

CHAPTER 6: RESULTS

This Chapter presents the results obtained by applying the methods described in Chapter 5, Materials and Methods. One hundred and fifty Growth Curves from OD-600 data were generated at 72 non-eclipse Times of Flask Inoculation (TOFIs) and 30 eclipse TOFIs, analyzed separately. The first set included 120 growth curves: 29 singles, 38 doubles, and 5 triples, set out in Table 6.3, showing numbers of growth curves for TOFIs on given dates. To explain for 48 extra growth curves in the total 150: At 72 TOFIs, 120 growth curves are generated (figure 6.1) which gives 38 extras from 38 doubles, and 10 extras from 5 triples.

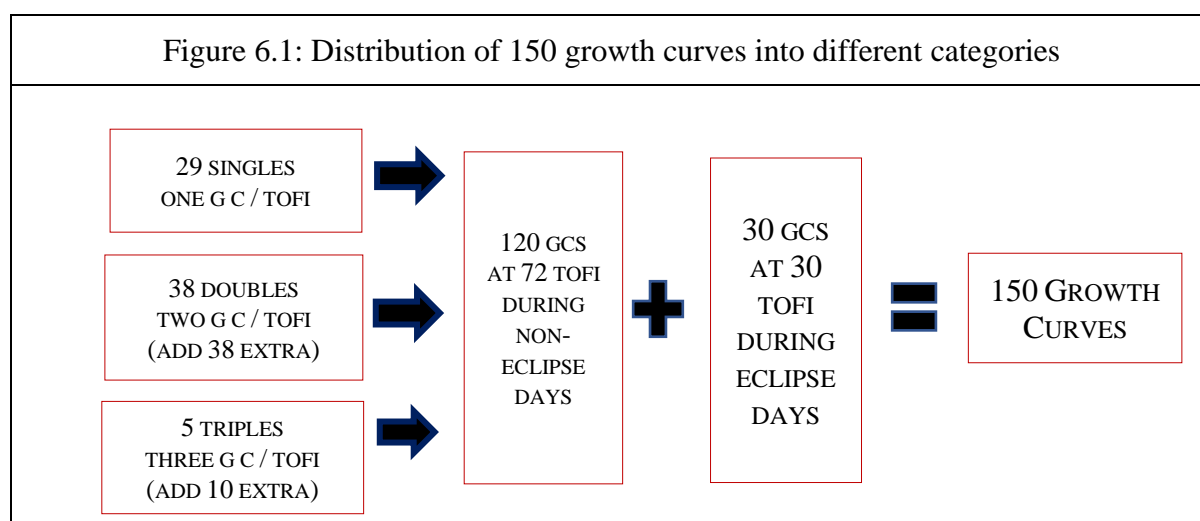


Table 6.1 presents a summary of the 150 *E. Coli* Bacterial Growth

After generating the GC, one of the first analysis performed was to derive the slope of the curve's segment of exponential phase of growth. It was this slope that was further used for comparison of different TOFIs. Slope data for the 150 growth curves is presented in **Table 6.2**, (available as a single web page file).

Table 6.1: Summary of Bacterial Growth Experiments	
No.	Aspect of Bacterial Growth Experiment
1	Bacterium: <ul style="list-style-type: none"> • <i>E. Coli</i> (kept in Glycerol Stock at - 80⁰ C) • Non-pathogenic strain: K-12 MG 1655 • Sourced from: National Centre for Biological Sciences (NCBS), Bengaluru
2	Place: Molecular Biology Laboratory, Anvesana Research Laboratories, S-VYASA.
3	Spectrophotometer used Nano Drop 2000 and Plate Reader
4	Range of Dates of Experiments: 31 March 2016 to 11 August 2018
5	Main Variables: <ul style="list-style-type: none"> • Rate of Exponential Phase Growth (EPGR) (Given by Mean Slope over Five Time Points: 180, 210, 240, 300 & 360 mins.) • Graha Shadbalas at Time of Flask Inoculation (TOFI) Jyotisha <i>Lagna Muhurtas</i> • Range of Lagnas utilized: All 12 <i>Rasis</i> from <i>Mesha</i> to <i>Meena</i>
6	<ul style="list-style-type: none"> • Pilot Study: 19 GCs @ 1GC/TOFI, between 2016.03.31 and 2017.02.15 (inclusive) • Main Study: Number of Growth Curves (GCs): 150 (Including the Pilot Study, Total No. is 169 (150+19) Growth Curves) 102 TOFIs during the period 2017.02.16 to 2018.08.11 (102 TOFIs with 38 doubles & 5 triples plus 59 (29+30) singles give us 150 GCs) During Eclipse days, 30 GCs at 30 TOFIs done @ One GC/TOFI. • Non-eclipse TOFIs: 91 (72+19) between 2016.03.31 and 2018.08.11 (inclusive) Refer to the flowchart above.

Please note that Table 6.3 provides ‘month and year’ wise summary of GCs per TOFI and how many TOFIs per day with Dates, TOFIs and Numbers for the complete set of 150 Experiments. 2nd, 3rd and 4th columns list “One GC”, Two GCs and Three GCs per TOFI respectively against the dates. On Eclipse’ days the TOFIs are more than three in a day, with ONE GC experiment conducted per TOFI. Table 6.6 gives Mean Slope values for 16 sets of 4 growth curves while raw data of Shadbalas and OD-600 for the 120 non-eclipse TOFI growth curves are given in Tables 6.7 and 6.8. Table 6.9 presents Eclipse days’ growth experimental data.

Further in the data analysis, variance between different individual and groups of GC was calculated from the slope of the curve. **Table 6.4** gives a comparison of these variances, while **Table 6.5** shows how variances increase with increasing time between TOFIs.

6.1 TWO FUNDAMENTAL LAWS

Looking at variances of different GC and groups of GC indicate that (Table 6.4 and 6.5) Exponential Phase Growth rates obey two fundamental laws: first, variances are much smaller for growth processes with the same TOFI than for the entire set of 150 growth curves generated over the total period of experimentation; second, these smaller variances for growth processes computed with same TOFI, slowly increase to that for all the curves over a time period of about two days or more.

6.2 VARIANCE ANALYSIS AND SUB GROUP VARIANCES

Table 6.4 presents results of variance analysis of sub-groups of 150 growth curves. As mentioned above, the variances were seen to increase with increase in time between TOFIs. Growth Curves with identical TOFI, n=91 in total, had the least variance (0.0218). This 91 GCs included triplets (n=5) and duplicates (n=38) which had variances (0.0212 and 0.0223 respectively) similar to the total (Table 6.4). In contrast, when TOFIs were apart and different, the variances increased dramatically. Among the GCs with TOFIs that were 2 hours apart the variance was 0.0739 (n=64) which increased further to 0.0999 (n=32) when the GCs with TOFIs that were 2 days apart. This phenomenon of increasing variance with different TOFI stands validated looking at the overall variance calculated for all 150 GC, which is 0.1327 (Table 6.4 and figure 6.2). The tendency in Table 6.4 for sub-groups of growth curves with closer TOFIs to exhibit smaller variances led to the formulation of two laws of variance: (a) Growth curves with the same TOFI exhibit a minimal variance, the best estimate of which is

0.0218, the weighted average of the 15 and the 76 growth curves; (b) as time between TOFIs increases, so does the variance for that subgroup.

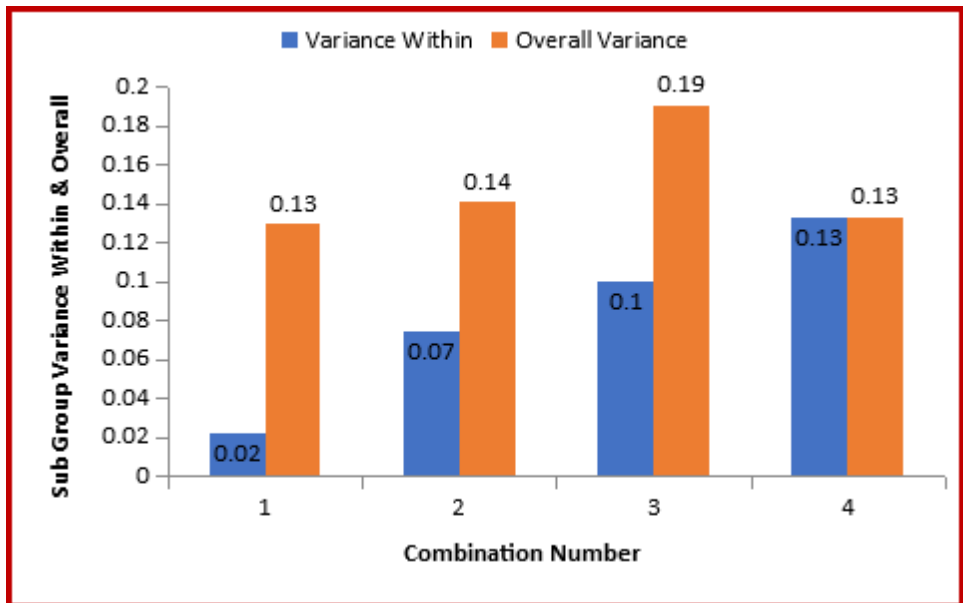
Table 6.3: Dates & No. of G.C.s done per TOFI. On Eclipse days', Growth Curves were Generated at 3 (min) to 7 (max) TOFIs to Capture their Effects			
Month & Year	One GC/TOFI	Two GCs/TOFI	Three GCs /TOFI
February 2017	16.02.2017 #	--	--
March 2017	06.03.2017 ## 10.03.2017 ##	--	--
April 2017	08.04.2017 # 12.04.2017 #	--	--
May 2017	--	--	03.05.2017 # 05.05.2017 # 13.05.2017 #
June 2017	05.06.2017 ### 09.06.2017 ## 11.06.2017 ## 16.06.2017 ## 20.06.2017 ## 22.06.2017 ##	--	--
July 2017	09.07.2017 ## 16.07.2017 ## 29.07.2017 ##	19.07.2017 ## 21.07.2017 ##	14.07.2017 ##
August 2017	07.08.2017 ### 08.08.2017 ## 21.08.2017 ### 22.08.2017 ##	05.08.2017 ## 10.08.2017 ## 17.08.2017 ## 19.08.2017 ##	--
September 2017	--	01.09.2017 ## 05.09.2017 ## 06.09.2017 ## 09.09.2017 ## 11.09.2017 ## 13.09.2017 ## 15.09.2017 ##	--
January 2018	31.01.2018 ***	--	--
July 2018	27.07.2018 ** 28.07.2018 ** 31.07.2018 ##	09.07.2018 ## 13.07.2018 * 17.07.2018 ## 18.07.2018 ## 21.07.2018 # 22.07.2018 #	--
August 2018	11.08.2018 *	--	--
Total 150 GCs	59 Singles	76 in Doubles	15 in Triples
Legend: # at 1 TOFI; ## at 2 TOFIs; ### at 3 TOFIs; * at 4 TOFIs; ** at 5 TOFIs; *** at 7 TOFIs			

Table 6.4: Comparison of Variances Within & Between Subgroups					
No. of GCs per TOFI or Day →	Pairs + Triples	4 GCS per day	8 GCS 2 days apart	Total 150 GCS	
No. Groups (k)	43	16	5	N/A	
Total Sample Size (N)	91	64	40	150	
Date From:	03.05.17	19.07.17	19.07.17	16.02.17	
Date To:	22.07.18	18.07.18	15.09.17	11.08.18	
Overall Variance	0.12898	0.1402	0.1902	0.1327	
Within Subgroup Variances	0.0218	0.0739	0.0999	0.1327	
F w/in Column	5.91218	1.897	1.904	N/A	
Degrees of Freedom (N-k)	48	48	35	N/A	
p value	< 10⁻⁸	0.0111	0.0283	N/A	
Between Sub Groups (k ₁ & k ₂)	43 & 16	16 & 5	43 & 5	16 & 150	5 & 150
F between Subgroups	3.390	1.352	4.583	1.796	1.327
p value	0.00001	0.1647	< 0.0001	0.0102	0.1647
Caption: Table 6.4 displays Subgroupings and their Properties, together with Variances, F & p values					

Table 6.5: Within and Overall Variances for Subgroups.			
Combination Number	T.S.S. & Number of Subgroups	Variance 1 Within Group	Variance 2 Overall Variance
1	91 & 43	0.0218	0.1290
2	64 & 16	0.0739	0.1402
3	40 & 5	0.0999	0.1902
4	150 & 1	0.1327	0.1327

Note: T.S.S. is Total Sample Size

Figure 6.2: Graph of Increasing Variance between TOFIs - Within group variance increases to overall variance as time between TOFIs increases.



6.3 GURU IN KANYA AND RAHU IN SIMHA

The GCs were next analyzed considering additional information of the lagna muhurta for the TOFIs. This was basically covered in the subgroup of 64 GCs, consisting of 16 sets of 4 growth curves with different TOFIs on the same day as given in Table 6.6. With a pairing of *Simha* and *Kanya Lagnas*, so chosen because *Guru* was in *Kanya* heading towards the next *Rashi, Tula*, while *Rahu* was in *Simha* moving towards the previous *Rashi, Karkataka*. This allowed us to compare effects of *Guru* versus *Rahu* in *Lagna* over many weeks. The first *Lagna, Simha* occupied by *Rahu*, exhibited lower growth rate significantly more often than the second *Lagna, Kanya*, occupied by *Guru*.

Table 6.6: Mean Slope values for 16 sets of 4 growth curves with two TOFIs/day.							
Mean slope values for 32 GCs made into two groups with Guru and Rahu in lagna at TOFI							
Serial Number	Date	Rahu in Simha Lagna			Guru in Kanya Lagna		
		TOFI -1		Average Slope	TOFI -2		Average Slope
		GC#Id	Slope	TOFI -1	GC#Id	Slope	TOFI -2
1	19/7/2017	49 A	1.9536	2.0376	50 A	2.0537	2.1564
2		49 B	2.1217		50 B	2.2591	
3	21/7/2017	51 A	1.7614	1.5906	52 A	1.8207	1.6009
4		51 B	1.4198		52 B	1.3812	
5	5/8/2017	55 A	2.0559	1.9715	56 A	2.2438	2.3122
6		55 B	1.8871		56 B	2.3806	
7	10/8/2017	62 A	1.9486	1.8480	63 A	1.5084	1.6029
8		62 B	1.7475		63 B	1.6973	
9	17/8/2017	64 A	1.9264	1.8005	65 A	2.9796	2.7736
10		64 B	1.6746		65 B	2.5677	
11	1/9/2017	73 A	1.5091	1.5411	74 A	1.7737	1.7407
12		73 B	1.5730		74 B	1.7077	
13	5/9/2017	75 A	1.6605	1.8938	76 A	1.8259	1.8613
14		75 B	2.1272		76 B	1.8968	
15	6/9/2017	77 A	1.7162	1.7289	78 A	2.0671	1.9941
16		77 B	1.7416		78 B	1.9210	

Note: Letter A and B after the GC#Id denotes replicas at that TOFI, start time.

This above observation confirmed previous findings (Rao et al., 2014; Rao et al., 2013a; Rao et al., 2013b; Rao et al., 2013c; Hankey & Rao, 2013; Ramesh Rao & Hankey, 2019), namely that the presence of *Guru* in *Lagna* tends to increase bacterial growth, while the presence of *Rahu* decreases it.

6.4 RESULTS OF CORRELATION ANALYSIS

As explained in sections 5.2.6, and 5.5.2, A Pearson's product-moment correlation coefficient was run to assess the relationship between Mean Slopes, (Tables 6.8 A & 6.8 B) of (the best-fit) trend line of exponential phase segment (spanning the five time points of 180,210,240,300, and 360 minutes reckoned from Time of Flask Inoculation, TOFI, *Lagna* Muhurta, process starting time) of *E. coli* bacterial growth curve and the raw Shadbalas of Saptagrahas (Tables 6.7 A & 6.7 B) computed for the same TOFI time. 72 growth curves generated at 72 TOFIs are evaluated for data analysis. After removing the four outliers, analyses showed the relationship to be linear with both variables normally distributed, as assessed by Shapiro-Wilk's test ($p > .05$). There was a statistically significant, negative correlation between the Mean Slope and the Shadbala of *Kuja* graha, $r(68) = .448$, $p < .0005$, with Shadbala of *Kuja* explaining 20% of the variation in the Mean Slope of trend line of the exponential phase of *E. coli* growth curve. Correlations between EPGR and Graha Shadbalas was found to be the strongest with *Kuja* (Mars) Shadbala at $R^2 = 0.201$, significance $p < .0005$. Other three Sani, *Guru* and *Chandra* grahas showed similar trends. The remaining ones showed weaker trends.

Tables 6.7 A & 6.7 B give the Shadbala values computed for 72 TOFIs, *Lagna* Muhurta starting times of process. And 6.8 A & 6.8 B give the Optical Density values at 600 nm recorded at the time points reckoned from those 72 TOFIs for 72 GCs.

Table 6.7 A: Shadbalas of Grahas for 1st Set of 36 of 72 TOFIs

S. No.	GC# Id	Lagna	Effective Shadbalas Sapta grahas computed at TOFI							Slope
		at TOFI	Surya	Chandra	Kuja	Budha	Guru	Sukra	Sani	
1	20	Meena	0.919	0.776	1.348	1.243	1.028	1.286	1.287	1.037
2	21	Meena	0.926	1.099	1.591	1.119	0.905	1.537	1.581	1.266
3	22	Vrishabha	1.418	0.941	1.540	1.051	0.892	1.448	1.280	1.396
4	23	Makara	0.779	1.161	1.798	0.924	0.939	1.452	1.145	1.336
5	24	Vrishabha	1.247	1.144	1.246	0.957	1.097	1.639	1.194	1.164
6	25	Vrishabha	1.159	1.116	1.331	1.110	1.052	1.287	1.451	1.470
7	26	Mithuna	1.260	0.982	1.365	1.131	1.159	1.401	1.301	1.329
8	27	Mesha	1.309	1.088	1.174	1.475	0.970	1.141	1.270	1.432
9	28	Mesha	1.267	0.934	1.158	1.275	1.005	1.507	1.289	1.354
10	29	Mithuna	1.161	1.133	1.161	1.185	1.194	1.222	1.532	1.399
11	30	Meena	0.941	1.201	1.478	0.962	1.107	1.691	1.449	1.384
12	31	Simha	1.323	0.976	1.125	1.054	1.301	1.710	1.204	1.585
13	32	Kanya	1.188	0.997	1.258	0.913	1.408	1.565	1.464	1.635
14	33	Simha	1.421	1.436	1.312	1.192	1.333	1.472	1.156	1.427
15	34	Kanya	1.295	1.234	1.242	1.193	1.444	1.558	1.213	1.462
16	35	Simha	1.538	1.006	1.075	0.950	1.283	1.288	1.305	1.433
17	36	Kanya	1.595	1.125	1.205	0.813	1.403	1.384	1.149	1.607
18	37	Simha	1.526	0.990	1.112	1.000	1.351	1.389	1.179	.589
19	38	Kanya	1.626	0.920	1.242	0.859	1.321	1.671	1.219	.593
20	39	Simha	1.310	1.180	1.187	1.193	1.123	1.257	1.221	1.597
21	40	Kanya	1.587	1.142	1.515	1.007	1.260	1.371	1.246	1.533
22	41	Simha	1.418	1.310	1.135	1.214	1.209	1.454	1.160	1.729
23	42	Kanya	1.696	1.193	1.197	1.107	1.500	1.390	0.930	1.372
24	43	Karkataka	1.071	1.177	1.127	1.182	1.027	1.404	1.295	1.289
25	44	Kanya	1.419	1.292	1.076	1.073	1.224	1.435	1.140	1.580
26	45	Simha	1.164	1.290	0.895	1.105	0.981	1.683	1.306	1.954
27	46	Kanya	1.477	0.956	1.148	0.963	1.137	1.606	1.055	1.954
28	47	Karkataka	1.248	0.817	1.133	1.176	0.916	1.478	1.242	1.685
29	48	Vrischika	1.150	0.901	0.946	0.984	0.964	1.464	1.394	2.177
30	49	Simha	1.175	1.273	1.016	1.206	0.892	1.369	1.297	2.038
31	50	Kanya	1.608	1.016	1.069	1.062	1.052	1.288	1.037	2.156
32	51	Simha	1.258	1.116	1.058	1.302	0.931	1.441	1.320	1.591
33	52	Kanya	1.537	1.221	1.348	1.131	1.091	1.354	1.115	1.601
34	53	Simha	1.088	1.324	1.179	1.417	1.132	1.166	1.398	1.309
35	54	Kanya	1.364	1.333	1.226	1.140	1.142	1.474	1.135	1.702
36	55	Simha	0.974	1.324	1.019	1.363	1.128	1.306	1.550	1.972

Caption: Table 6.7 A gives Effective Shadbalas of 7 grahas at TOFI for 1st set 36 of 72 GCs

Table 6.7 B: Shadbalas of Grahas for 2nd Set of 36 of 72 TOFIs

S. No.	GC# Id	Lagna	'Effective' Shadbala values of Sapta grahas computed at TOFI							Slope
		at TOFI	Surya	Chandra	Kuja	Budha	Guru	Sukra	Sani	
37	56	Kanya	1.250	1.346	1.068	1.096	1.292	1.595	1.087	2.312
38	62	Simha	0.891	1.222	0.949	1.462	1.422	1.356	1.254	1.848
39	63	Kanya	1.014	1.153	1.002	1.340	1.430	1.634	0.995	1.603
40	64	Simha	1.467	1.250	1.193	1.327	1.039	1.269	1.385	1.801
41	65	Kanya	1.446	1.148	1.046	1.243	1.320	1.539	0.920	2.774
42	66	Karkataka	1.406	1.309	1.383	1.164	0.997	1.260	1.165	2.899
43	67	Kanya	1.621	1.146	1.085	1.258	1.209	1.303	1.143	1.810
44	73	Simha	1.395	1.076	1.424	1.238	1.139	1.126	1.214	1.541
45	74	Kanya	1.196	1.323	1.073	1.240	1.174	1.309	0.969	1.741
46	75	Simha	1.086	1.315	1.268	1.194	1.228	1.171	1.158	1.894
47	76	Kanya	1.034	1.028	1.068	1.198	1.218	1.398	0.923	1.861
48	77	Simha	1.075	1.141	1.390	1.166	1.088	1.345	1.148	1.729
49	78	Kanya	1.025	1.035	0.886	1.275	1.233	1.207	1.110	1.994
50	79	Simha	0.950	1.180	1.313	1.181	1.072	1.326	1.174	1.397
51	80	Kanya	0.895	1.097	1.165	1.191	1.207	1.234	1.099	1.514
52	81	Simha	1.058	0.940	1.401	1.348	1.018	1.138	1.210	1.262
53	82	Kanya	0.883	1.146	1.053	1.216	1.301	1.250	0.990	1.608
54	83	Simha	0.966	1.128	1.595	1.223	1.060	1.359	1.246	1.575
55	84	Tula	0.948	0.977	1.146	1.375	1.233	1.311	1.273	1.592
56	85	Simha	1.219	1.025	1.439	1.187	1.111	1.101	1.212	1.785
57	86	Tula	1.045	1.107	1.141	1.234	1.165	1.373	1.044	1.778
58	94	Karkataka	1.114	1.307	1.395	1.218	1.011	1.096	1.281	1.169
59	95	Vrischika	1.227	1.396	1.109	0.906	1.013	1.137	1.558	1.628
60	99	Simha	1.430	1.046	1.164	0.922	1.093	1.195	1.291	1.738
61	100	Tula	1.464	0.885	1.626	0.999	1.166	0.923	1.097	1.614
62	101	Vrischika	1.483	0.968	1.301	0.882	1.032	0.991	1.146	1.702
63	102	Mithuna	1.092	1.288	1.710	0.955	0.939	1.106	1.462	1.653
64	103	Karkataka	1.176	1.154	1.800	1.030	1.023	1.151	1.302	1.725
65	104	Simha	1.408	0.954	1.024	1.065	1.149	1.241	1.384	1.691
66	105	Simha	1.244	1.446	1.001	1.035	1.159	1.255	1.215	1.722
67	106	Simha	0.902	1.432	0.977	1.039	1.164	1.400	1.380	1.720
68	107	Tula	1.245	1.272	1.021	0.943	1.379	1.465	1.190	1.470
69	108	Kumbha	0.776	1.335	1.118	0.776	1.070	1.499	1.391	1.287
70	116	Simha	0.950	1.068	1.123	1.184	1.178	1.170	1.373	1.665
71	117	Kanya	1.011	0.942	1.146	1.210	1.237	1.034	1.446	1.940
72	118	Simha	1.004	0.978	1.313	1.110	1.019	0.982	1.667	1.410

Caption: Table 6.7 B gives Effective Shadbalas of 7 grahas at TOFI for 2nd set 36 of 72 GCs

Table 6.8 A gives Standard Scores of OD 600 nm Readings (1st Set)

Standard Scores of Readings of OD 600 nm from T.O.F.I. (1st set)										
S. No.	GC# Id	Standard Scores of OD 600 nm at Minutes from T.O.F.I.								Slope
		60	120	150	180	210	240	300	360	
1	20	3.213	3.421	1.209	2.507	0.768	-0.776	-1.350	-1.319	1.037
2	21	-0.097	0.506	-0.523	-0.148	-0.519	-0.607	-1.449	-1.025	1.266
3	22	-0.349	-0.054	-1.200	-0.480	-1.005	-2.372	-1.589	-0.808	1.396
4	23	-0.097	-0.525	0.695	-0.665	-1.042	-1.713	-1.748	-0.942	1.336
5	24	-0.128	2.188	4.214	1.059	0.917	-0.223	-1.303	-1.021	1.164
6	25	-0.223	-0.503	0.560	0.302	-0.195	-0.032	-0.315	-0.487	1.470
7	26	-0.349	0.260	0.925	0.493	1.426	-0.266	-0.475	-0.681	1.329
8	27	0.092	0.304	0.970	0.784	1.177	0.436	0.008	-0.403	1.432
9	28	0.092	0.304	0.763	2.004	1.512	1.075	0.209	-0.468	1.354
10	29	0.082	0.379	0.970	0.747	0.130	0.415	-0.783	-0.468	1.399
11	30	-0.349	0.103	0.492	0.665	1.491	0.777	-0.189	-0.458	1.384
12	31	-0.349	-0.637	0.100	-0.111	-0.130	0.458	-0.157	-0.147	1.585
13	32	-0.349	-1.153	-1.172	-0.856	-0.940	-1.415	-0.793	-0.177	1.635
14	33	-0.349	-0.368	0.032	0.388	0.583	0.394	-0.348	-0.468	1.427
15	34	-0.160	-0.010	0.384	0.524	0.292	0.458	-0.268	-0.390	1.462
16	35	-0.349	-0.144	-0.036	0.259	0.389	0.692	-0.411	-0.448	1.433
17	36	-0.160	-0.458	-0.266	0.025	0.583	-0.223	-0.045	-0.041	1.607
18	37	-0.034	-0.346	-0.509	-0.788	-0.713	-1.883	-3.292	-3.011	0.589
19	38	0.281	0.058	-0.130	-0.628	-0.648	-1.883	-3.244	-2.982	0.593
20	39	-0.349	-0.144	0.722	0.419	0.843	0.756	0.209	0.027	1.597
21	40	0.155	-0.794	-0.848	-0.992	-0.746	-0.649	-0.380	-0.545	1.533
22	41	-0.349	-0.391	-0.212	0.339	0.907	1.032	0.369	0.445	1.729
23	42	-0.255	0.013	0.370	0.370	0.681	0.522	-0.061	-0.701	1.372
24	43	-0.034	0.999	0.817	0.912	1.361	0.947	0.050	-0.808	1.289
25	44	-0.191	-0.436	-0.293	-0.086	0.065	0.436	-0.491	-0.050	1.580
26	45	-0.139	0.147	0.109	0.181	0.605	0.571	0.475	1.066	1.954
27	46	-0.139	0.147	0.109	0.181	0.605	0.571	0.475	1.066	1.954
28	47	9.045	4.183	2.048	0.505	0.259	0.756	0.957	0.056	1.685
29	48	-0.255	-0.413	1.480	0.086	0.907	2.096	2.247	1.512	2.177
30	49	-0.349	0.248	0.479	0.459	0.259	1.192	1.594	1.095	2.038
31	50	-0.302	0.428	0.682	0.542	0.567	1.256	0.997	1.697	2.156
32	51	-0.144	2.692	3.246	5.001	4.035	2.394	1.427	0.833	1.591
33	52	-0.333	0.002	1.182	1.644	1.815	2.777	0.878	0.318	1.601
34	53	0.250	-0.592	-1.200	-1.121	-1.523	-1.393	-1.828	-1.108	1.309
35	54	-0.318	-0.458	-0.266	-0.209	-0.259	0.011	-1.159	0.425	1.702
36	55	-0.349	-0.110	0.424	0.560	0.389	0.766	0.862	1.056	1.972

Table 6.8 B gives Standard Scores of OD 600 nm Readings (2nd set)

Standard Scores of Readings of OD 600 nm from T.O.F.I. (2nd set)										
S. No.	GC# Id	Standard Scores of OD 600 nm at Minutes from T.O.F.I.								Slope
		60	120	150	180	210	240	300	360	
37	56	-0.349	-0.189	0.289	0.209	0.194	0.926	1.109	2.066	2.312
38	62	0.076	-0.548	-0.827	-0.884	-0.956	-1.351	-0.149	0.367	1.848
39	63	0.029	-0.077	-0.739	-0.872	-1.280	-1.010	-0.395	-0.400	1.603
40	64	-0.191	-0.099	-0.083	-0.089	0.032	0.362	0.130	0.513	1.801
41	65	0.124	0.091	-0.212	-0.132	0.324	-0.213	1.674	3.337	2.774
42	66	-0.097	-0.178	-0.306	-0.280	-0.648	-0.085	0.193	3.978	2.899
43	67	-0.128	-0.234	-0.530	-0.037	-0.584	1.756	1.769	0.163	1.810
44	73	-0.018	-0.279	-0.171	-0.246	0.016	-0.553	0.002	-0.410	1.541
45	74	-0.018	0.080	-0.015	0.018	-0.162	-0.617	0.130	0.221	1.741
46	75	0.108	-0.077	-0.124	-0.209	-0.519	-0.170	0.321	0.639	1.894
47	76	0.439	0.091	-0.300	-0.342	-0.081	0.160	-0.013	0.687	1.861
48	77	0.092	-0.178	-0.225	-0.012	-0.211	-0.298	0.305	0.153	1.729
49	78	0.155	-0.301	-0.780	-0.542	-0.535	-0.298	0.814	0.794	1.994
50	79	0.281	0.540	0.397	0.656	0.745	0.192	-0.204	-0.565	1.397
51	80	0.455	0.147	-0.279	-0.317	0.048	-0.585	0.273	-0.575	1.514
52	81	1.353	5.596	5.296	5.694	3.209	1.915	0.942	-0.206	1.262
53	82	0.203	-0.043	0.208	0.194	-0.178	-0.085	0.289	-0.196	1.608
54	83	-0.270	-0.402	-0.340	-0.080	-0.308	-0.149	-0.300	-0.215	1.575
55	84	-0.113	0.047	0.073	0.197	0.454	0.319	0.130	-0.089	1.592
56	85	-0.270	-0.761	-1.267	-1.013	-1.345	-1.628	-0.348	0.115	1.785
57	86	-0.191	-0.436	-0.388	-0.253	0.275	0.149	0.130	0.435	1.778
58	94	-0.050	-1.041	-1.551	-1.820	-2.518	-2.436	-2.313	-1.759	1.169
59	95	-0.333	-0.312	0.039	-0.040	-0.243	0.075	0.146	-0.118	1.628
60	99	0.092	0.304	-0.239	-0.179	0.275	1.075	0.782	0.221	1.738
61	100	-0.318	-0.312	-0.476	-0.499	-0.924	-0.734	0.337	-0.429	1.614
62	101	-0.128	-0.043	-0.083	-0.099	0.097	0.862	0.416	0.163	1.702
63	102	0.045	-0.211	-0.645	-0.751	-0.697	-0.925	-0.252	-0.167	1.653
64	103	0.061	-0.536	-0.746	-0.684	-1.329	-0.883	1.196	-0.371	1.725
65	104	-0.349	-0.402	-0.347	-0.431	-0.438	0.585	0.034	0.085	1.691
66	105	-0.097	-0.256	-0.076	0.117	0.551	0.202	0.591	0.221	1.722
67	106	0.029	0.416	0.668	0.286	0.081	1.181	0.432	0.289	1.720
68	107	-0.239	-0.110	-0.259	-0.222	-0.178	-0.138	0.607	-0.788	1.470
69	108	-0.349	-0.301	-0.063	0.406	2.917	1.075	-0.268	-0.565	1.287
70	116	-0.349	-0.548	-0.902	-0.360	-0.697	-0.904	0.456	-0.254	1.665
71	117	-0.223	-0.413	-0.090	0.025	-0.665	0.181	-0.093	0.930	1.940
72	118	0.896	0.103	-0.178	-0.055	-0.146	0.117	-0.236	-0.730	1.410

6.5 RESULTS FROM ECLIPSE DAY'S EXPERIMENTS

Jyotisha tradition states that the time of an eclipse is even more malefic than the influence of Rahu (Santhanam, 1984, pp. 109-117), suggesting that eclipses should therefore slow exponential phase bacterial growth rates.

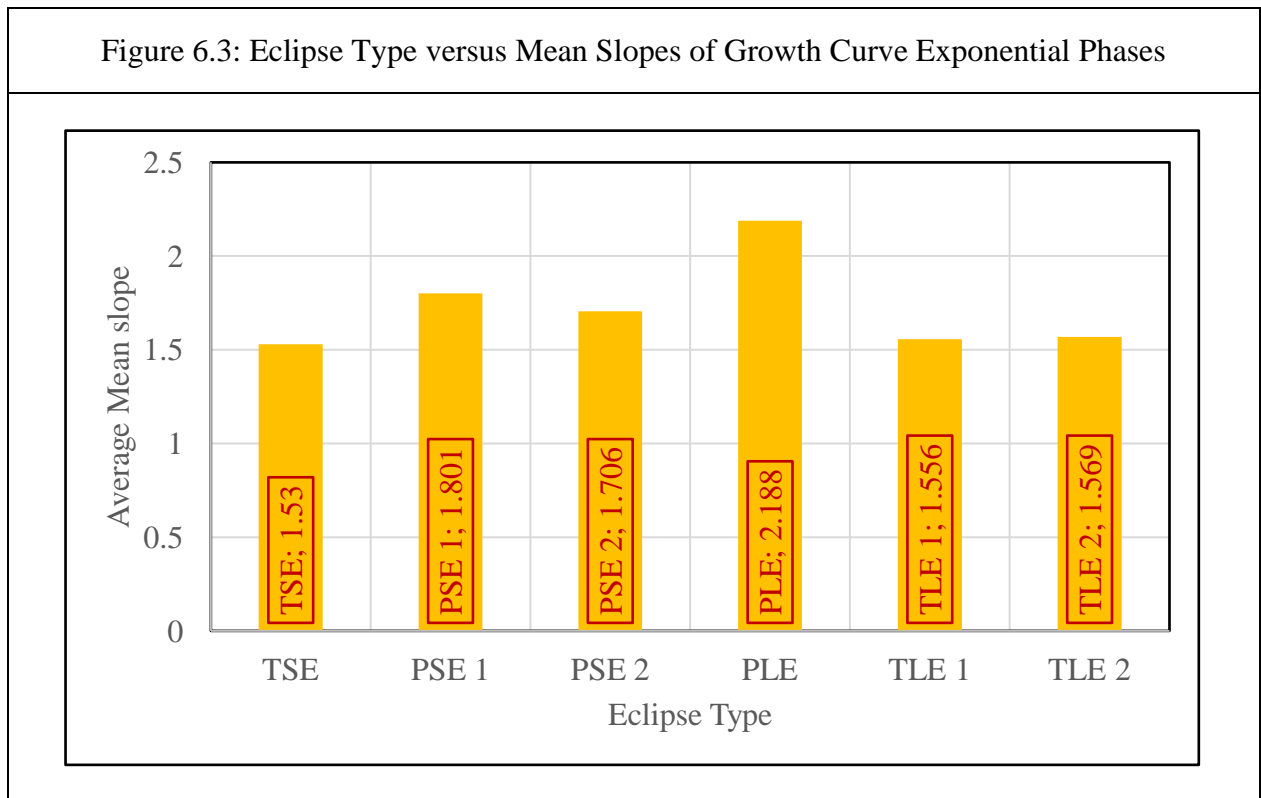
The solar eclipse results are consistent with the earlier findings; the lunar eclipse results are smaller in magnitude, indicating weaker effects. These new findings confirm that eclipses exert global, malefic, life-opposing influences. They extend previous findings, which concerned the influence of solar eclipses on virus propagation, first to bacterial growth, and second to lunar eclipses (Vegaraju et al., 2019a).

Effects of eclipse was analyzed using the trend line slope values. In this study mean of slope of all GCs conducted during a given condition (solar eclipse or lunar eclipse) are used to understand the rate of growth, with higher slope value indicating faster growth. In total 33 GC were conducted during Solar Eclipse (SE) and Lunar Eclipse (LE), covering in both cases partial and total eclipses (see Table 6.9 for numbers in individual category). Mean slope was least on the day of the total eclipse (slow growth), as hypothesized during both SE and LE (slope value – 1.5). Likewise, the growth during partial eclipses, again both during solar or lunar eclipse, was better than during total eclipse (slope value of 1.5 and 2.1 respectively).

Finally, note that the overall order of mean slope values is TSE < TLE < PSE < PLE. The order demonstrates that the effects of solar eclipses on growth curve slopes are consistently greater than those of corresponding lunar eclipses, suggesting that the former are more powerfully malefic than the latter.

TABLE 6.9: Types of eclipses with dates, Growth Curve ID numbers with no. of growth curves (GC) in parentheses and means of exponential phase slopes for each eclipse.				
TYPE: TOTAL / PARTIAL & GAMMA		DATE	GC # ID	MEAN SLOPE
SOLAR ECLIPSES				
Total: 14 GCs / Total: 11 TOFIs	Total – TSE ($\gamma = 0.4367$)	21-22 August 2017	68-72 (5)	1.530
	Partial-PSE1 ($\gamma = -1.5342$)	13 July 2018	96-98 (3x2)	1.801
	Partial-PSE2 ($\gamma = 1.1476$)	11 August 2018	119-121 (3)	1.706
LUNAR ECLIPSES				
Total: 19 GCs / Total: 19 TOFIs	Partial – PLE ($\gamma = 0.8668$)	7-8 August 2017	57-61 (5)	2.188
	Total-TLE1 ($\gamma = -0.3014$)	31 January 2018	87-93 (7)	1.556
	Total-TLE2 ($\gamma = 0.1168$)	27-28 July 2018	109-115 (7)	1.569

Gamma (γ) of an eclipse describes “how centrally the shadow of the Moon or Earth strikes other body & distance is Measured at the moment when axis of shadow cone passes closest to centre of Earth or Moon; stated as a fraction of equatorial radius of Earth or Moon.



6.6 THREE MAIN FINDINGS OF RESEARCH STUDY

Overall the results from this study can be summarized as follows:

Finding 1: Variances in exponential phase growth rates of bacteria are smaller when times between TOFIS are smaller.

Finding 1 A: This small variance gradually grows back to normal as difference between starting times increases.

Findings 1 and 1 A were published (Vegaraju et al., 2020a).

Finding 2: Correlations between exponential phase growth rates and *Graha Shadbalas* was found to be the strongest with *Kuja* (Mars) *Shadbala* at $R^2 = 0.201$, with significance $p \ll 0.0005$. A published paper (Vegaraju et al., 2020b) reported this as a stand-alone result.

Finding 3: Both Solar and Lunar Eclipses slowed bacterial growth rate;

Finding 3 A: Solar Eclipses slowed growth rate to a greater extent than Lunar Eclipses;

Finding 3 B: Total Eclipses showed greater impact than Partial Eclipses

Findings 3, 3 A and 3 B were published (Vegaraju et al., 2019a).