agMOOCs

Basic aspects of Relative humidity, Cloud cover and their application in crop production

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Welcome to this class on relative humidity and cloud cover. In the last class we had discussion on atmospheric temperature, how it is being measured and how it is useful to crop production. At this the today's class we will discuss something about on relative humidity and the cloud cover.

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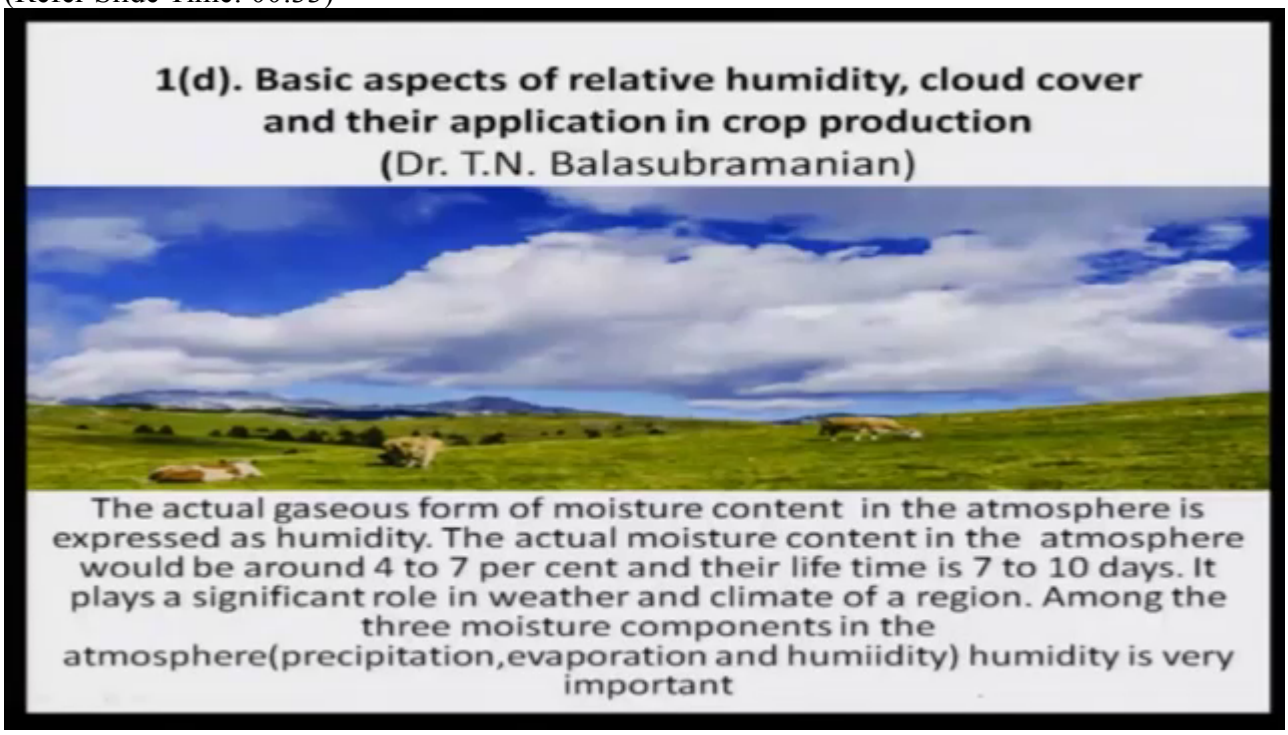

The humidity does indicate that the presence of water as a vapour in the air. This is very, very important. Presence of water vapour we have discussed already in the first class that water vapour and the aerosols are present in the atmosphere. In the absence of the atmospheric water vapour the rainfall does not occur. So this is very, very important. The water proper comes from your ocean as well as land surveys, as well as the plant body as your operation and being circulated in the atmosphere as water vapour.

Now for example here whenever a water molecule comes as a vapour from either ocean or plant or land it stays in the atmosphere for seven to ten days and beyond that it does not stay in the atmosphere. It may goes as rainfall or something else; some recycling is there. And it is around 7% in the – 4% to 7% in the atmosphere, the vapour water content of the atmosphere. So in this way a relative humidity or I can say humidity is very very important.

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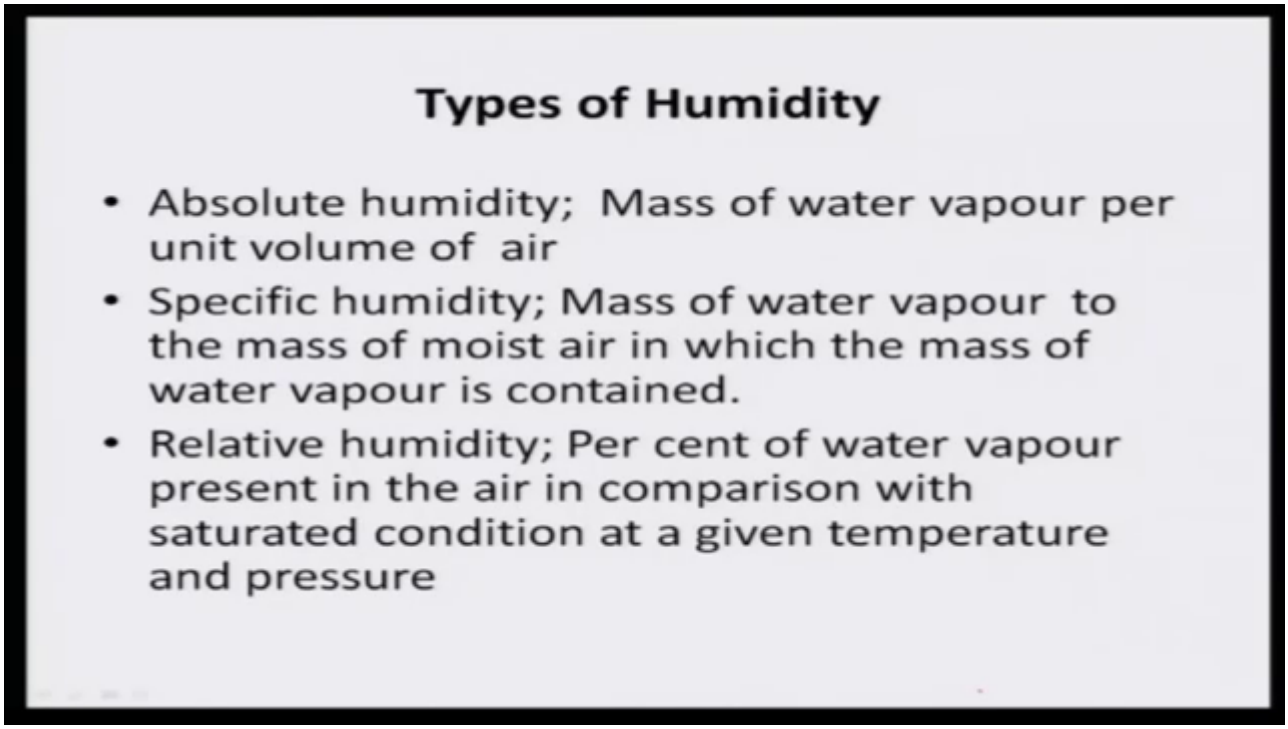

So humidity can be defined as the amount of water vapour present in the air. So it can be defined in three ways; one is your Absolute humidity, another one is Specific humidity and the third one is Relative humidity. In the case of the Absolute humidity this is nothing but mass of water vapour per unit volume of the air. What is the quantity of air within this what is a quantity of water vapour then it can be called as Absolute humidity.

Specific you want to specify the humidity then it called as Specific humidity. Here mass of water vapour to the mass of moist air in which in the mass of water vapour is contained. This is also very very important one. The third one is a relative humidity. This is being used normally across the different countries by meteorologists. And the Relative humidity indicates the percent of water vapour present in the air in comparison with saturated condition. There is a relative statement. This is a relative statement at a given temperature and pressure. At a given temperature and pressure this is very very important. In agriculture and other biological system we use a Relative humidity. Suppose for example, cattle, your thermal humidity index there also we take a Relative humidity as a component for computation of all those process.

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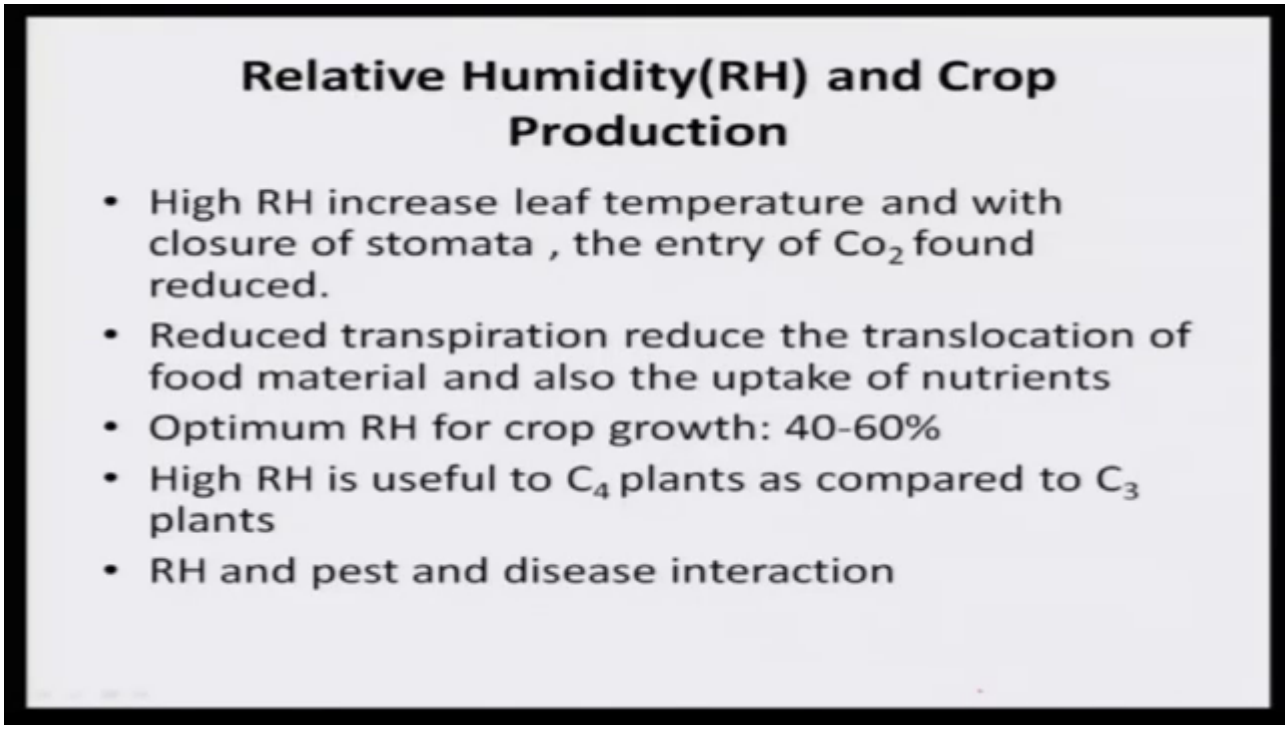

Now Relative humidity, how it is important to crop production? So there is scale, Relative humidity varies from zero to 100%, zero does not occur normally. So it occurs from 20 to 100% Relative humidity based on the geographical position of the place. For example, the coastal station is there, normal RH would be always 100% because water vapour is always fluctuated or increase, enhance (inaudible 00:03:43) with your sea water positions. So here when high RH increase, when the RH is 90% what will happen to the plant, leaf temperature get increased and this stomata will get closed and the entry of carbon dioxide found reduced. When carbon dioxide is inhibited there is no photosynthesis. Then further, in the absence of these reduced as closed stomata there is no transpiration then automatically in the pumping mechanism translocation of food material also on the uptake of nutrients get reduced. So this is the case of RH of higher of scale of 90% and other things.

What would be Optimum? Like we have discussed about cardinal temperature, the optimum temperature record for the germination of the seeds, so like that in the optimum Relative humidity for crop growth is it falls between 40% and 60%, but we cannot eliminate the high AH also. High RH is useful to C4 plants lies your like your maize, sorghum and the sugarcane as compared to C3 plants like your rice, C3 plant example we can rise C4 plants. So C4 plants, the photosynthetic pathway also something different between these two, hence in the high RH is highly useful to C4 plants and a good amount of interaction between the relative humidity and disease there is always a thumb rule between the prevalence of RH and disease, spore initiation and the multiplication and growth also, in that way pests and disease crop production everywhere RH plays vital role in crop grain production.
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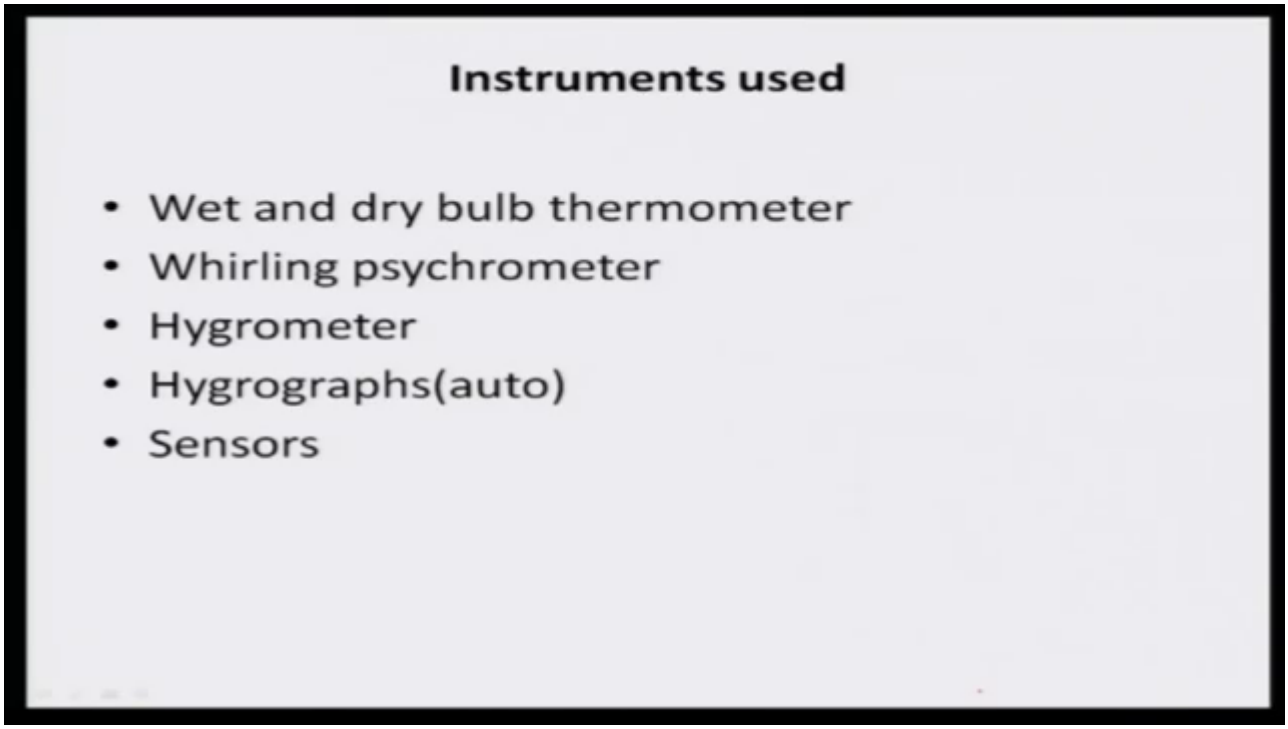

Then what are the instruments are being used to measure the relative humidity? See, I told already that relative humidity is very very important being used commonly in agriculture and all biosciences, so one is a wet and dry bulb thermometer. So this is being operated manually, wet bulb is there, the bulb is being moist, getting moist, moist to be there, your cotton threads through water supply this is a sensitive instrument. And dry bulb is normal thermometer is being. So the difference between normal and wet bulb thermometer gives the Relative humidity. So when you put to moist your bulb means, there is a difference between temperature because of the air saturation. So with these reading we can able to understand Relative humidity.

There is another instrument whirling psychrometer. If you rotate like a instrument it records the air Relative humidity and you can get the instant reading. Then another one is a hygrometer, small instrument being used in all laboratories as well as in farmer's field also. Australia and everywhere we can see hygrometer at the government place and everywhere people can understand the Relative humidity of a particular domain or a location. Then like a chart hygrograph is also there, auto. It gets moved through a drum. So a Relative humidity is being recorded across a day 24 hours in a timescale. This is also very important to find out or to record or to find out, compute weather forecast for certain area where the disease is epidemic rather than endemic. This is very very important. And there are also sensors being fitted in the automatic weather station which is being used to record relative humidity.

So next one is because of the relative humidity you get clouds, cloud is very very very very very important. In the absence of the clouds there is no rainfall. I was discussing about Bergeron ice crystal theory as well as you are coalition and royal ancestry where I was saying about the clouds, cold clouds and your warm clouds. So in that way clouds are very, very important.

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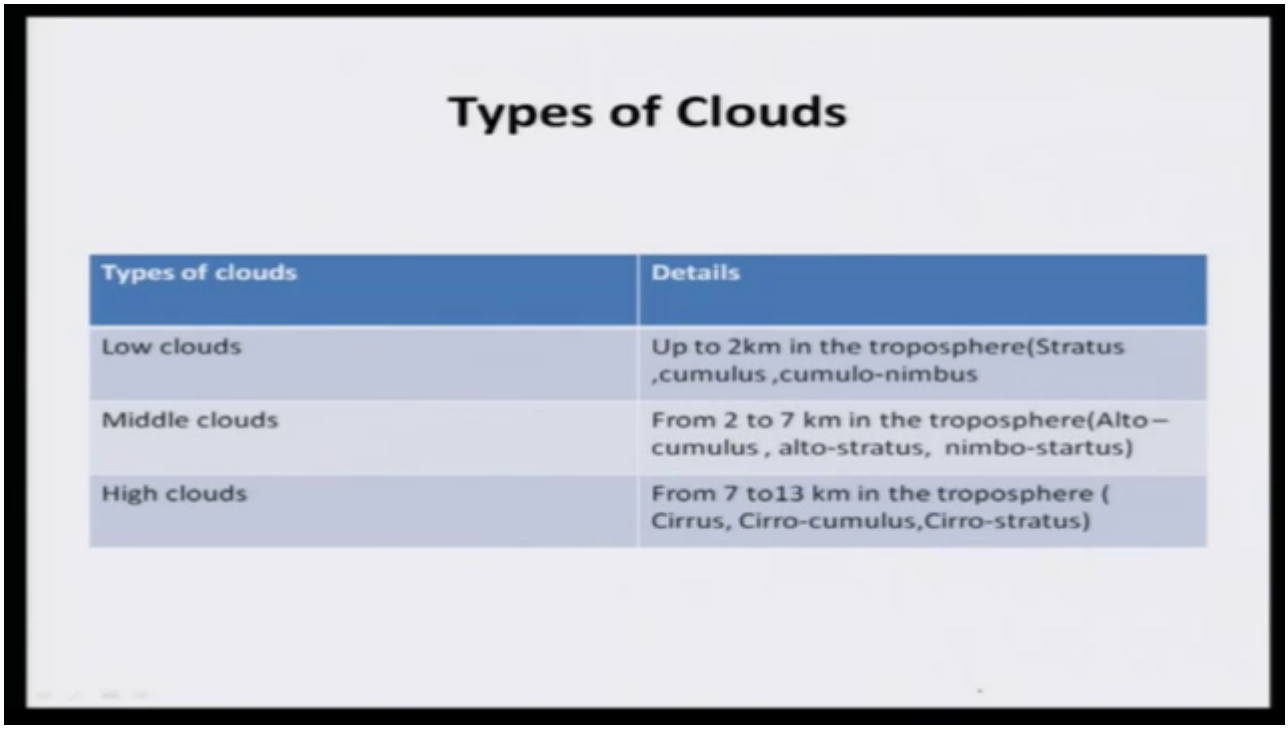

In general there are three types of clouds in the atmosphere, three types of clouds. One is your low air clouds, which is always here in the troposphere. This is up to two kilometre in the troposphere. Example, stratus, cumulus, a cumulo-nimbus. Cumulo-nimbus is a dangerous for low cloud. This is very, very, very vulnerable to all extents and all heavy rainfall also. Then middle clouds from 2 to 7 kilometre in the troposphere, examples are alto-cumulus, alto-stratus and nimbo-stratus, alto means middle.

Then high clouds, it stays from 7 to 13 kilometre in the troposphere, examples, cirrus, cirro-cumulus, and cirro-stratus. If you observe the clouds daily and you can say we observe this sky daily. You are the best skilful man to say this is the clouds or these are the clouds. Normally rain, we get rainfall from the low clouds that is your stratus, cumulus and cumulo-nimbus and rarely we get rainfall from the middle clouds and no rain could be anticipated from the high clouds. So clouds can be related to rainfall.

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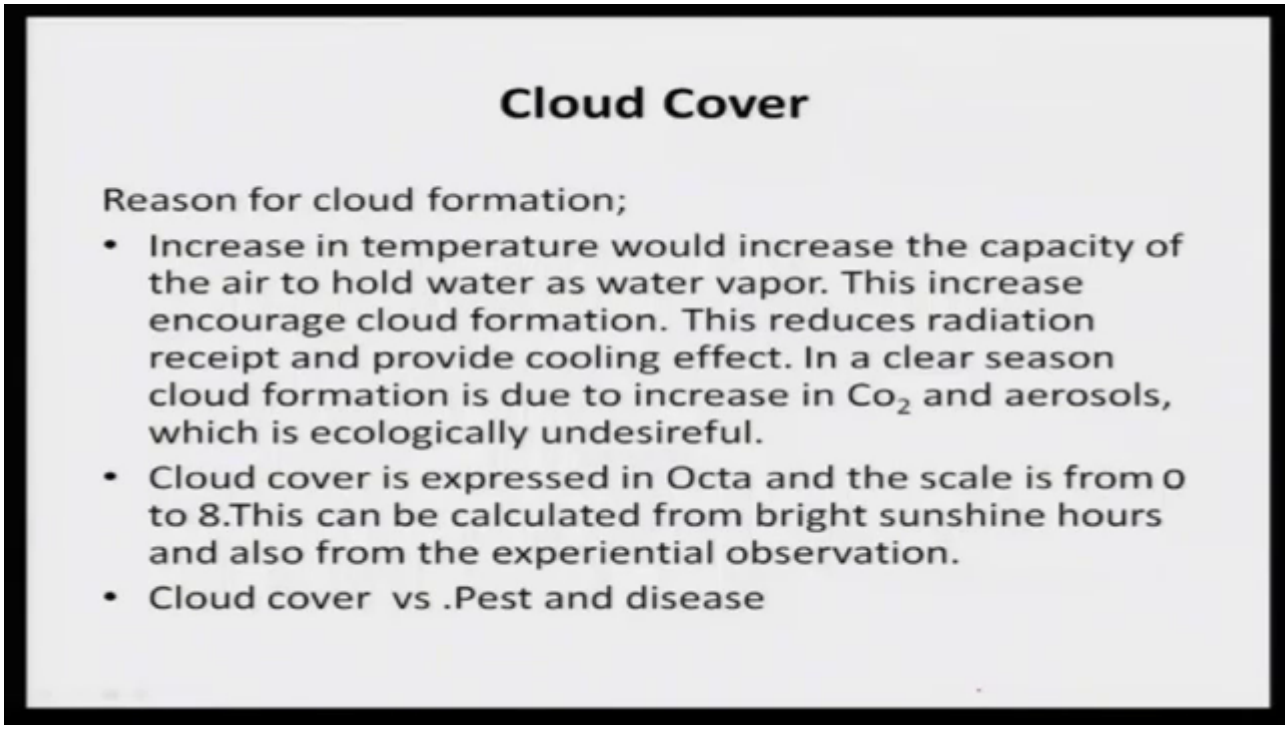

Next one is cloud cover. Cloud cover is a very very important. Reason for why cloud formation occurs in the absence of the clouds? There is no rainfall. For artificial rainfall making process cloud is must. So let me define clouds. See increase in temperature in the case of the convective process when we were discussing about the rainfall, convective rainfall, increase in temperature would increase the capacity of the air to hold water as water vapour, this encourage us cloud formation.

So this reduces radiation receipt and provide cooling effect also. So clouds are sometimes very important. Sometimes it is does not, it is not very very important, because the cloudy environment you get best multiplication of the best. In the cloudy environment there is no translocation of material in the plant system. There are limitations, there are positive and negative impacts from the clouds. But in a clear season the normal season. If you find clouds it is mainly due to increase in CO2 and aerosols which are not ecologically important. So there is always dangerous. So present days we feel that the carbon dioxide is getting increased and the aerosols also getting increase. According to last week paper the aerosols pollution is more than 429 milligrams per cubic meter of material air space. So this is not an encourageable statement. We could sue we see from the papper.

Then cloud cover is like temperature, temperature is measured degree centigrade, Fahrenheit, the rainfall is a millimetre, cloud also being estimated in Octa O-C-T-A. The scale is from one to eight. If this Octa is eight entire sky is cover with cloud. If the Octa is zero, it is a clear sky. So cloud cover as I indicated earlier indicated earlier it has got good relationship with the plant and nutrition as well as the pest and disease occurrence in crop plants. With this today we complete the class on the Relative humidity and cloud over. In the next class we could see something about it. Thank you very much.