Analyzing the Effect of Lockdown on Weather Parameters Amid COVID-19 Pandemic of Mid Hill Region of Rajouri District of Jammu & Kashmir, Union Territory, India

Rohit Sharma[1], Vishaw Vikas[2*], Mahender Singh[2], Manish Kr. Sharma[3], Narinder Panotra[4], Charu Sharma[2] and Deepak Kumar[1]

[1]*AMFU, RARS, Rajouri, SKUAST, Jammu, India.*
[2]*Agrometeorology Section, Division of Agronomy, SKUAST, Jammu, India.*
[3]*Division of Statistics and Computer Sciences, SKUAST, Jammu, India.*
[4]*Organic Farming Research Centre, SKUAST, Jammu, India.*

Authors' contributions

This work was carried out in collaboration among all authors. Author RS managed and edited the analysis. Author VV designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MS and MKS made the necessary corrections in manuscript. Authors NP, CS and DK managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

A study was conducted in mid hill region of Rajouri district, J&K, India to analyze the impact lockdown amid covid-19 pandemic on weather parameters**.** Day and night temperature readings were recorded fortnightly from 1st March to 30th June 2020 from maximum and minimum thermometer, rainfall values from ordinary rain gauge, and soil temperature at different depth from soil thermometers and values were compared with data from 2017-2019 and normal**.** After

---

*Corresponding author: E-mail: vishaw.vikas@gmail.com;

analyzing the data statistically using "Descriptive statistics" in MS-Excel 2010, it was observed that within the period of lockdown, the change in day temperature was -6.66% from normal mean value, however night temperature was least affected as it changes 10.33% and rainfall pattern was 19.27% more from normal mean value. The average change in soil temperature in morning at 5 cm, 10 cm and 20 cm depth in lockdown was -4.65%, 3.74% and 2.65% as compared to year 2019 (1st March to 30th June) mean value and the change in soil temperature in evening at same depths was -5.14%, -11.30% and 0.3% from year 2019 (1st March to 30th June) depicting a slow change in values. With the significant sustainable pattern observed in day and soil temperature parameters and rainfall it can be concluded that lockdown might be an effective tool in reducing speed of climate change in future.

1. INTRODUCTION

Despite continuous efforts to curb the emission worldwide, humans have still failed to reduce the greenhouse gases number even to near normal. Industrialization and Urbanization has synergized the greenhouse effect in atmosphere resulting in capturing the heat and then releasing it slowly; significantly increasing the global temperature. This sudden increase in temperature due to anthropogenic activities has a dynamic impact on the environmental health; affecting weather parameters and agricultural productivity [1, 2, 3]. It is already predicted that by 2030, due to rising temperature; India is expected to have 6 to 10 percent decrease in yield and can face changing weather pattern causing 1.5 percent loss towards GDP (Gross Domestic Product) [4]. In another aspect of study related to demand and supply, the population density in India over last two decades has increased with a growth rate of 37.60%, thereby having a direct impact on demand supply ratio, e.g. it has been noticed that sales of vehicle since 2008 has been increased with at least 15% per annum and in relation to this, the transport demand is expected to rise by 200% between 2015-2030 [5,6] significantly increasing emissions worldwide. Therefore, the absolute consequence of rising emissions, growing population and increasing supply demand ratio will be on the healthy ecosystem survival, long term productivity and sustainability.

COVID-19 disease was first identified in Wuhan, China in December 2019 and is highly contagious in nature. The disease has spread to almost every part of the world and has been declared a global pandemic in March 2020 by World Health Organization [7]. The ongoing pandemic of COVID-19 has forced several countries of the world to observe complete lockdown forcing people to stay in their homes. India also faced the phase of total lockdown for 21 days (in 1st phase) and subsequent lockdown and unlock down phases to avoid the spread of coronavirus to the maximum possible extent. By this reaction, almost every industrial sector and public transportation movement was prohibited and this ultimately had a dramatic impact on weather and pollution parameters of Shivaliks, PirPanjal and mid hill region of J&K. Therefore, lockdown can be assumed to be an effective alternative measure control the pace of climate change and the present work is intended to explore the degree of change in weather parameters from lockdown to current situation with respect to weather parameters from March to June month of Year 2017, 2018, 2019, 2020 and normal data of Rajouri district.

The impact of lockdown has been observed as very much effective in reducing the emissions and improvising the quality of air and soil. Nationwide lockdown amid COVID-19 pandemic has not only reduced the intensity of spread of this viral disease but has emerged as a new scientific tool to curb the pace of changing climate and weather parameters. The present study has provided an opportunity to study the change in weather context and has enforced to work more in this direction to evaluate the efficacy of lockdown in managing the weather parameter towards normal with high focus on sustainability. The objectives of the study:

(i) To compare the weather parameters change in Rajouri during the lockdown periods on forth night basis with normal weather data and

(ii) To quantify the magnitude of variation in temperature and moisture of mid hills of Rajouri due to the implementation of lockdown regulation during Lockdown period

Focusing on the Rajouri district, the study is expected to be a valuable addition to the scientific community and policy makers not only to assess the impacts of lockdown on weather parameters, but also its efficiency as a tool for upgrading the changing climatic pattern within the region with public involvement in upcoming years.

2. MATERIALS AND METHODS

Rajouri district occupies an area of about 2630 Sq. Km with peculiar physical features and lies in between 33.3716° N latitude and 74.3152° E longitude at an elevation of 915 meters above the mean sea level. The District is situated in the west of Jammu Province of Jammu Kashmir Union Territory, India and is surrounded by the Poonch, Reasi and Jammu Districts. In order to analyze the change in the entire experimental area, weather parameters were statistically analyzed fortnightly i.e. 1st March up to 30th June for year 2017-2020 and Normal but graphically compared between lockdown and Normal. Day, Night Temperature and Rainfall were the parameters observed, analyzed during lockdown and data was then compared with normal data compiled from weather data of 35 years. Calculation of deviation percentage and graphical comparison was done between lockdown and normal data. However, the soil temperature at different depths (5, 10, 20 cm) in Morning and Evening was statistically compared with year 2017, 2018 and 2019 data but the calculation of deviation percentage and graphical comparison was done between 2019 and lockdown data. Year 2020 data is considered as lockdown data.

Day and Night temperature readings were recorded from Maximum and Minimum thermometer, Rainfall values from ordinary rain gauge and Soil Temperature at different depth from Soil Thermometers. All the instruments have been installed at Agrometeorological Field Unit (AMFU), Regional Agriculture Research Station (RARS) Rajouri, J&K.

In order to have a representation of entire population, Descriptive statistics method was opted to find the Highest, Lowest, Mean, Standard Error, Standard Deviation, Coefficient of Variation, Kurtosis and Skewness values and was run in MS-Excel 2010 along with Pearson Correlation in SPSS 16.0 to find out the significant values and impact of one parameter over another.

3. RESULTS AND DISCUSSION

3.1 Effect on Temperature

3.1.1 Day and night temperature

As the lockdown began, the day temperature started decreasing and sustainable pattern was observed (Fig. 1) from 1st fortnight of March up to 2nd fortnight of June as compared to 2017-2020 and normal (Table 1). During 1st fortnight of March 2017-2020 and normal, lowest values observed were 12.0, 18.0, 13.6, 11.5 and 21.0; highest values observed were 24.0, 27.4, 22.6, 23.4 and 24.0. So, in 2020, the significant impact of lockdown was observed in 1st fortnight of March as day temperature was -15.78**%** than normal mean value. The standard deviation calculated was 3.84 in lockdown and 0.87 in normal. During 2nd fortnight of March 2017-2020 and normal, lowest values observed were 19.0, 19.6, 16.6, 16.4 and 23.4 lowest and highest values noted were 32.4, 33.0, 29.2, 24.8 and 27.4 hereby significantly expressing -13.16% change from normal. The standard deviation calculated was 2.04 in lockdown and 1.28 in normal. Again, in 1st fortnight of April 2017-2020 and normal, the lowest and highest values noted were 15.4, 23.4, 28.0, 23.6 and 25.7 whereas highest values observed were 34.0, 32.0, 31.6, 29.6 and 29.4 significantly depicting -1.48% variation from normal mean temperature value. The standard deviation calculated was 1.67 in lockdown and 1.16 in normal. Following data collection in 2nd fortnight of April 2017-2020 and normal, lowest values were 20.0, 22.0, 16.2, 23.0 and 27.7 and highest values were 35.0, 36.2, 33.8 30.8 and 31.1 illustrating -8.88% significant change from normal mean value. The standard deviation calculated was 2.58 in lockdown and 1.10 in normal. During 1st fortnight of May 2017-2020 and normal, lowest values observed were 24.8, 20.2, 26.2, 30.7 and highest values observed were 36.4, 34.8, 34.6, 32.6 and 33.0 representing -4.98% deviation from normal mean value. The standard deviation calculated was 2.60 in lockdown and 0.66 in normal. During 2nd fortnight of May 2017-2020 and normal, lowest values observed were 27.0, 32.4, 26.0, 26.0 and 32.9 highest values observed were 37.4, 38.0, 37.6, 36.5 and 34.7 representing -1.81% deviation from normal mean value. The standard deviation calculated was 2.68 in lockdown and 0.49 in normal. During 1st fortnight of June 2017-2020 and normal, lowest values observed were 29.8, 32.0, 21.0, 24.8 and 34.4 highest values observed were 40.4, 39.2, 38.2, 34.6 and 35.4

illustrating -14.09% deviation from normal mean value. The standard deviation calculated was 2.94 in lockdown and 0.36 in normal. During 2nd fortnight of June 2017-2020 and normal, lowest values observed were 22.4, 24.0, 29.8, 30.6 and

31.3 highest values observed were 35.8, 36.8, 37.6, 37.0 and 34.6 representing 1.17% deviation from normal mean value. The standard deviation calculated was 1.85 in lockdown and 0.92 in normal.

Table 1. Descriptive coefficients of day temperature (°C) from March –June for the year 2017-2020 and normal

Timeline	Year	Lowest	Highest	Mean	S.E	S.D	CV (%)	Kurtosis	Skewness
March (1st Fortnight)	2017	12.00	24.00	18.19	1.12	4.34	0.24	-1.47	-0.47
	2018	18.00	27.40	23.65	0.76	2.95	0.12	-0.35	-0.61
	2019	13.60	22.60	17.75	0.83	3.20	0.18	-1.61	0.18
	2020	11.50	23.40	19.04	0.99	3.84	0.20	-0.33	-0.94
	Normal	21.02	24.01	22.09	0.23	0.87	0.04	-0.02	0.59
March (2nd Fortnight)	2017	19.00	32.40	26.88	0.94	3.76	0.14	-0.23	-0.49
	2018	19.60	33.00	27.40	0.90	3.61	0.13	-0.26	-0.33
	2019	16.60	29.20	24.10	0.87	3.48	0.14	0.31	-0.42
	2020	16.40	24.80	22.41	0.51	2.04	0.09	4.40	-1.76
	Normal	23.38	27.37	25.35	0.32	1.28	0.05	-1.15	0.32
April (1st Fortnight)	2017	15.40	34.00	26.95	1.44	5.58	0.21	-0.58	-0.54
	2018	23.40	32.00	28.40	0.61	2.37	0.08	0.05	-0.43
	2019	28.00	31.60	29.92	0.31	1.20	0.04	-1.42	-0.02
	2020	23.60	29.60	26.93	0.43	1.67	0.06	-0.18	0.14
	Normal	25.66	29.38	27.31	0.30	1.16	0.04	-0.84	0.59
April (2nd Fortnight)	2017	20.00	35.00	30.47	1.13	4.38	0.14	0.66	-0.90
	2018	22.00	36.20	30.21	1.14	4.42	0.15	-1.07	-0.35
	2019	16.20	33.80	28.27	1.28	4.97	0.18	0.81	-1.02
	2020	23.00	30.80	27.01	0.66	2.58	0.10	-1.27	-0.31
	Normal	27.72	31.06	29.48	0.28	1.10	0.04	-1.39	-0.07
May (1st fortnight)	2017	24.80	36.40	32.50	0.83	3.22	0.10	0.99	-1.21
	2018	20.20	34.80	29.65	0.91	3.51	0.12	2.92	-1.17
	2019	26.20	34.60	31.13	0.64	2.50	0.08	-0.34	-0.65
	2020	24.40	32.60	30.13	0.67	2.60	0.09	0.06	-1.09
	Normal	30.72	32.98	31.69	0.17	0.66	0.02	-0.38	0.29
May (2nd fortnight)	2017	27.00	37.40	32.38	0.81	3.22	0.10	-1.01	-0.18
	2018	32.40	38.00	35.48	0.46	1.85	0.05	-1.14	-0.32
	2019	26.00	37.60	32.01	0.88	3.53	0.11	-0.79	-0.16
	2020	26.00	36.50	33.10	0.67	2.68	0.08	2.29	-1.43
	Normal	32.93	34.67	33.78	0.12	0.49	0.01	-0.52	0.05
June (1st fortnight)	2017	29.80	40.40	33.51	0.96	3.73	0.11	-0.92	0.80
	2018	32.00	39.20	35.65	0.55	2.14	0.06	-0.35	-0.06
	2019	21.00	38.20	34.41	1.09	4.21	0.12	7.83	-2.50
	2020	24.80	34.60	30.59	0.76	2.94	0.10	-0.12	-0.83
	Normal	34.38	35.42	34.81	0.09	0.36	0.01	-0.99	0.67
June (2nd fortnight)	2017	22.40	35.80	30.93	1.05	4.06	0.13	-0.51	-0.68
	2018	24.00	36.80	32.29	0.87	3.37	0.10	1.28	-1.00
	2019	29.80	37.60	34.18	0.59	2.30	0.07	-0.74	-0.31
	2020	30.60	37.00	33.94	0.48	1.85	0.05	-0.71	-0.05
	Normal	31.32	34.56	33.53	0.24	0.92	0.03	1.90	-1.53
Cumulative	2017	12.00	40.40	28.98	0.56	6.14	0.21	0.43	-0.87
	2018	18.00	39.20	30.36	0.44	4.89	0.16	-0.60	-0.35
	2019	13.60	38.20	28.96	0.56	6.20	0.21	-0.12	-0.80
	2020	11.50	37.00	27.89	0.50	5.47	0.20	-0.01	-0.59
	Normal	21.02	35.42	29.75	0.39	4.35	0.15	-1.03	-0.50

In cumulative analysis of 122 days data for day temperature, lowest values observed were 12.0, 18.0, 13.6, 11.5 and 21.0 in 2017-2020 and normal and Highest values noted were 40.4, 39.2, 38.2, 37.0 and 35.4.The change in day temperature in lockdown was -6.66% from normal mean value. The standard deviation calculated was 5.47 in lockdown and 4.35 in normal.

Table 2. Descriptive coefficients of night temperature (°C) from March –June for the year 2017-2020 and normal

| Timeline	Year	Lowest	Highest	Mean	S.E	S.D	CV (%)	Kurtosis	Skewness
March (1st Fortnight)	2017	2.00	8.00	3.62	0.41	1.59	0.44	3.49	1.86
	2018	4.60	11.40	8.16	0.50	1.94	0.24	-0.93	-0.08
	2019	2.80	9.20	5.57	0.39	1.52	0.27	1.42	0.66
	2020	4.20	8.60	6.43	0.35	1.35	0.21	-1.06	0.16
	Normal	4.90	6.75	5.75	0.12	0.47	0.08	0.24	0.46
March (2nd Fortnight)	2017	3.50	12.50	8.43	0.78	3.12	0.37	-1.32	-0.28
	2018	6.40	11.60	8.46	0.38	1.52	0.18	-0.72	0.54
	2019	4.60	11.20	7.11	0.47	1.86	0.26	0.60	1.08
	2020	5.60	10.40	8.20	0.33	1.30	0.16	-0.15	-0.34
	Normal	6.41	8.86	7.75	0.19	0.74	0.10	-0.79	-0.15
April (1st Fortnight)	2017	4.50	12.50	8.15	0.59	2.28	0.28	-0.74	0.14
	2018	8.40	14.40	11.05	0.51	1.96	0.18	-1.22	0.30
	2019	9.80	13.60	11.56	0.34	1.32	0.11	-1.41	0.27
	2020	9.50	13.20	10.86	0.29	1.12	0.10	-0.36	0.59
	Normal	8.17	10.98	9.54	0.21	0.83	0.09	-1.07	0.26
April (2nd Fortnight)	2017	8.40	17.50	12.27	0.68	2.64	0.22	-0.15	0.53
	2018	8.50	14.20	11.77	0.47	1.83	0.16	-1.17	-0.40
	2019	9.60	16.40	12.11	0.43	1.67	0.14	2.13	1.17
	2020	10.60	14.00	12.64	0.25	0.96	0.08	-0.19	-0.47
	Normal	10.33	11.87	11.17	0.10	0.40	0.04	0.18	-0.36
May (1st fortnight)	2017	7.50	16.50	13.89	0.65	2.53	0.18	2.06	-1.61
	2018	11.60	18.60	14.94	0.64	2.49	0.17	-1.27	0.17
	2019	10.40	14.20	12.77	0.29	1.13	0.09	-0.46	-0.51
	2020	12.40	16.80	14.55	0.28	1.08	0.07	0.58	0.04
	Normal	12.00	14.44	13.44	0.19	0.75	0.06	0.02	-0.68
May (2nd fortnight)	2017	12.80	19.00	16.04	0.44	1.78	0.11	-0.71	0.01
	2018	14.80	17.50	15.88	0.18	0.72	0.05	-0.03	0.54
	2019	13.50	16.20	14.88	0.19	0.77	0.05	-0.31	-0.18
	2020	16.20	19.80	17.59	0.30	1.18	0.07	-0.78	0.68
	Normal	14.14	15.81	15.06	0.13	0.51	0.03	-1.04	-0.01
June (1st fortnight)	2017	15.00	20.50	17.55	0.45	1.74	0.10	-1.12	0.26
	2018	17.00	22.40	19.21	0.47	1.81	0.09	-0.81	0.53
	2019	14.80	18.50	16.21	0.25	0.96	0.06	1.25	0.86
	2020	15.40	20.40	17.19	0.38	1.46	0.09	-0.09	0.63
	Normal	15.07	17.48	16.34	0.20	0.79	0.05	-1.44	0.15
June (2nd fortnight)	2017	16.50	21.60	19.20	0.39	1.49	0.08	-0.30	-0.46
	2018	17.60	20.80	19.35	0.22	0.86	0.04	-0.01	-0.08
	2019	15.40	18.40	17.23	0.21	0.82	0.05	0.32	-0.60
	2020	17.40	23.60	19.97	0.47	1.82	0.09	-0.52	0.42
	Normal	16.66	18.14	17.48	0.11	0.42	0.02	-0.37	-0.42
Cumulative	2017	2.00	21.60	12.39	0.49	5.44	0.44	-1.03	-0.33
	2018	4.60	22.40	13.58	0.41	4.48	0.33	-1.15	0.03
	2019	2.80	18.50	12.16	0.37	4.08	0.34	-0.83	-0.49
	2020	4.20	23.60	13.42	0.42	4.66	0.35	-0.95	-0.08
	Normal	4.90	18.14	12.06	0.36	4.00	0.33	-1.28	-0.17
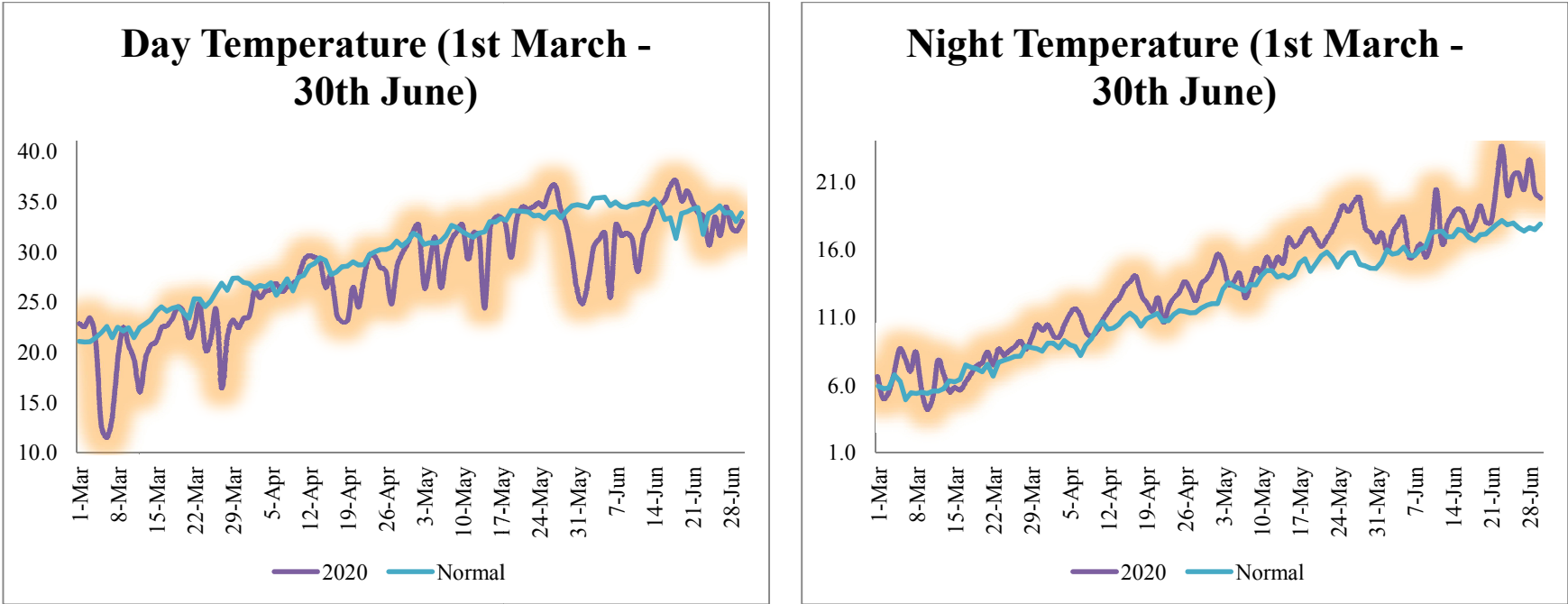
Fig. 1. Effect of lockdown on day and night temperature (°C) variation with normal

The night temperature started easing down and sustainable pattern was observed (Fig. 1) from 1st fortnight of March up to 2nd fortnight of June as compared to 2017-2020 and normal (Table 2) as the lockdown began. During 1st fortnight of March 2017-2020 and normal, lowest values observed were 2.0, 4.6, 2.8, 4.2 and 4.9, highest values observed were 8.0, 11.4, 9.2, 8.6 and 6.7. So, in 2020, the significant impact of lockdown was observed in 1st fortnight of March as night temperature 10.57% than normal mean value. The standard deviation calculated was 1.35 in lockdown and 0.47 in normal. During 2nd fortnight of March 2017-2020 and normal, lowest values observed were 3.5, 6.4, 4.6, 5.6 and 6.4 lowest and highest values noted were 12.5, 11.6, 11.2, 10.4 and 8.9 thereby significantly expressing 5.48% change from normal. The standard deviation calculated was 1.30 in lockdown and 0.74 in normal. Again, in 1st fortnight of April 2017-2020 and normal, the lowest and highest values noted were 4.5, 8.4, 9.8, 9.5 and 8.2 whereas highest values observed were 12.5, 14.4, 13.6, 13.2 and 11.0 significantly depicting 12.15% variation from normal mean temperature value. The standard deviation calculated was 1.12 in lockdown and 0.83 in normal. Following data collection in 2nd fortnight of April 2017-2020 and normal, lowest values were 8.4, 8.5, 9.6, 10.6 and 10.3 and highest values were 17.5, 14.2, 16.4, 14.0 and 11.9 illustrating -11.62% significant change from normal mean value. The standard deviation calculated was 0.96 in lockdown and 0.40 in normal. During 1st fortnight of May 2017-2020 and normal, lowest values observed were 7.5, 11.6, 10.4, 12.4 and 12.0 highest values observed were 16.5, 18.6, 14.2, 16.8 and 14.4 representing 7.62% deviation from normal mean value. The standard deviation calculated was 1.08 in lockdown and 0.75 in normal. During 2nd fortnight of May 2017-2020 and normal, lowest values observed were 12.8, 14.8, 13.5, 16.2 and 14.1 highest values observed were 19.0, 17.5, 16.2, 19.8 and 15.8 representing 14.38% deviation from normal mean value. The standard deviation calculated was 1.18 in lockdown and 0.51 in normal. During 1st fortnight of June 2017-2020 and normal, lowest values observed were 15.0, 17.0, 14.8, 15.4 and 15., highest values observed were 20.5, 22.4, 18.5, 20.4 and 17.5 illustrating 4.94% deviation from normal mean value. The standard deviation calculated was 1.46 in lockdown and 0.79 in normal. During 2nd fortnight of June 2017-2020 and normal, lowest values observed were 16.5, 17.6, 15.4, 17.4 and 16.7 highest values observed were 21.6, 20.8, 18.4, 23.6 and 18.1

representing 12.46% deviation from normal mean value. The standard deviation calculated was 1.82 in lockdown and 0.42 in normal.

In cumulative analysis of 122 days data for night temperature, lowest values observed were 2.0, 4.6, 2.8, 4.2 and 4.9 in 2017-2020 and normal and highest values noted were 21.6, 22.4, 18.5, 23.6 and 18.1 (Table 2). The change in night temperature in lockdown was 10.13% from normal mean value as no significant change was observed. The standard deviation calculated was 4.66 in lockdown and 4.00 in normal. In the study, it was found that the significant impact of lockdown was found to be more on day temperature than on night temperature and can be correlated to the CO_2 content in air. This essentially proves that the reduction in level of CO_2 might have reduced the warming capacity leading to reduced temperature during day time in lockdown period [1]. Also, the fluctuation in CO_2 pattern due to lack of anthropogenic activities amid lockdown could have reduced the gases content in atmosphere [7]. Also, due to the lockdown, emissions have reduced, thereby significantly reducing soot and sulphate particles which absorbs sunlight and causes more warming [1].

3.1.2 Effect on soil temperature (Morning and evening) at 5, 10 and 20 cm depth

As the lockdown began, the soil temperature at 5 cm depth in the morning started easing down and sustainable pattern was observed (Fig. 2) from 1st fortnight of March up to 2nd fortnight of June as compared to 2017-2019 and 2020 (Table 3). During 1st fortnight of March 2017-2019 and 2020, lowest values observed were 6.5, 9.0, 6.0 and 8.0, highest values observed were 10.0, 13.5, 9.5 and 12.0. So, in 2020, the significant impact of lockdown was observed in 1st fortnight of March as soil temperature at 5cm depth was 24.47% than 2019 mean value. The standard deviation calculated was 1.29 in lockdown and 0.94 in 2019. During 2nd fortnight of March 2017-2019 and 2020, lowest values observed were 8.0, 12.0, 8.0 and 9.5 lowest and highest values noted were 23.5, 23.5, 20.5 and 24.5 thereby significantly expressing 0.57% change from 2019 mean value. The standard deviation calculated was 3.74 in lockdown and 3.62 in 2019. Again, in 1st fortnight of April 2017-2019 and 2020, the lowest and highest values noted were 10.0, 15.0, 11.5 and 11.5 whereas highest values observed were 15.5, 16.5, 16.5 and 15.5 significantly depicting -5.68% variation from 2019 normal mean value. The standard

deviation calculated was 1.17 in lockdown and 1.61 in 2019. Following data collection in 2nd fortnight of April 2017-2019 and 2020, lowest values were 13.5, 12.5, 13.5 and 12.5 and highest values were 23.5, 23.5, 20.5 and 24.5 illustrating -1.18% significant change from 2019 mean value. The standard deviation calculated was 3.29 in lockdown and 1.57 in 2019. During 1st fortnight of May 2017-2019 and 2020, lowest values observed were 13.5, 14.5, 16.5 and 15.0 highest values observed were 22.0, 21.0, 19.5 and 18.5 representing -9.21% deviation from 2019 mean value. The standard deviation calculated was 1.06 in lockdown and 0.93 in 2019. During 2nd fortnight of May 2017-2019 and 2020, lowest values observed were 19.0, 19.5, 17.5 and 19.0 highest values observed were 23.5, 23.5, 20.5 and 24.5 representing 12.29% deviation from 2019 mean value. The standard deviation calculated was 1.54 in lockdown and 1.04 in 2019. During 1st fortnight of June May 2017-2019 and 2020, lowest values observed were 20.0, 21.5, 20.0 and 17.0 highest values observed were 24.5, 25.6, 22.0 and 23.5 illustrating -3.93% deviation from 2019 mean value. The standard deviation calculated was 2.10 in lockdown and 0.72 in 2019. During 2nd fortnight of June May 2017-2019 and 2020, lowest values observed were 20.0, 20.0, 20.0 and 23.0 highest values observed were 24.5, 23.5, 23.0 and 27.5 representing 15.59% deviation from 2019 mean value. The standard deviation calculated was 1.15 in lockdown and 1.08 in 2019.

In cumulative analysis of 122 days data for soil temperature at 5cm depth in morning, lowest values observed from 2017-2020 were 6.5, 9.0, 6.0 and 8.0 and highest values noted were 24.5, 25.6, 23.0 and 27.5. The change in soil temperature at 5cm depth in morning in lockdown was -4.65% from 2019 mean value. The standard deviation calculated was 4.94 in lockdown and 1.97 in 2019.

As the lockdown began, the soil temperature at 5 cm depth in the evening hours started easing down and sustainable pattern was observed (Fig. 2) from 1st fortnight of March upto 2nd fortnight of June as compared to 2017-2019 and 2020 (Table 4). During 1st fortnight of March 2017-2019 and 2020, lowest values observed were 11.5, 14.5, 11.5 and 10.5; highest values observed were 22.0, 23.5, 20.0 and 19.5. So, in 2020, the significant impact of lockdown was observed in 1st fortnight of March as day temperature was -81.85% than 2019 mean

value. The standard deviation calculated was 2.98 in lockdown and 2.59 in 2019 mean value. During 2nd fortnight of March 2017-2019 and 2020, lowest values observed were 17.0, 19.0, 14.0 and 16.0 lowest and highest values noted were 30.0, 30.0, 26.0 and 22.5 thereby significantly expressing 0.63% change from 2019 mean. The standard deviation calculated was 1.84 in lockdown and 3.34 in 2019. Again, in 1st fortnight of April 2017-2019 and 2020, the lowest and highest values noted were 15.0, 24.0, 27.5 and 22.0 whereas highest values observed were 30.0, 31.0, 31.5 and 27.0 significantly depicting -19.71% variation from normal mean value. The standard deviation calculated was 1.57 in lockdown and 1.03 in 2019. Following data collection in 2nd fortnight of April 2017-2019 and 2020, lowest values were 20.0, 20.0, 18.0 and 22.0 and highest values were 34.0, 34.0, 34.5 and 28.0 illustrating -9.45% significant change from normal mean value. The standard deviation calculated was 2.01 in lockdown and 4.61 in normal. During 1st fortnight of May 2017-2019 and 2020, lowest values observed were 22.5, 20.5, 26.0 and 23.5 highest values observed were 38.0, 34.5, 34.5 and 30.5 representing -8.26% deviation from 2019 mean value. The standard deviation calculated was 2.12 in lockdown and 2.73 in 2019. During 2nd fortnight of May 2017-2019 and 2020, lowest values observed were 24.0, 33.0, 25.5 and 28.0 highest values observed were 37.5, 38.5, 38.5 and 35.5 representing -1.47% deviation from 2019 mean value. The standard deviation calculated was in 1.96 lockdown and 4.26 in 2019. During 1st fortnight of June 2017-2019 and 2020, lowest values observed were 26.0, 26.5, 21.0 and 23.0 highest values observed were 37.5, 41.0, 39.0 and 35.0 illustrating -18.61% deviation from 2019 mean value. The standard deviation calculated was 3.48 in lockdown and 4.49 in normal. During 2nd fortnight of June 2017-2019 and 2020, lowest values observed were 22.5, 20.0, 28.0 and 33.0 highest values observed were 33.5, 37.5, 41.0 and 42.0 representing 5.83% deviation from 2019 mean value. The standard deviation calculated was 2.83 in lockdown and 3.49 in 2019 normal.

In cumulative analysis of 122 days, lowest values observed were 11.5, 14.5, 11.5 and 10.5 and highest values observed were 38.0, 41.0, 41.0 and 42.0 from 2017-2020. The change in soil temperature in the evening at 5cm depth in evening was -5.14% from 2019 mean value. The standard deviation calculated was 7.48 in lockdown and 6.65 in 2019.
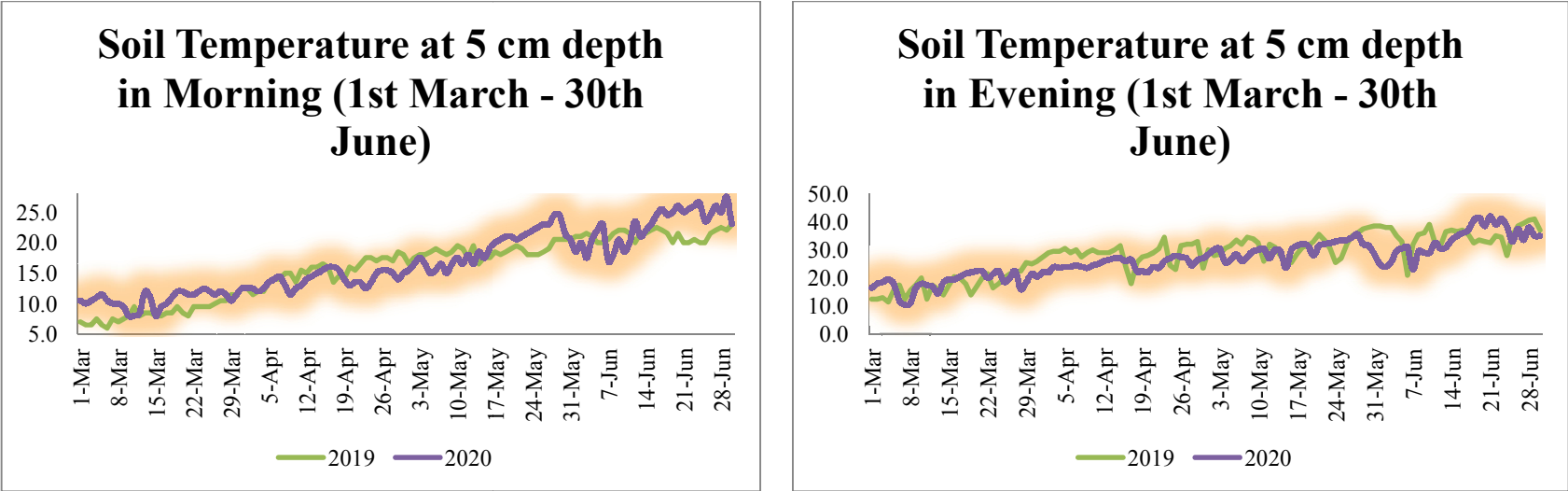
Fig. 2. Effect of lockdown on soil temperature (°C) at 5 cm depth in morning and evening variation with year 2019

Table 3. Descriptive coefficients of soil temperature (°C) at 5 cm depth in morning from March – June for the year 2017-2020 and normal

Timeline	Year	Lowest	Highest	Mean	S.E	S.D	CV (%)	Kurtosis	Skewness
March (1st Fortnight)	2017	6.50	10.00	8.10	0.25	0.99	0.12	-0.50	0.33
	2018	9.00	13.50	11.10	0.31	1.20	0.11	-0.16	0.09
	2019	6.00	9.50	7.50	0.24	0.94	0.13	-0.13	0.37
	2020	8.00	12.00	9.93	0.33	1.29	0.13	-0.89	-0.34
March (2nd Fortnight)	2017	8.00	23.50	16.60	0.48	4.20	0.25	-0.95	-0.30
	2018	12.00	23.50	17.03	0.37	3.27	0.19	-0.84	0.44
	2019	8.00	20.50	15.45	0.41	3.62	0.23	-0.79	-0.65
	2020	9.50	24.50	15.54	0.43	3.74	0.24	-0.38	0.72
April (1st Fortnight)	2017	10.00	15.50	13.07	0.43	1.68	0.13	-0.81	-0.55
	2018	15.00	16.50	15.73	0.15	0.56	0.04	-1.33	-0.08
	2019	11.50	16.50	14.13	0.42	1.61	0.11	-1.18	-0.23
	2020	11.50	15.50	13.37	0.30	1.17	0.09	-0.89	0.29
April (2nd Fortnight)	2017	13.50	23.50	19.38	0.37	2.50	0.13	-0.25	-0.63
	2018	12.50	23.50	18.76	0.44	2.99	0.16	-1.01	-0.10
	2019	13.50	20.50	17.87	0.23	1.57	0.09	0.98	-0.72
	2020	12.50	24.50	17.66	0.49	3.29	0.19	-0.88	0.48
May (1st fortnight)	2017	13.50	22.00	19.40	0.62	2.41	0.12	1.11	-1.15
	2018	14.50	21.00	17.97	0.48	1.88	0.10	-0.49	-0.26
	2019	16.50	19.50	18.13	0.24	0.93	0.05	-0.48	-0.30
	2020	15.00	18.50	16.60	0.27	1.06	0.06	-0.68	0.07
May (2nd fortnight)	2017	19.00	23.50	21.13	0.35	1.40	0.07	-1.39	0.17
	2018	19.50	23.50	22.00	0.30	1.18	0.05	-0.13	-0.93
	2019	17.50	20.50	18.97	0.26	1.04	0.05	-1.12	0.50
	2020	19.00	24.50	21.63	0.39	1.54	0.07	-0.13	0.54
June (1st fortnight)	2017	20.00	24.50	22.10	0.32	1.24	0.06	0.02	-0.01
	2018	21.50	25.60	23.17	0.28	1.08	0.05	0.84	0.89
	2019	20.00	22.00	21.13	0.19	0.72	0.03	-0.93	-0.54
	2020	17.00	23.50	20.33	0.54	2.10	0.10	-1.19	-0.05
June (2nd fortnight)	2017	20.00	24.50	22.13	0.34	1.32	0.06	-0.67	0.10
	2018	20.00	23.50	21.90	0.24	0.95	0.04	-0.14	-0.47
	2019	20.00	23.00	21.27	0.28	1.08	0.05	-1.56	-0.03
	2020	23.00	27.50	25.20	0.30	1.15	0.05	0.34	-0.36
Cumulative	2017	6.50	24.50	16.91	0.48	5.29	0.31	-1.11	-0.49
	2018	9.00	25.60	17.65	0.39	4.33	0.25	-1.25	-0.09
	2019	6.00	23.00	15.89	0.45	4.94	0.31	-1.02	-0.55
	2020	8.00	27.50	16.63	0.47	5.17	0.31	-1.04	0.34

As the lockdown began, the soil temperature at 10cm depth in the morning started easing down and sustainable pattern was observed (Fig. 3) from 1st fortnight of March upto 2nd fortnight of June as compared to 2017-2019 and 2020 (Table 5). During 1st fortnight of March 2017-2019 and 2020, lowest values observed were 7.5, 10.0, 7.5 and 10.0; highest values observed were 11.0, 14.0, 11.0 and 12.5. So, in 2020, the significant impact of lockdown was observed in 1st fortnight of March as day temperature was 23.15% than 2019 normal mean value. The standard deviation calculated was 0.80 in lockdown and 0.92 in normal. During 2nd fortnight of March 2017-2019 and 2020, lowest values observed were 8.5, 12.5, 9.0 and 11.0 lowest and highest values noted were 17.0, 16.0, 13.0 and 13.5 thereby significantly expressing 16.49% change from 2019 normal. The standard deviation calculated was 0.78 in lockdown and 1.15 in 2019. Again, in 1st fortnight of April 2017-2019 and 2020, the lowest and highest values noted were 11.5, 16.0, 12.5 and 13.5 whereas highest values observed were 16.5, 18.0, 18.0 and 17.0 significantly depicting -2.87% variation from 2019 normal mean value. The standard deviation calculated was 1.06 in lockdown and 1.83 in 2019. Following data collection in 2nd fortnight of April 2017-2019 and 2020, lowest values were 15.0, 13.5, 15.0 and 14.0 and

highest values were 23.0, 20.0, 20.0 and 17.5 illustrating -12.78% significant change from 2019 normal mean value. The standard deviation calculated was 1.06 in lockdown and 1.39 in 2019. During 1st fortnight of May 2017-2019 and 2020, lowest values observed were 16.5, 15.0, 18.0 and 16.5 highest values observed were 24.5, 21.5, 21.5 and 19.5 representing -10.50% deviation from 2019 normal mean value. The standard deviation calculated was 0.88 in lockdown and 0.98 in 2019. During 2nd fortnight of May 2017-2019 and 2020, lowest values observed were 20.0, 21.0, 19.0 and 20.5 highest values observed were 25.0, 25.5, 26.5 and 26.5 representing 11.02% deviation from 2019 normal

mean value. The standard deviation calculated was 1.52 in lockdown and 0.99 in 2019. During 1st fortnight of June 2017-2019 and 2020, lowest values observed were 21.5, 23.0, 22.0 and 20.5 highest values observed were 26.5, 26.0, 24.0 and 24.5 illustrating -3.13% deviation from 2019 normal mean value. The standard deviation calculated was 1.42 in lockdown and 0.67 in 2019. During 2nd fortnight of June 2017-2019 and 2020, lowest values observed were 21.5, 20.0, 21.5 and 24.5 highest values observed were 25.5, 25.0, 24.5 and 29.5 representing 11.24% deviation from normal mean value. The standard deviation calculated was 1.23 in lockdown and 1.04 in 2019.

Table 4. Descriptive coefficients of soil temperature (°C) at 5 cm depth in evening from March – June for the year 2017-2020

Timeline	Year	Lowest	Highest	Mean	S.E	S.D	CV (%)	Kurtosis	Skewness
March (1st Fortnight)	2017	11.50	22.00	17.23	0.92	3.58	0.21	-1.16	-0.38
	2018	14.50	23.50	20.13	0.72	2.79	0.14	-0.52	-0.84
	2019	11.50	20.00	15.03	0.67	2.59	0.17	-1.08	0.31
	2020	10.50	19.50	16.37	0.77	2.98	0.18	-0.08	-1.09
March (2nd Fortnight)	2017	17.00	30.00	24.47	0.90	3.58	0.15	-0.42	-0.41
	2018	19.00	30.00	25.34	0.78	3.14	0.12	-0.56	-0.10
	2019	14.00	26.00	20.50	0.84	3.34	0.16	-0.32	-0.04
	2020	16.00	22.50	20.63	0.46	1.84	0.09	1.12	-1.09
April (1st Fortnight)	2017	15.00	30.00	25.33	1.24	4.82	0.19	0.19	-1.10
	2018	24.00	31.00	27.20	0.56	2.16	0.08	-0.92	0.30
	2019	27.50	31.50	29.33	0.27	1.03	0.04	0.85	0.01
	2020	22.00	27.00	24.50	0.41	1.57	0.06	-0.52	0.19
April (2nd Fortnight)	2017	20.00	34.00	30.83	1.10	4.28	0.14	2.18	-1.71
	2018	20.00	34.00	28.10	1.20	4.64	0.17	-1.13	-0.36
	2019	18.00	34.50	27.77	1.19	4.61	0.17	-0.37	-0.46
	2020	22.00	28.00	25.37	0.52	2.01	0.08	-1.27	-0.51
May (1st fortnight)	2017	22.50	38.00	33.53	1.05	4.06	0.12	3.51	-1.87
	2018	20.50	34.50	27.37	0.97	3.75	0.14	-0.27	0.34
	2019	26.00	34.50	30.53	0.70	2.73	0.09	-0.92	-0.33
	2020	23.50	30.50	28.20	0.55	2.12	0.08	-0.13	-0.82
May (2nd fortnight)	2017	24.00	37.50	31.75	1.11	4.43	0.14	-1.16	-0.40
	2018	33.00	38.50	36.56	0.50	2.01	0.05	-1.01	-0.82
	2019	25.50	38.50	32.41	1.06	4.26	0.13	-0.98	-0.26
	2020	28.00	35.50	31.94	0.49	1.96	0.06	0.45	-0.39
June (1st fortnight)	2017	26.00	37.50	31.23	0.97	3.77	0.12	-1.20	0.40
	2018	26.50	41.00	36.37	0.94	3.64	0.10	2.85	-1.40
	2019	21.00	39.00	34.67	1.16	4.49	0.13	5.98	-2.17
	2020	23.00	35.00	29.23	0.90	3.48	0.12	-0.52	-0.38
June (2nd fortnight)	2017	22.50	33.50	29.17	0.87	3.36	0.12	-0.64	-0.47
	2018	20.00	37.50	31.87	1.23	4.78	0.15	1.47	-1.22
	2019	28.00	41.00	35.53	0.90	3.49	0.10	0.14	-0.25
	2020	33.00	42.00	37.73	0.73	2.83	0.08	-0.95	-0.14
Cumulative	2017	11.50	38.00	27.95	0.57	6.34	0.23	-0.27	-0.62
	2018	14.50	41.00	29.15	0.57	6.25	0.21	-0.91	-0.06
	2019	11.50	41.00	28.19	0.68	7.48	0.27	-0.59	-0.56
	2020	10.50	42.00	26.74	0.60	6.65	0.25	-0.23	0.05

Table 5. Descriptive coefficients of soil temperature (°C) at 10 cm depth in morning from March – June for the year 2017-2020

Timeline	Year	Lowest	Highest	Mean	S.E	S.D	CV (%)	Kurtosis	Skewness
March (1st Fortnight)	2017	7.50	11.00	9.10	0.27	1.06	0.12	-0.40	0.43
	2018	10.00	14.00	11.87	0.31	1.20	0.10	-0.90	0.11
	2019	7.50	11.00	8.63	0.24	0.92	0.11	1.94	1.16
	2020	10.00	12.50	11.23	0.21	0.80	0.07	-1.17	0.19
March (2nd Fortnight)	2017	8.50	17.00	12.97	0.73	2.91	0.22	-1.22	-0.24
	2018	12.50	16.00	14.09	0.26	1.02	0.07	-0.70	0.36
	2019	9.00	13.00	10.78	0.29	1.15	0.11	-0.38	0.21
	2020	11.00	13.50	12.91	0.19	0.78	0.06	1.34	-1.46
April (1st Fortnight)	2017	11.50	16.50	14.57	0.44	1.70	0.12	-1.02	-0.70
	2018	16.00	18.00	17.00	0.15	0.60	0.04	-0.75	-0.29
	2019	12.50	18.00	15.40	0.47	1.83	0.12	-1.07	-0.40
	2020	13.50	17.00	14.97	0.27	1.06	0.07	-0.87	0.52
April (2nd Fortnight)	2017	15.00	23.00	18.88	0.56	2.22	0.12	-0.66	0.14
	2018	13.50	20.00	17.25	0.51	2.02	0.12	-0.91	-0.39
	2019	15.00	20.00	18.08	0.35	1.39	0.08	0.05	-0.72
	2020	14.00	17.50	16.03	0.26	1.06	0.07	-0.73	-0.43
May (1st fortnight)	2017	16.50	24.50	21.20	0.58	2.25	0.11	-0.12	-0.43
	2018	15.00	21.50	18.93	0.52	2.03	0.11	-0.73	-0.43
	2019	18.00	21.50	19.67	0.25	0.98	0.05	-0.10	-0.28
	2020	16.50	19.50	17.80	0.23	0.88	0.05	-0.56	0.26
May (2nd fortnight)	2017	20.00	25.00	22.53	0.34	1.35	0.06	-0.32	0.04
	2018	21.00	25.50	23.69	0.33	1.31	0.06	-0.43	-0.69
	2019	19.00	22.50	20.91	0.25	0.99	0.05	-0.86	-0.12
	2020	20.50	26.50	23.50	0.38	1.52	0.06	0.54	0.21
June (1st fortnight)	2017	21.50	26.50	23.73	0.39	1.52	0.06	-0.65	0.27
	2018	23.00	26.00	24.30	0.23	0.88	0.04	-0.64	0.53
	2019	22.00	24.00	23.03	0.17	0.67	0.03	-1.23	-0.14
	2020	20.50	24.50	22.33	0.37	1.42	0.06	-1.13	0.39
June (2nd fortnight)	2017	21.50	25.50	23.53	0.30	1.17	0.05	-0.95	-0.09
	2018	20.00	25.00	23.30	0.34	1.31	0.06	1.70	-1.18
	2019	21.50	24.50	23.37	0.27	1.04	0.04	-0.75	-0.57
	2020	24.50	29.50	26.33	0.32	1.23	0.05	1.89	1.03
Cumulative	2017	7.50	26.50	18.33	0.49	5.46	0.30	-1.03	-0.52
	2018	10.00	26.00	18.80	0.41	4.57	0.24	-1.28	-0.11
	2019	7.50	24.50	17.46	0.48	5.27	0.30	-1.09	-0.52
	2020	10.00	29.50	18.14	0.47	5.18	0.29	-1.17	0.29

In cumulative analysis of 122 days, lowest values observed were 7.5, 10.0, 7.5 and 10.0; highest values observed were 26.5, 26.0, 24.5 and 29.5 from 2017-2020. The change in soil temperature in the evening at 10cm depth in morning in lockdown was 3.74% from 2019 mean value. The standard deviation calculated was 7.48 in lockdown and 6.65 in 2019.

As the lockdown began, the soil temperature at 10cm depth in the evening started easing down and sustainable pattern was observed (Fig. 3) from 1st fortnight of March upto 2nd fortnight of June as compared to 2017-2019 and 2020 (Table 6). During 1st fortnight of March 2017-

2019 and 2020, lowest values observed were 12.0, 13.0, 10.0 and 11.5; highest values observed were 18.5, 22.0, 17.5 and 17.0. So, in 2020, the significant impact of lockdown was observed in 1st fortnight of March as soil temperature (10cm) was 8.80% than 2019 normal mean value. The standard deviation calculated 1.81 was in lockdown and 2.06 in 2019. During 2nd fortnight of March 2017-2019 and 2020, lowest values observed were 15.0, 18.5, 13.5 and 14.5 lowest and highest values noted were 26.0, 27.5, 24.5 and 22.0 thereby significantly expressing -6.17% change from 2019 normal mean value. The standard deviation calculated was 1.67 in lockdown and 3.22 in

2019. Again, in 1st fortnight of April 2017-2019 and 2020, the lowest and highest values noted were 15.5, 22.5, 26.5 and 19.0 whereas highest values observed were 28.0, 29.0, 30.0 and 24.5 significantly depicting -25.87% variation from 2019 normal mean value. The standard deviation calculated was 1.60 in lockdown and 0.92 in 2019. Following data collection in 2nd fortnight of April 2017-2019 and 2020, lowest values were 21.0, 17.5, 19.0 and 20.5 and highest values were 30.0, 33.0, 32.5 and 25.0 illustrating -15.49% significant change from 2019 normal mean value. The standard deviation calculated was 1.62 in lockdown and 3.77 in 2019. During 1st fortnight of May 2017-2019 and 2020, lowest values observed were 23.0, 20.0, 26.0 and 21.0 highest values observed were 36.0, 32.0, 32.5 and 26.5 representing -17.25% deviation from 2019 normal mean value. The standard deviation calculated was 1.63 in lockdown and 2.10 in 2019. During 2nd fortnight of May 2017-2019 and 2020, lowest values observed were 25.0, 31.5, 24.5 and 25.5; highest values observed were 35.0, 36.5, 36.0 and 30.0 representing -11.61% deviation from 2019 normal mean value. The standard deviation calculated was 1.26 in lockdown and 3.90 in 2019. During 1st fortnight of June 2017-2019 and 2020, lowest values observed were 24.5, 29.5, 22.5 and 23.5 highest values observed were 31.0, 37.5, 37.0 and 31.5 illustrating -22.91% deviation from 2019 normal mean value. The standard deviation calculated was 2.48 in lockdown and 3.95 in 2019. During 2nd fortnight of June 2017-2019 and 2020, lowest values observed were 23.0, 21.00, 27.0 and 31.0 highest values observed were 29.0, 36.0, 38.0 and 38.5 representing 2.99 deviation from 2019 normal mean value. The standard deviation calculated was 2.46 in lockdown and 3.15 in 2019.

In cumulative analysis of 122 days, lowest values observed were 12.0, 13.0, 10.0 and 11.5; highest values observed were 36.0, 37.5, 38.0 and 38.5 from 2017-2020. The change in soil temperature in the evening at 10cm depth in evening in lockdown was -11.30% from 2019 mean value. The standard deviation calculated was 6.04 in lockdown and 7.29 in 2019.

As the lockdown began, the soil temperature at 20cm depth in the morning started easing down and sustainable pattern was observed (Fig. 4) from 1st fortnight of March upto 2nd fortnight of June as compared to 2017-2019 and 2020

(Table 7). During 1st fortnight of March 2017-2019 and 2020, lowest values observed were 9.5, 11.5, 9.5 and 11.5; highest values observed were 12.5, 15.5, 11.5 and 13.5. So, in 2020, the significant impact of lockdown was observed in 1st fortnight of March as soil temperature at 20cm depth was 18.29% than 2019 normal mean value. The standard deviation calculated was 0.50 in lockdown and 0.56 in 2019. During 2nd fortnight of March 2017-2019 and 2020, lowest values observed were 11.0, 14.0, 10.5 and 12.5 lowest and highest values noted were 18.5, 18.0, 14.0 and 15.5 thereby significantly expressing 15.41% change from 2019 normal mean value. The standard deviation calculated was 0.98 in lockdown and 1.09 in 2019. Again, in 1st fortnight of April 2017-2019 and 2020, the lowest and highest values noted were 14.0, 17.5, 13.5 and 15.5 whereas highest values observed were 20.0, 19.5, 19.0 and 18.0 significantly depicting -0.24% variation from 2019 normal mean value. The standard deviation calculated was 0.81 in lockdown and 1.87 in 2019. Following data collection in 2nd fortnight of April 2017-2019 and 2020, lowest values were 18.0, 15.5, 17.5 and 17.6 and highest values were 22.0, 22.0, 21.5 and 18.5 illustrating -10.46% significant change from 2019 normal mean value. The standard deviation calculated was 0.46 in lockdown and 1.30 in 2019. During 1st fortnight of May 2017-2019 and 2020, lowest values observed were 20.0, 16.5, 20.5 and 17.5 highest values observed were 25.5, 22.5, 22.5 and 2.5 representing -13.68% deviation from 2019 normal mean value. The standard deviation calculated was 0.89 in lockdown and 0.51 in 2019. During 2nd fortnight of May 2017-2019 and 2020, lowest values observed were 21.5, 22.0, 21.0 and 21.0 highest values observed were 25.5, 26.0, 24.0 and 27.0 representing 10.42% deviation from 2019 normal mean value. The standard deviation calculated was 1.68 in lockdown and 0.75 in 2019. During 1st fortnight of June 2017-2019 and 2020, lowest values observed were 24.0, 24.0, 24.0 and 22.5, highest values observed were 27.5, 26.0, 26.0 and 26.0 illustrating -2.77% deviation from 2019 normal mean value. The standard deviation calculated was 0.92 in lockdown and 0.73 in 2019. During 2nd fortnight of June 2017-2019 and 2020, lowest values observed were 22.5, 22.0, 24.0 and 26.0 highest values observed were 26.0, 26.0, 26.5 and 30.5 representing 7.06% deviation from 2019 normal mean value. The standard deviation calculated was 1.10 in lockdown and 0.81 in 2019 normal.

Table 6. Descriptive coefficients of soil temperature (°C) at 10 cm depth in evening from March – June for the year 2017-2020

Timeline	Year	Lowest	Highest	Mean	S.E	S.D	CV (%)	Kurtosis	Skewness
March (1st Fortnight)	2017	12.00	18.50	15.57	0.56	2.18	0.14	-1.29	-0.21
	2018	13.00	22.00	18.53	0.73	2.84	0.15	-0.73	-0.79
	2019	10.00	17.50	13.47	0.53	2.06	0.15	-0.56	0.22
	2020	11.50	17.00	14.77	0.47	1.81	0.12	-0.67	-0.80
March (2nd Fortnight)	2017	15.00	26.00	21.94	0.89	3.55	0.16	-1.10	-0.36
	2018	18.50	27.50	23.50	0.71	2.85	0.12	-1.14	0.09
	2019	13.50	24.50	18.91	0.81	3.22	0.17	-0.57	0.31
	2020	14.50	22.00	17.81	0.42	1.67	0.09	2.10	0.55
April (1st Fortnight)	2017	15.50	28.00	22.70	1.00	3.88	0.17	-0.54	-0.46
	2018	22.50	29.00	25.60	0.52	2.01	0.08	-0.96	0.22
	2019	26.50	30.00	28.07	0.24	0.92	0.03	0.28	0.56
	2020	19.00	24.50	22.30	0.41	1.60	0.07	0.14	-0.83
April (2nd Fortnight)	2017	21.00	30.00	27.63	0.76	2.92	0.11	1.49	-1.63
	2018	17.50	33.00	26.63	1.24	4.79	0.18	-0.96	-0.37
	2019	19.00	32.50	26.83	0.97	3.77	0.14	-0.44	-0.28
	2020	20.50	25.00	23.23	0.42	1.62	0.07	-1.33	-0.51
May (1st fortnight)	2017	23.00	36.00	30.85	0.83	3.23	0.10	1.76	-1.15
	2018	20.00	32.00	26.13	0.85	3.29	0.13	-0.17	0.31
	2019	26.00	32.50	29.43	0.54	2.10	0.07	-0.90	-0.30
	2020	21.00	26.50	25.10	0.42	1.63	0.06	1.41	-1.31
May (2nd fortnight)	2017	25.00	35.00	30.63	0.86	3.44	0.11	-1.28	-0.33
	2018	31.50	36.50	34.41	0.44	1.74	0.05	-1.29	-0.59
	2019	24.50	36.00	30.94	0.97	3.90	0.13	-1.20	-0.43
	2020	25.50	30.00	27.72	0.32	1.26	0.05	-0.61	0.25
June (1st fortnight)	2017	24.50	31.00	27.27	0.49	1.88	0.07	-0.18	0.27
	2018	29.50	37.50	34.37	0.64	2.50	0.07	-0.31	-0.78
	2019	22.50	37.00	33.10	1.02	3.95	0.12	2.50	-1.45
	2020	23.50	31.50	26.93	0.64	2.48	0.09	-0.76	-0.03
June (2nd fortnight)	2017	23.00	29.00	26.50	0.44	1.70	0.06	-0.50	-0.28
	2018	21.00	36.00	30.33	0.99	3.83	0.13	1.48	-0.90
	2019	27.00	38.00	33.63	0.81	3.15	0.09	-0.14	-0.58
	2020	31.00	38.50	34.67	0.64	2.46	0.07	-1.35	0.05
Cumulative	2017	12.00	36.00	25.40	0.51	5.59	0.22	-0.37	-0.48
	2018	13.00	37.50	27.46	0.54	5.93	0.22	-0.83	-0.15
	2019	10.00	38.00	26.77	0.66	7.29	0.27	-0.55	-0.82
	2020	11.50	38.50	24.05	0.55	6.04	0.25	-0.24	-0.15

In cumulative analysis of 122 days, lowest values observed were 9.5, 11.5, 9.5 and 11.5; highest values observed were 27.5, 27.5, 26.5 and 30.5 from 2017-2020. The change in soil temperature in the evening at 20cm depth in morning in lockdown was 2.65% from 2019 mean value. The standard deviation calculated was 5.08 in lockdown and 5.38 in 2019.

As the lockdown began, the soil temperature at 20cm depth in the evening started going down and sustainable pattern was observed (Fig. 4) from 1st fortnight of March up to 2nd fortnight of June as compared to 2017-2019 and 2020 (Table 8). During 1st fortnight of March 2017-

2019 and 2020, lowest values observed were 11.5, 12.0, 10.0 and 12.5; highest values observed were 14.0, 16.0, 15.0 and 15.5. So, in 2020, the significant impact of lockdown was observed in 1st fortnight of March as soil temperature was 15.28% than 2019 normal mean value. The standard deviation calculated was 0.90 in lockdown and 1.29 in 2019. During 2nd fortnight of March 2017-2019 and 2020, lowest values observed were 11.5, 16.0, 13.0 and 15.0 lowest and highest values noted were 22.5, 21.0, 20.0 and 18.5 thereby significantly expressing 7.48% change from 2019. The standard deviation calculated was 1.06 in lockdown and 2.17 in 2019. Again, in 1st fortnight

of April 2017-2019 and 2020, the lowest and highest values noted were 16.5, 20.0, 20.5 and 17.5 whereas highest values observed were 20.5, 22.5, 25.5 and 23.0 significantly depicting -11.57% variation from normal mean value. The standard deviation calculated 1.55 was in lockdown and 1.50 in 2019. Following data collection in 2nd fortnight of April 2017-2019 and 2020, lowest values were 21.0, 17.5, 19.0 and 19.0 and highest values were 25.0, 26.0, 27.0 and 23.5 illustrating -7.38% significant change from 2019 normal mean value. The standard deviation calculated was 1.55 in lockdown and 2.25 in 2019. During 1st fortnight of May 2017-

2019 and 2020, lowest values observed were 21.0, 20.0, 22.5 and 20.5 highest values observed were 28.5, 24.5, 27.5 and 25.0 representing -5.92% deviation from 2019 normal mean value. The standard deviation calculated was 1.20 in lockdown and 1.65 in 2019. During 2nd fortnight of May 2017-2019 and 2020, lowest values observed were 23.5, 23.5, 22.0 and 24.0 highest values observed were 28.0, 29.0, 27.5 and 28.5 representing 3.84% deviation from 2019 normal mean value. The standard deviation calculated was 1.28 in lockdown and 1.50 in 2019. During 1st fortnight of June 2017-2019 and 2020, lowest values observed were 24.5, 23.0,

Table 7. Descriptive coefficients of soil temperature (°C) at 20 cm depth in morning from March – June for the year 2017-2020

| Timeline	Year	Lowest	Highest	Mean	S.E	S.D	CV (%)	Kurtosis	Skewness
March (1st Fortnight)	2017	9.50	12.50	11.10	0.25	0.99	0.09	-1.18	0.13
	2018	11.50	15.50	12.90	0.34	1.30	0.10	-0.51	0.87
	2019	9.50	11.50	10.27	0.15	0.56	0.05	0.26	0.42
	2020	11.50	13.50	12.57	0.13	0.50	0.04	0.62	-0.30
March (2nd Fortnight)	2017	11.00	18.50	14.63	0.61	2.44	0.17	-1.18	-0.09
	2018	14.00	18.00	15.56	0.25	0.98	0.06	1.51	0.89
	2019	10.50	14.00	12.13	0.27	1.09	0.09	-0.91	0.21
	2020	12.50	15.50	14.34	0.24	0.98	0.07	-0.19	-0.78
April (1st Fortnight)	2017	14.00	20.00	16.97	0.37	1.43	0.08	1.15	-0.11
	2018	17.50	19.50	18.30	0.12	0.46	0.02	2.74	0.97
	2019	13.50	19.00	16.67	0.48	1.87	0.11	-1.04	-0.54
	2020	15.50	18.00	16.63	0.21	0.81	0.05	-1.05	0.54
April (2nd Fortnight)	2017	18.00	22.00	20.80	0.30	1.15	0.06	0.92	-0.83
	2018	15.50	22.00	18.90	0.51	1.97	0.10	-0.90	-0.05
	2019	17.50	21.50	19.63	0.34	1.30	0.07	-0.96	-0.39
	2020	17.00	18.50	17.77	0.12	0.46	0.03	-0.48	-0.11
May (1st fortnight)	2017	20.00	25.50	22.80	0.53	2.05	0.09	-1.44	-0.03
	2018	16.50	22.50	20.00	0.50	1.92	0.10	-1.00	-0.61
	2019	20.50	22.50	21.60	0.13	0.51	0.02	0.40	-0.46
	2020	17.50	20.50	19.00	0.23	0.89	0.05	-1.01	0.09
May (2nd fortnight)	2017	21.50	25.50	23.69	0.32	1.26	0.05	-0.92	-0.40
	2018	22.00	26.00	24.44	0.35	1.40	0.06	-1.04	-0.54
	2019	21.00	24.00	22.25	0.19	0.75	0.03	0.56	0.60
	2020	21.00	27.00	24.84	0.42	1.68	0.07	0.31	-0.74
June (1st fortnight)	2017	24.00	27.50	25.27	0.32	1.22	0.05	-0.42	0.90
	2018	24.00	27.50	25.63	0.22	0.85	0.03	0.60	0.31
	2019	24.00	26.00	24.80	0.19	0.73	0.03	-1.19	0.50
	2020	22.50	26.00	24.13	0.24	0.92	0.04	-0.12	0.19
June (2nd fortnight)	2017	22.50	26.00	24.77	0.28	1.08	0.04	-0.55	-0.61
	2018	22.00	26.00	24.87	0.26	1.01	0.04	3.87	-1.81
	2019	24.00	26.50	25.40	0.21	0.81	0.03	-0.84	-0.69
	2020	26.00	30.50	27.33	0.28	1.10	0.04	4.57	1.71
Cumulative	2017	9.50	27.50	19.99	0.46	5.11	-0.94	-0.58	-0.48
	2018	11.50	27.50	20.07	0.41	4.53	-1.20	-0.16	-0.15
	2019	9.50	26.50	19.06	0.49	5.38	-1.17	-0.47	-0.82
	2020	11.50	30.50	19.58	0.46	5.09	-1.24	0.23	-0.15
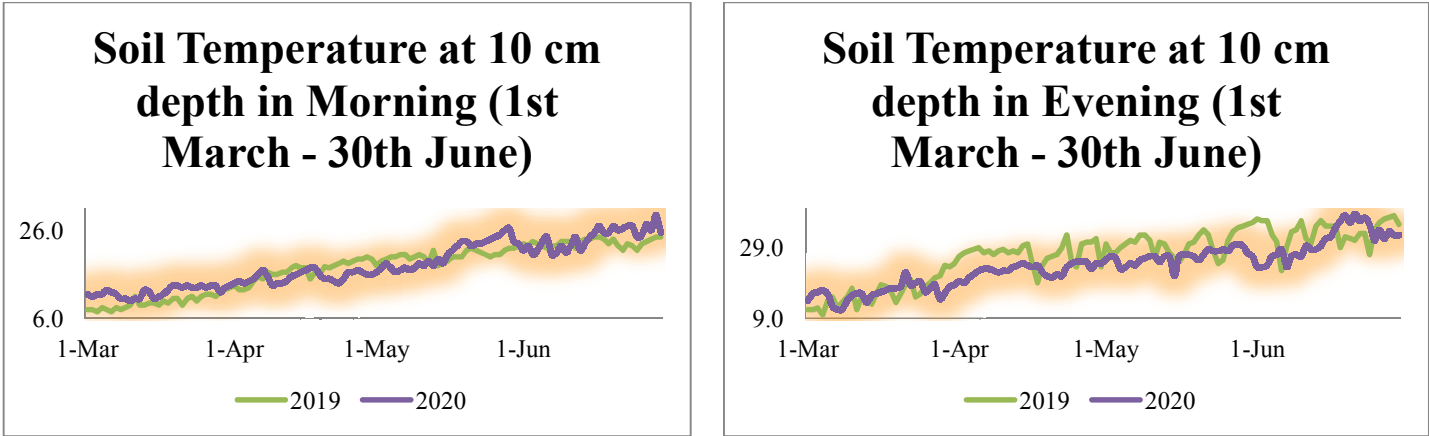
Fig. 3. Effect of lockdown on soil temperature (°C) at 10 cm depth in morning and evening variation with year 2019
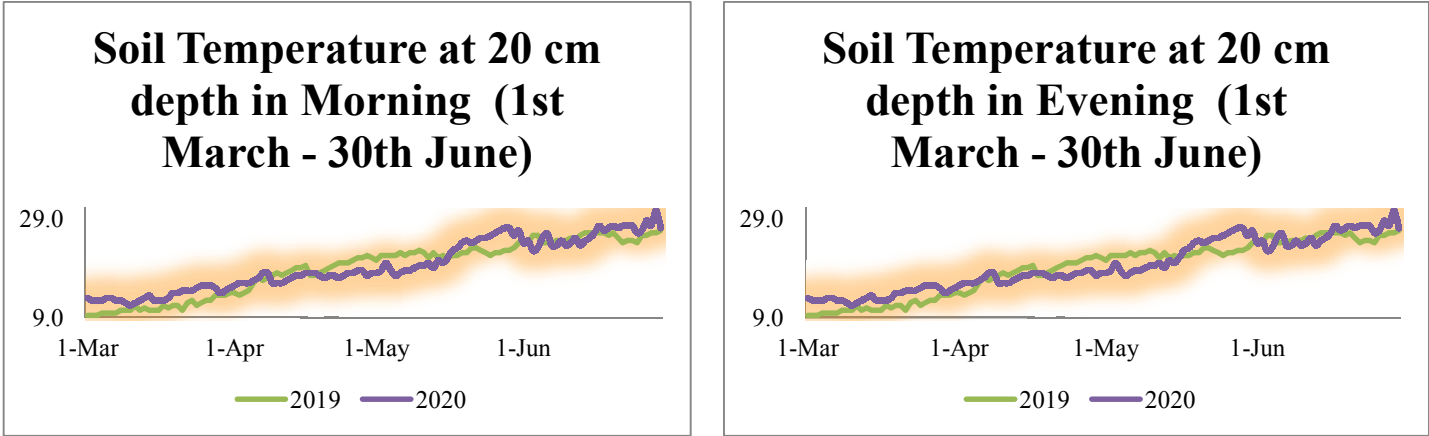

Fig. 4. Effect of lockdown on soil temperature (°C) at 20 cm depth in morning and evening variation with year 2019

24.0 and 24.0; highest values observed were 31.0, 30.5, 29.0 and 27.5 illustrating -3.88% deviation from 2019 normal mean value. The standard deviation calculated was 0.96 in lockdown and 1.37 in 2019. During 2nd fortnight of June 2017-2019 and 2020, lowest values observed were 23.0, 21.5, 25.0 and 28.5 highest values observed were 29.0, 32.5, 31.5 and 31.5 representing 7.93% deviation from 2019 normal mean value. The standard deviation calculated was 0.74 in lockdown and 2.11 in 2019.

In cumulative analysis of 122 days, lowest values observed were 11.5, 12.0, 10.0 and 12.5; highest

values observed were 31.0, 32.5, 31.5 and 31.5 from 2017-2020. The change in soil temperature in the evening at 20cm depth in evening in lockdown was 0.3% from 2019 mean value. The standard deviation calculated was 5.60 in lockdown and 5.11 in 2019. Soil temperature is a major parameter affecting crop germination and soil biota and is directly correlated with the air temperature. In study it has been analyzed that lockdown has consistently dropped the day temperature values thereby sustainably moving soil temperature values at varying depths [8] [9].

Table 8. Descriptive coefficients of soil temperature (°C) at 20 cm depth in evening from March – June for the year 2017-2020

Timeline	Year	Lowest	Highest	Mean	S.E	S.D	CV (%)	Kurtosis	Skewness
March (1st Fortnight)	2017	11.5	14	13.02	0.17	0.67	0.05	0.05	-0.69
	2018	12	16	14.7	0.31	1.19	0.08	0.54	-1.06
	2019	10	15	11.97	0.33	1.29	0.11	1	0.58
	2020	12.5	15.5	14.13	0.23	0.9	0.06	-1.01	-0.38
March (2nd Fortnight)	2017	11.5	22.5	17.12	0.71	2.85	0.17	0.14	-0.02
	2018	16	21	18.44	0.39	1.57	0.09	-1.59	0.16
	2019	13	20	15.44	0.54	2.17	0.14	-0.52	0.65
	2020	15	18.5	16.69	0.27	1.06	0.06	-1.12	0.25
April (1st Fortnight)	2017	16.5	20.5	18.36	0.35	1.35	0.07	-1.25	-0.02
	2018	20	22.5	21	0.2	0.76	0.04	-0.57	0.29
	2019	20.5	25.5	23.43	0.39	1.5	0.06	-0.35	-0.7
	2020	17.5	23	21	0.4	1.55	0.07	1.21	-1.32
April (2nd Fortnight)	2017	21	25	22.67	0.27	1.05	0.05	0.41	0.57
	2018	17.5	26	21.53	0.68	2.63	0.12	-1.03	0.25
	2019	19	27	23.4	0.58	2.25	0.1	-0.05	-0.62
	2020	19	23.5	21.79	0.4	1.55	0.07	-1.24	-0.67
May (1st fortnight)	2017	21	28.5	25.5	0.67	2.59	0.1	-1.06	-0.7
	2018	20	24.5	22.43	0.31	1.21	0.05	-0.12	-0.24
	2019	22.5	27.5	25.03	0.43	1.65	0.07	-1.42	-0.01
	2020	20.5	25	23.63	0.31	1.2	0.05	1.98	-1.25
May (2nd fortnight)	2017	23.5	28	25.66	0.38	1.52	0.06	-0.93	0.13
	2018	23.5	29	27.44	0.42	1.66	0.06	0.49	-1.11
	2019	22	27.5	25.03	0.37	1.5	0.06	-0.21	-0.24
	2020	24	28.5	26.03	0.32	1.28	0.05	-0.6	0.38
June (1st fortnight)	2017	24.5	31	27.27	0.49	1.88	0.07	-0.18	0.27
	2018	23	30.5	27.63	0.56	2.15	0.08	0.09	-0.76
	2019	24	29	26.73	0.35	1.37	0.05	-0.08	-0.54
	2020	24	27.5	25.73	0.25	0.96	0.04	0.32	0.34
June (2nd fortnight)	2017	23	29	26.5	0.44	1.7	0.06	-0.5	-0.28
	2018	21.5	32.5	27.37	0.6	2.34	0.09	3.39	-0.53
	2019	25	31.5	28.2	0.55	2.11	0.07	-1.38	0.08
	2020	28.5	31.5	30.63	0.19	0.74	0.02	4.25	-1.73
Cumulative	2017	11.5	31	22	0.47	5.22	0.24	-0.97	-0.48
	2018	12	32.5	22.57	0.43	4.75	0.21	-0.9	-0.15
	2019	10	31.5	22.37	0.51	5.6	0.25	-0.51	-0.82
	2020	12.5	31.5	22.44	0.46	5.11	0.23	-0.83	-0.15

3.2 Effect on Moisture

3.2.1 Rainfall

As the lockdown began, sustainable pattern was observed (Fig. 5) from 1st fortnight of March upto 2nd fortnight of June as compared to 2017-2020 and normal (Table 9). During 1st fortnight of March 2017-2020 and normal, lowest values observed were 0.0, 0.0, 0.0, 0.0 and 0.7; highest values observed were 13.8, 6.8, 22.6, 32.8 and 5.3. So, in 2020, the significant impact of lockdown was observed in 1st fortnight of March as rainfall was 65.68% than normal mean value. The standard deviation calculated was 11.4 in lockdown and 1.72 in normal. During 2nd fortnight of March 2017-2020 and normal, lowest values observed were 0.0, 0.0, 0.0, 0.0 and 0.0, highest values noted were 0.0, 1.4, 26.4, 40.8 and 9.2 thereby significantly expressing 44.87% change in rainfall from normal. The standard deviation calculated was 11.38 in lockdown and 2.20 in normal. Again, in 1st fortnight of April 2017-2020 and normal, the lowest and highest values noted were 0.0, 0.0, 0.0, 0.0 and 0.4 whereas highest values observed were 55.6, 15.8, 3.4, 4.2 and 6.9 significantly depicting -242.37% variation from normal mean rainfall value. The standard deviation calculated was 1.28 in lockdown and 1.67 in normal. Following data collection in 2nd fortnight of April 2017-2020 and normal, lowest values were 0.0, 0.0, 0.0, 0.0 and 0.0 and highest values were 15.2, 15.4, 17.2, 10.2 and 3.4 illustrating -10.21% significant change from normal mean value. The standard deviation calculated was 3.10 in lockdown and 1.18 in normal. During 1st fortnight of May 2017-2020 and normal, lowest values observed were 0.0, 0.0, 0.0, 0.0 and 0.1 highest values observed were 8.0, 12.4, 16.8, 5.2 and 4.0 representing 3.41% deviation from normal mean value. The

standard deviation calculated was 1.71 in lockdown and 1.01 in normal. During 2nd fortnight of May 2017-2020 and normal, lowest values observed were 0.0, 0.0, 0.0, 0.0 and 0.1 highest values observed were 8.0, 0.0, 8.4, 7.4 and 3.9 representing -91.80% deviation from normal mean value. The standard deviation calculated was 1.91 in lockdown and 1.01 in normal. During 1st fortnight of June 2017-2020 and normal, lowest values observed were 0.0, 0.0, 0.0, 0.0 and 0.5 highest values observed were 20.0, 38.8, 25.2, 16.8 and 4.2 illustrating -123.24% deviation from normal mean value. The standard deviation calculated was 4.46 in lockdown and 1.17 in normal. During 2nd fortnight of June 2017-2020 and normal, lowest values observed were 0.0, 0.0, 0.0, 0.0 and 1.7 highest values observed 0.0, 44.6, 4.2, 32.8 and 8.1 representing -35.73% deviation from normal mean value. The standard deviation calculated was 8.48 in lockdown and 2.06 in normal.

In cumulative analysis of 122 days data for rainfall, lowest values observed in all years was 0.0 in 2017-2020 and normal and highest values noted were 55.6, 44.6, 26.4, 44.8 and 9.25. The change in rainfall in lockdown was 19.27% from normal mean value as significant change was observed. The standard deviation calculated was 7.09 in lockdown and 1.81 in normal. The reasons for increase in rainfall can be explained by sulphate aerosols accumulation which might help in cloud formation by acting as cloud condensation nuclei (CCN) which could lead to the formation of enormous cumulonimbus clouds and effectively cause heavy thunderstorm events [1]. Also, it has been studied already that the drop in pollution levels can have a direct positive impact on rainfall pattern [10,11].
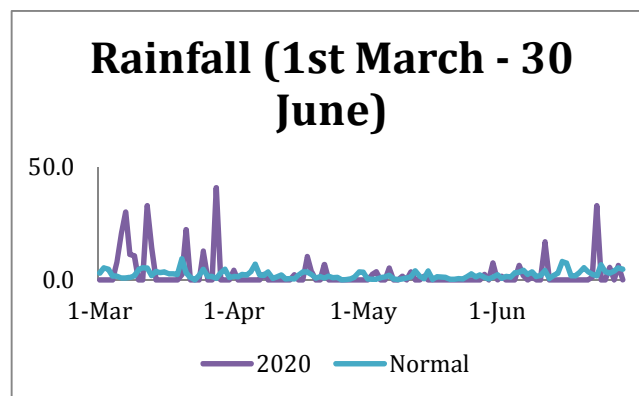

Fig. 5. Effect of lockdown on rainfall (mm) variation with normal

Table 9. Descriptive coefficients of rainfall (mm) from March – June for the year 2017-2020 and normal

Timeline	Year	Lowest	Highest	Mean	S.E	S.D	CV (%)	Kurtosis	Skewness
March (1st Fortnight)	2017	0.00	13.80	2.19	1.03	3.97	1.82	4.76	2.15
	2018	0.00	6.80	0.61	0.47	1.82	2.97	11.03	3.28
	2019	0.00	22.60	4.39	2.07	8.00	1.82	1.83	1.75
	2020	0.00	32.80	8.48	2.95	11.41	1.35	0.31	1.19
	Normal	0.73	5.26	2.91	0.44	1.72	0.59	-1.64	0.19
March (2nd Fortnight)	2017	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2018	0.00	1.40	0.09	0.09	0.35	4.00	16.00	4.00
	2019	0.00	26.40	2.00	1.66	6.65	3.33	14.32	3.74
	2020	0.00	40.80	4.88	2.84	11.38	2.33	6.79	2.62
	Normal	0.00	9.25	2.69	0.55	2.20	0.82	4.68	1.83
April (1st Fortnight)	2017	0.00	55.60	4.80	3.70	14.34	2.99	13.54	3.63
	2018	0.00	15.80	1.87	1.16	4.48	2.40	7.03	2.65
	2019	0.00	3.40	0.35	0.25	0.96	2.78	7.91	2.86
	2020	0.00	4.20	0.59	0.33	1.28	2.19	3.89	2.14
	Normal	0.39	6.89	2.02	0.43	1.67	0.83	4.64	1.87
April (2nd Fortnight)	2017	0.00	15.20	1.37	1.03	3.97	2.89	12.43	3.46
	2018	0.00	15.40	1.51	1.05	4.05	2.69	11.48	3.30
	2019	0.00	17.00	2.17	1.31	5.06	2.33	5.58	2.50
	2020	0.00	10.20	1.37	0.80	3.10	2.26	4.51	2.28
	Normal	0.00	3.45	1.51	0.30	1.18	0.78	-0.72	0.65
May (1st fortnight)	2017	0.00	8.00	0.67	0.54	2.09	3.14	12.82	3.53
	2018	0.00	12.40	1.39	0.88	3.42	2.47	8.29	2.84
	2019	0.00	16.80	1.48	1.15	4.46	3.01	11.61	3.36
	2020	0.00	5.20	1.17	0.44	1.71	1.46	0.62	1.28
	Normal	0.11	3.99	1.13	0.30	1.15	1.02	1.88	1.56
May (2nd fortnight)	2017	0.00	8.00	1.55	0.64	2.55	1.64	1.91	1.67
	2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2019	0.00	8.40	1.14	0.64	2.57	2.26	3.83	2.17
	2020	0.00	7.40	0.61	0.48	1.91	3.11	12.39	3.47
	Normal	0.07	3.89	1.17	0.25	1.01	0.86	2.48	1.45
June (1st fortnight)	2017	0.00	20.00	3.51	1.67	6.47	1.84	1.90	1.70
	2018	0.00	38.80	2.95	2.59	10.02	3.40	14.29	3.75
	2019	0.00	25.20	3.13	1.81	7.00	2.23	7.33	2.65
	2020	0.00	16.80	1.85	1.15	4.46	2.41	10.20	3.12
	Normal	0.53	4.17	2.28	0.30	1.17	0.51	-1.09	0.16
June (2nd fortnight)	2017	0.00	39.80	5.07	2.83	10.97	2.16	7.60	2.69
	2018	0.00	44.60	6.08	3.05	11.83	1.94	8.79	2.85
	2019	0.00	4.20	0.44	0.29	1.12	2.56	10.07	3.09
	2020	0.00	32.80	3.05	2.19	8.48	2.78	12.87	3.52
	Normal	1.72	8.13	4.14	0.53	2.06	0.50	-0.55	0.65
Cumulative	2017	0.00	55.60	2.37	0.64	7.12	3.01	31.61	2.15
	2018	0.00	44.60	1.78	0.55	6.10	3.42	30.84	3.28
	2019	0.00	26.40	1.88	0.47	5.15	2.74	10.88	1.75
	2020	0.00	40.80	2.75	0.64	7.09	2.58	12.71	1.19
	Normal	0.00	9.25	2.22	0.16	1.81	0.81	2.06	0.19

Table 10. Correlation of coefficients among weather parameters from March - June for year 2020 (lockdown period)

	Day Temp.	Night Temp.	Rainfall	Soil Temp. 5cm (M)	Soil Temp. 5cm (E)	Soil Temp. 10cm (M)	Soil Temp. 10cm (E)	Soil Temp. 20cm (M)
Night Temp.	0.82**							
Rainfall	-0.40**	-0.19*						
Soil Temp. 5cm (M)	0.81**	0.95**	-0.14					
Soil Temp. 5cm (E)	0.86**	0.90**	-0.31**	0.92**				
Soil Temp. 10cm (M)	0.80**	0.95**	-0.15	0.99**	0.90**			
Soil Temp. 10cm (E)	0.85**	0.91**	-0.26**	0.93**	0.99**	0.92**		
Soil Temp. 20cm (M)	0.81**	0.95**	-0.16	0.98**	0.89**	0.99**	0.91**	
Soil Temp. 20cm (E)	0.86**	0.94**	-0.26**	0.94**	0.95**	0.94**	0.97**	0.94**

**Correlation is significant at 1% level of significance; *Correlation is significant at 5% level of significance

Along with descriptive statistics, Pearson's correlation coefficient was analyzed during lockdown period (March – June, 2020) in order to find impact of one weather parameter over another in fortnightly interval (Table 10).

4. CONCLUSION

Increase in anthropogenic activities has led to greater emissions and dynamic trend towards increase in CO_2 and GHG (Greenhouse Gases). Although several worldwide appeals have been made to reduce emissions and protocols which have been framed to limit pollution, humans have failed to curb the major problem of climate change. In hilly regions, where ecosystem degradation is on rise, lockdown may emerge as a solution to reduce the pace of disastrous change. In the initial phase of strict lockdown, very significant observations has been noted leading to positive change in day temperature pattern, sustainability in night temperature, increase in rainfall illustrating a promising effect of lockdown amid COVID-19 pandemic. Therefore, implementing lockdown in phases can be a solution to reduce or curb the pace of climate change.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Balasubramanian S. As Emissions Reduce Due to Lockdown, What's in Store for Weather Patterns Across India; 2020. Available:www.weather.com/en-IN
2. Kallos G, Kassomensos P, Pielke RA. Synoptic and mesoscale weather conditions during air pollution episodes in Athens. Greece. 1993;62:163.
3. Yen MC, Peng CM, Chen TC, Chen CS, Lin NH, Tzeng RY, Lee YA, Lin CC. Climate and weather characteristics in association with the active fires in northern Southeast Asia and spring air pollution in Taiwan during 2010 7-SEAS/Dongsha experiment. Atmos. Environ. 2013;78:35–50.
    DOI: 10.1016/j.atmosenv.2012.11.015
4. Goswami S. Climate change impact on agriculture leads to 1.5 per cent loss in India's GDP; 2017. Available:www.downtoearth.org.in
5. SIAM, Vehicle Sales and Projections. Society of Indian Automobile Manufacturing, Government of India, New Delhi, India; 2013.
6. Amann M, Purohit P, Bhanarkar AD, Bertok I, Borken-Kleefeld J, Cofala J, Heyes C, Kiesewetter G, Klimont Z, Liu J, Majumdar D. Managing future air quality in megacities: A case study for Delhi. Atmos. Environ. 2017;161:99–111.
7. WHO, Coronavirus disease 2019 (COVID-19) Situation Report–63; 2020. Available:https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200323-sitrep-63-covid-19.pdf?sfvrsn=b617302d_4
8. Bhatt RP. Climate change assessment, impacts of global warming, projections and mitigation of GHG emissions endorsing green energy. 2018;4(1):33-48.
9. Gobel L, Heinz C, Dietrich H, Sandra W, Christoph L. The role of low soil temperature for photosynthesis and stomatal conductance of three graminoids from different elevations. Frontiers in Plant Science. 2019;10:330.
10. Rosenfeld D. Suppression of rain and snow by urban and industrial air pollution. Science. 2000;287:1793.
11. Gavati A, Rosenfeld D. Quantifying precipitation suppression due to air pollution. Journal of Applied Meteorology. 2004;43:1038-1056.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/60205