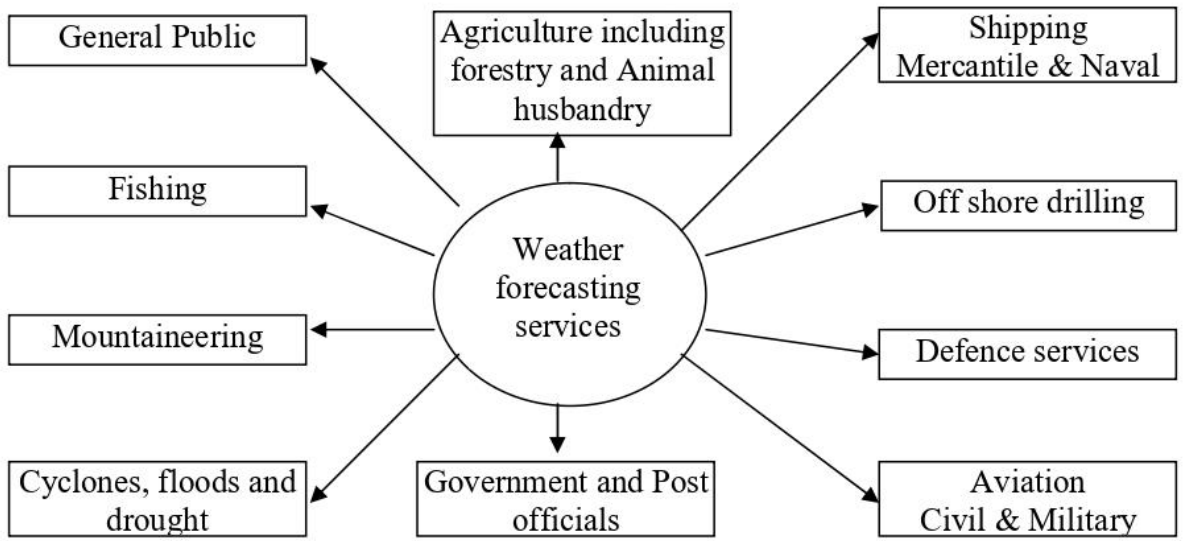
# AGROCLIMATIC NORMALS, WEATHER FORECASTING – TYPES, IMPORTANCE – SYNOPTIC CHART – CROP WEATHER CALENDAR.

**Climatic normals**

The climatic normals are the average value of 30 years of a particular weather element. The period may be week, month and year. The crop distribution, production and productivity depend on the climatic normals of a place. If the crops are selected for cultivation based on the optimum climatic requirements it is likely that the crop production can be maximized.

**Weather forecast**

The prediction of weather for the next few days to follow. The Figure below depicts different weather forecasting services normally practiced in a country.



## NEED / IMPORTANCE OF FORECAST

- Basically weather has many social and economic impacts in a place.
- Among different factors that influence crop production, weather plays a decisive role as aberrations in it alone explains up to 50 per cent variations in crop production
- The rainfall is the most important among the required forecast, which decides the crop production in a region and ultimately the country's economy.
- The planning for moisture conservation under weak monsoon condition and for flood relief under strong monsoon condition is important in a region.
- A reliable weather forecasting when disseminated appropriately will pave way for the effective sustainability.
- One can minimize the damage, which may be caused directly or indirectly by unfavourable weather.
- The recurring crop losses can be minimized if reliable forecast on incidence of pest and diseases is given timely based on weather variables.
- Help in holding the food grain prices in check through buffer stock operations. This means that in good monsoon years when prices fall, the government may step in and buy and in bad years when price tend to rise, it may unload a part of what it had purchased.
- Judicious use of water can be planned in a region depending up on the forecast.

**Type of weather forecast**

| | Types of forecast | Validity period | Main users | Predictions |
|---|---|---|---|---|
| 1 | Short range<br>a) Now casting | Up to 72 hours<br>0-2 hours | Farmers marine agencies, general public | Rainfall distribution, heavy rainfall, heat and cold wave conditions, thunder storms etc. |
| | b) Very short range | 0-12 hours | | |
| 2 | Medium range | Beyond 3 days and upto 10 days. | Farmers | Occurrence of rainfall, Temperature. |
| 3 | Long range | Beyond 10 days upto a month and a season. | Planners | This forecasting is provided for Indian monsoon rainfall. The out looks are usually expressed in the form of expected deviation from normal condition. |

**Accuracy, usefulness and main limitations of weather forecasts for agriculture**

| *Type of weather forecast* | *Accuracy*[a] | *Usefulness* | | *Main limitations* |
|---|---|---|---|---|
| | | *Real* | *Potential* | |
| Nowcasting | Very high | Very low | Low | Unsuitability of broadcasting system; insufficient flexibility of agricultural technology |
| Very short-range forecast | Very high | Low | Moderate | Unsuitability of broadcasting system; insufficient flexibility of agricultural technology; farmers do not know how to make the most use of available forecasts |
| Short-range weather forecast | High | Moderate | High | Further adaptation of forecasts to farmers' requirements is needed; farmers do not know how to make the most use of available forecasts |
| Medium-range weather forecast | High or moderate until 5 days; lower thereafter | High | Very high | Further adaptation of forecasts to farmers' requirements is needed; farmers do not know how to make the most use of available forecasts |
| Long-range forecast | Very low | High in warning of delays in arrival of weather systems. Very low otherwise | Poor | Reliability (The reliability of LRF is higher for the tropics than for mid-latitudes. This is because tropical areas have a moderate amount of predictable signal, whereas in the mid-latitudes random weather fluctuations are usually larger than the predictable component of the weather.) |

# Synoptic Charts

The word synoptic means a summary of the current situation. Therefore, in weather terms, a synoptic chart is a map that summarises what kind of weather is moving over places. Synoptic charts are a tool meteorologists use to observe and predict weather conditions over a large area, such as a country or continent.

## Representation of Weather Elements

**Air Pressure**: One of the main elements displayed on a synoptic chart is air pressure, which is critical for forecasting weather.

**Isobars:** These are lines that connect areas of the same air pressure. They help identify high and low-pressure systems.

**Wind Patterns**: By studying the isobars, meteorologists can deduce the wind direction and speed.

**Temperature, Rainfall, and Other Weather Symbols**: These charts may also include specific symbols that represent different weather conditions like temperature, humidity, rainfall, etc.

| Symbol | Precipitation | Symbol | Cloud cover | Symbol | Wind speed |
|---|---|---|---|---|---|
| | Drizzle | | Clear sky | | Calm |
| | Shower | | *One okta* | | 1-2 knots |
| | Rain | | Two oktas | | 5 knots |
| | Snow | | Three oktas | | 10 knots |
| | Hail | | Four oktas | | 15 knots |
| | Thunderstorm | | Five oktas | | 20 knots |
| | Heavy rain | | Six oktas | | 50 knots or more |
| | Sleet | | Seven oktas | | |
| | Snow shower | | Eight oktas | | |
| | Mist | | Sky obscured | | |
| | Fog | | | | |

## High and low-pressure systems

High Pressure: This often means settled and clear weather. On the chart, it’s represented by widely spaced isobars.

Low Pressure (Depression): This is typically associated with unsettled weather, like rain and storms. Closely spaced isobars represent low pressure.

## Why are synoptic charts important in weather forecasting

Synoptic charts provide a big-picture view of the weather over a region, making them essential for weather prediction.

They help in understanding the movement and development of weather systems.

They are helpful for everyone, from meteorologists to pilots, sailors, and even ordinary people planning their day.

**Synoptic charts**

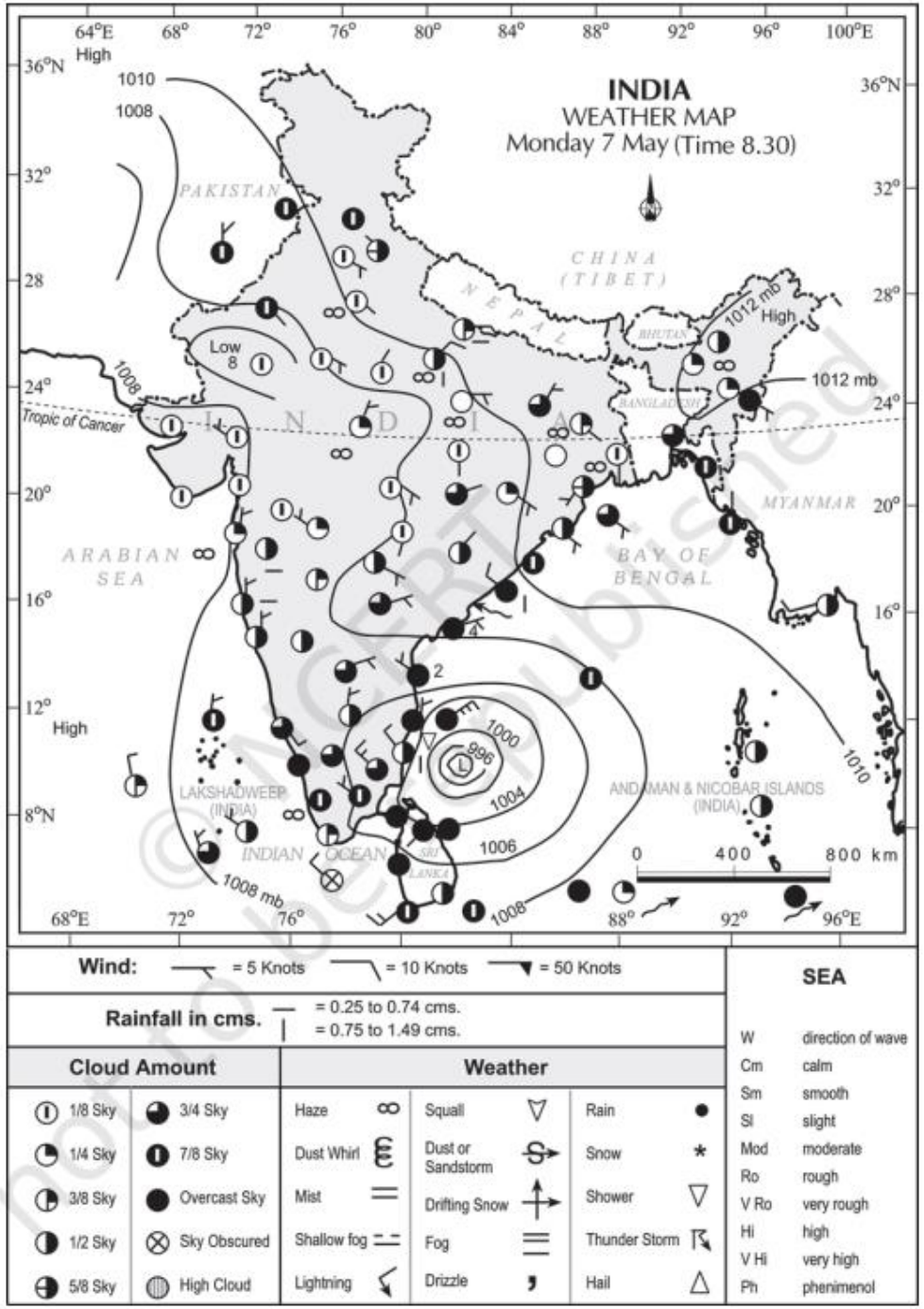
An enormous volume of meteorological data is being collected from all over the world continuously round the clock through various telecommunication channels. To assess, assimilate and analyse the vast data, they have to be suitably presented. For this purpose, the observations are plotted on maps in standard weather codes. These maps are called 'Synoptic maps or charts'.

Synoptic charts display the weather conditions at a specified time over a large geographical area. The surface synoptic charts plotted for different synoptic hours (00, 03, 06, 09, 12, 15, 18, 21 UTC) depict the distribution of pressure, temperature, dew point, clouds, winds, present and past weather. In place of GMT, UTC (Universal Time Co-ordinate) is used. The upper air charts are also prepared at the standard pressure levels of the atmosphere (different heights) of the atmosphere wherein the pressure, wind and temperature are plotted. The surface charts together with the upper air charts provide a composite three-dimensional weather picture pertaining to a given time. Thus it gives a birds eye view of the state of atmosphere at a time over a large area and is a important tool used by operational meteorologists and scientists.

The surface synoptic charts are the most used charts. It contains the maximum number of observations with the largest number of parameters plotted and often forms the base on which the pressure level charts are built up. The pattern of the pressure distribution is brought out by drawing isobars, troughs, ridges, lows, highs, depressions, cyclones, cols, fronts and discontinuities. These systems are clearly marked and labeled using appropriate symbols and colours.

In synoptic charts different weather phenomena and atmospheric characters are marked with different symbols as mentioned below.

| S.No | Symbols | Weather element/character/phenomenon |
|---|---|---|
| 1. | Narrow black lines | Isobars |
| 2. | Numbers at ends of isobars | Pressure values in hPa |
| 3. | Shading | Precipitation |
| 4. | Arrows | Wind direction |
| 5. | Feathers in the arrows | Wind velocity |
| 6. | Small circles with shading | Amount of clouds |




**Wind:** = 5 Knots = 10 Knots = 50 Knots

**Rainfall in cms.** = 0.25 to 0.74 cms. = 0.75 to 1.49 cms.

| Cloud Amount | | Weather | | | |
|---|---|---|---|---|---|
| 1/8 Sky | 3/4 Sky | Haze | Squall | Rain | |
| 1/4 Sky | 7/8 Sky | Dust Whirl | Dust or Sandstorm | Snow | |
| 3/8 Sky | Overcast Sky | Mist | Drifting Snow | Shower | |
| 1/2 Sky | Sky Obscured | Shallow fog | Fog | Thunder Storm | |
| 5/8 Sky | High Cloud | Lightning | Drizzle | Hail | |

**SEA**

| | |
|---|---|
| W | direction of wave |
| Cm | calm |
| Sm | smooth |
| Sl | slight |
| Mod | moderate |
| Ro | rough |
| V Ro | very rough |
| Hi | high |
| V Hi | very high |
| Ph | phenimenol |

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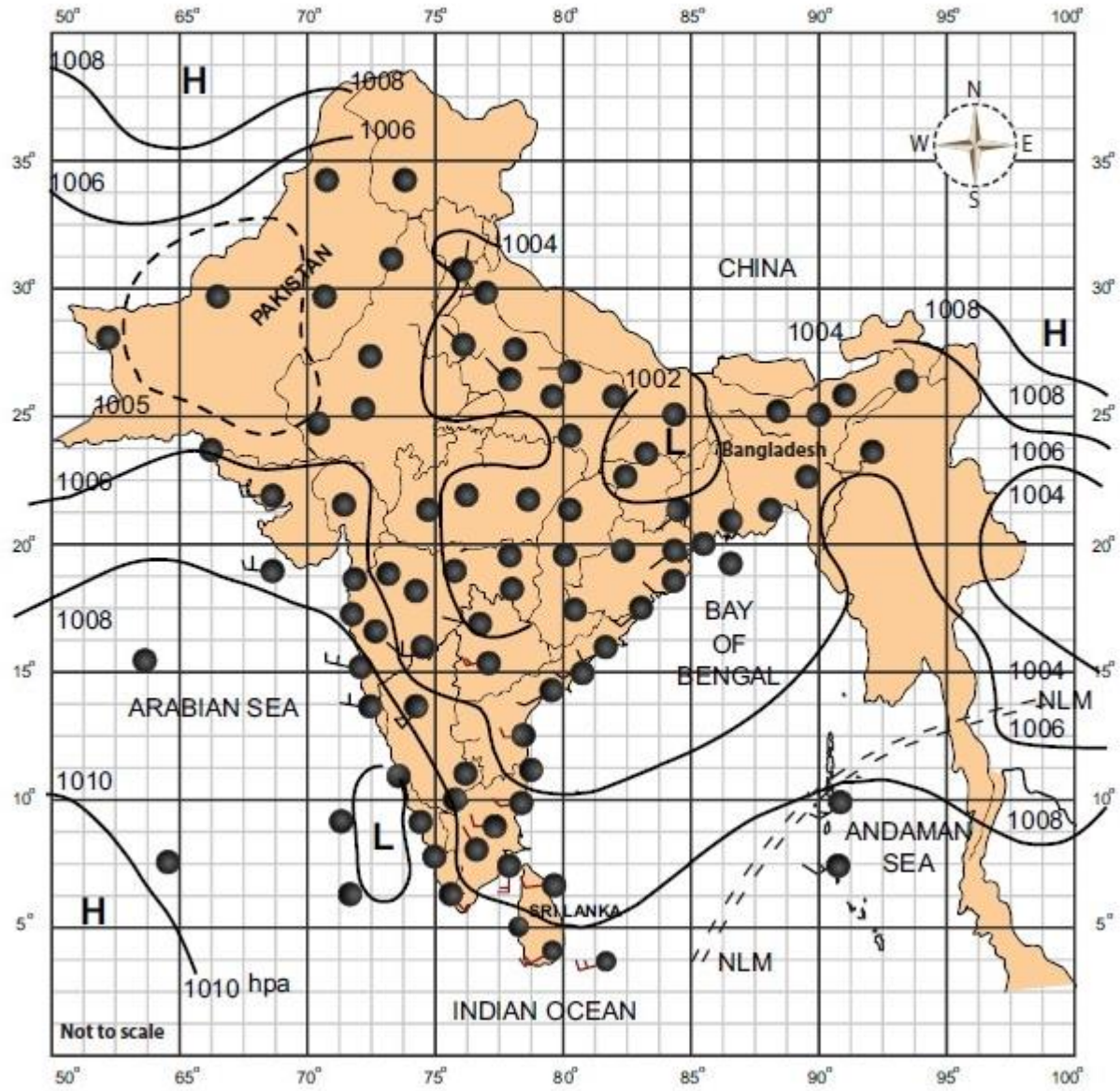
# INDIAN DAILY WEATHER REPORT

## WEATHER MAP AT 08.30 HRS .I.S.T. (0300 HRS. G.M.T)

Monday 1 June 1992 (11 Jyaistha 1914 Saka)



# Current weather Forecast

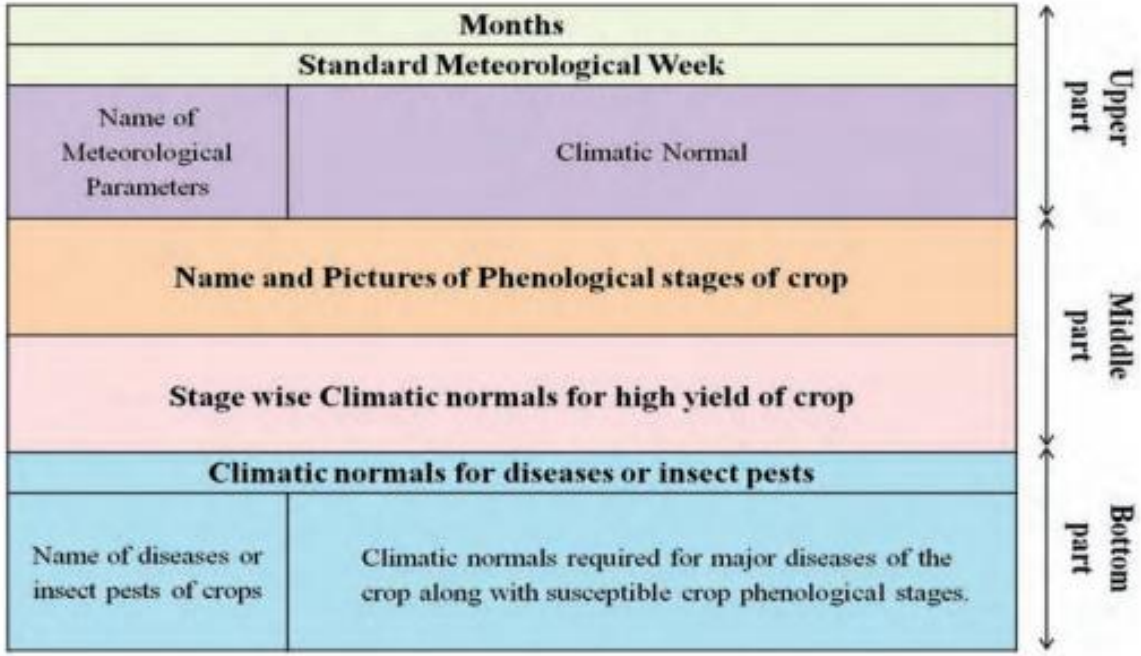
https://www.weather-forecast.com/maps/India

*Crop-Weather Calendars*

- Weather is one of the most important factors affecting the agricultural production.
- The increase in climatic variability and associated extreme weather episodes such as erratic rainfall distribution, abrupt change in day and night temperatures during crop season and sudden outbreaks in pest disease population, are throwing challenges to sustaining production levels of different crops.
- One strategy that farmers can adopt to sustain or increase crop yields in the face of a highly variable climate is to manipulate the crop environment through improved management strategies for adaptation.
- Agriculture is one of the most important sectors for India. Proper planning for this sector requires relevant and reliable information in timely manner. Information on crop, its stages and the week by week weather during the crop season is essential for proper management of agriculture.
- Farm operations planned in conjunction with weather information are very likely to curtail the costs of inputs and various field operations.
- Crop weather calendar is a comprehensive guide for farmers.
- It is a tool that provides information on average weather of every week, planting, sowing and harvesting periods of locally adapted crops in a specific agro-ecological zone.
- Further, stage-wise pest disease infestation information can also be added

- The weather calendar provides information on the sowing rates of seed and planting material and the main agricultural practices.
- This tool supports farmers and agriculture extentionists in taking appropriate decisions on crops and their sowing period, respecting the agro- ecological dimension.
- It also provides a solid base for emergency/contingency planning of the rehabilitation of farming systems after disasters.
- The concept of using crop-weather calendar provide information on the crop sowing and harvesting dates, seed rate, operation timings of mechanical equipment in the period etc.
- This calendar describes the month wise weather and operations to be taken up during the period

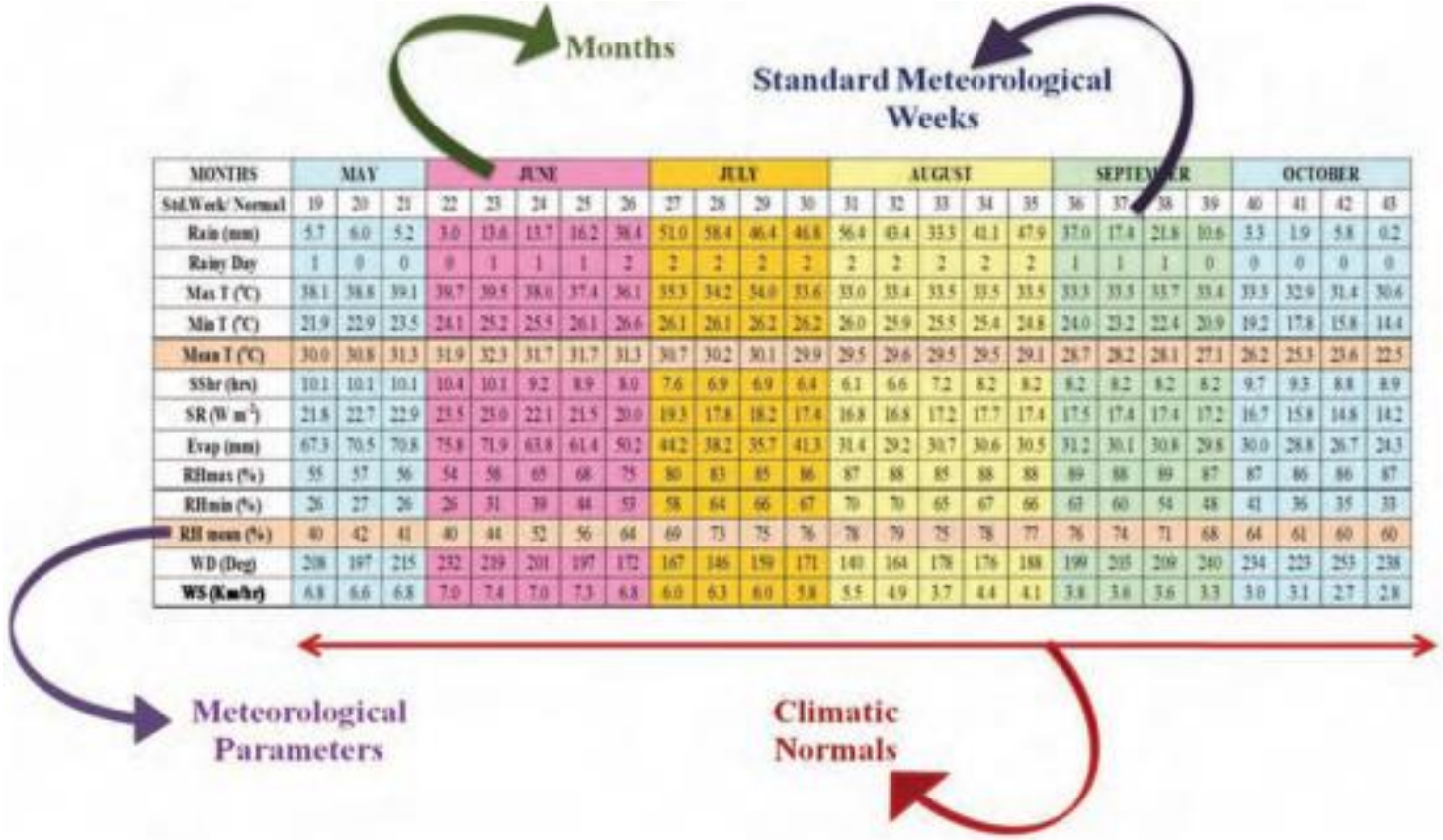
Structure of the Crop-weather Calendar




- Structure of crop weather calendar consists of three parts.
- Climatic normals for location specific crop growing season is presented in the upper portion.
- Phenological events of the crop are represented in a weekly time frame in the middle portion together with favourable climatic parameters to realize potential or optimum yield.
- On the lower part of the calendar, the favourable weather conditions for development of pests and diseases are reported. The components of each part of the calendar are discussed here under.

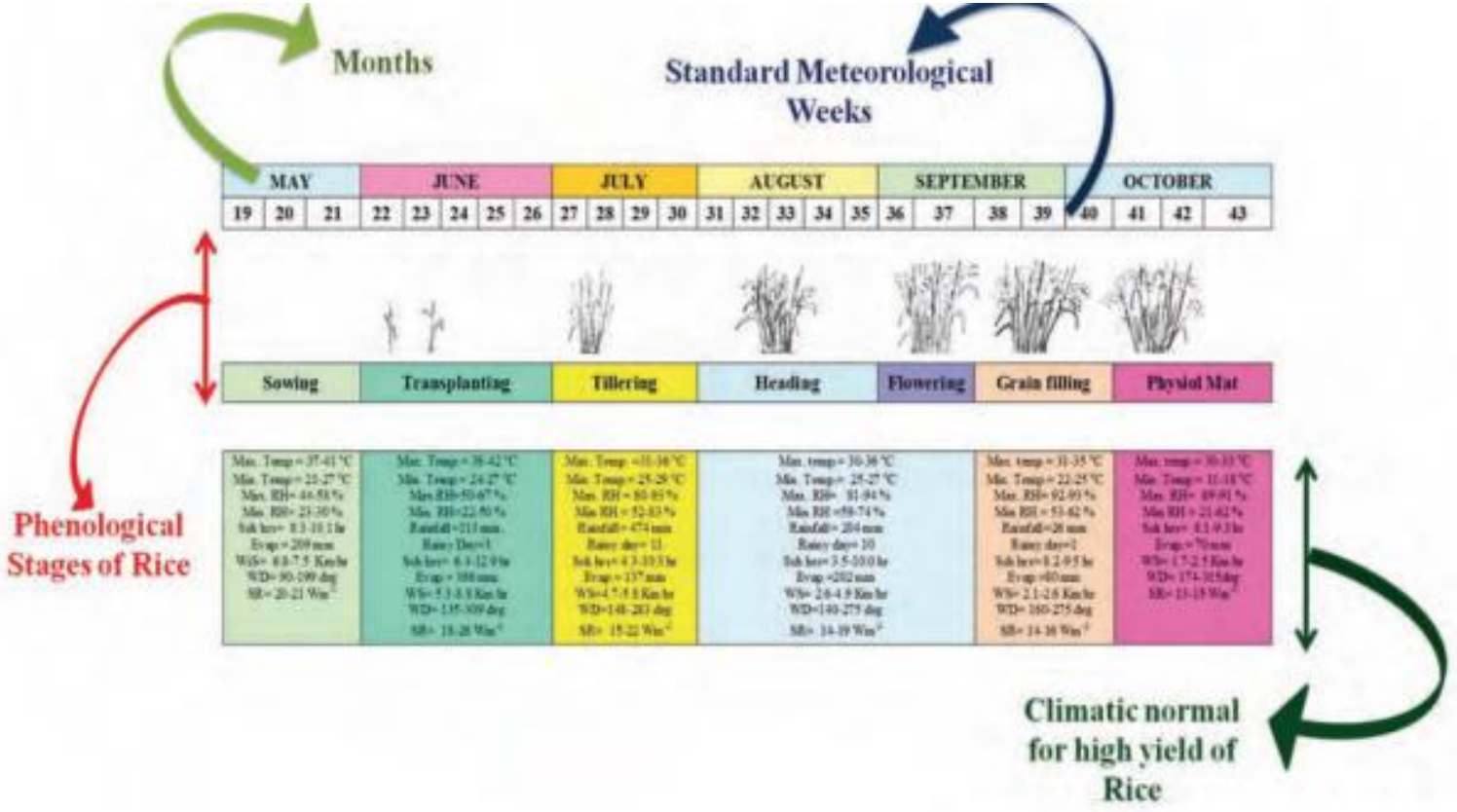
Top Portion of the Calendar Part I - Climatic normals

These climatic normals of each centre computed for total weekly rainfall (mm), number of rainy days, evaporation (mm), weekly maximum temperature (°C), minimum temperature (°C), mean temperature (°C), sunshine hours (hours), solar radiation, maximum relative humidity (%), minimum relative humidity (%), mean relative humidity (%), wind speed (Km/hr) and wind direction (degree) arranged in standard meteorological week wise in the upper portion of crop weather calendar



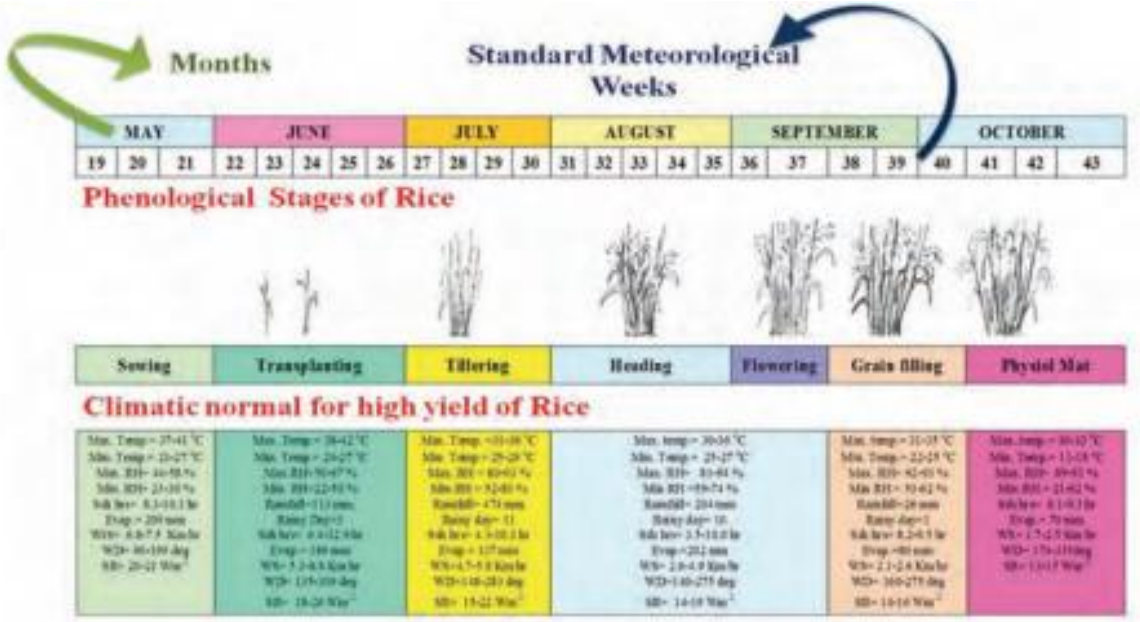

| MONTHS | MAY | | | JUNE | | | | | JULY | | | | AUGUST | | | | | SEPTEMBER | | | | OCTOBER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Std.Week/ Normal | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 |
| Rain (mm) | 5.7 | 6.0 | 5.2 | 3.0 | 13.6 | 13.7 | 16.2 | 38.4 | 51.0 | 58.4 | 46.4 | 46.8 | 56.4 | 43.4 | 33.5 | 41.1 | 47.9 | 37.0 | 17.4 | 21.8 | 10.6 | 3.3 | 1.9 | 5.8 | 0.2 |
| Rainy Day | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Max T (°C) | 38.1 | 38.8 | 39.1 | 39.7 | 39.5 | 38.0 | 37.4 | 36.1 | 35.3 | 34.2 | 34.0 | 33.6 | 33.0 | 33.4 | 33.5 | 33.5 | 33.5 | 33.3 | 33.5 | 33.7 | 33.4 | 33.3 | 32.9 | 31.4 | 30.6 |
| Min T (°C) | 21.9 | 22.9 | 23.5 | 24.1 | 25.2 | 25.5 | 26.1 | 26.6 | 26.1 | 26.1 | 26.2 | 26.2 | 26.0 | 25.9 | 25.5 | 25.4 | 24.8 | 24.0 | 23.2 | 22.4 | 20.9 | 19.2 | 17.8 | 15.8 | 14.4 |
| Mean T (°C) | 30.0 | 30.8 | 31.3 | 31.9 | 32.3 | 31.7 | 31.7 | 31.3 | 30.7 | 30.2 | 30.1 | 29.9 | 29.5 | 29.6 | 29.5 | 29.5 | 29.1 | 28.7 | 28.2 | 28.1 | 27.1 | 26.2 | 25.3 | 23.6 | 22.5 |
| SShr (hrs) | 10.1 | 10.1 | 10.1 | 10.4 | 10.1 | 9.2 | 8.9 | 8.9 | 7.6 | 6.9 | 6.9 | 6.4 | 6.1 | 6.6 | 7.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 8.2 | 9.7 | 9.3 | 8.8 | 8.9 |
| SR (W m$^{-2}$) | 21.8 | 22.7 | 22.9 | 23.5 | 23.0 | 22.1 | 21.5 | 20.0 | 19.3 | 17.8 | 18.2 | 17.4 | 16.8 | 16.8 | 17.2 | 17.7 | 17.4 | 17.5 | 17.4 | 17.4 | 17.2 | 16.7 | 15.8 | 14.8 | 14.2 |
| Evap (mm) | 67.3 | 70.5 | 70.8 | 75.8 | 71.9 | 63.8 | 61.4 | 50.2 | 44.2 | 38.2 | 35.7 | 41.3 | 31.4 | 29.2 | 30.7 | 30.6 | 30.5 | 31.2 | 30.1 | 30.8 | 29.8 | 30.0 | 28.8 | 26.7 | 24.3 |
| RHmax (%) | 55 | 57 | 56 | 54 | 58 | 65 | 68 | 75 | 80 | 83 | 85 | 86 | 87 | 88 | 85 | 88 | 88 | 89 | 88 | 89 | 87 | 87 | 86 | 86 | 87 |
| RHmin (%) | 26 | 27 | 26 | 26 | 31 | 39 | 44 | 53 | 58 | 64 | 66 | 67 | 70 | 70 | 65 | 67 | 66 | 63 | 60 | 58 | 48 | 42 | 36 | 35 | 33 |
| RH mean (%) | 40 | 42 | 41 | 40 | 44 | 52 | 56 | 64 | 69 | 73 | 75 | 76 | 78 | 79 | 75 | 78 | 77 | 76 | 74 | 71 | 68 | 64 | 61 | 60 | 60 |
| WD (Deg) | 208 | 197 | 215 | 232 | 229 | 201 | 197 | 172 | 167 | 146 | 159 | 171 | 140 | 164 | 178 | 176 | 188 | 199 | 205 | 209 | 240 | 234 | 223 | 253 | 238 |
| WS (Km/hr) | 6.8 | 6.6 | 6.8 | 7.0 | 7.4 | 7.0 | 7.3 | 6.8 | 6.0 | 6.3 | 6.0 | 5.8 | 5.5 | 4.9 | 3.7 | 4.4 | 4.1 | 3.8 | 3.6 | 3.6 | 3.3 | 3.0 | 3.1 | 2.7 | 2.8 |

Middle Portion of the Calendar Part-II Phenological observations and Climatic normal of crops



Bottom Portion of Calendar  Part-III Climatic normal favourable for incidence of major pest

The Crop-Weather-Pest and Disease calendars comes as bottom part of the calendar which contain the climatic normals required for major pest or diseases of the crop as well as susceptible crop phenological stages. Thus if the climatic conditions are favourable and the pathogen is present, there are chances of occurrence of the pest and disease.




- These crop-weather-pest and disease calendars act as  a guiding tool while issuing Agromet-advisory for the farmers of the region.

- These calendars can also be used for advising the farmers for need based spraying of the insecticides and pesticides

# Crop weather calendar of Rice – Kanpur, Uttar Pradesh

Kanpur is situated in the hot moist semi-arid ESR of Uttar Pradesh with deep loamy alluvium-derived soils, medium to high AWHC and LGP of 120-150 days. Rice is the major crop in *Kharif* season.

**Crop: Rice (Kharif)** **Duration: Medium (120-135)** **State: Uttar Pradesh** **District: Kanpur**

| | MONTH | JUNE | | | JULY | | | | AUGUST | | | | | SEPTEMBER | | | | OCTOBER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Std.Week | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 |
| | Tmax (°C) | 39.0 | 37.9 | 36.1 | 35.2 | 33.8 | 33 | 32.8 | 32.8 | 32.4 | 32.4 | 32.7 | 32.9 | 32.6 | 32.2 | 32.7 | 32.9 | 32.9 | 32.8 | 32.1 | 31.4 |
| | Tmin (°C) | 27.4 | 27.4 | 26.9 | 26.8 | 26.3 | 25.9 | 26.1 | 26.2 | 26 | 25.8 | 25.8 | 25.9 | 25.1 | 24.7 | 24.3 | 23.3 | 22.1 | 20.7 | 18.8 | 17.0 |
| | RHm (%) | 62 | 70 | 76 | 78 | 84 | 86 | 86 | 86 | 87 | 87 | 85 | 84 | 85 | 86 | 84 | 81 | 79 | 77 | 76 | 75 |
| | RHe (%) | 46 | 54 | 60 | 64 | 72 | 74 | 75 | 75 | 77 | 76 | 74 | 72 | 73 | 74 | 70 | 64 | 61 | 56 | 52 | 52 |
| | WS (kmph) | 7.6 | 9.0 | 6.6 | 6.9 | 6.4 | 6.1 | 6.4 | 5.8 | 5.6 | 5.3 | 5.4 | 5.3 | 5.0 | 4.9 | 4.2 | 3.6 | 3.0 | 2.9 | 2.3 | 2.1 |
| | Rain (mm) | 7.0 | 14.0 | 25 | 45 | 58 | 63 | 67 | 63 | 55 | 59 | 67 | 49 | 40 | 54 | 63 | 29 | 19 | 20 | 17 | 7 |
| | Evp (mm) | 71 | 66 | 59 | 51 | 47 | 39 | 34 | 33 | 31 | 31 | 30 | 31 | 31 | 30 | 30 | 31 | 30 | 30 | 28 | 26 |
| | BSS (hr) | 6.7 | 5.8 | 5.4 | 4.3 | 4.5 | 4.1 | 3.2 | 4.0 | 5.3 | 5.2 | 4.0 | 5.4 | 5.4 | 4.9 | 5.6 | 6.4 | 7.0 | 6.3 | 7.4 | 7.2 |

| | Phenophase | Emergence | Seedling | Tillering | Heading | Flowering | Grain filling | Maturity |
|---|---|---|---|---|---|---|---|---|
| | Duration (days) | (2-3) | (25-30) | (30-32) | (30-35) | (7-9) | (10-15) | (8-10) |
| Phenophase wise weather for better yield | Tmax (°C) | 31-44 | 31-36 | 27-37 | 32-35 | 31-36 | 29-34 | 31-33 |
| | Tmin (°C) | 23-30 | 24-28 | 23-28 | 22-26 | 22-25 | 20-24 | 12-24 |
| | RHm (%) | 52-95 | 78-97 | 72-96 | 82-93 | 82-95 | 79-92 | 80-90 |
| | RHe (%) | 26-81 | 49-92 | 50-89 | 57-79 | 54-85 | 44-80 | 24-60 |
| | WS (kmph) | 4-11 | 2-10 | 2-10 | 3-8 | 3-8 | 3-8 | 2-3 |
| | Rain (mm) | 268 | 357 | 171 | 160 | 79 | 143 | 1 |
| | Evp (mm) | 90 | 73 | 51 | 52 | 53 | 54 | 51 |
| | BSS (hr) | 2-10 | 0-6 | 1-8 | 3-8 | 4-9 | 3-9 | 5-8 |

| Congenial weather for pest / diseases incidence | |
|---|---|
| | Plant hopper: Tmax. 33°C, Tmin. 25°C & RHe. 80-90% |
| | Leaf folder: Tmax. 34-35°C, Tmin. 24-27°C, RHm 90-99% & RHe 67-81% |
| | Stem Borer: Tmax. 35.0°C, Tmin. 17.0°C & RHm 90-100% |
| | Rice Hispa: Tmax. 32-35°C, Tmin. 24-26°C, RHm 96-99% & RHe 75-81% |
| | Gundhi Bug: Tmax. 32-35°C, Tmin. 22-25°C & RHe 75-81%, |
| | Armyworm: Tmax. 30-35°C |
| | Bacterial blight: Temperature 28-0-30.0°C, RH 80-90% Favours cloudiness and >30.0mm rainfall |
| | Sheath blight: Temperature 30.0-32.0°C & RH 98-100% |
| | Brown leaf spot: Temp. 27.0-30.0°C & RH >90%, |

# Crop weather calendar of wheat – Ludhiana, Punjab

Ludhiana is situated in hot semi-arid ESR of Punjab state with deep loamy alluvium-derived soils medium AWHC and LGP of 90-120 days. This crop weather calendar is prepared for medium to long duration wheat crop.

| MONTHS | OCT | NOVEMBER | | | | DECEMBER | | | | JANUARY | | | | FEBRUARY | | | | MARCH | | | | | APRIL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Std.Week/Norr | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Rain (mm) | 0.5 | 3.8 | 0.7 | 0.9 | 2.5 | 1.6 | 0.5 | 2.8 | 6.1 | 5.9 | 2.9 | 3.4 | 3.2 | 8.1 | 7.2 | 4.9 | 11.7 | 7.9 | 6.4 | 9.8 | 2.5 | 6.3 | 7.5 | 2.9 | 6.0 |
| Max T (°C) | 31.0 | 28.1 | 28.1 | 27.1 | 25.3 | 23.8 | 22.9 | 21.6 | 20.7 | 19.1 | 19.1 | 18.9 | 19.1 | 19.8 | 19.6 | 20.9 | 21.6 | 22.3 | 23.9 | 25.4 | 27.0 | 27.4 | 29.5 | 31.2 | 33.6 |
| Min T (°C) | 14.2 | 11.3 | 11.3 | 10.3 | 8.8 | 7.4 | 6.4 | 6.3 | 5.6 | 5.9 | 5.0 | 5.1 | 5.0 | 6.0 | 6.0 | 6.2 | 7.9 | 7.7 | 8.8 | 10.1 | 11.2 | 12.1 | 13.5 | 14.6 | 16.2 |
| Mean T (°C) | 22.6 | 19.7 | 19.7 | 18.7 | 17.1 | 15.6 | 14.7 | 14.0 | 13.2 | 12.5 | 12.1 | 12.0 | 12.1 | 12.9 | 12.8 | 13.6 | 14.8 | 15.0 | 16.4 | 17.8 | 19.1 | 19.8 | 21.5 | 22.9 | 24.9 |
| SShr (hrs) | 9.5 | 9.1 | 9.1 | 9.0 | 8.8 | 8.5 | 8.2 | 7.6 | 7.0 | 6.9 | 7.3 | 6.8 | 7.1 | 6.8 | 7.5 | 8.3 | 7.6 | 8.1 | 7.9 | 8.1 | 8.1 | 8.6 | 9.4 | 9.1 | 9.7 |
| Evap (mm) | 25.8 | 22.4 | 22.4 | 20.4 | 18.1 | 15.7 | 14.4 | 12.8 | 11.7 | 11.9 | 10.9 | 10.4 | 11.8 | 12.0 | 13.4 | 16.6 | 17.0 | 18.8 | 20.6 | 24.6 | 24.5 | 28.6 | 33.4 | 36.6 | 51.1 |
| RHmax (%) | 78 | 83 | 83 | 86 | 86 | 87 | 87 | 90 | 90 | 91 | 91 | 91 | 90 | 91 | 89 | 88 | 88 | 88 | 84 | 82 | 82 | 81 | 78 | 73 | 70 |
| RHmin (%) | 36 | 36 | 36 | 38 | 39 | 42 | 36 | 46 | 50 | 53 | 51 | 51 | 50 | 51 | 51 | 47 | 51 | 48 | 45 | 42 | 42 | 42 | 36 | 31 | 30 |
| RH mean(%) | 57 | 60 | 60 | 62 | 63 | 65 | 62 | 68 | 70 | 72 | 71 | 71 | 70 | 71 | 70 | 68 | 70 | 68 | 65 | 62 | 62 | 62 | 57 | 52 | 50 |

**Phenological stages of wheat**

| Sowing & emergence | CRI | Jointing | Anthesis | Grain filling | Physiological Maturity |
|---|---|---|---|---|---|

**Climatic normals for potential yield of Wheat**

| Sowing & emergence | CRI | Jointing | Anthesis | Grain filling | Physiological Maturity |
|---|---|---|---|---|---|
| Max. Temp.=27-33°C | Max. Temp.= 13-24 °C | | Max. Temp.= 17-20 °C | Max. Temp.= 19-25 °C | Max. Temp.= 26-37°C |
| Min. Temp.= 12-18 °C | Min. Temp.= 5-10 °C | | Min. Temp.= 4-9 °C | Min. Temp.= 5-9 °C | Min. Temp.= 10-16 °C |
| Max. RH= 84-93 % | Max. RH= 91-100 % | | Max. RH= 89-98 % | Max. RH= 86-96 % | Max. RH= 75-92 % |
| Min. RH= 32-45 % | Min. RH= 30-81 % | | Min. RH=57-71 % | Min. RH= 38-51 % | Min. RH=17-42 % |
| Ssh hrs= 3.7-8.0 hr | Rainfall= 36 mm | | Rainfall=54 mm | Rainfall= 9 mm | Rainfall= 12 mm |
| Evap.= 94 mm | Rainy Day=4 | | Rainy Day=6 | Rainy day=1 | Rainy Day=1 |
| WS= 1.3-2.2 Km/hr | Ssh hrs = 2.2-9.4 hr | | Ssh hrs= 5.0-9.0 hr | Ssh hrs= 9.0-10.3 hr | Ssh hrs= 8.0-12.0 hr |
| WD=90-276 deg | Evap.= 81 mm | | Evap.= 53 mm | Evap.= 81 mm | Evap.= 190 mm |
| SR= 9-13 $Wm^{-2}$ | WS= 1.5-5.4 Km/hr | | WS=3.8-5.0 Km/hr | WS= 2.7-4.9 Km/hr | WS= 3.2-5.3 Km/hr |
| | WD= 167-315 deg | | WD= 174-289deg | WD= 231-302deg | WD= 193-270 deg |
| | SR= 5-13 $Wm^{-2}$ | | SR= 10-14$Wm^{-2}$ | SR= 16-18 $Wm^{-2}$ | SR= 18-23$Wm^{-2}$ |

**Climatc normals for wheat diseases**

| | |
|---|---|
| Flag smut | Temperature 18-24°C, RH >40% |
| Leaf Blight | Optimim temperature 8-13°C for sp. A.triticina & 18-22°C for sp. D.sorokiniana |
| Powdery mildew | Optimim temperature 15-20°C, RH > 40% |
| Yellow rust | Temperature 8-13°C, Saturated RH 6 hrs |
| Brown rust | Temperature 20°C, Dew for 4hrs |
| Loose smut | Temperature22-25°C,RH 60-85% |
| Karnal bunt | Temperature18-22°C,RH >70% |
| Head scab | Temperature 22-25°C |
| Black point | Rain during ripening |

# Crop weather calendar of Mustard– Mohanpur, West Bengal

Mohanpur comes under hot moist sub-humid ESR with deep loamy to clayey alluvium-derived soils, medium to high AWHC and LGP ranges from 210-240 days.

**Crop- Mustard (Irrigated)** **Duration- Short (95-105)** **State - West Bengal** **District- Nadia**

| | OCTOBER | | | NOVEMBER | | | | DECEMBER | | | | JANUARY | | | | FEBRUARY | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STD WEEK | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Tmax (oc) | 32.3 | 31.4 | 30.9 | 30.8 | 30.1 | 29.6 | 28.5 | 27.6 | 26.8 | 26.0 | 25.4 | 24.8 | 25.2 | 25.6 | 26.0 | 26.8 | 27.7 | 29.1 |
| Tmin(0C) | 23.4 | 21.8 | 20.8 | 19.2 | 17.9 | 16.5 | 14.8 | 13.3 | 12.9 | 11.9 | 11.1 | 10.8 | 11.1 | 11.4 | 11.3 | 12.4 | 13.6 | 14.9 |
| RHm (%) | 92 | 91 | 92 | 91 | 92 | 91 | 91 | 91 | 92 | 92 | 92 | 92 | 92 | 91 | 91 | 91 | 90 | 89 |
| RHe(%) | 63 | 60 | 59 | 54 | 52 | 51 | 49 | 48 | 48 | 48 | 47 | 49 | 48 | 48 | 46 | 45 | 45 | 43 |
| WS(KMPH) | 0.7 | 0.7 | 0.5 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.6 | 0.4 | 0.7 | 0.7 | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 |
| RF(mm/wk) | 22.9 | 19.1 | 8.4 | 7.7 | 3.3 | 1.7 | 1.9 | 0.4 | 1.9 | 0.6 | 1.7 | 2.4 | 2.8 | 2.2 | 3.8 | 5.3 | 5.6 | 4.4 |
| BSS(hr/day) | 7.3 | 7.4 | 7.1 | 7.8 | 8.2 | 8.1 | 8.3 | 8.1 | 7.8 | 7.2 | 7.6 | 7.2 | 7.5 | 7.4 | 7.7 | 7.9 | 7.9 | 8.5 |
| Evap(mm/wk) | 17.0 | 16.7 | 13.8 | 13.5 | 12.4 | 11.4 | 10.7 | 9.3 | 9.0 | 8.6 | 10.2 | 8.9 | 9.1 | 10.4 | 11.6 | 12.5 | 14.4 | 16.7 |

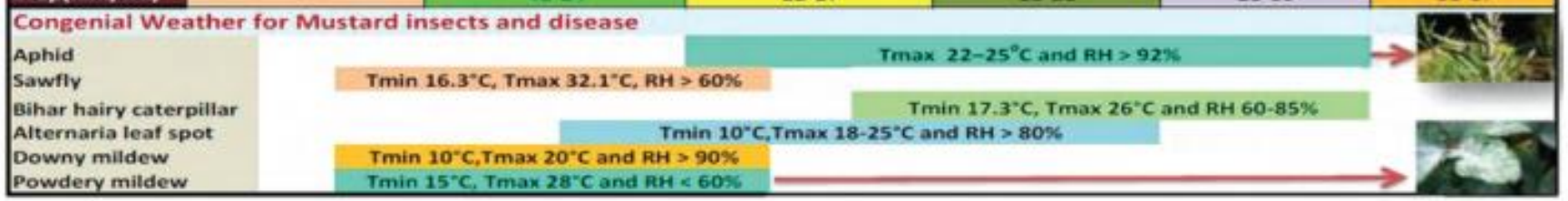
Sowing | Vegetative (28) | Siliqua formation (14) | Maturity /Harvest (10)

Emergence (4) | Flowering (15) | Seed development (26)

**Favourable Weather for higher yield**

| | | | | | | |
|---|---|---|---|---|---|---|
| Tmax (oc) | 31-33 | 30-31 | 29-30 | 26-29 | 24-27 | 21-25 |
| Tmin(0C) | 22-23 | 19-20 | 16-18 | 13-16 | 11-12 | 8-11 |
| RHm (%) | 23-25 | 97-98 | 97-99 | 96-100 | 98-100 | 98-100 |
| RHe(%) | 28-34 | 58-66 | 45-57 | 45-61 | 50-59 | 44-62 |
| WS(KMPH) | 0-12 | 0-1 | 0-1 | 0-1 | 0-1 | 0-1 |
| RF(mm/wk) | 6-11 | 1-48 | 0-1 | 0-7 | 0-3 | 0-1 |
| BSS(hr/day) | - | 6-8 | 7-9 | 5-9 | 7-8 | 6-7 |
| Evap(mm/wk) | - | 40-84 | 22-27 | 18-21 | 28-39 | 11-17 |

**Congenial Weather for Mustard insects and disease**



# Crop weather calendar of Cotton– Parbhani

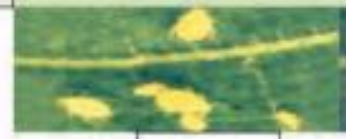
Parbhani is located in Marathwada region of Maharashtra and comes under hot moist semi-arid ESR with shallow and medium loamy clayey black soils. AWHC is medium to high and LGP ranges from 120-150 days.

**CROP NAME : COTTON** **DURATION: LONG (180-220 days)** **STATE : MAHARASHTRA** **DISTRICT : PARBHANI**

| | MONTH | JUNE | | | | JULY | | | | AUG | | | | | SEPT | | | | OCT | | | | NOV | | | | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Std. week / Parameter | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 |
| Clim | Rain (mm) | 4 | 7 | 6 | 6 | 5 | 6 | 6 | 11 | 7 | 9 | 7 | 8 | 8 | 8 | 5 | 6 | 5 | 6 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Tmax(°C) | 37 | 36 | 33 | 32 | 31 | 30 | 31 | 31 | 31 | 30 | 31 | 31 | 31 | 31 | 31 | 32 | 32 | 32 | 33 | 32 | 32 | 32 | 31 | 31 | 30 | 31 | 31 |
| | Tmin (°C) | 25 | 21 | 21 | 22 | 21 | 22 | 23 | 22 | 22 | 22 | 23 | 23 | 23 | 22 | 22 | 23 | 23 | 21 | 20 | 22 | 19 | 18 | 20 | 21 | 20 | 17 | 16 |
| | RHm (%) | 76 | 72 | 73 | 71 | 71 | 67 | 65 | 63 | 62 | 63 | 61 | 59 | 59 | 60 | 63 | 64 | 63 | 61 | 61 | 58 | 55 | 49 | 47 | 48 | 44 | 42 | 40 |
| | RHe (%) | 56 | 54 | 51 | 50 | 49 | 47 | 44 | 43 | 44 | 45 | 44 | 43 | 41 | 42 | 40 | 43 | 41 | 41 | 39 | 36 | 32 | 30 | 30 | 31 | 29 | 27 | 24 |

| Phenophases | Emergence | Square formation | Flowering | Boll setting | Boll bursting |
|---|---|---|---|---|---|
| Duration (Days) | 4-7 | 29-38 | 20-25 | 42-72 | 73-140 |
| Tmax(°C) | 29.8-36.0 | 28-32.8 | 29.4-32.5 | 27.6-31.9 | 30.2-38.8 |
| Tmin (°C) | 20.4-23.3 | 20.1-23.6 | 20.2-23.4 | 19.6-22.7 | 7.6-17.1 |
| RHm (%) | 69-84 | 71-92 | 72-89 | 77-89 | 58-81 |
| RHe (%) | 40-66 | 61-77 | 55-70 | 60-79 | 37-52 |
| BSS (hrs) | 5.6 | 4.2 | 7.5 | 7.2 | 10.2 |
| Rain(mm) | 80 | 111 | 222 | 380 | 66 |

| | |
|---|---|
| Aphids | Optimum Temp. 27-34°C, RH > 61 |
| Jasids | |
| Whitefly | |



Aphids Jassids Whitefly

## WEATHER NORMALS FOR AGRICULTURAL CROPS

| Sl. No. | Crops | Optimum Temperature ° C | | Day length | Rainfall (mm) | Altitude above MSL (m) |
|---|---|---|---|---|---|---|
| | | Germination | Growth stage | | | |
| 1 | Rice | Min 10 ° C | 22-25 (flowering)<br>20-21(grain formn)<br>20-25(ripening) | | 1500 | <3000 |
| 2 | Maize | 35-44 ° C | | | | |
| 3 | Sorghum | 7-10 | 25-30 | Short day | | |
| 4 | Pearl millet | | 28-32 | | 400-750 | |
| 5 | Finger millet | | | | 500-1000 | |
| 6 | Kodo millet | | | | 400-500 | |
| 7 | Wheat | 20-22 | 16-22 | | 250-1800 | <3500 |
| 8 | Barley | | 12-15 (growth)<br>30(reproduction) | Long day | 400-500 | |
| 9 | Oats | 15-25 | | | 380-1140 | |
| 10 | Ground nut | 27-30 | 24-27 | | 500-1250 | |
| 11 | Sesame | 25-27 | | Short day | 500-650 | <1250 |
| 12 | Castor | 20-26 | | Long day | 500-600 | <3000 |
| 13 | Sunflower | 20-25 | | | 500-700 | <2500 |
| 14 | Rape seed and Mustard | 18-25 | | Long day | 300-400 | |
| 15 | Safflower | 15-16 | 25-30 | Day neutral | 600-900 | |
| 16 | Soybean | 15-32 | 30-33 | | 600-650 | 1200-2000 |
| 17 | Pigeon pea | 20-30 | | | | |
| 18 | Green gram | 15 | 20-40 | Short day | 600-1000 | |
| 19 | Black gram | | | | | 1500 |
| 20 | Cow pea | 12-15 | 21-35 | Short day | 600 | |
| 21 | Bengal gram | | 15-25 | | 600-1000 | |
| 22 | Cotton | 18 | 21-27 | Day neutral | 500 | |
| 23 | Jute | | 27-40 | Short day | 1500 | |
| 24 | Tobacco | 28 | 25-35 | | 500-1000 | |
| 25 | Sugar cane | | 24-30 | Long day | 2000-2500 | |
| 26 | Sugar beet | 12-15 | 22-30 | Long day | | |
| 27 | Potato | 18-20 | 18-20 | | | |

# Important Applications of Crop Weather Calendars

- Crop weather calendars are excellent examples of the type of compiled information that can assist forecasters in framing weather warnings and forecasts directed at farmers.
- District level crop weather calendars (CWC) for important crops viz., rice,wheat, groundnut, soybean, maize, mustard, rabi sorghum, cotton and chick pea in 22 states.
- With proper guidance as services provided by agricultural meteorologists, these calendars will also be of much interest to the agricultural professionals and to the various government departments concerned with Agriculture and Food Production, as well as educationally to the general public.
- Most importantly, it will be a worthy tool for preparation of crop contingency plans and identifying the growth stage specific thresholds for designing weather based crop insurance products