

Probing the association of lunar phases (*Thithies*) with rainfall at Coimbatore

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ABSTRACT

Based on the interaction between earth and moon in relation to sun, each month is governed by both new moon and full moon. In between these two there are fourteen *thithies* covering the 14 days interval. A study was undertaken to find out the association between rainfall and the different *thithies*. Results revealed that the first eight *thithies* succeeding new moon, and eight *thithies* preceding the new moon did relate to annual rainfall events. Higher rainfall occurred normally during the eight *thithies* preceding the new moon as compared to *thithies* succeeding the new moon. Almost similar results could be noticed for both south west and north east monsoon seasons. Analysis also indicated that towards full moon phase, the *thithi Shashti* (sixth phase) is associated with high rainfall while such effect was noticed at *Ekadasi* (eleventh phase) *thithi* towards new moon. High intensity events occurred frequently during new moon phase as compared to full moon phase.

Key Words: *Thithi*, Moon phases, Rainfall

The earth rotates on its axis once in approximately 24 hrs. The time of day is determined by which side of the earth is currently towards the Sun. The earth makes a complete orbit around the sun in about one year. Our calendar (the Gregorian Calendar) is, roughly synchronized with the orbit of the earth. The moon orbits the earth in about 27 days. There are two major phases of the moon viz., full moon and new moon. The shadow effect of earth triggers new moon day while the opposite one is full moon day, when it is the brightest. Every mean full moon is exactly 29 days 12 hours 44 minutes and 2.9 seconds apart. Between the full moon and new moon phase

days, waxing (getting brighter) and waning (getting dimmer) occur cyclically as viewed from the earth. The moon waxes for about two weeks and then wanes for about two weeks. Then the cycle repeats (Pisharoty, 1986).

Each month is governed by both new moon and full moon and in between these two there are fourteen *thithies* (moon phases) covering the 14 - day interval (Table 1). It is also scientifically proved that during full / new moon day, there are tidal effects on ocean waters. Since these *thithies* are governed by the revolution of the moon with reference to the earth, it is

Table 1: Annual rainfall in relation to different *thithis* during full moon phase (FMP) and new moon phase (NMP).

Sl.No	Thithi	Mean rainfall in mm		Frequency of occurrence of rainfall						Probable rainfall in mm				No. of days with rain		No. of rainy days**	
		RMP	NMP	> 30 mm	> 15 mm	> 10 mm	> 5 mm	50%	30%	FMP	NMP	FMP	NMP	FMP	NMP	FMP	NMP
				FMP	NMP	FMP	NMP	FMP	NMP	FMP	NMP	FMP	NMP	FMP	NMP	FMP	NMP
1	New moon	-	17.1	-	3	-	5	-	8	-	-	36.6	-	2 ^s	-	14	
2	Padyami	38.1	14.0	5	1	10	4	10	6	40.5	6.1	65.5	26.1	24	20	18	
3	Vidiya	17.0	8.0	1	0	6	4	7	6	20	7.5	26.4	14.0	21	16	14	
4	Thadhyo	15.7	14.3	2	3	7	4	8	6	12.3	7.0	21.3	30.3	25	23	16	
5	Chaturthi	27.3	18.8	4	3	5	4	7	6	28.7	9.2	56.0	42.1	32	20	15	
6	Panchami	26.5	29.9	3	3	6	4	8	7	25.5	14.0	41.5	35.4	29	27	23	
7	Shashthi	47.4	33.3	4	5	6	8	7	9	24.6	33.0	64.0	46.5	30	27	23	
8	Sapthami	28.6	25.5	2	2	5	6	7	9	18.5	21.0	27.2	22.0	29	23	16	
9	Ashtami	21.7	25.3	2	3	6	5	7	6	20.2	22.0	27.2	33.3	28	28	14	
10	Navami	13.1	15.0	1	1	3	5	5	7	10.8	15.0	18.1	27.5	26	24	15	
11	Dasami	19.5	39.2	1	6	7	9	10	10	14.0	42.5	15.7	66.9	28	28	22	
12	Ekdashi	11.5	47.3	1	5	6	8	7	10	11.0	34.0	15.0	58.5	19	30	11	
13	Dwadasi	7.3	18.2	0	1	2	9	6	10	7.0	17.9	7.8	19.1	15	26	8	
14	Trayodasi	14.8	34.3	1	6	3	8	6	9	7.7	30.9	20.0	44.0	21	35	11	
15	Chaturdasi	31.2	38.7	3	5	4	7	6	7	10.2	30.3	36.5	76.0	19	29	16	
16	Full Moon	24.6	-	3	-	6	-	9	-	18.2	-	34.9	-	29	-	16	

NMP : New Moon Phase FMP : Full Moon Phase

* - Day with at least some rains (trace and above)

** - Day with more than 2.5 mm rainfall

Table 2: Chi-square values for annual rainfall at different *thithies*

Sr. No.	<i>Thithi</i>	> 30 mm	> 15 mm	> 10 mm	> 5 mm	Rainfall days	Rainy days
1	<i>Padyami</i>	3.8 *	3.3	8.6 *	5.0 *	0.4	0.6
2	<i>Vidiya</i>	1.1	3.3	0.8	0.2	0.8	1.2
3	<i>Thadiya</i>	0.3	0.0	1.8	1.0	0.1	0.4
4	<i>Chathurthi</i>	0.2	0.8	0.2	0.2	3.5	0.8
5	<i>Panchami</i>	0.0	0.8	0.3	0.4	0.1	0.5
6	<i>Shashti</i>	0.2	1.0	1.3	0.0	0.2	0.1
7	<i>Sapthami</i>	0.0	0.2	0.0	0.0	0.9	0.0
8	<i>Ashtami</i>	0.3	0.2	0.2	1.0	0.0	0.9
9	<i>Navami</i>	0.0	0.8	0.0	0.2	0.1	0.0
10	<i>Dasami</i>	5.5 *	1.8	1.3	Nil	0.0	0.3
11	<i>Ekadasi</i>	3.8 *	1.8	1.0	3.5	3.1	3.6
12	<i>Dwadasi</i>	1.1	7.5 *	9.9 *	5.0 *	3.6	4.3 *
13	<i>Thrayodasi</i>	5.5 *	5.1 *	5.1 *	2.4	4.6 *	4.3 *
14	<i>Chathurdasi</i>	0.8	1.8	0.2	0.2	2.6	0.1

* - Significant at 5% level

assumed that they may have some influence on rainfall occurrence. Hence, a study was undertaken to investigate any such association.

MATERIAL AND METHODS

Daily rainfall data were collected from Department of Agricultural Meteorology, Tamil Nadu Agricultural University, Coimbatore for the period from 1991 - 2000. These daily data were related to daily *thithi* both for new moon phase and for full moon phase and grouped for annual and seasonal (southwest and northeast monsoon seasons) accounts. The information on *thithi* was collected from Almanac (Vasan, 1991 to 2000). Statistical

procedure viz., chi-square test was adopted to analyse the results. Initial probability analysis was done for different quantities of rainfall for annual rainfall as well as for southwest monsoon (SWM) and northeast monsoon (NEM) seasons. For annual rainfall, the probability analysis was done for > 30mm, >15 mm, >10 mm and > 5 mm. For SWM, it was done for >10 mm and > 5 mm rainfall and for NEM for >7.5 mm and > 5 mm.

RESULTS AND DISCUSSION

Annual rainfall

Each *thithi* occurred once in a month in new moon phase and once in a month in

Table 3 : Effect of *thithies* on annual rainfall quantum during full moon and new moon phases

Particulars	Chi - square value of		
	<i>Thithies</i> irrespective of moon phase	Full moon phase	New moon phase
>30 mm rainfall	20.79NS	16.46 NS	24.00 *
>15 mm rainfall	11.55 NS	17.58 NS	19.79 NS
>10 mm rainfall	14.88 NS	21.83 NS	22.64 *
>5 mm rainfall	19.35 NS	16.37 NS	21.09 NS
Days with rainfall	12.50 NS	16.76 NS	15.24 NS
No. of rainy days	15.27 NS	19.71 NS	11.15 NS

NS - Not Significant statistically * - Significant at 5 % level

full moon phase and hence one *thithi* occurred for 24 times in a year (12 times in new moon phase and 12 times in full moon phase). Mean annual rainfall received during different *thithies*, frequency of occurrence of rainfall > 30 mm, >15 mm, >10 mm and >5 mm and 50 per cent and 30 per cent probable rainfall are presented in Table 1.

The data from Table 1, it could be inferred that the first eight *thithies* succeeding new moon, and eight *thithies* preceding to new moon did relate to rainfall events. Further it is observed that higher intensity rainfall is normally associated with the eight *thithies* preceding the new moon day as compared to those succeeding the new moon day.

Analysis indicated that towards full moon phase, the *thithi Shashti* (sixth day) had a tendency for high rainfall up to 47 mm while such occurrence is seen on *Ekadasi thithi* (eleventh day) towards new

moon. Nevertheless, all the *thithies* both during new moon phase and full moon phase did have rainfall events though not as high.

The 30 per cent probable rainfall analysis brought to light that *Padyami* and *Shashti* *thithies* towards full moon and *Dhasami*, *Ekadasi* and *Chathurdasi* towards new moon phase did meet with higher rainfall as compared to the other *thithies* evaluated.

The frequency analysis on fixed quantities of rainfall viz., >30, >15, >10 and >5 mm that occurred among 15 *thithies* during full moon, the *thithi Padyami* had shown comparatively more frequency for >30 mm rainfall while during new moon phase *Shashti*, *Dhasami*, *Ekadasi*, *Thrayodasi* and *Chathurdasi* had such performance. The results further indicated that relatively high intensity events occurred frequently during new moon phase as compared to full moon phase.

Table 4. : South west monsoon rainfall in relation to different *thithis* during NMP and FMP

Sr. No.	Thithi	Mean rainfall in mm		Frequency of occurrence of rainfall		Probable rainfall in mm				No. of days with rain		No. of rainy days	
		FMP	NMP	>10 mm	>5 mm	FMP	NMP	FMP	NMP	FMP	NMP	FMP	NMP
1	New moon	-	4.7	1	1	1.2	-	3	-	9	-	2	-
2	Paadyami	11.2	2.6	3	3	4	2.5	13.5	13	9	9	9	5
3	Vidya	5.6	3.5	3	3	4	3.6	12	4.8	7	7	4	4
4	Thadiya	8.6	0.7	3	2	4.7	0.5	11.2	10.2	9	5	5	5
5	Chathurthi	10.6	2.6	3	4	2	1	12.8	7.2	15	7	9	6
6	Panchami	12.2	5.0	6	3	13.2	9.3	15.1	11	13	9	8	8
7	Shashti	18.0	6.7	4	7	8.3	7	21	20.5	14	10	6	6
8	Sapthami	6.5	4.7	3	5	8.5	2.5	10.5	24.3	12	9	5	5
9	Ashtami	10.7	11.1	2	4	2.4	3	19.2	4.2	14	11	7	7
10	Navamami	3.3	3.1	1	2	3	2	4.2	7.6	12	11	4	6
11	Dasami	8.6	16.7	1	6	3.4	4	4.8	4.5	10	12	8	7
12	Ekadasi	4.7	7.8	2	3	2	8.5	6.5	15	5	13	4	9
13	Dwodasi	1.3	7.5	0	6	0	5.5	1.8	15.6	5	17	9	9
14	Thrayodasi	1.7	8.0	0	1	1	4.1	2.6	16	6	17	4	10
15	Chaturdasi	6.8	11.6	2	4	3	9.7	7.5	12.5	7	13	7	7
16	Full Moon	15.4	-	3	6	7	-	14.6	-	14	-	9	-

In an year, number of rainy days were more for *Panchami*, *Dasami*, and *Chathurdasi thithies* during full moon phase while during new moon phase similar effects were found for the *thithies Padyami*, *Chathurthi*, *Panchami*, *Shashti* and *Sapthami*.

Chi square analysis was performed to test the null hypothesis that there is no difference in rainfall of full moon phase and new moon phase of different *thithies* and the results are presented in Table 2.

The hypothesis on no difference, between full moon phase and new moon phase in respect of different *thithies* was rejected since the *thithi Padyami* did differ for >30, >10 and >5mm rainfall frequencies. Similarly the *thithi*, *Dwadasi* differed for > 15, > 10 and > 5mm rainfall.

Another chi-square analysis was performed to test the null hypothesis that *thithies* do not have any association with rainfall. The results are presented in Table 3. The results indicate that, during full moon phase, there was difference for different *thithies* for >30, >15, >10 and >5 mm rainfall frequencies as well as for the rainfall observed and for the number of rainy days. However, the *thithies* differed significantly for 10 mm and >30 mm rainfall frequencies during the new moon phase.

S-W monsoon rainfall

Each *thithi* occurred four times each in full moon and new moon phases during south west monsoon period. Mean seasonal rainfall received during different *thithies*,

frequency of occurrence of > 10 mm and >5 mm of rainfall and 50 per cent and 30 per cent probable rainfall are presented in Table 4.

The results indicate that during south west monsoon season, from *Padyami* to *Shashti thithi* (first six *thithies* after new moon day) in full moon phase as well as the *Ashtami* to *Chathurdasi* (seven *thithies* prior to full moon day) during new moon phase did have more mean seasonal rainfall. This observation is similar to the observations made for annual rainfall.

The analysis of 30 per cent rainfall probability for both new moon phase and full moon phase revealed that the quantity of rainfall received was higher from *Padyami* to *Shashti* during full moon phase and from *sapthami* to *Chathurdasi* in the new moon phase. The percentage of rainy days from rain days seemed to perform differently for each *thithi* under two study phases of Full moon and new moon. The *thithies Padyami*, *Vidiya*, *Panchami*, *shashti*, *Sapthami*, *Dasami*, *Ekadasi*, *Thrayodasi* and *Chathurdasi* of Full moon phase had rainfall more than 2.5 mm. Such influence was noticed for *Thrayodasi*, *Chathurdasi*, *Ashtami*, *Navami* and *Dwadasi* during new moon phase.

Chi square analysis was performed to test the null hypothesis that there was no difference in rainfall of new moon phase and full moon phase of different *thithies* during the south west monsoon period and the results are presented in Table 5. The *Thithi Dwadasi* did exhibit significance for both 10 and 5 mm rainfall frequency and

Table 5: Chi-square values for south west monsoon rainfall at different *thithies*

Sr. No.	<i>Thithi</i>	>10 mm	>5 mm	Rainfall days	Rainy days
1	<i>Padyami</i>	3.53	0.27	1.00	1.39
2	<i>Vidiya</i>	1.25	0.00	0.31	0.95
3	<i>Thadiya</i>	0.27	0.95	0.58	0.00
4	<i>Chathurthi</i>	3.53	0.22	4.01 *	0.74
5	<i>Panchami</i>	1.82	1.82	0.00	0.07
6	<i>Shashti</i>	0.00	0.83	0.95	1.25
7	<i>Sapthami</i>	0.27	0.20	0.58	0.83
8	<i>Ashtami</i>	0.95	0.00	0.52	0.39
9	<i>Navami</i>	1.05	0.00	0.06	0.46
10	<i>Dasami</i>	2.40	3.33	0.25	0.08
11	<i>Ekadasi</i>	0.27	1.82	4.59 *	2.30
12	<i>Dwadasi</i>	5.00 *	3.81 *	9.03 *	5.16 *
13	<i>Thrayodasi</i>	5.00 *	2.40	7.38 *	3.12
14	<i>Chathurdasi</i>	0.95	0.83	2.40	0.00

* - Significant at 5 % level

Table 6: Effect of *thithies* on south west monsoon rainfall during full moon and new moon phases

Particulars	Chi - square value of		
	<i>Thithies</i> irrespective of moon phases	Full moon phase <i>thithies</i>	New moon phase <i>thithies</i>
10 mm rainfall	21.50 NS	18.44 NS	18.93 NS
5 mm rainfall	29.76 **	17.50 NS	10.85 NS
Days with rainfall	5.34 NS	20.60 NS	15.91 NS
No. of rainy days	5.66 NS	14.60 NS	7.31 NS

NS - Not Significant statistically ** - Significant at 1 % level

there by the null hypothesis that there was no difference in rainfall between full moon phase and new moon phase of different *thithies* was rejected.

The analysis through Chi-square test (Table-6) for the hypothesis that the *thithies* do not have any association with rainfall got

disproved since for the 5 mm frequency, the chi-square value was significant at 1 per cent level.

North east monsoon rainfall

Each *thithi* occurred three times each in during north east monsoon period. Mean

Table 7 : North east monsoon rainfall in relation to different *thithies* during NMP and FMP

Sl. No.	Thithi	Mean Rainfall in mm		Frequency of occurrence of rainfall				Probable rainfall in mm				No. of days with rain		No. of rainy days	
		FMP	NMP	>7.5 mm		>5 mm		50%		30%		FMP	NMP	FMP	NMP
				FMP	NMP	FMP	NMP	FMP	NMP	FMP	NMP				
1.	New moon	-	4.58	-	3	-	4	-	3.0	-	9.0	-	9	-	6
2.	Pachyami	15.7	8.5	5	3	6	3	11.5	2.5	17.5	8.0	7	9	7	7
3.	Vadya	5.2	4.6	3	3	3	3	0.4	2.0	14.5	10.0	6	9	3	5
4.	Thaidiya	4.1	4.9	3	2	3	2	2.5	0.0	7.5	3.8	7	7	7	4
5.	Chathurthi	13.1	11.8	3	4	3	4	1.0	0.5	27.0	30.0	9	6	7	4
6.	Panchami	13.1	19.7	5	3	5	3	12.0	3.4	23.0	35.0	14	9	12	6
7.	Shashthi	16.6	12.9	4	4	4	4	1.5	4.0	18.6	12.0	10	10	7	8
8.	Saptami	19.9	19.6	4	6	5	5	5.0	9.5	27.2	21.0	10	10	7	10
9.	Ashtami	9.1	12.8	4	3	4	3	4.4	2.5	13.2	11.8	8	11	5	9
10.	Nawami	5.8	8.7	2	5	3	4	4.5	5.5	5.0	18.0	11	9	9	7
11.	Davami	8.9	12.1	5	3	7	3	10.0	3.0	13.2	23.0	13	9	10	7
12.	Ekadasi	5.8	18.5	3	7	3	6	4.5	13.0	8.9	36.5	10	10	7	7
13.	Dwadasi	4.7	9.1	2	6	2	5	2.0	8.0	3.0	14.5	7	8	3	7
14.	Thrayodasi	8.1	20.6	3	7	3	6	2.2	12.5	17.5	26.0	9	11	5	7
15.	Chathurdasi	22.5	21.7	4	6	4	6	2.5	17.0	30.0	29.3	9	12	7	10
16.	Full Moon	5.5	-	2	-	3	-	3.0	-	5.0	-	9	-	6	-

NMP: New Moon Phase FMP: Full Moon Phase

* - Day with at least some rains (trace and above)

** - Day with more than 2.5 mm rainfall

Table 8 : Chi-square values for north east monsoon rainfall at different *thithies*

Sr. No.	<i>Thithi</i>	>7.5 mm	>5 mm	Rainfall days	Rainy day
1	<i>Padyami</i>	0.83	1.82	0.34	0.00
2	<i>Vidiya</i>	0.00	0.00	0.80	0.58
3	<i>Thadiya</i>	0.27	0.27	0.00	1.00
4	<i>Chathurthi</i>	0.22	0.22	0.80	1.00
5	<i>Panchami</i>	0.83	0.83	1.76	2.86
6	<i>Shashti</i>	0.00	0.00	0.00	0.09
7	<i>Sapthami</i>	0.80	0.00	0.00	0.74
8	<i>Ashtami</i>	0.22	0.22	0.69	1.49
9	<i>Navami</i>	1.98	0.22	0.30	0.34
10	<i>Dasami</i>	0.83	3.20	1.15	0.74
11	<i>Ekadasi</i>	3.20	1.82	0.00	0.00
12	<i>Dwadasi</i>	3.33	1.98	0.09	1.92
13	<i>Thrayodasi</i>	3.20	1.82	0.30	0.42
14	<i>Chathurdasi</i>	0.80	0.80	0.66	0.74

Table 9 : Effect of *thithies* on north east monsoon rainfall during full moon and new moon phases.

Particulars	Chi - square value of		
	<i>Thithies</i> irrespective moon phase	Full moon phase	New moon Phase
7.5 mm rainfall	20.00 NS	5.85 NS	15.17 NS
5 mm rainfall	20.00 NS	10.46 NS	9.50 NS
Days with rainfall	8.85 NS	10.74 NS	5.12 NS
No. of rainy days	11.42 NS	14.69 NS	8.57 NS

NS - Not Significant statistically

seasonal rainfall received during rainfall different *thithies*, frequency of occurrence of > 7.5 mm and >5 of rainfall and 50 per cent and 30 per cent probable rainfall are presented in Table 7.

During north east monsoon season, the mean rainfall was more upto *Sapthami* during full moon phase and from *Ashtami* to *Chathurdasi* during new moon phase.

The analysis of 30 per cent probable rainfall revealed that the *thithies Vidiya, Thadiya, Shashti, Sapthami* and *Ashtami* had higher rainfall during full moon phase while during new moon phase, *Chathurthi, Panchami, Navami, Dasami, Ekadasi, Dwadasi, Thrayodasi* and *Chathurdasi* did record higher rainfall.

During full moon phase, *Padyami,*

Vidiya, Chathurthi, Panchami and *Navami* had more rainy days. Under new moon phase, the *thithies Vidiya, Shashti, Sapthami, Ashtami, Dwadasi* and *Chathurdasi* had more number of rainy days. Interestingly, *Dasami, Ekadasi* and *Thrayodasi* of both new moon and full moon phases had similar rainy days during north east monsoon.

The null hypothesis that there was no difference in rainfall between full moon and new moon phases of different *thithies* during the north east monsoon period was tested through Chi square analysis and the results are presented in Table 8. The results indicated that between *thithies* and frequency of rainfall, the results were not significant. All *thithies* had either strong influence or no influence on rainfall.

To test the null hypothesis that *thithies* do not have any influence on rainfall, another chi-square analysis was performed (Table 9). The result was not significant for the hypothesis that the *thithies* did not have any association with rainfall during north east monsoon. It is observed that independently *thithies* do not have any association but in combination with other parameters it had some synergetic effect.

CONCLUSION

The results of the study undertaken to find out any association between the rainfall occurrence and the different *thithies* in between the two phases of the moon viz., full moon and new moon revealed that the first eight *thithies* (days) succeeding new moon and eight *thithies* preceding to new moon did influence annual rainfall events. Further it is observed that with reference to higher intensity rainfall, it occurred normally during the eight *thithies* preceding the new moon as compared to *thithies* succeeding the new moon. Almost similar results could be noticed for both south west and north east monsoon seasons. The results further indicated that high intensity events occurred frequently during new moon phase as compared to full moon phase.

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