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RAINFALL FEATURES OVER VALPARAI - A HILL STATION IN TAMIL NADU

1. In Tamil Nadu, northeast monsoon season (October - December) is the principal rainy season contributing about 48% of the annual rainfall. However, in southwest monsoon season some of the north interior districts like Vellore, Tiruvannamalai, Salem and Dharmapuri receive rainfall almost equal to that of north east monsoon season. Valparai (10° 20' N, 76° 55' E) is a hill station located at the southern end of Coimbatore district in Tamil Nadu. Geographically it is at the southern edge of Palghat pass at a height of about 1077 m above sea level and also to the west of Anaimudi hill which is the highest peak in Western Ghat. Location of the station is shown in Fig. 1.

In Tamil Nadu earlier to this analysis Kodaikanal was considered as the station with the highest annual rainfall (1594 mm). Kodaikanal, also a hill station receives maximum rainfall in October. In this paper an attempt has been made to study the rainfall features in Valparai based on data for the period 1981-2000 and the results are presented.

2. *Data* - Daily rainfall data of Valparai for the period 1981 to 2000 was collected from the Department of Economics and Statistics of Tamil Nadu Government. With this data the monthly mean rainfall, number of rainy day, and the mean daily rainfall have been calculated in all the months of the year. Probability that a rainy day is followed by next rainy day, third day is a rainy day, fourth day is rainy day etc., have been worked out. Occurrence of heavy rainfall has been worked out and discussed month wise.

TABLE 1(a)

Mean seasonal rainfall, rainy day and daily rainfall

Season	Mean rainfall (mm)	Mean rainy day	Mean daily rainfall on rainy days (mm/day)
Winter	47	3.9	12
Pre-monsoon	401	26.1	16
Monsoon	2994	89.6	34
Post monsoon	615	29.8	21

TABLE 1(b)

Monthly mean rainfall, rainy days and daily rainfall

Months	Mean rainfall (mm)	Mean rainy day	Mean daily rainfall on rainy days (mm/day)
January	23.5	1.8	13.0
February	23.2	2.1	10.2
March	67.3	4.0	16.8
April	117.4	9.9	11.9
May	215.0	12.2	17.9
June	852.0	23.3	37.5
July	981.0	25.6	38.3
August	750.5	23.8	31.5
September	409.2	17.0	24.2
October	333.5	16.5	19.7
November	213.5	9.3	23.0
December	68.2	3.9	17.5

3.1. *Seasonal features* - Annual mean rainfall in Valparai is 406 cm with 149 rainy days. Table 1 (a) gives the mean seasonal rainfall, rainy day and mean daily rainfall. Southwest monsoon contributes around 74 % of annual rainfall and only about 15% of annual rainfall is occurring in post monsoon months. In pre monsoon and post monsoon seasons the rainy days are nearly the same. The mean daily rainfall on rainy days is the highest in monsoon season (34 mm/day) followed by post monsoon season with mean daily rainfall of 21mm/day.

3.2. *Monthly features* - Table 1(b) gives the monthly mean rainfall, mean rainy day and mean dally rainfall on rainy days. Mean monthly rainfall in January and February is around 23mm. The mean rainy day is around 2 days in January and February. The least mean daily rainfall is observed in February during this season (10.2mm/day). In pre-monsoon season highest rainfall yielding month is May (215mm) and the rainy day is also highest in this month. Mean daily rainfall is almost similar in March and May even though the least monthly rainfall of the season is in March. The rainy days vary between 4.0 in March and 12.2 in May.

In monsoon season the highest mean monthly rainfall is occurring in July (981 mm) followed by June 852 mm. The mean rainy day is 26 days in July followed by 23/24 days each in June and August. The daily rainfall is also highest in July (38.3 mm/day) followed by June (37.5 mm/day). In post monsoon season the monthly mean rainfall is the highest in October (334 mm) and the least in December. Though monthly mean rainfall is the highest in October, the mean daily rainfall is the highest in November (23 mm/day).

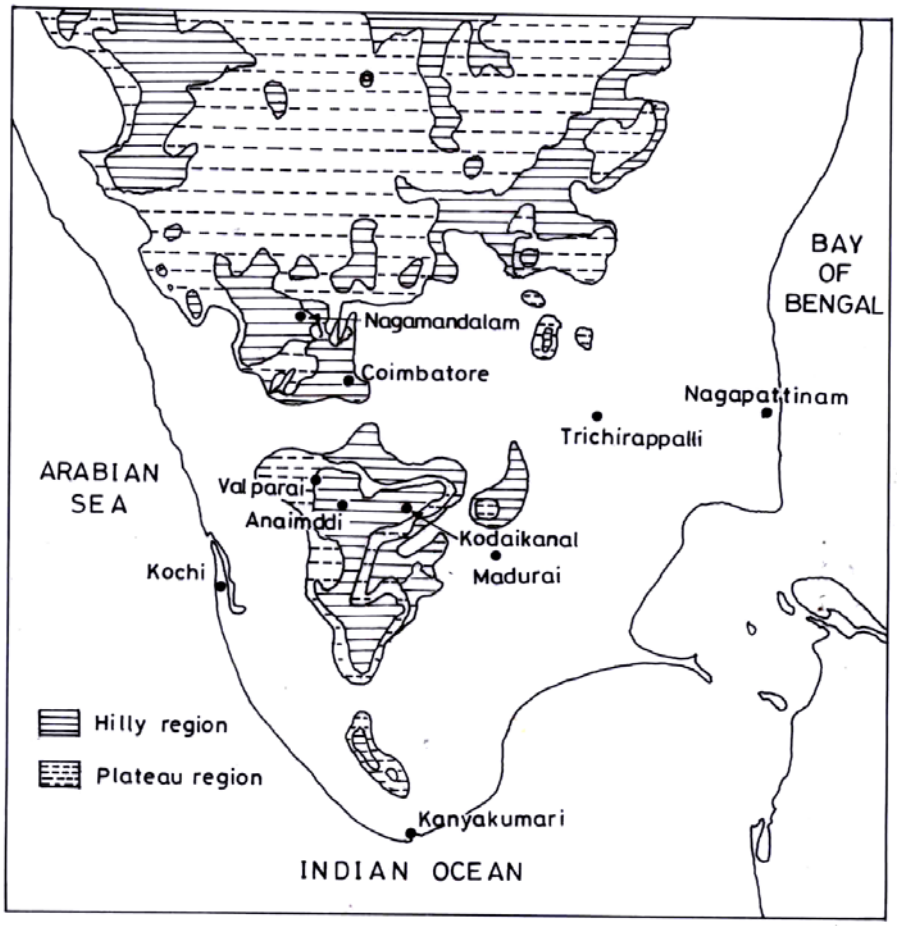

Fig. 1. Location of Vatparai

3.3. *Weekly and daily rainfall distribution* - On critically examining of the daily rainfall data, it is seen that in winter season mean rainfall is very small and it is in the order of 0.73 mm/day. After 15 January mean daily rainfall is zero till 4 February. Afterwards the rainfall starts increasing gradually *i.e.*, the annual cycle of rainfall starts only in the middle of first week of February and it ends in third week of January. During third week of January to first week of February there is a lull in rainfall activity at Valparai.

In pre monsoon season the daily mean rainfall in the month of March is 2.2 mm/day and it increases to 3.9mm/day in April and 7.0 mm/day in May. The daily rainfall in the middle of March is small. In the first three weeks of May the daily mean rainfall is 2.1 mm/day and it subsequently increases to 40.0mm/day in the last week. This sudden increase in daily rainfall may be due to the earlier onset of southwest monsoon. This is almost equivalent to June mean daily rainfall. In southwest monsoon season higher daily rainfall is observed in the first week of June and it decreases in the third week and again it increases to higher value in the last week. Similar pattern is observed in July month also. The daily rainfall gradually decreases further in August and September. In post monsoon months the daily rainfall is of the order of 20 mm/day in the beginning of October and it decreases to around 5 mm/day by the end of the month. In November in the beginning of the month the daily rainfall is in the order of 13mm/day and in the end of the month it is 0.3 mm/day.

3.4. *Heavy rainfall occurrence* - When a station receives rainfall of 6.5 cm or more in 24 hours the rainfall is classified as heavy rainfall. In this station heavy rainfall days are mostly occurring in monsoon season only. Approximately 2 heavy rainfall occasions are seen in the month of June and it is 3 in July. The probability that a heavy rainfall is followed by another heavy rainfall is 40% in June and 46 % in July. In August heavy rainfall occurred only on one day and in September it is only 0.5 Annually about 6.5 days are heavy rainfall days.

TABLE 2

Percentage probabilities that a rainy day is followed by rainy day, third, fourth day etc.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8	7	13	18	28	77	79	71	51	42	26	11
5	4	9	15	25	71	76	67	44	37	20	7
3	2	7	13	25	70	74	70	43	39	19	6
2	2	7	14	25	70	71	67	44	38	17	6
2	1	6	11	23	69	73	65	43	34	16	5
2	2	1	14	23	70	75	65	43	36	18	6

TABLE 3

Mean rainfall and rainy days in some of the stations in the windward side of the western ghats

Station	Position		Annual		Southwest monsoon			Northeast monsoon		
	Lat. (°N)	Long. (°E)	Rainfall (cm)	Rainy days	Rainfall (cm)	Rainy days	% to Annual	Rainfall (cm)	Rainy days	% to Annual
Valparai	10° 20'	76° 05'	406.0	149.4	299.0	89.6	74.0	62.0	29.8	15.0
Allepey	9° 33'	76° 25'	315.0	137.9	185.0	80.3	59.0	53.0	24.5	17.0
Kochi	9° 57'	76° 16'	323.0	139.9	207.0	82.3	64.0	69.0	27.5	21.0
Kozhikode	11° 15'	75° 47'	329.0	121.0	241.0	79.8	71.0	43.0	18.2	13.0

3.5. *Rainy days* - Table 2 gives the probability of rainy day followed by another rainy day, for third rainy day, fourth rainy day etc. It is observed that probabilities are very small from January to April for rainy day to be followed by another rainy day. These probabilities are large in the monsoon months and it is 42 % in October, 26% in November and 11 % in December. The probability that third day of rainfall to be a rainy day is also very small upto March. In monsoon months this probability varies between 67 & 76% during June to August and it is 44 in September. In post monsoon months this probability is 37% in October, 20% in November and 7% in December.

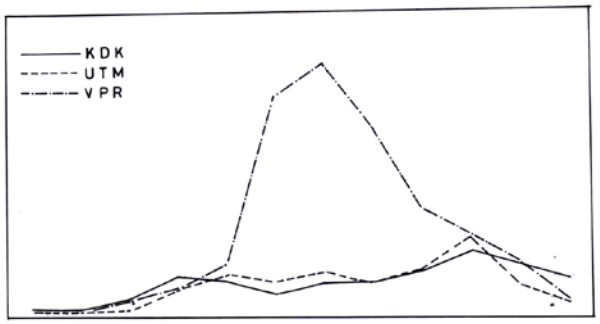

Fig. 2. Monthly rainfall in Kodaikanal, Uthagamandalam and Valaparai

3.6. *A comparative study with other hill stations in Tamil Nadu* - Kodaikanal and Uthagamandalam are the two hill stations in the neighbourhood of Valparai. Fig. 2 gives the monthly rainfall of above three stations. In Kodaikanal the amount of rainfall northeast monsoon season is almost similar to Valparai *i.e.*, both the stations receive same amount of rainfall in the order of 61 cm and both stations have almost the same number rainy days (30 in Valparai and 34 in Kodaikanal). But in southwest monsoon season the rainfall pattern is entirely different. Valparai receives six times more rainfall than Kodaikanal in this season while the rainy days at Valparai is 2.3 times that of Kodaianal. If we compare this station with Uthgamandalam, in post monsoon season it is seen that the rainfall is similar in both stations, but in monsoon season Valparai receives six times that of Uthagamandalam and the rainy day is 2.1 times of Uthagamandalam. The reason is mainly due to the location of Valparai which is on the western side of the western ghat and at an altitude of 1077 m above the sea level. On eastern side of this station is Anaimudi hill which is more than 2000 m high. During southwest monsoon season the humid wind from west is obstructed by Anaimudi Peak up to 2 km and gives a forced lifting to wind and hence more rainfall occurs in this area. But the other stations Uthagamandalam and Kodaikanal are

located on the eastern side of the western Ghat and hence receive less rainfall in southwest monsoon season.

3.7. *Comparison with neighbouring stations in the windward side* - In order to determine variation of rainfall with other stations in the windward side of Western ghats stations close to Valparai, *viz.*, Kochi Alllepey and Kozhikode were considered. Table 3 gives the rainfall and rainy days in respect of annual, monsoon and post monsoon seasons for all the stations. It is seen that the annual rainfall is the highest in Valparai. In southwest monsoon season also the neighbouring stations received rainfall less than Valparai. The rainy days of Valparai is also greater than other stations It can hence be inferred that though the stations in the windward side of Western ghats receive higher rainfall, the local topography plays a vital role in influencing the rainfall feature in Valparai, a station in Tamil Nadu.

4. *Conclusions* - Valparai a hill station in Tamil Nadu is on the western side of the western ghats and receives highest amount of 406 cm of annual rainfall in the state. 74 % of this rainfall is contributed by southwest monsoon season. July is the rainiest month with about 98 cm of rainfall and 25.6 rainy days. There is a lull in rainfall from third week of January to first week of February. Daily rainfall in this station never exceeded 17 cm. In monsoon season on 1% of occasions rainfall exceeded 9 cm. In post monsoon season more than 50% of rainy days are in the month of October. In post monsoon season the rainfall pattern is similar to other two hill stations Kodaikanal and Udagamandalam but in monsoon season Valparai rainfall is six times of other two stations. The reason for such large difference of rainfall in monsoon season may be attributed to its location. Further annual and southwest monsoon rainfall over Valparai is greater than the neighbouring stations in the windward side of the western ghats.

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