

## 4: CLIMATIC REQUIREMENT

Wheat is mainly grown during Rabi season and has wide adaptability. It can be grown not only in the tropical and sub-tropical zones, but also in the temperate zone and the cold tracts of the far north, beyond even the 60° North altitude. Wheat can tolerate severe cold and snow and resume growth with the setting in warm weather in spring. It can be cultivated from sea level to an altitude of 3300 meters.

The most favourable climatic condition for wheat cultivation is cool and moist weather during the vegetative growth period followed by dry, warm weather for the grain to mature and ripening. The optimum temperature range for ideal germination of wheat seed is 20-25 °C. Warm and damp climatic conditions are not suited for wheat growing.

During the heading and flowering stages, excessively high or low temperatures and drought are harmful to wheat. Cloudy weather, with high humidity and low temperatures is conducive for rust attack. Wheat plant requires about 25-30 °C optimum average temperature at the time of ripening. The temperature at the time of grain filling and development are very crucial for yield. Temperatures above 25 °C during this period tend to depress grain weight. The congenial temperature for various growth stages of wheat crop is as under:

**Table- 4.1: Temperature requirements at different Growth stages**

Growth stages	Temperature requirements
Germination	20 to 25°C mean daily
Accelerated growth	20 to 23°C mean daily
Proper grain filling	23 to 25°C mean daily

### 4.1: Effect of temperature on Wheat Yield:

Temperature requirement may slightly differ from one variety to another at the time of germination. The critical minimum temperature for wheat crop is from 3.5 to 5.5 °C, optimum 20-25 °C and the maximum is around 35 °C. If temperature is more than 30 °C at the time of maturity, it leads to forced maturity and yield loss. An UN report (Anon, 2011) stated that the earth will be warmer by 2.4 °C by the year 2020 and the crop yield in India may fall by upto 30% by then.

Instances in India are there indicating that the terminal heat creates a significant yield reduction in wheat. Therefore, maintaining the optimum sowing time and growing ideal cultivars may manage the problem to some extent. Conventional breeding processes generally aimed at diseases resistance, quality improvement and ultimately yield enhancement. In view of the climate change impact particularly that of temperature rise, these breeding programmes need to be focused to develop heat tolerant varieties. Low temperature during the initial stage and high temperature at later maturity stage lead to the completion of major part of wheat growth cycle.

In the North western India, it has been observed that considering every grain weighs 40 mg, every degree C rise in mean temperature during the terminal reproductive phase beyond 17°C causes a loss of yield to the tune of 2.5q/ha\*. This is due to the fact that the crucial advanced reproductive phase is affected by rising temperature results in poor grain filling, shorter earhead, lesser 1000 grain weight and ultimately lower production.

#### 4.2: Recommendation for cultivation of Wheat in view of climatic change:

Due to climate change, there is an overall reduction in crop yield and the various crop production stages right from sowing to harvesting and threshing are badly affected. It ultimately causes decline in water resources and soil organic matter. Some preventive measures given as below for minimize the loss by climatic change.

- Modification in Agronomy of crop- Manipulation of sowing dates/optimisation to minimise the effect of temperature/soil moisture on germination, panicle initiation, panicle sterility etc.
- Diversification of farming- shifting from sole cropping of wheat to diversified system i.e. sowing of wheat mixed with gram, mustard, pea etc. or intercropping with mustard, gram etc.
- Use of zero seed-cum-fertilizer drill – this is energy –cum-resource conservation technology.
- Inclusion of green manures crop in the cropping system to build up the nutrient status of the soil resulting its soil health sustainability.
- Inclusion of high yielding rainfed/heat tolerant wheat varieties in the cropping system to tackle the related problem.
- Use of mechanization in farming- This will help in timely execution of agricultural operations and will save from the vagaries of climate.
- Use of light irrigations in the event of terminal temperature rise.
- Judicious use of water, adoption of Integrated Nutrient Management (INM), Integrated Pest Management (IPM) and Conservation Agriculture practices.
- Use of System of Wheat Intensification (SWI) technique has been emerging as a technique to ensure quick germination as well as in economizing the use of water. The technique needs to be authenticated by research findings yet.
- Use of hydrogel- an indigeneous semisynthetic superabsorbent polymer developed by Indian Agricultural research Institute, New Delhi recommended for reducing moisture stress resulting in reduced irrigation and fertigation requirement of crops.

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*\*(Ref. Heat wave of March, 2004- Impact on Agriculture, Samra and Gurbachan Singh, 2004 pub by ICAR)*