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Mini Review

# Role of Weather Parameters on Quality Seed Production

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## Abstract

Weather and climate are important factors deciding the growth of any crop. Meteorologists and seed technologist view the weather as a dominant element influencing yield and acreage behaviour of crops. The meteorological inputs, unlike other inputs such as land, labour, high-yielding variety (HYV) seeds, fertilizers, pesticides, etc. is a direct input in seed production. The functional relationship between weather and yield is as much complicated as the term 'weather' itself. Occurrence of abnormal weather episodes during the growing season or during critical development stages may hamper growth processes resulting in yield reduction. Optimum temperature is the balanced heat requirement for the crop since lower or higher temperature results in abnormal effect of the crop growth. When the temperature goes below the minimum or the base level it is said that the physiology will be reduced or even nil. Similarly, when the temperature goes above the maximum the metabolic activity is enormous leading to the scorching or burning effect. The range of wavelength is a part of electromagnetic spectrum of the radiant energy which includes short wave, x-rays and g rays, long radio waves. The electromagnetic spectrum comprises of U-V, visible, IR wavelength which together transmits 90% of energy. Precipitation in any forms say rainfall, snow, fog, mist, dew, etc is important for the crop growth in relation to the seed production. Because the requirement of water for a plant growth is fulfilled naturally by precipitation. However, the effect is more contemplated in tropical countries like India. Amount of water vapour present in the atmosphere at a given time to the same atmosphere under saturation is termed as relative humidity. The VPD namely Vapour Pressure Deficit which is the difference between the pressure exerted by an atmosphere at a given condition to the same at atmosphere at hundred per cent saturation. That means the VPD is the prime cause for the transpiration of the crop plants. Seed production in efficient manner is a challenge in today's context in correlation to weather parameters. The sowing window is to be adjusted accordingly so that all the growth phases coincides with favourable weather conditions and the crop is having an opportunity to produce quality seeds. The farm shall have wind breaks and shelter belts to enable suitable microclimate for crop production. Weather cannot be changed but managed by knowing before its occurrence termed as weather forecasting.

## Introduction

Weather is presumed to be the physical condition of the atmosphere at a given time for a small area; while climate is the average of weather conditions prevailing over comparatively larger area, for a longer period. Meteorological parameters are critical factors influencing the production of crops in any region. It is viewed by meteorologists and seed technologist as a dominant element influencing yield and acreage behaviour of crops. The meteorological inputs, unlike other inputs such as land, labour, high-yielding variety (HYV) seeds, fertilizers, pesticides, etc. is a direct input in seed production. The functional relationship between weather and yield is as much complicated as the term 'weather' itself. Occurrence of abnormal weather episodes during the growing season or during critical development stages may hamper growth processes resulting in yield reduction. This climate variability makes a threat to seed production leading to serious social and economic implications. However, a clear understanding of the vulnerability of food crops as well as climate variability enable one to implement adaptive strategies to quality seed production.

The following weather related concepts has to be understood for quality seed production:

- Average Temperature: Maximum & Minimum
- Total Solar Radiation
- Total Rainfall: Temporal & Spatial variation
- Mean Relative Humidity and Vapour Pressure Deficit
- Mean Wind velocity & Direction
- Soil temperature dynamics
- Evaporation and Transpiration

## Average Temperature

Temperature is responsible for the metabolic activity of the crop plants. It is also interesting to note that maximum and minimum temperature has a specific role in the physiology and the quality of seed production. Optimum temperature is the balanced heat requirement for the crop since lower or higher temperature results in abnormal effect of the crop growth. When the temperature goes below the minimum or the base level it is said that the physiology will be reduced or even nil. Similarly, when the temperature goes above the maximum the metabolic activity is enormous leading to the scorching or burning effect. Hence the growth of the plant is decided by degree day i.e. the departure from the base temperature of a day. When this degree day is submated over the growth phases say like nursery or vegetative, then it is called as Growing Degree Day (GDD). The crop will complete its life cycle or the phase only when it attains the required GDD. Till then it is said to be under vegetative lag phase.

## Total Solar Radiation

The energy that strikes earth from sun is called insolation. It is transmitted in various wavelengths usually U-V, IR band and visible spectrum. The range of wavelength is a part of electromagnetic spectrum of the radiant energy which includes short wave, x-rays and g rays, long radio waves. The electromagnetic spectrum comprises of U-V, visible, IR wavelength which together transmits 90% of energy.



Shortwave radiation is more likely absorbed by plants leading to increased transpiration which in turn makes the plant absorb more. Such a situation is observed especially during Kharif season where abundant shortwave radiation impact is visualized. Long wave radiation is more common in the inclined solar radiation and especially during night re-radiation which has a little impact over the crop production. Thus, the role of green house and glass house play the role in deciding the making of availability of shortwave or long wave radiation to the crop. Green house reduces the shortwave radiation and permits the long wave re-radiation which is more useful for the tropical countries. Glass house permits shortwave radiation and prevents the long wave re-radiation back there by increases the inner atmospheric temperature and leads to more transpiration; hence glass house is more suitable for temperate countries to trap the solar radiation [1].

### Rainfall

Precipitation in any forms say rainfall, snow, fog, mist, dew, etc is important for the crop growth in relation to the seed production. Because the requirement of water for a plant growth is fulfilled naturally by precipitation. However the effect is more contemplated in tropical countries like India. Hence rain fall should be abundant and required at appropriate space and time which is the need of the hour. It is also a necessary criterion that excess rainfall leads to flood situation and may also have adverse effect bringing poor quality of seeds. Therefore, a crop needs optimum moisture through rain at a given time and space to produce better yield.

Total rainfall during vegetative phase always shows a significant positive correlation with grain yield, whereas during reproductive and maturity phases does not so.

### Relative humidity (Vapour Pressure Deficit)

Amount of water vapour present in the atmosphere at a given time to the same atmosphere under saturation is termed as relative humidity. Atmospheric pressure is defined as pressure exerted by a column of air with a cross sectional area of a given unit extending from the earth's surface to the upper-most boundary of the atmosphere. Here the pressure exerted by the atmosphere is to be noted which is called as the vapour pressure. The VPD namely Vapour Pressure Deficit which is the difference between the pressure exerted by an atmosphere at a given condition to the same at atmosphere at hundred per cent saturation. That means the VPD is the prime cause for the transpiration of the crop plants. The transpiration though being controlled by other parameters also, here VPD has a greater role in making the physiology of the plant to undertake the metabolic activity. The closure and opening of the stomata is controlled by VPD. The intake of nutrients from in the soil along with the moisture is decided by the rate of transpiration. This has to be taken into consideration while dealing about the crop growth and quality seed production.

Therefore, in seed production it is important to ensure that favourable humidity percentage is present at times of crop requirement.

### Wind velocity

Wind is the horizontal movement of atmosphere while vertical movement of atmosphere is called air currents [2]. Wind is an invisible weather element which can be felt or scan by the movement of tree branches, dust, etc. Wind pattern is affected by various factors. Wind velocity is as important as that of direction. The speed at which the wind is

approaching both wet and cool wind as well dry and hot wind decide the physiology of the crop plants. The major transpiration and photosynthesis is indirectly handled by this wind velocity and direction. Any wind velocity above 13 kmph is supposed to affect the crop yield in various ways. Hence studies are in need to document and decide the mode of management of these wind problems during south west monsoon period.

### Soil temperature dynamics

Direct solar radiation heats up the soil and results in air movement. The heat energy gained during day time is released during night time. The input of energy equals the stored energy under outflow daily. This causes temperature change below the soil surface. The condition of heat below the soil surface depends on the thermal properties of soil, i.e., specific heat, thermal conductivity and thermal diffusivity. The heat energy received is conducted to sub soil layer by soil mineral matter during day time. The heated subsoil during day time loses its temperature soil surface by convection during night hours and escapes to atmosphere in the form of long wave radiation by re-radiation or extra-terrestrial radiation. Dewfall is the resultant of the effect of re-radiation during night time.

Soil temperature is the most important factor in deciding the germinability of the seeds. Though quality seeds are sown but the germination is controlled by soil temperature due to which the rate of seed is supposed to vary with the soil environment.

### Transpiration

Transpiration is important for the physiology of the crop production. The crop has its best production efficiency only when it is undergoing proper transpiration loss, of course it is a necessary evil. However, the rate of transpiration and evaporation with the stages of the crop growth.

### Conclusion

Seed production in efficient manner is a challenge in today's context in correlation to weather parameters. The sowing window is to be adjusted accordingly so that all the growth phases coincides with favourable weather conditions and the crop is having an opportunity to produce quality seeds. The farm shall have wind breaks and shelter belts to enable suitable microclimate for crop production. Weather cannot be changed but managed by knowing before its occurrence termed as weather forecasting. The role of weather forecasting done on biweekly basis by Gramin Krishi Mausam Sewa (GKMS) supported by India Meteorological Department (IMD), Chennai & New Delhi and operated over one hundred and thirty-five centres in India is to be utilized and exploited to identify the optimum sowing window and other field operations. Therefore, this training will help to spark a thinking in the mind of the seed producers, field workers and Scientist to manage the weather for quality seed production.

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