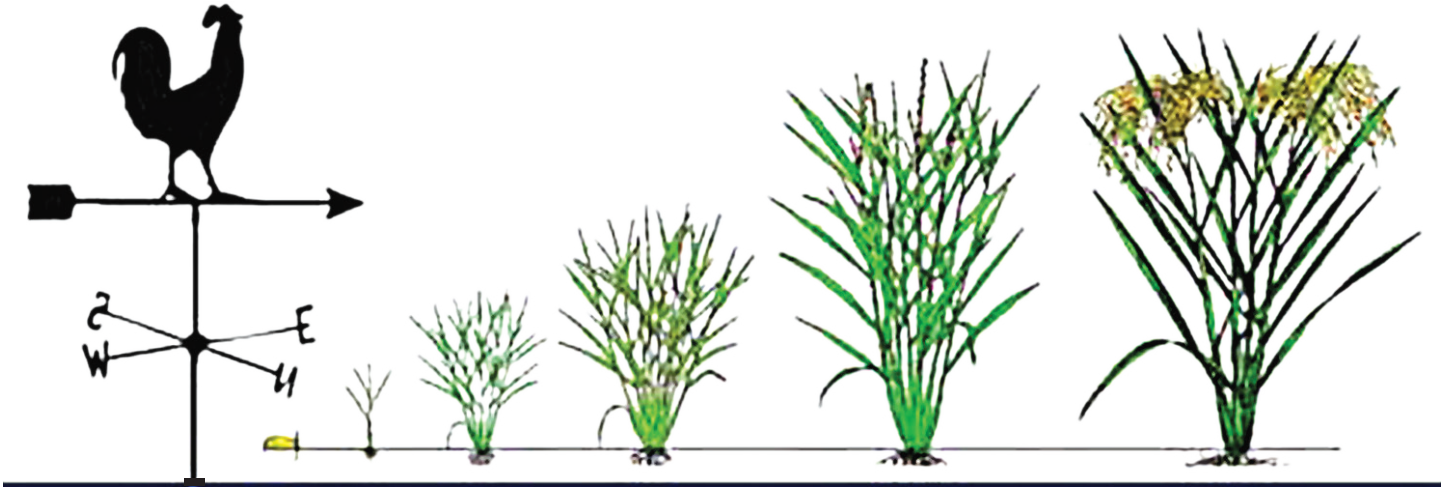

District Level Crop Weather Calendars of Major Crops in India

V.U.M. Rao, A.V.M. Subba Rao, M.A. Sarath Chandran, Prabhjyot Kaur,
P. Vijaya Kumar, B. Bapuji Rao, I.R. Khandgonda and Ch.Srinivasa Rao

All India Coordinated Research Project on Agrometeorology
ICAR- Central Research Institute for Dryland Agriculture
Santoshnagar, Hyderabad – 500059

Contributing Centres

Crop	Scientist	Center
Rice	S. Pasupalak	Bhubaneswar
	Bondita Goswami	Jorhat
	D.N. Jagtap	Dapoli
	Anuruddh Prasad Dubey	Kanpur
	Abdus Sattar	Samastipur
	B. Ajith Kumar	Thrissur
	Prabhjyot Kaur	Ludhiana
Wheat	Prabhjyot Kaur	Ludhiana
	M.M. Lunagaria	Anand
	Rajendra Prasad	Palampur
	J.L. Choudhary	Raipur
	N. S. Solanki	Udaipur
	Pragyan Kumari	Ranchi
Groundnut	S.N. Malleswari	Anantapur
	H.S. Shivaramu	Bangalore
Rabi Sorghum	H. Venkatesh	Bijapur
	A. Solaimalai	Kovilpatti
	J.D. Jadhav	Solapur
Soybean	Anil Karunakar	Akola
	Manish Bhan	Jabalpur
Mustard	Diwan Singh	Hisar
	Asis Mukherjee	Mohanpur
Maize	Meenakshi Gupta	Jammu
Cotton	A. Khobargade	Parbhani
Chickpea	A.K.Singh	Faizabad

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Deputy Director General (NRM)

Preface

Climate variability and frequent extreme weather events such as droughts, unseasonal rain, heat wave, cold wave, hail storms, flood etc are posing great threat to Indian agriculture. Crop contingency plans and Agromet advisory services are some of the measures to tackle this kind of situations which requires understanding of the crop phenology and effect of weather parameters on crop growth. Crop weather calendar assumes great importance in this scenario. Crop weather calendar contains information on favourable weather, planting of the crop, important phenophases and harvesting periods of locally adapted crops in specific agro-ecological zone or a district.

The Project Coordinating unit of All India Coordinated Research Project on Agrometeorology (AICRPAM) and its 25 Cooperating Centers have utilized the results of field experiments taken under the project for more than 30 years to prepare crop weather calendars for major crops of India. Twenty five district level crop weather calendars for important crops viz., rice, wheat, groundnut, soybean, maize, mustard, *rabi* sorghum, cotton and chickpea in 22 states have been prepared. The crop weather calendars will be useful to crop insurance personnel in identifying critical stages and appropriate weather indices. Scientists and other government departments of states/country concerned with agriculture and food production will have an idea of normal and favourable weather conditions in different phenophases for taking appropriate management decisions.

I appreciate the efforts of scientists of AICRPAM coordinating unit and cooperating centers in bring out this timely document and believe that this publication will be of immense use in preparing Agromet advisory bulletins, crop contingency plans and development of insurance products.

Alok K Sikka

Acknowledgements

Occurrence of unseasonal rainfall and extreme weather events like drought, heavy rainfall, hailstorms, flash floods, heat waves are on the rise. Comprehensive recommendations in the form of agromet advisories or crop contingency plans are the need of the hour. We hope this document will facilitate for preparation of site specific Agromet advisory bulletins, crop contingency plans and also for persons working in weather based crop insurance for identifying critical stages and for fixing threshold values.

Authors are grateful to Dr AK Sikka, Deputy Director General, NRM for his keen interest in addressing the threats posed by extreme weather events and for his constant support and guidance in bringing out this publication.

Field experiment data generated since the inception of the project was utilized in the preparation of location specific crop weather calendars. We express our deep sense of gratitude to the scientists and staff of AICRPAM cooperating centers in bringing out the crop calendar for major crop of their respective centers. We thank our research staff namely P. Santhibhushan Chowdary, V.M. Sandeep, V.P. Pramod, V. Narasimha Rao, P. Pani and O Bhavani for the help rendered in completing the task within stipulated time. We place on record the secretarial assistance rendered by D. Harini and A. Mallesh Yadav in the compilation.

AUTHORS

Contents

Crop Weather Calendars for improved Agromet Advisory Services in India

1. Introduction

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, especially in developing countries, 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. Thus, 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.

It also 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 is not new. For instance, FAO calendars provide information on the crop sowing and harvesting dates, seed rate, operation timings of mechanical equipment in the period etc. Also, the University of Kentucky prepared production calendars for soybean and maize crops. This calendar describes the month wise weather and operations to be taken up during the period.

Crop weather calendars by IMD in operation

IMD prepared district-wise crop-weather calendars almost two decades ago using normal weather, crop water requirement for major cereals, pulses and oilseed crops. Later IMD has revised these by incorporating present cropping patterns, soil types and conditions favorable for development of pests and diseases.

Information provided in the calendars give broad indications of the progress of growth of the crop along with climate direction of development which may prove useful to the planners, agricultural administrators, plant breeders and the farmers in the formulating policy matters regarding plant breeding, crop adoption, drought proofing, supplemental irrigation, maximising the yield etc.

Crop weather calendars designed by All India Coordinated Research Project on Agrometeorology

AICRPAM has 25 co-operating centres operating in all the states of India carrying out research (agroclimatic characterization, crop weather relationships, crop growth modeling and inf luence of weather on pests and disease development) and extension activities (agromet advisory services). A wealth of experimental data on crop phenology and daily meteorological conditions have been archived in different crops for more than 30 years. These data were used in the designing of location specific crop-weather calendars with an intent to improve the agromet advisory services.

2. Data and Methodology

Climatic data requirement

Weekly climatic normal for standard meteorological weeks for each location were computed for all the 25 AICRPAM centers. These normal meteorological data sets were arranged in a weekly format for the cropping season from the month of sowing till the harvest of the crop in question.

Information on crop phenology

Crop phenological information collected from sowing to maturity is arranged on a weekly basis. Important 'phases' like sowing, germination / emergence, transplanting (in case of rice), vegetative growth, f lowering, grain formation and maturity are tabulated as per the Standard Meteorological Weeks. Further, information on the favourable meteorological conditions for the crop (stage-wise or whole crop growth period) which lead to high yield were deduced from the long-term experimental data and tabulated.

Information on pest and diseases

The data on weather conditions favourable for incidence of pests and diseases and the nature of the weather warnings were collected.

Structure of crop weather calendar designed by AICRPAM consists of three parts in the main body as depicted in the Figure 1. 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 favorable 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.

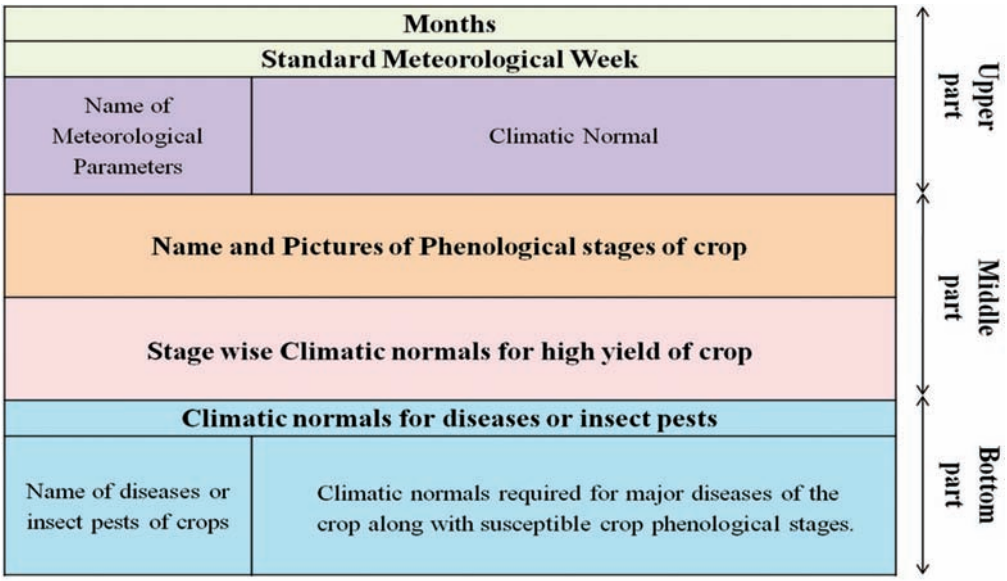
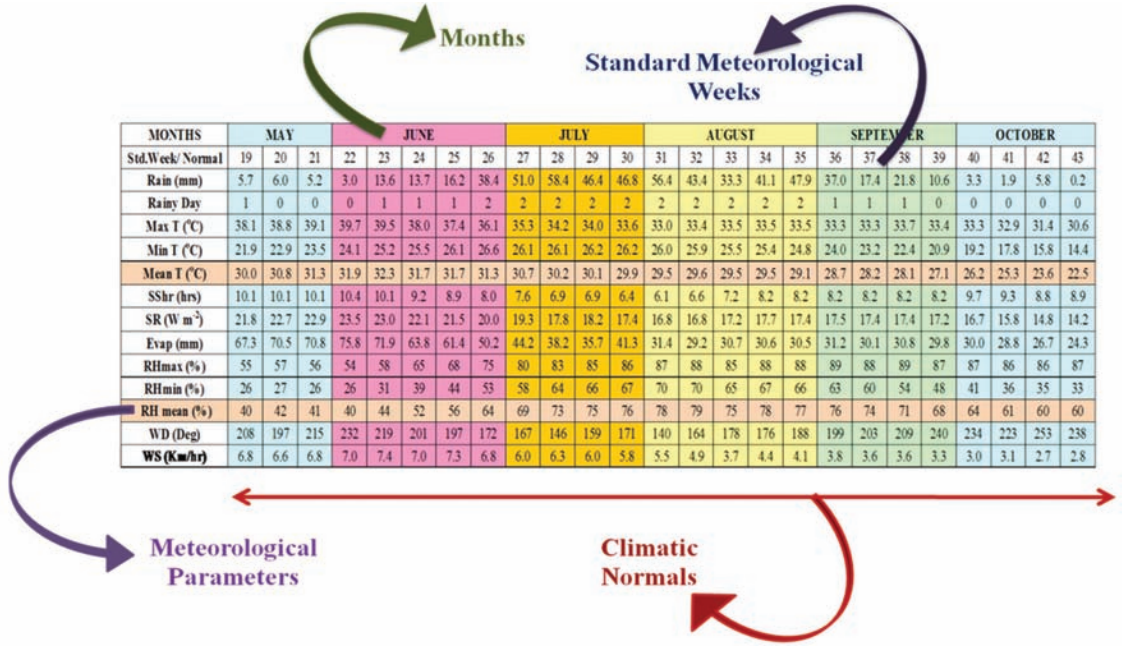


Figure.1: Structure of crop weather calendar

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 (oC), minimum temperature (oC), mean temperature (oC), 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 as per the above Proforma. An example of arranged climate normal for Ludhiana centre is depicted as Figure 2.



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	33.3	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	33.3	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	8.0	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	54	48	41	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	219	201	197	172	167	146	159	171	140	164	178	176	188	199	203	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

Figure.2: Top portion of crop weather calendar of rice crop containing climatic normals

Part-II Phenological observations and Climatic normal for high yield of crops

Collect the pictures of individual stage of each crop and arrange in such a way that the stage wise figure should adjust to the week of start of that stage to end of Stage wise climatic normals for high productivity of the crop in a location will be computed based on a simple procedure. Select the best 3 high productivity years of a crop from minimum 10 years of continuous field experiment data. growth stage wise meteorological normals will be computed and arranged for the selected high productivity years. Then arrange the range of each parameter for individual stage. The arrangement is shown in the Figure .3.

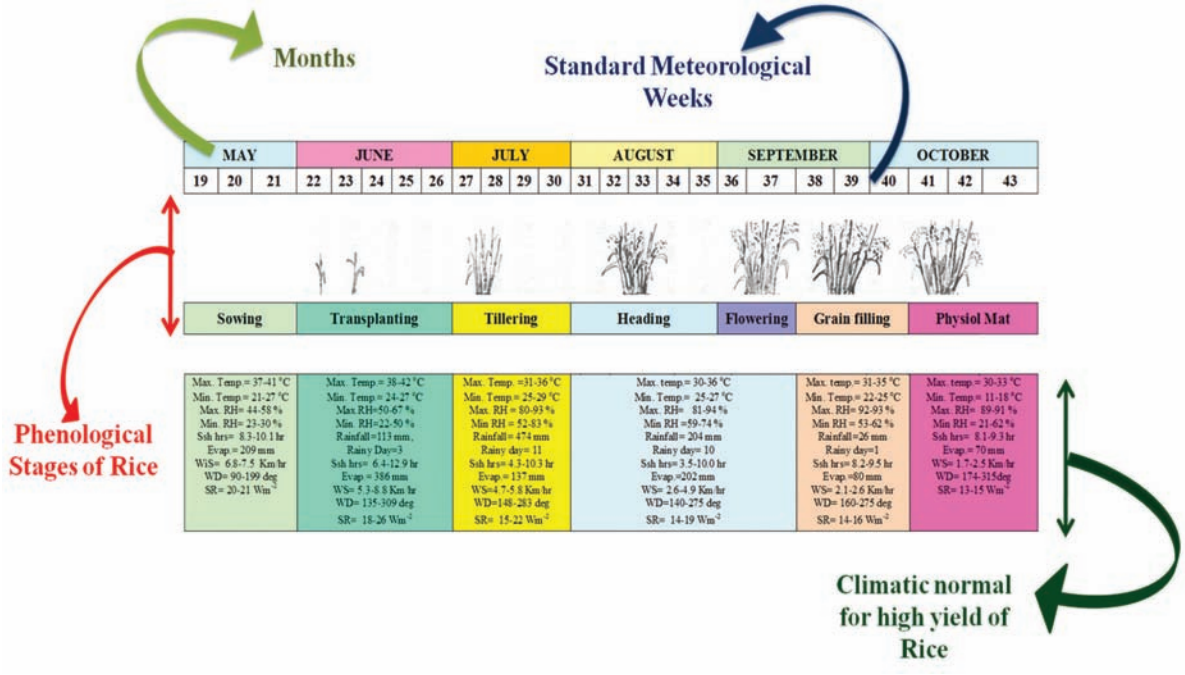


Figure.3: Middle portion of crop weather calendar containing phenological stages and climatic normal for high yield

Part-III Climatic normal favourable for incidence of major pest of rice crop

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 (Figure 4).

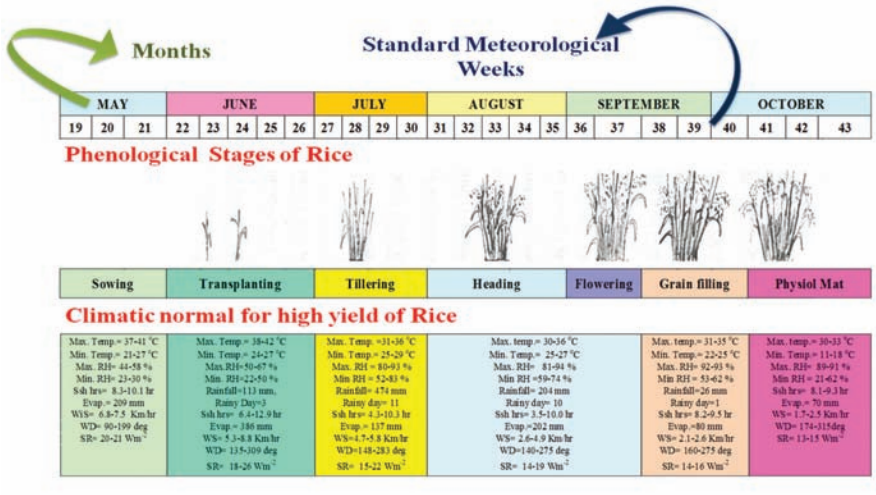


Figure.4: Bottom portion of crop weather calendar containing climatic normal favourable for incidence of major pest of rice crop

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

All the 25 cooperating centers of AICRPAM have prepared location wise crop weather calendar for major mandatory crop of their region and the list of crops and centers is provided in the side table;

Information of Crop wise CWC from AICRPAM centers

Name of the Center	Crops
Faizabad	Chickpea
Parbhani	Cotton
Anantapur	Groundnut
Bangalore	Groundnut
Jammu	Maize
Hisar	Mustard
Mohanpur	Mustard
Bijapur	*Rabi* Sorghum
Kovilpatti	*Rabi* Sorghum
Solapur	*Rabi* Sorghum
Bhubaneswar	Rice
Dapoli	Rice
Jorhat	Rice
Kanpur	Rice
Samathipur	Rice
Thrissur	Rice
Ludhiana	Rice and Wheat
Ranchi	Rice and Wheat
Akola	Soybean
Jabalpur	Soybean
Anand	Wheat
Palampur	Wheat
Raipur	Wheat
Udaipur	Wheat

Crop weather calendar of Rice - Bhubaneswar

Crop weather calendar of rice crop for different locations viz., Bhubaneswar, Jorhat, Dapoli, Kanpur, Samasthipur, Ranchi and Thrissur are presented here. The crop is grown in varied soils and landscape and ecosystems.

Bhubaneswar, Odisha

Bhubaneswar is situated in eastern ghats of Odisha state with a climate classified as hot moist sub-humid eco-sub region (ESR) with medium to deep loamy Red and Lateritic soils, medium available water holding capacity (AWHC) and a length of growing period (LGP) of 180-210 days. Rice is the major crop in this region. The crop calendar is developed for medium duration rice crop.

CROP- Kharif Paddy : Medium Duration (125)

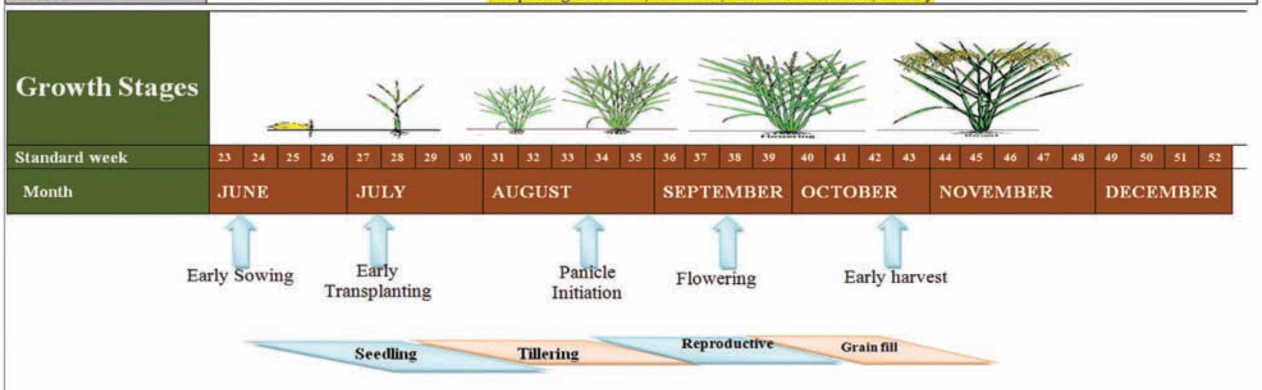
Block: Bhubaneswar (Khorda District)

Weather warnings				
	Rain	>200 mm/day	>200 mm/day	>100 mm/day
	Duration Of wet spell	>125 mm for 3 days	>125 mm for 5 days	>50 mm for 3days
	Cloudy weather	Cloudy > 6 days	Cloudy >4 days	Cloudy >3 days
	Drought	10days	15days	20days
	High wind		62km/hr	62km/hr

Weekly Long Period Average Weather	JUNE				JULY				AUGUST					SEPTEMBER				OCTOBER				NOVEMBER					DECEMBER			
Week	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	50	51	52
Rain (mm)	31	54	61	59	61	67	79	72	84	85	77	78	74	61	55	64	43	61	31	37	14	29	14	5	4	1	2	2	1	0
Tmax. (°C)	37	36	34	33	33	32	32	32	32	32	32	32	32	32	32	32	33	32	32	32	32	31	31	31	30	30	29	29	28	28
Tmin..(°C)	27	26	26	26	26	26	26	26	26	26	26	26	25	25	25	25	25	25	24	23	22	21	20	19	18	16	15	15	14	14
RHm (%)	86	87	89	90	89	90	90	89	92	92	92	92	93	93	93	93	93	93	92	92	90	90	90	90	89	87	88	89	89	89
RHe (%)	58	63	69	74	74	75	76	75	78	78	79	77	80	78	77	75	72	73	68	65	59	59	54	49	46	44	42	44	41	42
BSS (h/day)	6.6	5.6	4.3	4.0	3.6	4.0	4.0	4.5	4.2	4.0	4.3	5.1	4.5	4.5	5.3	5.9	6.5	6.3	7.1	7.4	7.9	7.3	7.4	7.9	7.9	8.1	8.1	7.9	8.3	8.1

Favourable Local Weather for high yield	Sowing	Seedling	Tillering	Reproductive	Grain filling
Rain (mm)	55-135	78-215	253-349	286-386	145-205
Tmax. (°C)	30 -34	30 -34	28-32	29-35	28-32
Tmin..(°C)	24 -27	24-27	24-27	24-26	20-24
RHm (%)	74-96	89-92	87-93	88-97	82-97
RHe (%)	42-62	74-76	63-86	66-78	42-66
BSS (h/day)	3.6-6.5	4.0-5.6	3.5-5.1	4.3-7.3	7.3-10.3
Water Requirements, **mm**	60-100	100-140	245-410	210-300	105-150

Weather criteria for Rice Diseases and Insect Pest	
Stem borer	Temp. range 19-33 °C, RH <90% Dry weather
Leaf Folder/Case worm	High Humidity >90 , Cloudy
BPH	High Temperature >32 C , High humidity, drizzle , Wet spell Rain <75 mm
Gundhi Bug	Dry or Intermitant Rain, Low Temperature
Blast	Night Temp.16-20 °C for 10 hrs, Day temp 25-30 °C for 10hrs, Day/night temperature >10C, RH>90%, Cloudy
BLB	Temp. Range 28-35 °C , High Soil Moisture, RH >90%
Sheath blight	Temp 28-32 °C, high RH, Cloudy Weather
Sheath rot	Temp 25-28 °C, Cloudy Weather, High RH >90%
Brown spot	Temp.28-30 °C, High RH, Cloudy Weather
Foot rot	Temp. Range 28-30 °C , RH>90%, Intermittent Rainfall , Cloudy



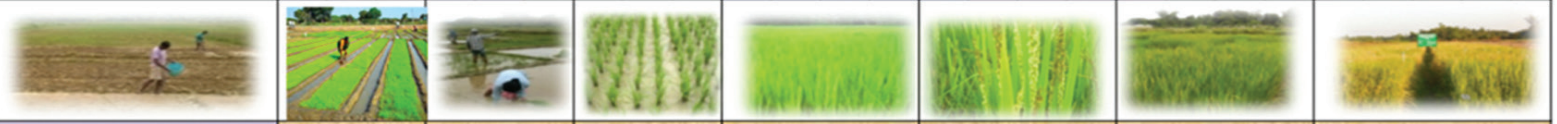
Crop weather calendar of Rice – Jorhat, Assam

Jorhat is situated in Upper Brahmaputra plain of Assam having climate of warm to hot per humid ESR with moderately deep to deep loamy, alluvium-derived soils, medium AWHC and LGP >300 days. The crop weather calendar has been prepared for the long duration rice crop grown in the region.

CROP WEATHER CALENDAR

Crop: Rainfed Sali Rice | **Duration: Long (145-162 days)** | **State: Assam** | **District: Jorhat**

	Month	June					July				August					September				October				November			
Climatic Normals	Std Week	22	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
	Tmax (°C)	31	32	32	32	32	32	32	32	32	33	33	33	32	33	32	32	32	31	31	31	30	30	30	29	28	27
	Tmin (°C)	24	24	24	25	25	25	25	25	25	25	25	25	25	25	25	24	24	24	23	23	22	20	19	17	16	14
	RHm (%)	88	89	90	90	90	90	91	91	90	91	90	90	92	91	92	92	92	92	92	93	93	93	93	93	94	94
	RHe (%)	73	74	75	76	75	76	77	77	76	75	74	75	77	75	76	76	76	77	77	75	74	71	68	68	67	67
	BSS (hr/day)	5	5	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	6	6	7	7	7	7	7
	Rain (mm/wk)	48	62	70	76	69	84	95	79	71	60	75	63	78	68	57	73	49	43	43	32	25	15	8	8	5	5



Phenophase	Emergence	Seedling	Tillering	Panicle Initiation	Flowering	Grain Filling	Physiological Maturity
Duration (days)	(5-7)	(7-28)	(28-30)	(9-10)	(12-13)	(10-12)	(15-17)
Phonophase wise weather for better yield: Tmax (°C)	30-34	28-32	28-34	30-35	28-33	28-31	26-30
Tmin (°C)	23-25	24-27	24-25	24-26	24-25	21-23	15-21
RHm (%)	88-95	89-96	90-95	89-93	90-94	90-95	91-98
RHe (%)	70-88	71-88	68-84	74-84	75-85	73-87	67-78
BSS (hr/day)	1-6	1-7	2-7	2-7	2-6	2-7	3-9
Rain (mm/wk)	9-84	13-116	10-114	13-163	6-124	7-142	3-39

Congenial weather for pest/disease	
Bacterial Blight	Tmax 28-30 °C & RHm 80-90%
Blast of rice	Tmax 25-28 °C & RHm 98-100%
Brown leaf spot	Tmax 27-30 °C & RH m> 90%

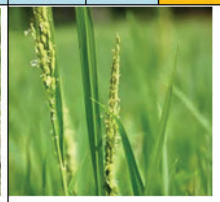
Crop weather calendar of Rice – Dapoli, Maharashtra

Dapoli is situated in hot moist sub-humid to humid transitional ESR climate of Maharashtra with deep loamy to clayey red and lateritic soils, low to medium AWHC and LGP of 210-270 days.

Crop: Rainfed Khaif Rice | Duration: Medium (105-120 days) | State: Maharashtra | District: Dapoli

Parameter \ Std week	June				July					August				September				October			
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Tmax (°C)	31.8	29.8	29.1	28.9	28.5	28.3	27.9	27.6	27.6	27.6	27.7	28.0	27.8	28.1	28.6	28.8	29.6	30.2	30.8	31.8	32.5
Tmin (°C)	24.0	23.6	23.8	23.6	23.4	23.3	23.2	23.1	23.2	23.0	23.1	22.9	22.6	22.5	22.3	22.2	22.3	22.1	21.7	20.4	18.8
RHm (%)	89	92	93	93	94	94	94	94	94	94	94	94	95	95	95	94	94	94	94	93	91
RHe (%)	74	82	85	87	88	89	89	90	90	90	88	87	88	86	84	82	81	79	74	68	62
WS (kmph)	6.2	6.8	8.0	8.3	8.1	8.5	9.2	9.0	8.7	8.1	6.9	5.9	5.3	4.8	3.8	3.7	3.5	3.4	2.9	2.8	2.7
BSS (hr/day)	5.8	3.6	3.1	3.0	2.6	2.2	1.9	1.9	2.0	2.2	2.8	3.0	3.5	3.4	4.5	5.1	5.3	5.4	6.0	7.2	7.8
Rain (mm)	135	249	260	281	287	258	267	283	279	220	173	149	205	138	81	76	59	52	32	14	9
EVP (mm/week)	21.1	13.5	12.1	13.4	11.9	10.9	9.7	10.6	10.9	11.7	13	12.7	12.9	13.1	15.5	16.5	17.1	17.2	18.2	19.5	20.4





Phenophases	Emergence & Seedling	Tillering	Panicle Initiation	Heading	Flowering	Grain filling	Phy. maturity
Duration (Days)	5–21	24–45	10–12	20–25	8–10	20–25	5–7
Tmax. (°C)	28-34	26-30	26-29	24-29	28-31	27-32	30-34
Tmin. (°C)	23-25	22-27	21-25	20-24	22-23	21-31	18-23
RHm (%)	91-98	94-99	92-98	95-99	94-98	96-99	95-98
RHe (%)	60-92	85-98	87-98	73-95	77-96	68-90	44-87
WS (kmph)	5-7	6-8	7-9	4-6	2-3	2-4	2-3
BSS (hr/day)	3-5	2-4	1-3	2-4	3-5	4-6	6-8
EVP (mm)	23-27	14-16	19-21	18-20	21-23	21-23	27-29

Bacterial blight	Temp. 28-30 °C, RH> 80%
Sheath blight	Temp. 30-32 °C, RH> 90%
Blast of rice	Temp. 25-28 °C, RH >90%
Brown leaf spot	Temp. 27-30 °C, RH> 90%
False Smut	Temp. 23-31 °C, RH >96%
Leaf folder	Tmax 34-35 °C, Tmin 24-27 °C, Max RH 90-99%, Min. RH 67-81%
Stem Borer	Tmax. 35 °C, Tmin. 17 °C, Optimum Temp 24-29 °C, RH 90-100%, Sunshine 14.5-16 hrs
Rice Hispa	Tmax. 32-35 °C, Tmin. 24-26 °C, Max. RH 96-99%, Min. RH 75-81%
Army Worm	Temp. 15-35 °C

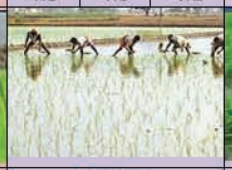
Crop weather calendar of Rice – Kanpur, Uttar Pradesh

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 Rice – Samasthipur, Bihar

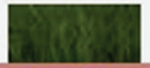
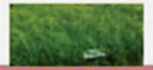
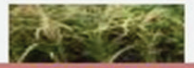
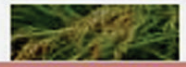
Samasthipur is situated in North Bihar and avdh plains of Bihar having the climate classified as hot dry to moist sub- humid ESR with deep, loamy alluvium-derived soils, low to medium AWHC and LGP of 180-210 days.

State:- Bihar Crop:- Rice District:- Samastipur Duration:-125-145

	June					July				August					September				October			
STD. WEEK	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Rain(mm/week)	13	23	31	49	60	93	76	76	66	65	54	79	72	67	76	67	43	28	35	15	16	8
Rainy Days	1	1	1	2	3	3	3	3	3	3	2	3	2	3	3	3	2	2	1	1	1	0
T max (°C)	35	36	36	35	34	33	33	32	35	33	33	32	33	33	33	33	32	32	33	32	31	31
T min (°C)	25	27	27	26	26	26	27	26	27	27	26	26	26	27	26	26	25	25	25	24	21	20
T mean (°C)	30	31	31	31	30	30	30	29	31	30	30	29	29	30	30	29	29	28	29	28	26	25
BSS (hrs/day)	7	7	8	4	4	4	5	7	7	7	5	4	5	6	7	6	5	6	6	7	6	7
Evap (mm/day)	5	6	6	4	4	4	4	3	4	4	4	3	3	4	4	4	4	3	3	3	3	3
RH m (%)	82	84	81	86	87	89	89	90	88	88	89	91	88	88	88	89	90	90	90	90	91	90
RH e (%)	56	53	56	65	69	73	70	74	68	71	74	76	72	69	66	67	69	65	66	62	61	53
WS(Km/hr)	8	7	7	7	7	6	6	7	7	7	7	5	5	7	6	5	5	5	4	4	4	2

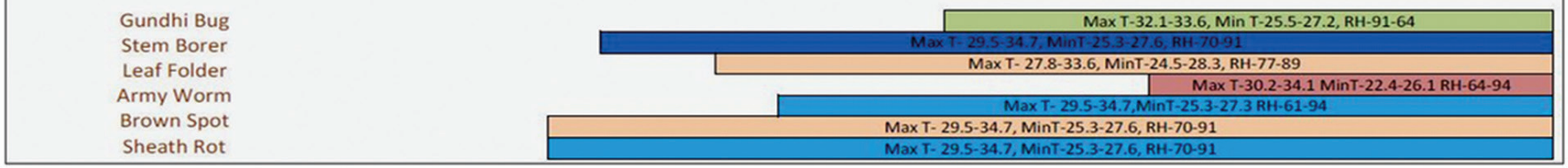
Weather condition favorable for yield



Sowing	Transplanting	Tillering	Heading	Flowering	Grain Filling	Physiol. Mat.
T max =32-41 °C	31-36	30-34	29-34	32-35	30-34	30-33
T min = 24-27°C	26-27	25-27	25-27	26-27	25-26	21-26
RH m =76-87 %	83-91	87-93	86-94	88-91	87-94	88-93
RH e =37-60 %	55-78	70-79	67-82	72-78	64-78	44-68
Ranfall= (mm)	114-322	130-231	101-308	13-52	127-280	78-134
BSS (hrs/day)=7-8	1-8	3-8	2-8	2-10	3-9	4-9
Evap =79-143 mm	103-156	114-167	124-176	132-184	136-139	140-198
WS= 5-9Km/hr	5-11	6-9	4-8	4-8	4-7	2-4
WD=120-275Deg	90-195	90-288	130-240	90-260	165-269	120-238

Weather condition favorable for incidence of pest



Crop weather calendar of Rice – Ranchi, Jharkhand

Ranchi is situated in the Chota Nagpur plateau and Garjat hills with climate hot dry sub-humid ESR with moderately deep to deep, loamy to clayey, red and lateritic soils, medium AWHC and LGP of 150-180 days.

Crop : Rainfed Upland Rice **Duration : Short (90 – 95 days)** **State : Jharkhand** **District : Ranchi**

	Std week / Parameters	June		July				August				September				
		25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
Climatic Normal	Tmax (°C)	32.2	30.7	30.1	29.5	29.1	29.2	28.9	28.9	28.9	29	29.1	29	28.8	29.4	29.0
	Tmin (°C)	23.5	23.3	23.2	23.1	22.9	23	22.9	22.8	22.8	22.8	22.5	22.5	22.1	21.9	21.3
	RHm (%)	82	87	87	89	90	90	91	91	91	90	91	91	91	89	90
	RHe(%)	63	69	72	75	77	76	76	76	77	76	75	75	74	71	70
	WS (kmph)	7.3	7.3	7.3	6.5	6.5	6.2	6.5	6.5	6.5	5.9	5.7	5.5	6.0	4.9	4.9
	BSS(hr/day)	4.5	3.3	3.9	3.6	3.7	3.5	3.3	4.4	4.2	4.1	4.7	4.2	4.6	6.1	5.7
	Rain(mm/week)	68	75	68	81	89	89	77	73	72	65	70	69	69	54	43
	EVP(mm/week)	42	32	28	28	26	28	24	26	27	25	22	23	25	26	25







Phenophase duration		Emergence (6-7)	Vegetative stage (40 – 45)	Flowering (4-5)	Milking &grain filling (25-30)	Maturity (15-20)
Phenophase wise weather for better yield	Tmax (°C)	29 - 31	28-29	29-31	27-31	28-30
	Tmin (°C)	22 - 23	20-22	20-23	19-22	18-22
	RHm (%)	80 - 89	80-89	84-88	86-91	89-90
	RHe(%)	60 - 70	69-73	72-79	73-77	58-78
	BSS(hr/day)	3.5 – 4.5	5.6-9.3	2.5-3.8	2-5.5	4-8
	Rain (mm)	100-172	398-654	21	180	10-43
Climatic normal for diseases	Brown Spot		T max>29.5°C, RHe>85% 			

Crop weather calendar of Rice – Thrissur, Kerala

Thrissur is located in the hot humid to per humid transitional ESR in Kerala state with deep, clayey to loamy, acidic, coastal alluvium-derived soils, low AWHC and LGP 240-270 days.

Crop: Rice (*Virippu*) **Duration : Short Duration (110-125)** **State: Kerala** **District: Thrissur**

Months	May			June					July				August					September				October			
Std week	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
T_{Max} (°C)	33.9	33.3	33	32	30.5	29.5	29.6	29.3	29.5	29.1	28.8	29	29.2	29.2	29.5	29.8	29.8	30	30.3	30.6	31	30.7	31.1	31.3	31.5
T_{Min} (°C)	25.1	24.8	24.7	24.3	23.5	23.3	23.3	23.2	23.1	23	22.9	23	23.1	23.1	23.2	23.3	23.3	23.2	23.3	23.2	23.2	23.1	23.1	23	23.2
RHm (%)	87	88	89	91	93	94	94	94	94	95	95	95	94	95	94	94	94	93	93	92	92	92	92	91	90
RHe (%)	61	63	65	69	76	80	79	79	78	80	81	79	79	78	77	75	74	73	71	70	69	71	71	69	68
Rain (mm/week)	37.2	37	53.3	92	151.5	182.6	168.2	178.6	144.6	155	160.2	135	136.5	109.1	104.1	73.9	79.8	69.3	64.4	49.8	63.8	79.1	76.9	70.8	59.3
WS (kmph)	3.9	3.9	3.8	3.9	3.8	3.8	3.7	3.5	3.5	3.4	3.4	3.4	3.5	3.3	3.4	3.7	3.5	3.2	3.3	3.2	3	3	2.8	3	3.4
BSS (hrs/day)	6.7	6.2	6	5	3.3	2.6	2.9	2.7	2.9	2.4	2.1	2.5	2.8	3	3.7	4.3	4.4	4.6	5.6	5.5	5.6	5.4	5.3	5.5	5.7
Evp (mm/week)	34.3	32.4	30	26.4	21.5	19.8	21	20.5	20.6	19.9	18.3	19.4	20.3	20.8	22	23.1	23.6	23.3	25.5	25.2	24.9	23.4	23.5	23.6	24.5

Weather condition favorable optimum growth

	Sowing (18)	Transplanting (27)	Tillering (19)	Panicle Initiation (20)	Booting (9)	Heading (9)	50% flowering (30)	Physiological Maturity
T_{Max} (°C)	31-33	29-31	29-30	29-31	29-30	28.0-29.0	28.5-30.0	29-31
T_{Min} (°C)	24-25	23-24	23-24	23-24	22-23	23-24	23-24	23-24
RHm (%)	90 -92	94-96	94-97	94-97	94-97	95-98	94-97	93-97
RHe (%)	66 – 71	77-79	73-86	72.0-85.0	76-84	79.0-83.0	71-80	71-74
Rain (mm/week)		450-900	150-300	150-300	300-600	250-300	100-200	300-400
WS (kmph)		2	2.0-4.0	2.0-5.0	2.0-3.0	2.0-3.0	1.5-2.0	2.0-3.0
BSS (hrs/day)	04-May	2.0-3.0	3.0-5.0	3.0-5.0	1.0-3.0	1.0-2.0	2.0-3.5	4.0-6.0
Evp (mm/week)	60-70	65-66	26-31	26-36	52-62	23-26	25-28	80-100

Weather condition favorable for Pest and Disease

Leaf Roller (T_{MX} :32-33 °C % and RHI:92-95%)

Leaf Blight (T_{MX} :33-35 °C % and RHI:90%)

Crop weather calendar of Rice – 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	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)	6.4	5.5	4.0	20.0	8.8	9.2	18.3	28.0	54.5	58.2	53.2	47.9	56.0	55.0	38.3	44.3	34.2	42.2	25.8	27.3	16.0	3.3	3.3	2.3	0.5
Max T (°C)	38.2	38.5	39.5	40.3	40.7	39.1	39.1	37.6	36.3	34.0	33.6	33.6	33.4	33.3	33.5	33.7	33.7	33.7	32.7	34.2	33.7	33.7	33.7	31.8	31.0
Min T (°C)	21.3	21.7	23.5	24.1	25.4	25.7	26.1	27.7	25.9	25.7	25.7	25.7	25.7	25.4	25.1	24.9	24.4	23.9	23.0	21.9	20.5	18.7	18.7	15.4	14.2
Mean T (°C)	29.8	30.1	31.5	32.2	33.1	32.4	32.6	32.7	31.1	29.9	29.7	29.7	29.6	29.4	29.3	29.3	29.1	28.8	27.9	28.1	27.1	26.2	26.2	23.6	22.6
SShr (hrs)	10.0	9.7	10.4	10.8	10.1	9.7	9.0	8.1	7.9	7.6	6.9	7.2	6.3	6.3	7.6	8.1	8.5	8.0	9.0	9.6	9.4	8.7	8.7	9.3	9.5
Evap (mm)	65.6	71.2	75.7	80.2	76.9	67.6	66.5	54.3	62.7	39.1	35.9	31.0	30.0	25.9	31.3	31.4	33.9	32.1	32.0	32.8	30.6	32.5	32.5	29.2	25.8
RHmax (%)	51	52	50	47	51	59	62	72	75	80	82	81	85	86	87	87	85	86	86	85	83	81	81	80	78
RHmin (%)	25	25	29	24	26	34	39	48	53	60	64	61	69	71	69	67	63	62	58	51	46	39	39	35	36
RH mean(%)	38	39	40	36	39	47	51	60	64	70	73	71	77	79	78	77	74	74	72	68	65	60	60	58	57

Phenological stages of Rice

Sowing	Transplanting	Tillering	Heading	Flowering	Grain filling	Physiol Mat

Cimatic normals for Rice

Min temperature more than 10°C is required				Opt temp = 22-23°C	Opt temp = 20-21°C	
Minimum temperature more than 15°C		Rainfall = 125 cm				
			Solar radiation = 300 cal/m^2 per day			
Maximum temperature = 40°C		Mean temperature = 22°C		Rainfall = 200 mm per month for lowland rice		

Climatc normals for Rice insect pests

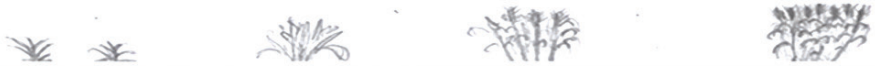
Plant hopper		Maximum Temp 33°C, Minimum Temp 25°C, Optimum Temp 28-30°C, RH 85%				
Leaf folder		Maximum Temp 34-35°C, Minimum Temp 24-27°C, Maximum RH 90-99%, Minimum RH 67-81%				
Stem Borer		Maximum Temp 35°C, Minimum Temp 17°C, Optimum Temp 24-29°C, RH 90-100%, Sunshine 14.5-16 Hrs				
Rice Hispa		Max Temp32-35°C, Min Temp24-26°C, Max RH96-99%, Min RH75-81%				
Armyworm			Temperature 15 - 35°C			
Root weevil		Temperature 20-27.5°C				

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/Nor	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= 10-14Wm^{-2}	SR= 16-18 Wm^{-2}	SR= 18-23Wm^{-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 wheat- Anand, Gujarat

Anand in Gujarat located in hot moist semi-arid ESR with medium and deep clayey black soils, medium to high AWHC and LGP of 120 -150 days. Wheat is major crop in *rabi* season.

District: Anand **Crop : Wheat** **Duration : 112 -120 days**

	November			December				January				February				March		
Std. week	46	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10	11
T max (C)	32.9	32.1	30.9	30.8	29.6	29.4	28.2	27.6	27.5	28.0	28.7	29.0	29.7	30.4	31.5	33.1	34.2	35.4
T min(C)	16.1	15.1	14.1	13.5	12.7	12.8	11.8	11.5	11.6	10.9	11.1	11.3	11.3	12.4	13.2	14.3	15.3	17.1
BSS (h)	9.3	9.2	9.2	9.2	9.0	8.9	8.9	9.0	9.0	9.4	9.5	9.6	9.8	9.8	9.9	9.9	9.8	9.6
RH m (%)	78	79	77	78	80	82	81	80	80	80	80	78	79	78	76	72	68	69
RH e (%)	34	33	32	33	36	37	37	39	38	35	34	32	31	31	29	25	23	24

Favorable weather conditions

	Emergence	Seedling	CRI	Tillering	Booting	Flowering	Milking	Dough	Phys Mat
BSS (h)	4.6-10	2.6-10.5	0-10.2	0.3-10	1.4-10.2	5.8-10.2	2.6-10.6	6.2-11.1	5.2-10.9
Wind Dir	NE	N	NE	NE	NE	NE	NE	NE	N
Wind (km/h)	1-3.7	0.8-5	0.5-9.2	0.8-6.7	0.5-7.2	0.8-5.5	0.6-8.3	1.1-5.8	1.2-5.7
T max (C)	31-36	27-34	24-34	22-32	22-34	24-32	20-36	27-37	30-39
T min(C)	12-19	10-19	8-18	7-17	8-17	5-17	5-19	9-19	10-22
RH m(%)	63-96	58-100	50-100	14-100	15-98	15-98	13-98	19-100	20-98
RH e(%)	12-53	20-49	21-75	18-87	18-74	10-64	18-74	18-44	10-56

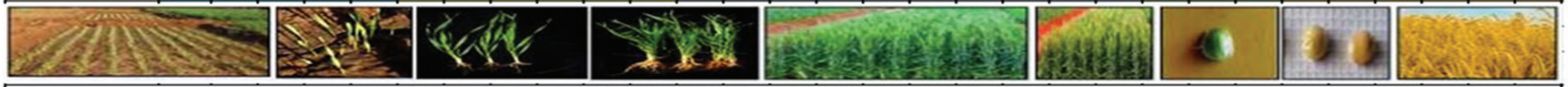
Congenial weather for diseases

Loose smut	18-20°C, RH 60-68 %
Leaf blight	25°C, high humidity
Leaf rust	15-25°C, Rain and high dew

Crop weather calendar of wheat- Palampur, Himachal Pradesh

Palampur is situated in Himachal Pradesh with warm humid to per humid transitional ESR and shallow to medium deep loamy brown forest and podzolic soils, low to medium AWHC and LGP of 270-300 days.

State : Himachal Pradesh					Crop : Wheat						Variety: HS 240										Duration : 180-190 days									
Months	October				November				December			January					February					March			April					May
Normals (SMW)	42	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	16	17	18	19
date/month	October 15 -- November 18					November 19---- December 31						January 1----------March 11										March 12-- April 1			April 2-------May 13					
Physiological Stages of Wheat																														
Parameters	Sowing & Emergence					Emergence to Tillering						Tillering to Heading										Head. to GF			GF to phy.maturity					
Rain (mm)	7.9	4	4.3	5.3	5.1	3.9	7.4	5	13	11	20	17	21	21	29	17	27	34	24	29	21	28	31	16	15	12	14	13	16	18
Max T (°C)	24.6	24	23	22	21	20	19	19	18	17	16	15	15	15	15	16	16	17	17	18	20	21	22	23	24	26	27	28	29	29
Min T (°C)	13.1	12	12	11	9.5	8.5	7.4	7.4	6.7	6.2	5.1	4.7	4.9	4.8	5	5.6	5.9	6.5	6.7	8.1	9.2	9.9	11	12	13	14	15	17	17	18
SShr (hrs)	8.9	8.9	8.8	8.4	8.4	7.9	8	7.4	6.5	6.9	6.7	5.9	6.2	5.8	6.7	6.6	5.7	5.7	6.1	6.7	7.2	6.8	6.3	7.4	7.9	8.2	7.8	8.8	7.8	8.6
RH I (%)	26.7	25	25	24	23	22	19	17	16	15	17	13	14	13	14	16	16	18	19	22	25	26	28	31	35	38	42	44	47	48
RH II (%)	61	61	58	59	57	57	60	56	58	58	61	61	63	63	62	62	63	64	61	60	57	58	56	56	51	50	50	48	47	49
WS (Kmph)	47	47	46	47	44	45	46	45	49	48	50	51	50	54	51	50	54	52	49	48	45	47	46	45	41	39	39	37	37	39



Climatic normal for high yield of wheat					
Parameters	Sowing & Emergence	Emergence to Tillering	Tillering to Heading	Heading to Grain filling	Grain filling to Physiological Maturity
Rain (mm)	0.0-30.9	0.0-282.0	208.7-586.5	0.0-34.3	25.9-68.0
Max T (°C)	15.5-25.5	13.5-24.5	8.4-29.2	20.5-30.5	18.2-33.0
Min T (°C)	4.5-12.3	2.5-10.5	0.0-18.2	8.0-20.0	8.6-23.8
SShr (hrs)	0.0-9.9	0.0-9.8	0.0-11.0	1.0-11.4	0.0-12.0
RH I (%)	33-93	32-90	25-100	27-85	-
RH II (%)	24-94	22-70	20-100	18-86	-
WS (Kmph)	2.5-7.5	3.5-11.2	2.0-15.8	4.7-11.4	-
Wind Direction	North easterly & south westerly	North easterly & west south westerly	Easterly northeasterly & west south westerly	ENE &WSW	-

Climatic normals for wheat disease

Crop weather calendar of wheat- Raipur, Chattisgarh

Raipur in Chhattisgarh state is located in Moderately to gently sloping Chhattisgarh / Mahanadi basin with climate of hot moist/dry sub humid transitional ESR with deep loamy to clayey red and yellow soils, medium AWHC, LGP 150-180 days.

Location : Raipur **State : Chhattisgarh** **Crop : Wheat**

Parameter	Nov.		Dec				Jan				Feb				Mar					Apr	
Std. Week	47	48	49	50	51	52	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
T Max (°C)	29.1	28.4	27.8	27.5	27.2	27.0	26.6	27.2	27.7	28.1	28.8	29.1	30.3	31.5	32.7	33.7	34.9	36.8	37.3	38.6	39.7
T Min (°C)	13.9	12.7	11.6	11.2	10.6	10.8	10.1	11.3	11.5	11.7	12.7	12.9	14.1	14.5	15.3	16.6	17.6	18.7	19.7	21.0	22.3
RH m(%)	90	90	89	90	90	90	89	89	87	86	84	82	81	76	73	70	68	60	56	53	49
RH e (%)	37	36	34	35	33	36	35	38	36	34	35	35	34	28	27	27	23	19	19	19	17
Rain (mm /week)	3.3	2.7	1.9	1.7	0.9	1.5	2.1	3.7	2.0	3.9	4.3	4.3	4.4	1.6	3.3	4.1	2.9	2.0	2.5	4.2	1.8
BSH (hrs)	8.6	8.7	8.2	7.9	8.2	7.6	7.8	7.6	8.2	8.5	8.4	8.5	8.8	9.3	9.2	8.8	8.9	9.2	9.1	9.1	9.3
WS kmph	2.8	2.7	2.6	2.7	2.8	2.7	2.8	2.9	3.0	3.2	3.6	3.7	3.9	3.9	4.4	4.5	4.6	5.0	5.4	6.0	6.5

Phonological stages and range of favourable meteorological parameters for better yield

Parameter	Emergence	CRI	Tillering	Jointing	Heading	Grain formation	Physiological maturity
Tmax (°C)	28-31	26-30	23-31	20-30	18-31	22-36	28-36
Tmin (°C)	12-18	9-17	6-16	4-18	9-19	9-21	10-21
RF (mm)					0-134.8	0-82.2	0-14.5
RHm (%)		88-91	59-98	71-96	74-100	57-97	43-98
RHe (%)		39-95	21-61	17-57	23-98	12-89	11-56
WS (km/h)		0-3.6	1.3-5.8	0.6-4.9	1.2-9.2	1.3-7.4	1.3-10.1
Evap (mm/day)		2.4-4.7	2.0-4.6	0.9-4.8	1.0-6.4	0.6-7.9	1.4-8.0
BSS (hr)		0-.9.8	0-10.0	0.3-10.1	0.0-10.2	0.2-10.6	1.6-10.6

Crop weather calendar of wheat-Udaipur, Rajasthan

Udaipur is situated in hot dry semi-arid ESR with deep loamy gray brown and alluvium derived soils, mediumAWHC and LGP 90 -120 dayss.

CROP- WHEAT **DURATION-** Medium **117 to 132 days** **STATE- RAJASTHAN** **DISTRICT- UDAIPUR**

MONTHS	NOVEMBER					DECEMBER				JANUARY				FEBUARY				MARCH				APRIL
Std. Week	45	46	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10	11	12	13	14
T Max (°c)	30.6	29.1	27.9	26.8	26.8	26.0	25.6	24.2	23.5	23.5	23.8	24.6	24.8	25.6	26.4	27.4	29.2	30.4	31.9	32.9	33.8	34.7
T Min (°c)	11.7	11.2	10.2	8.6	7.9	7.1	6.8	6.3	5.4	5.8	5.6	6.1	6.4	6.7	8.2	9.2	10.5	10.8	13.1	14.3	15.5	16.9
RH m (%)	74.8	77.7	77.5	79.1	81.0	82.7	84.2	85.0	85.8	85.4	83.2	80.1	78.7	74.9	74.0	71.4	67.9	61.2	59.0	54.8	48.0	44.0
RH e (%)	30.8	33.5	34.5	32.9	32.6	34.4	35.3	37.9	37.1	35.5	33.3	32.2	31.9	28.6	28.2	26.8	26.3	22.0	21.7	19.6	18.0	19.0
WS (Km/ hr)	2.6	2.4	2.4	2.4	2.2	2.1	2.2	2.4	2.6	2.8	2.9	2.9	3.1	3.1	3.4	3.7	3.7	3.8	4.1	4.7	4.9	5.1
BSS(hrs/day)	9.1	8.6	8.7	8.8	8.8	8.8	8.6	8.5	8.7	8.7	8.9	9.1	8.9	9.3	9.4	9.5	9.6	9.5	9.3	9.5	9.9	9.9
Evap (mm/week)	3.7	3.3	3.2	2.9	2.8	2.7	2.5	2.4	2.4	2.6	2.8	2.9	3.2	3.6	3.9	4.4	4.9	5.6	6.2	7.7	7.9	8.8
Rain (mm/week)	3.0	2.8	5.9	0.3	0.0	1.5	1.2	0.1	0.0	0.6	0.3	0.7	0.7	0.5	0.6	0.4	0.4	0.1	0.1	0.5	0.0	0.6
Phenological Stages																						
	Sowing & Emergence 4 -6 days					CRI 5-21 days				Tillering 21-30 days				Heading 62-74 days				Grain filling 63-124 days				Physiological Maturity 117-132 days
Favorable weather for better yield	T Max : 22-32 °C					24-31 °C				24-29 °C				23-28 °C				25-32 °C				27-35 °C
	T Min : 8-16 °C					5-17 °C				5-12 °C				3-11 °C				6-12 °C				10-17 °C
	RH m:-					71-90 %				78-90 %				78-88 %				78-86 %				56-73 %
	RH e :-					24-74 %				26-64 %				18-39 %				25-35 %				13-28 %
	WS(kmph):-					0.2-1.9				0.2-2.1				0-1.8				0.2-2.9				2.4-5
	BSS(Hours):-					4.0-8.7				6.0-9.0				4.1-9.1				6.4-8.9				8.1-10.0
	Evap (mm):-					1.6-3.7				1.7-3.9				2.0-3.5				2.4-4.1				4.3-8.3
	Rain (mm):0-37					0-75				0-2				0-2				0-6				0

Crop weather calendar of wheat- Ranchi, Jharkhand

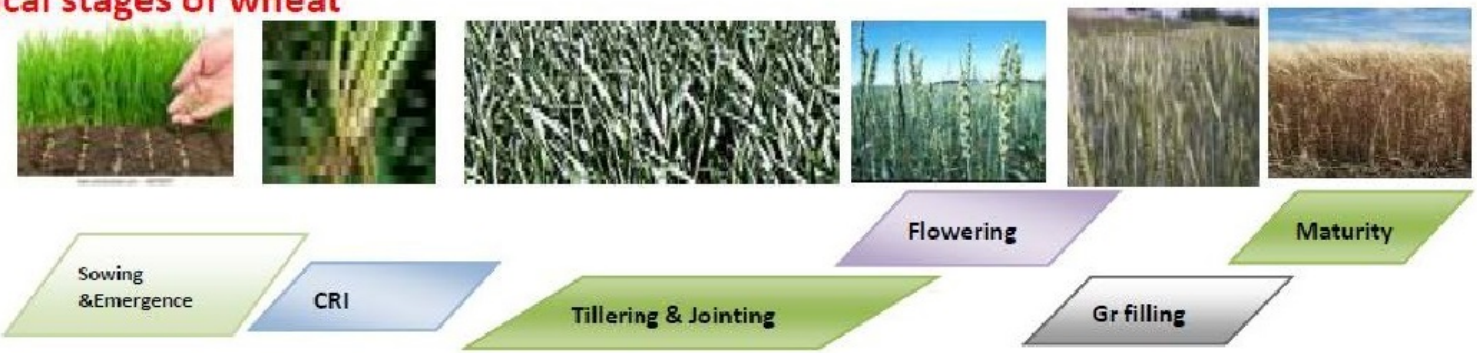
Ranchi is situated in the Chota Nagpur plateau and Garjat hills under hot dry-subhumid ESR with moderately deep to deep, loamy to clayey, red and lateritic soils, medium AWHC and LGP 150-180 days.

CROP WEATHER CALENDAR

STATE - JHARKHAND **CROP - WHEAT**
PLACE - (RANCHI) **DURATION - 120 – 125 DAYS**

Month	November		December				January				February				March				
Std week/normal	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10	11	12	13
Rainfall(mm)	2.1	3.1	0.7	1.7	0.5	4.9	2.4	3.2	3.7	5.6	6.9	9.8	8.3	5.2	7.4	4.8	5.7	6.3	6.6
T max(°C)	25.4	24.5	23.9	23.4	23	22.6	22.2	22.8	22.9	23.3	23.7	24.3	25.9	26.7	27.9	29	30.4	32.2	32.7
T min(°C)	15	13.1	12	11.2	9.9	8.6	7.5	8.2	8.1	8.3	9.2	9.7	11	11.6	12.5	13.4	14.4	15.8	16.8
RH M(%)	83	82	83	85	82	82	83	81	81	81	79	78	78	75	74	71	69	68	65
RH E (%)	43	44	42	41	39	43	42	40	39	38	43	39	38	33	33	32	29	28	28
BSS (hr/day)	8.6	8.6	8.6	8.7	8.3	8.2	7.9	7.6	8.2	8.6	8.3	8.4	8.8	9	8.8	8.5	8.6	8.8	8.3

Physiological stages of wheat



Favourable weather for better yield of wheat

Tmax 23-26°C Tmin 6 – 11°C	Tmax 22-29°C T min 5-14°C	T max 22-24 °C T min 7-8°C SShr5-11.2	T max 21-27°C T min 7 – 11°C SShr 8.2-11.2	T max 23-29°C T min 7-10°C Sshr 4.1-11.4	T max 30-32°C T min 11-13°C SShr 8.2-11.3

Crop weather calendar of Groundnut – Anantapur, Andhra Pradesh

Anantapur comes under hot arid ESR with deep loamy and clayey mixed red and balck soils having low to mediumAWHC and a LGP of 60-90 days.

CLIMATIC NORMALS DURING CROP GROWING PERIOD

STD Wk	JULY				AUGUST					SEPTEMBER				OCTOBER				NOVEMBER			
	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
T max (°C)	35	34	34	33	33	33	33	33	33	33	33	33	33	33	33	32	32	31	31	31	31
T min (°C)	24	24	24	23	23	23	23	23	23	23	23	23	23	23	22	22	21	20	20	19	18
RH m (%)	72	76	75	76	76	78	78	78	79	78	78	79	80	81	81	80	81	84	83	85	83
RH e (%)	41	44	45	46	46	47	47	47	47	47	45	47	47	48	46	45	48	50	47	47	44
WS (KMPH)	19	18	19	18	18	18	17	15	15	13	11	10	8	7	6	6	5	6	6	6	6
RF (mm/Week)	10.3	22.7	25.7	21.2	14.1	13.2	11.9	34.0	26.1	32.0	28.7	31.3	28.7	26.9	19.7	18.8	15.2	13.3	13.8	7.3	3.8
Rainy Days	1	1	1	1	1	1	1	2	1	2	1	2	2	2	1	1	1	1	1	1	0
BSS (Hrs/Day)	5.4	5.0	5.2	4.7	5.0	5.0	5.2	6.0	5.7	6.3	6.9	6.7	7.2	7.0	7.2	7.4	7.0	6.7	7.2	7.8	8.0
EVP (mm/Week)	65	58	58	56	57	56	54	55	53	52	53	49	47	44	43	42	41	38	39	37	37

PHENOLOGICAL STAGES

FAVOURABLE WEATHER CONDITIONS FOR BETTER YIELD

Sowing & Seedling Emergence (6-7 days)		Vegetative (16 – 27 days)	Flowering to Pegging (10 – 19 days)	Pegging to Pod Development (11 – 19 days)	Pod Development to Maturity (40 – 76 days)
T max (°C)	30 - 33	32 – 35	32 - 35	32 - 33	31 – 33
T min (°C)	23 - 24	23 – 24	22 – 24	23 - 24	20 – 23
RH m (%)	-	73-81	75-83	76-88	82-87
RH e (%)	-	39-56	38-49	45-59	44-55
RF (mm)	14.3	68.0	23.1	83.6	153.6
Rainy Days	0-2	1 – 5	1 – 3	1 – 6	5 – 18
BSS (Hrs/Day)	-	3.0-6.4	4.2-6.8	4.2-5.2	4.8-7.5

CONGENIAL WEATHER CONDITIONS FOR INCIDENCE OF PESTS & DISEASES

LEAF MINER	Dry spell, Increase in T max by 3 to 5 °C, Late sown crop during last week of July to 2nd week of August
THRIPS	Dry spell for 15 days during July to September months
RHC	Moths emerge on the second day after receipt of 20 mm or more rainfall in July month
SPODOPTERA	Rainfall of 10-20 mm for 2-3 days, T max 30-32 °C, T min – 21 -23 °C and RH > 80%
LATE LEAF SPOT	Continuous leaf wetness for 2-3 days at 50 -60 DAS, T min 16-22 °C and RH > 90%
RUST	Drizzling for 2-3 days, T min 20 -22 °C, RH > 90% and SSH < 5hrs/day

Crop weather calendar of Groundnut- Bangalore

Bangalore comes under Central Karnataka plateau with hot-moist semi-arid ESR and have medium to deep red loamy soils, low AWHC and LGP of 120 -150 days.

Crop: *Kharif* Groundnut | **Duration :Medium(120 days)** | **State: Karnataka** | **District: Bengaluru (ACZ :Eastern Dry Zone)**

Climatic normal's

STD	JUN				JUL				AUG					SEP				OCT				Nov
week	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Parameter																						
Rain(mm/week)	24	20	10	8	18	25	25	26	31	24	30	35	31	43	50	53	43	59	34	30	26	26
T max (^{0}C)	30.3	29.2	29.1	29.0	28.8	28.3	28.0	27.8	27.6	27.5	27.5	27.7	27.9	28.1	28.2	28.1	28.1	27.9	28.2	27.7	27.6	26.9
T min (^{0}C)	19.7	19.5	19.3	19.2	19.1	19.1	19.1	19.0	18.8	18.9	18.9	18.8	18.7	18.8	18.8	18.9	18.8	18.7	18.6	18.3	18.0	17.6
RH %(m)	85	86	87	87	88	87	88	90	90	90	90	89	88	89	88.	89	89	89	88	87	87	88
RH%(e)	50	54	53	53	54	55	57	58	58	58	58	59	56	58	56	58	59	58	56	58	57	57
WS (kmph)	11.2	12.2	13.8	13.5	12.8	12.0	12.2	11.3	11.1	11.4	10.1	9.1	8.9	7.9	7.4	6.8	6.0	5.9	5.2	5.1	5.5	6.0
BSS (hr/day)	6.6	5.3	5.4	5.4	4.8	4.3	4.3	3.8	4.0	4.3	4.6	5.1	5.5	5.4	5.8	5.9	6.1	5.9	6.1	6.3	6.1	5.5
Evap(mm/week)	43	40	40	41	40	37	35	34	32	33	33	33	34	34	33	35	34	32	32	32	33	32
Rainy days	2	2	2	1	1	1	1	2	2	2	2	2	2	3	2	2	2	2	2	3	2	2

Phenophasewise congenial weather for better yield

Phenophase Duration days	Sowing	Seedling	Vegetative	Flowering to pegging	Pod filling	Physiological maturity
T max	26-30	24-27	27-31	23-28	25-31	25-31
T min	18-20	18-20	18-20	18-20	18-22	18-20
RH %(m)	91-98	93-98	93-98	91-96	80-98	88-98
RH(%E)	45-65	53-65	49-68	54-61	45-65	45-63
	0-8	0-9	0-9	0-6.3	0-9.4	0-8.2
	96mm	48mm	112mm	77mm	168mm	8mm

Congenial weather for pest attack

High monsoon showers (> 20 mm)in June-July favours enmass emergence of white grub beetles

Consecutive heavy rains in June-July (>20mm) lead to emergence & outbreak of Red headed hairy caterpil

Dry spell >15 days lead to heavy infestation of **aphids and/or thrips, leaf minor**

Mean RH of >70 % and mean tempr of >20^0 C for 7 days spreads **leaf spot**

Crop weather calendar of *Rabi* Sorghum – Bijapur, Karnataka

It is located in Karnataka plateau, hot arid ESR. Dominant soil textures are deep loamy and clayey mixed red and black soils. AWHC is low to medium and LGP ranges from 60-90 days. Crop weather calendar prepared for rabi sorghum is presented below.

Crop: Sorghum (*Rabi*) **Duration: Medium (120-125 days)** **State: Karnataka** **District: Vijayapura**

Climatic normals

Std Week	September		October					November				December				January					February	
Parameter	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5	6	7
Tmax (°C)	30	30	31	32	29	30	30	30	30	31	29	30	30	29	28	31	31	30	32	29	32	35
Tmin (°C)	20	21	22	22	20	20	19	18	17	16	16	14	14	13	13	15	14	15	15	16	17	17
RHm (%)	81	84	83	82	82	81	75	77	76	78	75	72	75	71	72	79	76	74	72	70	70	67
RHe (%)	51	52	53	52	53	51	46	46	46	46	41	37	40	38	36	47	47	43	41	41	36	37
WS(kmph)	11	11	10	8	4	6	4	4	4	3	4	4	4	3	5	4	3	4	4	5	6	8
WD	NW	NE	W	NE	N	W	N	NW	NW	N	NW	N	N	NW	W	NE	NE	E	E	SE	E	N
BSS (hr/day)	4	8	5	7	9	4	9	8	9	9	7	8	10	10	9	8	9	10	9	9	9	9
Rain (mm/week)	32	45	49	40	24	14	7	5	7	4	1	3	1	0	1	0	1	3	0	0	2	1
Evap (mm/week)	28	36	28	30	28	20	21	23	24	24	21	24	29	26	25	31	33	36	36	40	42	48
Rainy days	2	3	3	3	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Phenophase Duration (days)	Seedling establishment (8-10)	Vegetative (20-25)	Panicle initiation (8-10)	Flowering (8-10)	Grain development (35-40)	Maturity (20-25)
Phenophase-wise congenial weather for better yield						
Tmax (°C)	29 -32	29- 31	30-32	29-31	29-31	29-30
Tmin (°C)	17 - 21	16- 19	11-17	9-19	10-16	11-13
RHm (%)	81 - 91	81 - 94	70 - 90	71 - 90	77 - 92	56 - 88
RHe (%)	42 - 68	34 - 60	27 - 47	32 - 58	29 - 47	25 - 40
WS (kmph)	-	-	-	-	-	-
WD	-	-	-	-	-	-
BSS (hr/day)	3-9	6-10	9-10	8-10	8-10	8-10
S Rad (MJ/m^2/day)						
Rain (mm/week)	0 - 196	3 - 22	0 - 22	0	0	0
Evap (mm/week)	-	-	-	-	-	-
Rainy days	-	-	-	0	0	0

congential weather for pest/disease incidence

Shoot fly — Tmax 28- 30^{0}C, RHm > 80

Stem borer

Tmax. 27-32^{0}C, RHe <60%

Aphids

Tmin. 10-12^{0}C, RH- 60%

Crop weather calendar of Rabi Sorghum – Kovilpatti, Tamilnadu

Kovilpatti is located in uplands of Tamilnadu and leeward flanks of south sahyadris. It comes under hot, dry semi-arid ESR with moderately deep to deep, loamy to clayey , mixed red and black soils. AWHC of the region is medium and LGP ranges from 90-120 days.

Crop: Rainfed Sorghum (Rabi) **Duration: Short (95 – 100 days)** **Sate: Tamil Nadu** **District: Thoothukudi**

Climatic normals

Month	October				November					December				January
Std week	40	41	42	43	44	45	46	47	48	49	50	51	52	1
Tmax (°C)	35.8	35.3	34.2	32.9	32.2	31.3	31.7	31.0	31.0	30.6	30.9	30.4	31.0	30.8
Tmin (°C)	22.3	22.2	21.7	21.5	21.3	21.1	20.8	20.7	20.2	19.6	19.0	19.2	18.6	18.6
RHm (%)	78	81	84	88	90	91	89	89	88	88	88	87	87	86
RHe (%)	50	53	57	60	65	66	62	63	62	62	59	59	56	52
WS (kmph)	7.6	7.2	5.2	4.3	3.9	3.4	3.2	3.2	3.0	2.9	3.3	3.5	3.5	3.5
WD	SW	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	W	W
BSS (hr/day)	6.6	6.6	6.1	6.0	5.2	4.8	6.0	5.6	6.1	5.7	6.2	5.8	6.6	6.7
Rain (mm/week)	23	41	43	67	48	47	21	30	20	16	15	11	8	8
Evp (mm/week)	49	42	35	28	22	23	26	22	22	22	24	24	24	26
Rainy days	1	2	2	3	3	3	1	2	1	1	1	1	0	0








Phonophase-wise weather for better yield

Phenophase duration (days)	Emergence & seedling establishment (13- 15)	Vegetative (19-21)	Flag leaf (8-10)	Heading (10 – 12)	Flowering (10 – 11)	Grain filling (19 – 21)	Phy. maturity (10 – 12)
Tmax (°C)	30-35	28-36	27-32	27-32	27-31	27-32	29-32
Tmin (°C)	21-25	19-23	19-21	19-21	17-21	14-19	16-21
RHm (%)	62-94	74-94	85-95	85-95	73-92	74-92	73-91
RHe (%)	32-70	38-75	58-78	58-78	44-75	38-76	40-66
WS (kmph)	3 – 11	3 –8	2 – 4	2– 4	2 – 4	3– 5	3 – 5
WD	SW	NE	NE	NE	NE	NE	W
BSS (hr/day)	2 – 8	3 – 9	3 – 8	3 – 8	2 – 5	3 – 9	5 – 9
Rain (mm/week)	94	148	30	15	13	28	0
Evp (mm/week)	35	41	24	26	23	27	28
Rainy days	4	9	1	2	1	1	0

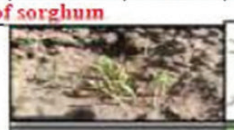
Congenial weather for pest/disease incidence

Shoot fly	Mean temp of 26-31 °C & mean RH of >60 %		
Stem borer		Mean temp of 25-30 °C & mean RH of >70 %	
Anthracnose			Rainfall accompanied by mean temp of 28-30 °C & mean RH of 90 % 

Crop weather calendar of Rabi Sorghum– Solapur, Maharashtra

Solapur is located in south western Maharashtra having hot dry semi-arid ESR with shallow and medium loamy black soils. AWHC is medium to high and LGP ranges from 30-120 days.

STATE - MAHARASHTRA DISTRICT – SOLAPUR CROP- RABI SORGHUM DURATION - MEDIUM (120-125 DAYS)

	OCTOBER					NOVEMBER				DECEMBER				JANUARY				FEBRUARY
Std. Week	40	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5
Rain (mm/week)	37.2	21.6	15.8	13.3	6.1	9.4	4.9	2.9	2.2	1.6	1.3	0.1	1.9	0.5	1.4	1.5	0.3	0.5
Max T (°C)	32.4	33	32.7	32.3	32.1	31.7	31.3	31	30.8	30.7	30.4	30.3	30	30.2	30.5	30.9	31.7	32.3
Min T (°C)	21.4	20.5	19.6	18.9	17.9	17.5	16.8	15.7	15	14.4	13.9	13.2	13.5	13.9	14.2	14.4	14.8	15.5
BSS (hrs/day)	6.4	7.7	7.8	7.8	7.9	8	8.4	8.2	8.5	8.8	8.7	8.8	8.8	8.8	8.8	9	9.3	9.3
Evap (mm/week)	36.8	39.1	42	41.7	39.6	40.7	39.8	38.3	37.9	38.7	37.2	38.2	43.1	37.8	39.3	40.4	43.6	46.3
RHm (%)	86	81	78	77	74	75	75	73	72	71	73	71	70	72	71	68	67	64
RHe (%)	54	46	45	44	42	40	40	39	36	35	38	34	38	37	36	36	36	35
WS (kmph)	5	4.8	5.2	5.1	5.4	5.5	5.7	5.1	4.6	4.6	4.8	5	4.7	5	5.3	5.4	5.4	5.7
Phenological stages of sorghum																		
																		
	Sowing/Emergence	3 leaf	Panicle initiation		Flag leaf		50% flowering	Soft Dough		Hard dough		Phy Maturity						
	7-8	7-8	18-20		27-31		11-13	12-14		11-12		10-12						
Favourable weather for achieving high yield of Sorghum																		
Max T (°C)	31-33	30-34	32-34		31-33		30-32	29-31		30-32		30-33						
Min T (°C)	20-22	19-23	16-20		15-20		15-17	11--16		12--16		12-16						
RHm (%)	83-92	84-91	67-87		70-85		75-82	65-82		68-80		62-76						
RHe (%)	39-63	39-63	28-57		36-53		37-47	20-58		33-63		22-48						
BSS (hrs/day)	5.2-8.5	4.8-8.3	5.8-8.1		6.3-8.1		5.9-8.0	6.8-9.8		6.4-9.0		7.8-9.3						
RF (mm/week)	14	33	109		95		6	1		32		3						
E pan (mm/week)	28	28	90		134		60	80		73		92						
WS (kmph)	2.8-5.7	1.5-4.9	2.9-3.7		2.5-3.9		2.9-4.3	2.3-4.4		2.8-3.9		3.3-4.9						
Favourable weather for occurrence sorghum diseases																		
Downy mildew			Opt. Temp. 24-26°C, RH- 90%, Light drizzeling															
Rectngular leaf spot			Opt. Temp. 15-18°C, RH- 90%, Mod. RF															
Anthracnose			Opt. Temp. 15-18°C, RH- 90%, Mod. RF															
Rust	Opt. Temp. 10-12°C, RH- 85%, RF																	
Grain smut/Kernel smut / Covered smut / Short smut													Opt. Temp. 20-25°C, RH- 85%, Mod RF, Cloudy weather					
Favourable weather for occurrence sorghum pests																		
Shoot fly		Opt. Temp. 18-35°C, RH- 90%, Mod RF																
Stem borer			Opt. Temp. 27-32°C, RH- 70%															
Aphids													Opt. Temp. 10-12°C, RH- 60%					

Crop weather calendar of Soybean– Akola, Maharashtra

Akola is located in Eastern Maharashtra Plateau, hot moist semi-arid ESR with medium and deep clayey black soils (shallow loamy to clayey black soils as inclusion), medium to high AWC and LGP 120 -150 day.

CROP : SOYBEAN **MEDIUM DURATION : 95-100** **STATE: MAHARASHTRA** **DISTRICT : AKOLA**

	JUNE			JULY				AUGUST					SEPTEMBER				OCTOBER			
STND WK	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
T Max (°C)	38.2	35.4	34.1	33.5	32.3	31.9	31.6	31.1	30.3	30.5	30.5	30.4	31.2	32.3	33.4	33.7	33.9	34.1	34	33.2
T Min (°C)	25.4	24.7	24.2	24	23.6	23.5	23.3	23.2	22.9	22.9	22.7	22.7	22.3	22.3	22.3	21.8	21.1	19.6	18.3	17.1
RHm(%)	71	75	81	82	84	84	85	86	87	87	87	87	86	85	83	83	81	77	74	73
RHe (%)	40	49	55	58	62	63	63	66	69	67	67	67	61	56	53	50	46	40	35	36
Rain(mm/wk)	47.4	50.6	37.6	35.7	51.2	58.5	41.2	49.5	62.8	40.6	46.7	47.8	28.5	20.2	24.8	24.3	21.8	15.8	3.2	10
WS (km/hr)	7.6	6.1	5.2	5.3	3.9	4.2	4.3	3.7	3.6	4.4	4.4	4.1	5.8	6.9	7.2	7.6	8.1	8.3	8.6	8.5
BSS (hrs/day)	7.6	6.1	5.2	5.3	3.9	4.2	4.3	3.7	3.6	4.4	4.4	4.1	5.8	6.9	7.2	7.6	8.1	8.3	8.6	8.5
Evap(mm/wk)	78.3	65.2	51.9	47.8	38.9	36.7	35.7	33.2	30.4	31.8	30.8	29.7	33.2	36.3	37.1	35.1	39.1	37.1	38.4	37.1

Phenology

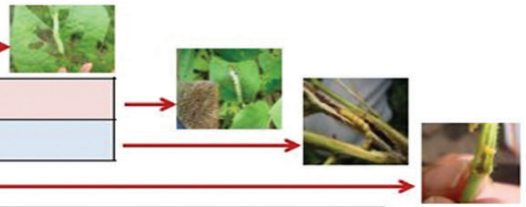
SOWING/EMERGENCE	VEGETATIVE	FLOWERING	POD FORMATION	SEED DEVELOPMENT	PHYSIOL. MATURITY
7	31-32	11-12	12-13	28-29	6-7

Favourable weather for better yield

T Max (°C)	27-35	24-35	25-32	25-32	26-32	30-36
T Min (°C)	22-26	22-26	22-25	22-24	21-24	20-23
RHm(%)	80-92	85-93	89-92	90-94	86-89	81-87
RHe (%)	63-77	67-71	64-78	64-76	52-58	36-45
Rain(mm)	50-80	150-200	40-50	75-100	75-100	00-10
WS (km/hr)	5.1-8.7	4.6-8.6	5.1-8.7	3.3-4.0	3.4-4.0	1.1-1.8
BSS (hrs/day)	1.4-2.8	1.7-2.8	1.1-2.9	3.7-4.6	3.7-5.6	5.7-6.0
Evap(mm)	25-40	100-130	35-50	40-60	60-100	30-40

Favourable weather for insect pest

Semilooper	Tmax 29.2-32.1°C,Tmin 22.6-23.6°C RHm 83-93% and RHe 57-79 %
Leaf eating caterpillar	Tmax 30-34°C and Tmin 21.9-24°C
Girdle Beetle	Tmax 30-34°C,Tmin 22.5-24°C and RH 55-88 %
Stem Fly	Tmax 30-33.5°C,Tmin 23-24.5°C, BSH 3-5.5 hrs and RH 55-88 %



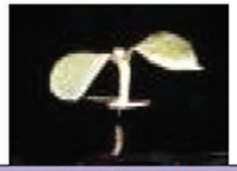
Crop weather calendar of Soybean– Jabalpur, Madhya Pradesh

Jabalpur has hot dry sub-humid ESR with medium and deep clayey black soils(shallow loamy black soils as inclusion), high AWHC and LGP ranges from 150-180 days.

Crop– SOYBEAN Duration: SHORT Location: JABALPUR

	June		July				August					September				October	
SMW	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Tmx (°C)	36	33.1	31.5	30.4	30.1	30.3	29.7	28.4	28.7	29	29.1	29.8	30.1	30.9	31.3	31.5	31.5
Tmn (°C)	26	25.2	24.7	24.4	24.5	24.3	24.3	23.9	23.9	23.9	23.7	23.6	23.6	23.3	22.9	21.5	20.1
RHm (%)	72	81	85	88	87	88	89	91	91	90	90	89	87	87	87	86	86
RHe (%)	51	62	69	74	72	76	75	80	79	79	78	74	67	63	61	54	47
WS (kmph)	8.7	8.3	8.3	7.6	7.5	7.2	7.2	8.2	7	6.8	6.4	6.4	5.6	3.9	3.4	3.2	2.9
SSH (hrs)	6.2	4.6	3.8	3.6	3.2	3.5	3.8	2.7	2.9	3.8	4.5	5	6	7.4	7.8	8.1	8.9
RF (mm)	45.1	85.4	77.8	84.5	65.7	80.2	91.5	103.3	118.4	86.8	50.4	69.6	47.9	18.8	25.8	17.9	10.9
RD (days)	2	4	5	4	4	5	4	4	4	4	4	3	2	2	2	1	1

Phenology and favorable weather parameters for better yield





PARAMETERS	Sowing to emergence 4-6 days	Branching/Vegetative 7-41 days	Flowering 41-46 days	Pod & seed development 74-84 days	Phy mat. 90-96 days
Tmax (°C)	31-33	28-32	26-33	26-34	24-35
Tmin (°C)	24-26	22-26	22-25	22-25	20-24
RHm (%)	75-85	78-96	82-96	80-96	75-96
Rhe (%)	59-70	57-96	55-92	54-95	40-95
WS (kmph)	4-9	2-10	3-10	2-9	1-10
SSH (hrs)	1-6	0-6	0-8	0-8	0-9
RF (mm)	44	118	82	60	18
RD (days)	4	13	14	6	2

Major insect-pest and favorable weather conditions

Tobacco cat erpillar	(31st- 41st SMW. Tmax: 30.1°C, Tmin.: 22.2 °C, RH:90 %, SSH: 9.6 hrs)
Green Semilooper	29th – 39th SMW. Tmax:32°C, Tmin.: 28.2°C, RH: 91 %, SSH :6.2 hrs)

Crop weather calendar of Mustard– Hisar, Haryana

Hisar comes under hot typic-arid ESR with deep loamy desert soils and low AWHC and LGP ranges from 60-90 days.

State-Haryana — **Station-Hisar (Long: 75°43'6"E, Lat:29°9'11"N Alt: 215.2 m)** — **Season-Rabi**

Month	October		November					December				January				February				March				
SMW	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10	11	12	13
T_{Mx}(°C)	33.1	32.1	31.3	30.1	28.6	27.1	25.5	24.5	22.9	21.4	19.8	19.0	19.1	19.3	20.2	20.9	21.8	22.9	23.8	25.0	27.1	28.4	30.1	31.7
T_{Mn}(°C)	15.7	13.9	12.5	11.4	10.2	8.6	6.9	6.2	5.7	5.3	4.5	4.4	4.3	4.8	5.1	5.3	5.7	7.5	7.8	8.6	9.9	11.3	12.5	13.7
RH_m(%)	81	81	82	83	85	86	87	88	91	91	93	92	92	92	91	91	90	89	88	88	86	85	83	79
RH_e (%)	32	30	30	33	35	35	36	36	42	47	52	52	51	51	48	47	46	47	46	44	40	40	35	33
WS (kmph)	3.6	3.1	2.8	2.8	2.6	2.8	2.7	2.7	3.1	3.1	3.2	3.5	3.4	3.8	4.2	4.0	4.8	4.7	5.1	4.9	5.3	5.2	5.2	5.2
BSS (hrs)	8.7	8.5	8.2	8.0	7.8	7.8	7.7	7.7	6.9	6.3	5.9	5.8	6.2	6.2	7.0	7.2	7.5	7.4	7.9	8.0	8.0	8.2	8.4	8.7
EVP (mm/wk)	32.8	29.4	26.2	23.6	21.2	19.9	17.6	16.4	14.0	12.2	12.3	11.0	11.0	12.8	14.1	15.0	17.5	18.9	22.0	25.2	28.0	29.8	34.9	39.1
RAINFALL (mm/wk)	3.6	0.9	1.7	0.3	0.1	0.2	1.4	0.6	1.1	1.0	2.4	2.1	2.8	3.7	2.5	2.0	4.9	4.2	5.8	2.9	3.8	4.1	2.5	2.1

Phenological stages

Indian mustard
Raya
Brassica juncea L.


Sowing & seedling establishment (15-21 days)


Vegetative (25-30 days)


Flowering (15-20 days)


Pod development (25-30 days)


Maturity (15-30 days)

FAVOURABLE WEATHER CONDITIONS FOR BETTER YIELD

T_{Mx} (°C)	Mean optimum 15-20 Soil temp. > 10	15-25	15-20	18-28	20-30
T_{Mn} (°C)		7-10	5-10	8-12	12-15
RH_m(%)	>60	>65	>65	>90	-
RH_e (%)	>35	>30	>35	>40	-
WS (kmph)	-	-	3-7	3-6	3-6
BSS (hrs)	Clear days	Clear days	>8 hrs	>9 hrs	Clear days
RAINFALL (mm)	-	10-20	20-30	20-25	-

CONGENIAL WEATHER CONDITIONS FOR INCIDENCE OF PESTS & DISEASES

PESTS & DISEASES				
	 Mainly dry weather T_{mean} 27-29 °C RH_{mean} >75 %	 Cloudy weather T_{mean} 10-20 °C RH > 82%	 T_{mx} 18-27 °C, T_{mn} 8-12 °C, T_{mean}>10 °C, Monthly RH > 92% (RH_e 40% & RH_{mean} 70%)	 T_{mx}>26 °C, T_{mn} 8-16 °C, RH_{mean} 38-87%
Growth phase/period of occurrence	White fly (Seedling establishment)	Aphid [Flowering & pod development (Jan-Feb)]	Alternaria Blight, Downy mildew and White rust (Reproductive & seed development)	Painted bug (Seedling establisment & maturity)

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 | Emergence (4) | Vegetative (28) | Flowering (15) | Siliqua formation (14) | Seed development (26) | Maturity /Harvest (10)

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

Aphid — Tmax 22–25°C and RH > 92%

Sawfly — Tmin 16.3°C, Tmax 32.1°C, RH > 60%

Bihar hairy caterpillar — Tmin 17.3°C, Tmax 26°C and RH 60-85%

Alternaria leaf spot — Tmin 10°C,Tmax 18-25°C and RH > 80%

Downy mildew — Tmin 10°C,Tmax 20°C and RH > 90%

Powdery mildew — Tmin 15°C, Tmax 28°C and RH < 60%

Crop weather calendar of Maize – Jammu

It comes under warm moist to dry sub-humid transitional ESR with medium to deep loam to clayey brown forest and podzolic soils medium AWC and LGP ranges from 150-210 days.

Crop: Irrigated Maize Duration: 90-95 days State: Jammu & Kashmir District: Jammu

	MONTHS	JUNE	JULY					AUGUST				SEPTEMBER			OCTOBER		
	Std. Week	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
	T max. (°C)	36.2	36.4	35.0	34.3	33.4	33.2	33.5	33.5	33.3	33.5	32.9	32.9	33.4	33.6	33.5	32.3
	T min (°C)	22.0	22.0	21.7	21.9	21.9	21.6	21.8	21.8	21.4	21.0	19.2	22.3	23.8	23.4	19.2	15.2
	RHm (%)	76	80	82	86	87	88	90	88	87	89	86	85	86	87	86	80
	RHe (%)	54	57	62	65	70	70	71	69	67	67	66	68	59	56	55	54
	BSS (hr/day)	4	4	5	4	4	4	4	4	4	4.0	4	5	5	5	4	4
	Rain (mm/w)	37	63	66	89	61	108	74	66	86	41.7	12	23	7	5	-	-
																	
Phenophase wise weather for better yield	Phenophase	Emergence				Vegetative growth				Tasseling			Silking		Physiol. Maturity		
	Duration	(7-21)				(22-46)				47-51			(52-54)		(80-85)		
	Tmax. (°C)	37- 39				32-33				31-33			34-33		34-33		
	Tmin. (°C)	22- 23				24-25				24-25			24- 24		24- 24		
	RHm (%)	52-74				88-89				87-89			81-87		81-87		
	RHe (%)	22-55				65-69				66-72			66-72		62-63		
	BSS (hr/day)																
	Rain (mm/w)																
Congenial weather	Stem borer	Temp. 18-35 °C, RH- 90%															
	Leaf spot	Temp. 22-325 °C, RH- 90%								Tmax. 27-32 °C, RH-70%							

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**

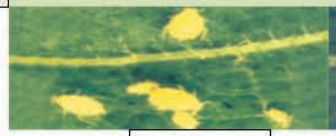
Clim	MONTH	JUNE				JULY				AUG					SEPT				OCT				NOV				Dec	
	Std. week / Parameter	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
	Rain (mm)	4	7	6	6	5	6	6	11	7	9	7	8	8	8	5	6	5	6	3	2	2	1	1	1	1	1	0
	Tmax(^{0}C)	37	36	33	32	31	30	31	31	31	30	31	31	31	31	31	32	32	32	33	32	32	32	31	31	30	31	31
	Tmin (^{0}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

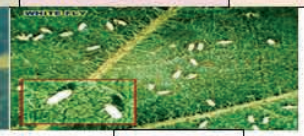





Phenophases	Emergence	Square formation	Flowering	Boll setting	Boll bursting
Duration (Days)	4-7	29-38	20-25	42-72	73-140
Tmax(^{0}C)	29.8-36.0	28-32.8	29.4-32.5	27.6-31.9	30.2-38.8
Tmin (^{0}C)	20.4-23.3	20.1-23.6	20.2-23.4	19.6-22.7	7.6-17.1
RHm (%)	69-84	71-92	72-89	77-89	58-81
RHe (%)	40-66	61-77	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^{0}C, RH > 61
Jasids	
Whitefly	





Aphids Jassids Whitefly

Crop weather calendar of Chickpea– Faizabad

Faizabad is located in eastern Uttar Pradesh and comes under hot dry sub-humid ESR with deep loamy alluvium-derived soils. AWHC is medium to high and LGP ranges from 150 -180 days.

Crop – Chickpea **Duration - long(145-155days)** **State - U.P** **District-Faizabad**

Climatic normals																												
Months	October				November				December				January				February				March				April	
Std Week	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Tmax (°C)	34	33	33	32	32	31	30	30	30	29	28	28	27	28	29	29	30	31	31	32	34	35	36	38	38	39
Tmin (°C)	20	18	16	16	15	15	13	12	11	11	10	10	10	11	12	11	11	12	14	14	15	17	17	19	20	21
RHm(%)	81	80	76	76	75	78	76	74	74	76	74	76	76	76	73	69	67	64	61	59	57	54	53	46	44	43
RHe (%)	43	41	37	35	36	37	34	33	32	34	33	35	37	37	33	29	29	27	27	25	24	24	23	19	19	17
WS (kmph)	3.3	3.4	2.9	3.1	3.0	3.1	2.8	2.8	3.0	2.9	3.0	3.1	3.8	3.7	4.0	3.7	3.8	4.4	4.7	4.8	5.3	5.2	5.5	5.7	6.4	6.3
BSS (hr/day)	7.6	7.4	7.8	7.7	7.7	7.5	7.8	7.9	7.5	7.4	7.6	7.3	7.1	7.0	7.6	8.1	8.0	8.2	8.0	8.6	8.6	8.7	8.5	8.7	8.7	9.0
Rain (mm)	13	6	2	3	7	5	4	1	2	0	3	5	4	2	0	1	4	2	3	5	6	3	1	2	1	1
Evp (mm)	34	32	33	32	31	28	27	27	26	26	25	28	25	26	29	32	33	37	41	45	51	53	55	64	68	70






Phenophasewise weather for better yield	Sowing - Emer	Vegetative Phase	Flowering	Pod Formation	Pod Maturity
Duration (day)	(6-7)	(92-96)	16-18)	(17-19)	(22-25)
Tmax (°C)	28-34	24-32	30-35	32-38	30-41
Tmin (oC)	17-20	10-18	17-18	14-20	17-25
RHm(%)		51-91	80-85	79-90	63-74
Rhe(%)		14-59	48-58	45-58	36-42
WS(kmph)		1-7	2-6	2-6	2-10
BSS(hr/day)		5-9	8-9	5-9	7-9
Rain(mm)		35-40	0-5	50-60	0-5
Evp(mm)		190-200	40-57	47-61	90-110

Congenial weather for pest/ disease incidence

Cutworm

Temp 25-30 °C

Pod borer

Tmax 21-38°C & Tmin18-20°C

3. Conclusion

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.The All India Coordinated Research Projecton Agrometeorology has developed 26 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.

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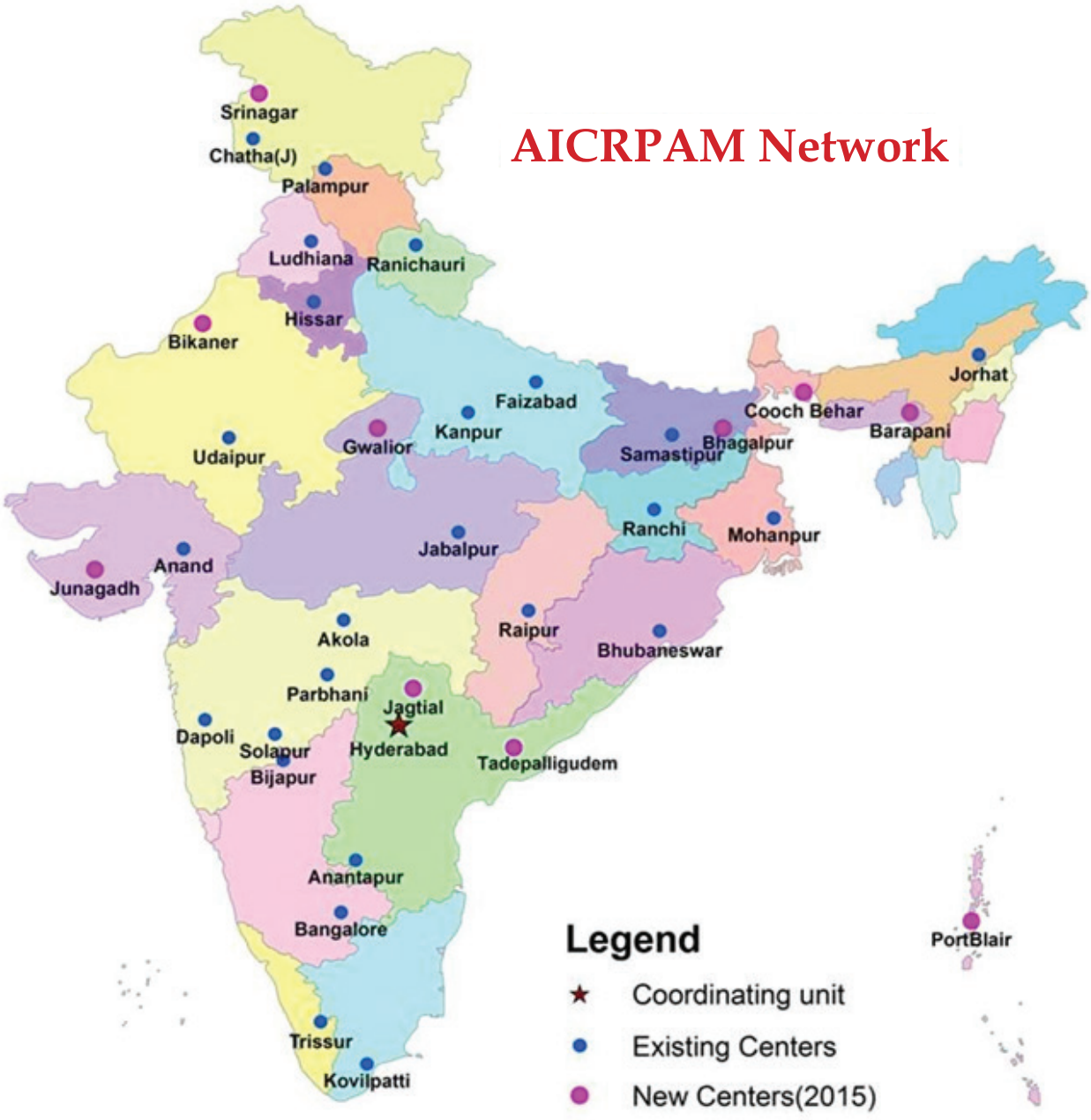
Capacity enhancement program conducted for scientist of cooperating centers during 3-12 Feb, 2015 at CRIDA, Hyderabad

Capacity enhancement program conducted for scientist of cooperating centers during 28 July-6 Aug, 2015 at CRIDA, Hyderabad

AICRPAM Network



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