Rainfall at Coimbatore as Influenced by Other Meteorological Factors

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Introduction : No aspect of climate has greater economic significace than rainfall. It is a recognised fact that success in crop production is mainly due to the receipt of timely rains in required quantities. So the importance of precipitation to agriculture hardly needs to be emphasized.

Material and Methods : The meteorological data collected in the observatory attached to the Agricultural College and Research Institute, Coimbatore, for a period of 37 years were taken up to assess the relative influence of the various meteorological factors like relative humidity, maximum and minimum temperatures and wind velocity on the rains received in the locality where the Institute is situated.

At first simple correlations between various factors were worked out for different months of the year Then the mean co-efficients of correlation were worked out between rainfall and other factors, for all possible combinations of the variables taken in pairs, after which the partial correlations were worked out to assess the relationship between rainfall and relative humidity by removing the interference due to other meteorological factors.

Results and Discussion : The results of analysis of the weather data are furnished in tables I, II and III. They reveal the following features :—

Of all the possible combinations of the five elements of climate studied, a high degree of positive correlation exists between rainfall and relative humidity and a significant negative correlation between rainfall and maximum temperature.

The partial correlation between rainfall and relative humidity after eliminating the other three factors, namely, maximum temperature, minimum temperature and wind velocity is + 0.3959, while the total correlation without the elimination of these three factors is + 0.5321. This proves the importance of these three elements of climate as influencing precipitation. Further, it becomes evident that no one climatic factor acts alone.

There exists a significant total negative correlation between relative humidity and maximum temperature. Eliminating the effects of minimum temperature and wind velocity, either singly or in combination, the degree of negative correlation between relative humidity and

maximum temperature is enhanced and the coefficient of correlation becomes highly significant. High wind velocity, especially when accompanied by low atmospheric humidity, reduces chances of precipitation.

There is a positive significant total correlation between relative humidity and minimum temperature and there is an apparent increase in the value of the coefficient of correlation, when the effects of maximum temperature and wind velocity are removed, but it is not significant. Low wind velocity seems to form conditions favourable for condensation of clouds.

Conclusion: Rainfall is a vital factor which goes a long way in accentuating crop production. The other factor of climate like relative humidity, air temperature and wind velocity are important in influencing the precipitation.

TABLE I
Total and Partial Correlations of all possible combinations of Factors Taken in Pairs.

1 = Rainfall,   2 = Relative Humidity
3 = Maximum Temperature.   4 = Minimum Temperature.
5 = Wind Velocity,

S. No.	Factors between which correlation has been worked out	Total Correlation.	Partial Correlation	
1.	Rainfall and Relative Humidiay	+ 0·5321**	r12·345	+ 0·3959*
2.	Rainfal and Maximum Temperature	— 0·4652**	r113·245	— 0·3378*
3.	Rainfall and Minimum Temperature	+ 0·1405*	r14·235	+ 0·1047
4.	Rainfall and Wind Velocity	— 0·0182	r15·234	+ 0·0356
5.	Relative Humidity and Maximum Temperature.	— 0·4005*	r23·145	— 0·2453
6.	Relative Humidity and Minimum Temperature.	+ 0·2060*	r24·135	+ 0·1923
7.	Relative Humidity and Wind Velocity.	— 0·1259*	r25·134	— 0·1621
8.	Maximum Temperature and Minimum Temperature.	+ 0·0809	r34·125	+ 0·2012
9.	Maximum Temperature and Wind Velocity.	— 0·0503	r35·124	+ 0·0010
10.	Minimum Temperature and Wind Velocity.	— 0·0844	r45·123	— 0·0606

Note :— * Significant.   ** Highly Significant.

TABLE II.

Correlation Between Rainfall and Relative Humidity showing the Successive Values of Partial Correlation after the Elimination of other Factors.

S. No.	Particulars of the factors correlated	Total Correlation	After eliminating one factor	After eliminating two factors	After eliminating three factors
1.	Rainfall and Relative Humidity	$r12 + 0·5321$ ‡	$r12·5 + 0·5343$ ‡	$r12·45 + 0·5222$ ‡	
			$r12·4 + 0·5194$ ‡	$r12·43 + 0·3953$ *	$r12·345 + 0·3959$ *
			$r12·3 + 0·4204$ ‡	$r12·35 + 0·4248$ ‡	
2.	Rainfall and Maximum Temperature	$r13 — 0·4652$ ‡	$r13·5 — 0·4670$ ‡	$r13·45 — 0·4839$ ‡	
			$r13·4 — 0·4831$ ‡	$r13·42 — 0·3378$ *	$r13·245 — 0·3378$ *
			$r13·2 — 0·3250$	$r13·25 — 0·3210$	
3.	Rainfall and Minimum Temperature	$r14 + 0·1405$ *	$r14·5 + 0·1305$	$r14·35 + 0·1990$	
			$r14·3 + 0·2018$	$r14·23 + 0·1036$	$r14·235 + 0·1047$
			$r14·2 + 0·0373$	$r14·25 + 0·0409$	
4.	Rainfall and Wind Velocity	$r15 — 0·0182$	$r15·4 — 0·0064$	$r15·53 — 0·0315$	
			$r15·3 — 0·0470$	$r15·23 + 0·0236$	$r15·234 + 0·0356$
			$r15,2 + 0·0581$	$r15·24 + 0·0605$	

Note.— * Significant.   ‡ Highly Significant.

TABLE III

Correlation Between Relative Humidity and Maximum Temperature Showing the Successive Values of Partial Correlation after the Elimination of Certain Factors.

S. No.	Particulars of factors correlated	Total Correlation.	After eliminating one factor	After eliminating two factors	After eliminating three factors
1.	Relative Humidity and Maximum Temperature	$r23 - 0 \cdot 4005^*$	$r23 \cdot 1 - 0 \cdot 2040$		
			$r23 \cdot 4 - 0 \cdot 4278 \ddagger$	$r23 \cdot 45 - 0 \cdot 4358 \ddagger$	$r23 \cdot 145 - 0 \cdot 2453$
			$r23 \cdot 5 - 0 \cdot 4107^*$		
2.	Relative Humidity and Minimum Temperature	$r24 + 0 \cdot 2060^*$	$r24 \cdot 1 + 0 \cdot 1565$		
			$r24 \cdot 3 + 0 \cdot 2611$	$r24 \cdot 35 + 0 \cdot 2523$	$r24 \cdot 135 + 0 \cdot 1923$
			$r24 \cdot 5 + 0 \cdot 1977$		
3.	Relative Humidity and Wind Velocity	$r25 - 0 \cdot 1259^*$	$r25 \cdot 1 - 0 \cdot 1373$		
			$r25 \cdot 3 - 0 \cdot 1596$	$r25 \cdot 34 - 0 \cdot 1613$	$r25 \cdot 134 - 0 \cdot 1621$
			$r25 \cdot 4 - 0 \cdot 1269$		

Note:— *Significant.   ‡ Highly Significant.