluozo. S. N, Afiibor. B.B. *Mathematical Model to Monitor the Transport of Bordetella Influenced by Heterogeneous Porosity in Homogeneous Gravel Depositions Journal of Geotechnical Engineering Vol. 6, No 1 (2019)*

[11] Ezeilo F.E, Eluozo S.N. Linear Phase Velocity Effect on Accumulation of Zinc in Homogeneous Fine Sand Applying Predictive Model, *International Journal of Mechanical and Civil Engineering Vol. 4 Issue 4 April 2018Pp. 17-32.*

[12] Eluozo S.N, Ezeilo F. E. Predicting the Behaviour of Borrelia in Homogeneous Fine Sand in Coastal Area of Bakana*Recent Trend in Civil Engineering & Technology 2018.Vol, 8 Issue (2): Pp1-19.*

[13] Eluozo S.N, Oba A.L Modeling and simulation of cadmium transport influenced by high degree of saturation and porosity on homogeneous coarse depositions MOJ Civil Engineering Vol. 4 issue 4.2018

[14] Eluozo SN, Afiibor B.B. Dispersion and dynamics influences from phosphorus deposition on e-coli transport in coastal deltaic Lake, MOJ Applied Bionics and biomechanics 2018 Vol. 2 Issue 5

[15] Eluozo S.N, Oba A.L Predicting heterogeneous permeability coefficient pressured by heterogeneous seepage on coarse deposition MOJ Civil Engineering Vol. 4 issue 4.2018

[16] Fenwick, A. (2006) Waterborne Infectious Diseases-Could they be consigned to History? Science. 313, 1077-1081.

[17] Gerba, C.P. and Smith, J. (2005) Sources of pathogenic microorganisms and their fate during and application of wastes. Journal of Environmental Quality 34, 42–48.

[18] John, D.E. and Rose, J.B. (2005) Review of factors affecting microbial survival in groundwater. Environment Science & Technology 39(19), 7345-7356.

[19] Jamieson, R., Gordon, R., Sharples, K., Stratton, G. and Madani, A. (2002) Movement and persistence of fecal bacteria in agricultural soils and subsurface drainage water. Canadian Biosystems Engineering 44, 6.1–6.10.

[20] Nelson, E.J., Harris, J.B., Glenn Morris, J., Calderwood, S.B. and Camilli, A. (2009) Cholera transmission: the host, pathogen and Bacteriophage dynamic. Nature Reviews Micro-biology 7(10), 693-702.

[21] Okun, D.A. (1996) From cholera to cancer to cryptosporidiosis. Journal of Environmental Engineering 122(6), 453-458.

[22] Pachepsky, Y.A. and Shelton, D.R. (2011) *Escherichia coli* and fecal coliforms in fresh water and estuarine sediments. Critical Reviews in Environmental Science Technology. 41(12), 1067-1110.

[23] Pandey P. K. 2012 Modeling In- Stream Escherichia coli Concentrations Graduate Dissertation Iowastate university pp62-75.

Citation: *Eluozo, S. N, Ikebude C.F,"Predicting the Transport of Coxella Influenced by Variation of Dispersion and Velocity in Chokocho River", International Journal of Emerging Engineering Research and Technology, 8(5), 2020, pp. 27-38.*