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Profile of relative humidity in wheat (*Triticum aestivum* L.) crop

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Abstract
A field experiment was conducted at Research Farm, Dept of Agril Meteorology, CCS HAU, Hisar Haryana, India during the *R*abi season in the 2017-18. Experimental designed laid out with split plot, as main plot treatment: three growing environment *i.e.* D_1-1st week of November, D_2-3rd week of November and D_3-1st week of December with sub plot treatment viz., V_1: WH-1105, V_2: HD-3086, V_3; HD-2967 and V_4: WH-1080. Humidity in the atmosphere is of great biological importance. Measurements relative humidity was made at 2.30 hourly intervals throughout the observation day with the help of Psychrometric. The relative humidity profiles were lapse inside the crop canopy throughout the day but profiles were near iso-humic at 0930 hours in all treatments during both the crop seasons. Decrease in relative humidity with height from the ground.

Keywords: wheat, profile, relative humidity, iso-humic and phenology

Introduction
Wheat is the second most important cereal crop. It is the main food crop, in north and north-western part of the country. Wheat crop requires a cool growing season and a bright sunshine at the time of ripening. It requires 50 to 75 mm of annual rainfall evenly- distributed over the growing season. Wheat (*Triticum* aestivum L.) occupies the prime position among the food crops in the world. In India, and contributes to the total food grain production of the country to the extent of about 25%. Wheat has played a very vital role in stabilizing the food grain production in the country over the past few years. Relative humidity levels affect when and how plants open the stomata on the undersides of their leaves. Plants use stomata to transpire, or "breathe". When the weather is warm, a plant may close its stomata to reduce water losses. The stomata also act as a cooling mechanism. When ambient conditions are too warm for a plant and it closes its stomata for too long in an effort to conserve water, it has no way to move carbon dioxide and oxygen molecules, slowly causing the plant to suffocate on water vapor and its own transpired gases. Information on temperature and humidity within crop canopy helpful in effective way to investigate disease and pest management. High humidity results reduces evapotranspiration, increases heat load of plants, Stomatal closure, reduced CO2 uptake, reduced transpiration influences translocation of food materials and nutrients whereas low RH increases the evapotranspiration. Hoffman (1973) has shown that atmosphere humidity influence the internal water potential of plants and the rate at which plants transpire water into the atmosphere. Humidity conditions also affect the growths and developments of many phytopathogens, especially the fungal organism. Keeping in view of potential significance of these meteorological parameters in wheat growth, so, the present investigation was undertaken to study the relative humidity profile within wheat canopy during daytime hours.

2. Materials and Methods
Wheat is a Rabi crop, and wheat production in India is ranked second in the world after China. It is grown in the northwest quadrant of India where the soil is a mixture of clay and sand. Wheat doesn't need as much water as rice and can thrive in cooler temperatures. A field experiment was conducted at Research Farm, Dept of *Agril.* Meteorology, CCS HAU, Hisar (Lat.: 29°10' N, Log.: 75°36' E & 215.2 m above MSL), Haryana, India during the *Rabi* season (2017-18). Experimental designed laid out with split plot, as main plot treatment: three

growing environment *i.e.* D_1-1st week of November, D_2-3rd week of November and D_3-1st week of December with sub plot treatment viz., V_1:WH-1105, V_2: HD-3086, V_3; HD-2967 and V_4: WH-1080 with three replication. The climate of the region is arid to semi-arid, characterized by dry hot summer and cool winter. Humidity profile studies with the help of dry and wet bulb temperatures were measured with the help of Assmann Psychrometer at ground level, middle and top of the crop canopy at jointing, booting, anthesis, heading and physiological maturity stages from 0930 to 1700 hours. By using the corresponding values relative humidity profiles were drawn at different phenophases.

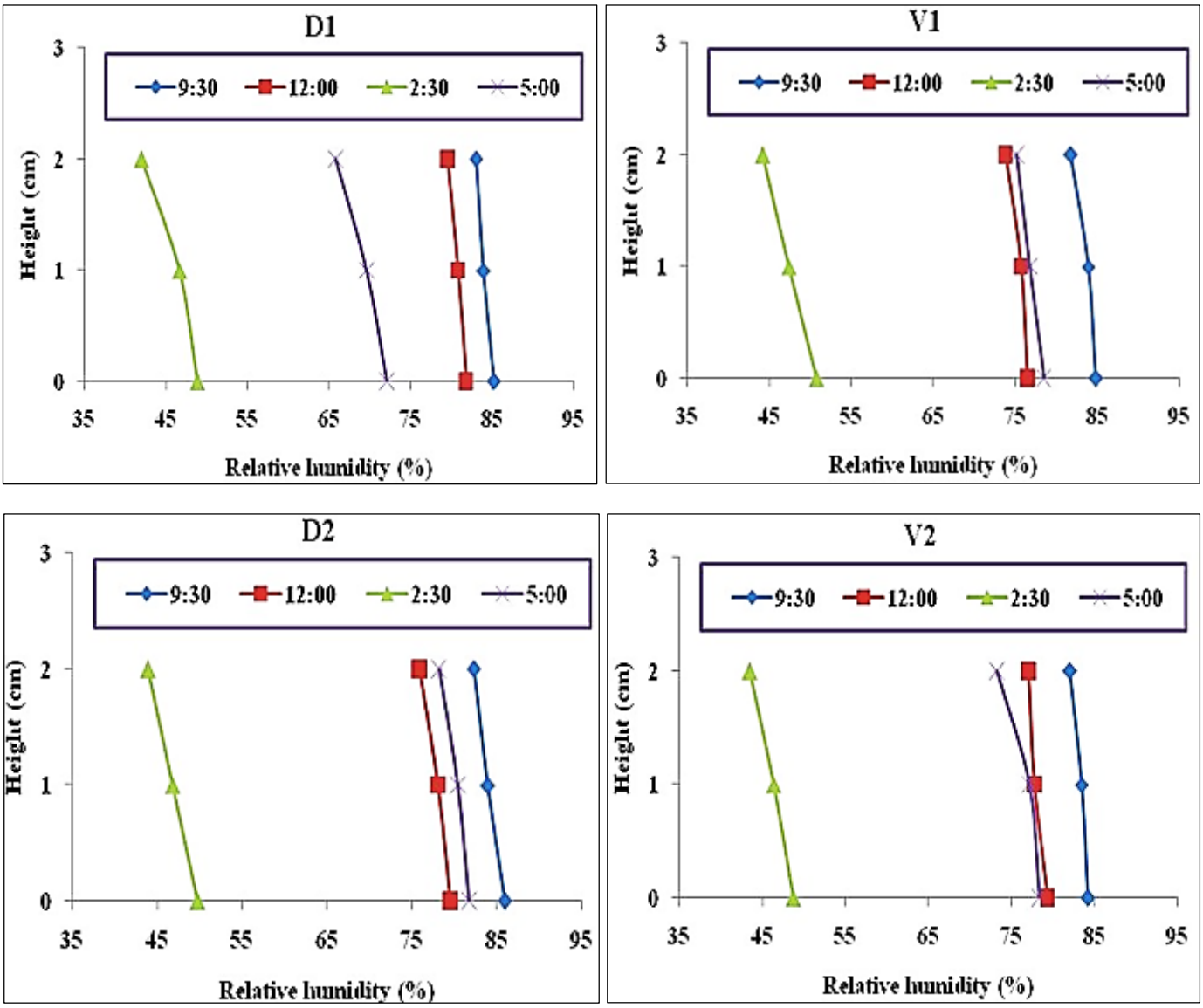
3. Results and Discussion

Relative humidity is the amount of water vapour in the air relative to the maximum amount of water vapour that the air can hold at a certain temperature. The humidity profiles shown in Fig 1 to 6 indicated that the relative humidity was higher inside the crop canopy than above the canopy in all the treatments *i.e.* the relative humidity profiles were lapse inside the crop canopy throughout the day but profiles were near iso-humic at 9:30 hours at different growth stages during crop seasons. The maximum relative humidity during the day was observed at 9:30 hours. The relative humidity was lowest at afternoon time. The relative humidity varied from bottom to top of canopy as well as phenophase to phenophase under different growing environments among the treatments. The maximum humidity at morning was 86.0% in D_2, 90.7% in D_1, 88.5% in D_1, 83.4% in D_3, 85.8% in D_2 and 75.6% in D_3 at jointing, booting, heading, anthesis milking and physiological maturity, respectively. The highest humidity was measured at booting during the crop seasons.

Among varieties, The maximum humidity at morning was 86.1% in V_4, 90.1% in V_4, 86.7% in V_3, 81.5% in V_3, 82.8% in V_2 and 72.4% in V_2 at jointing, booting, heading, anthesis and physiological maturity, respectively, during crop season 2017-18.

The humidity profiles was higher inside the crop canopy than above the canopy in all the treatments *i.e.* the relative humidity profiles were lapse inside the crop canopy throughout the day while profiles were near iso-humic at 9:30 hours at different growth stages during both crop seasons. The relative humidity decreased with height under all treatments at all phenophases. Similar results were reported by Roy and Tripathi (2006); Chhabra (2018) and Sattar *et al.*, (2003).

Whereas 0 is bottom of canopy, 1 is middle of canopy, 2 is top of canopy and 3 is above the canopy



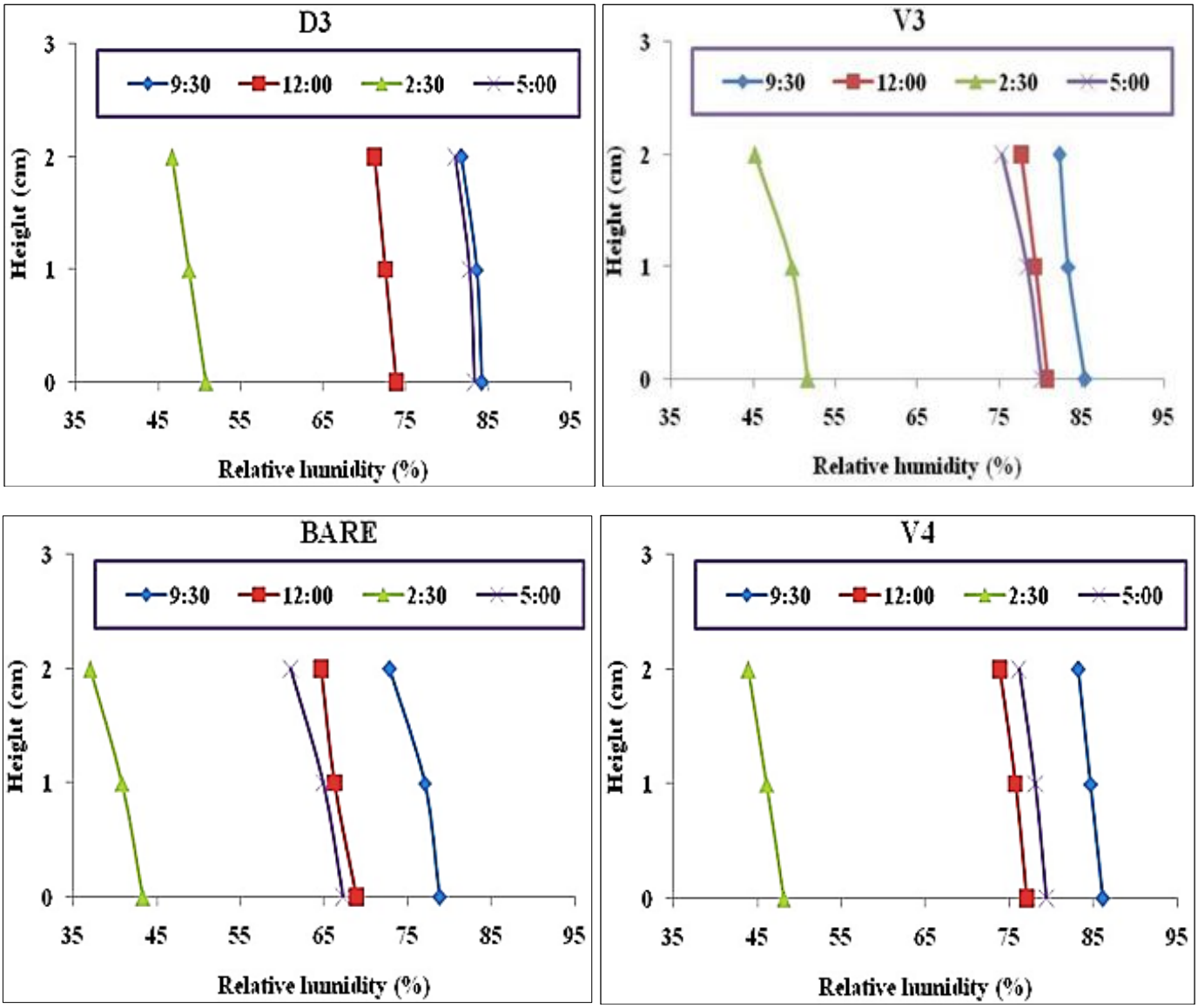
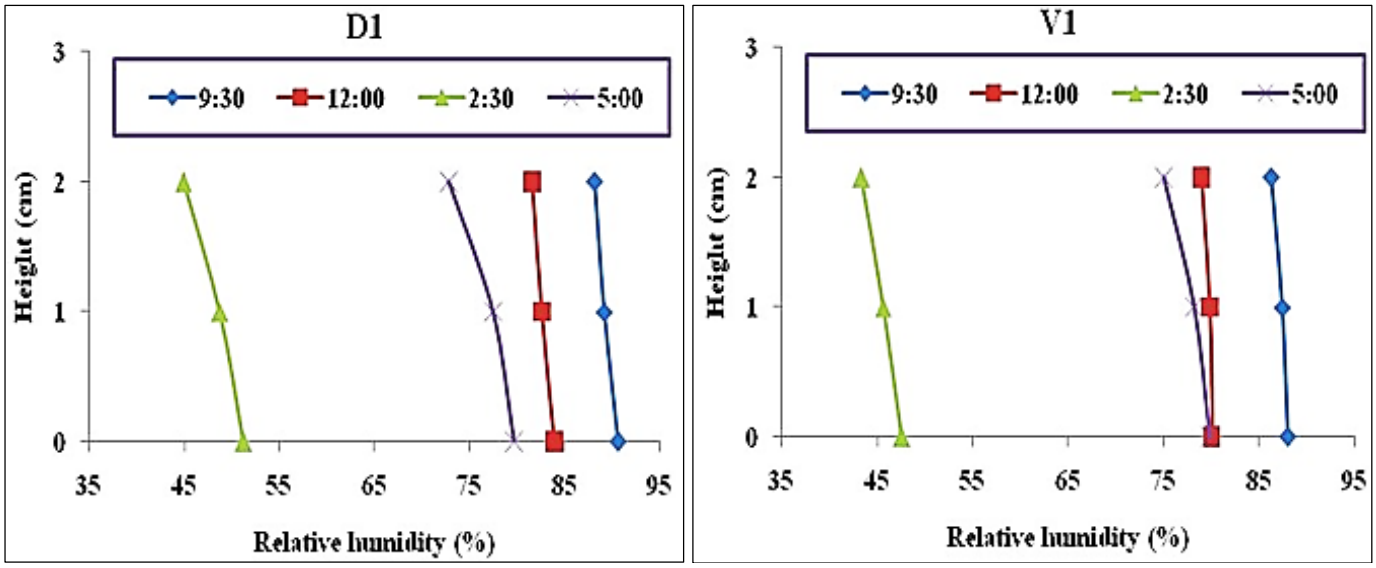
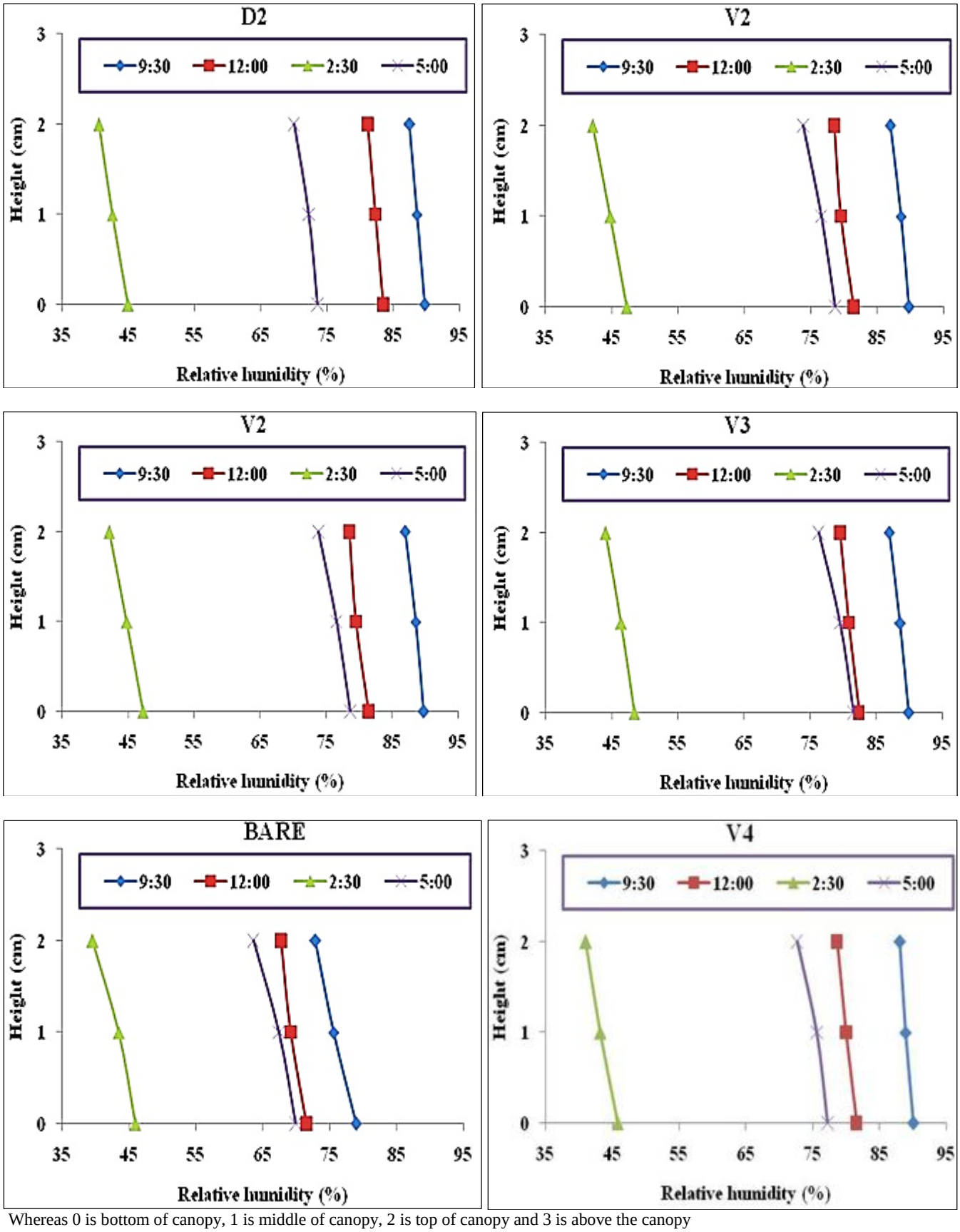


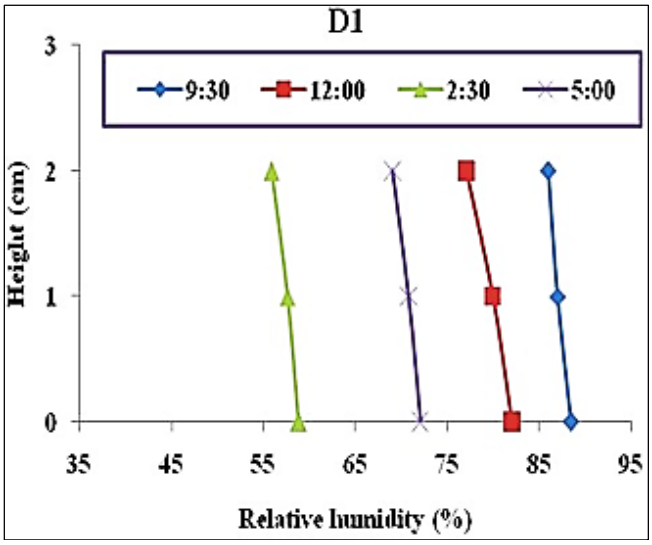
Fig 1: Relative humidity profile at jointing under different growing environments and varieties of wheat crop and bare soil during 2017-18

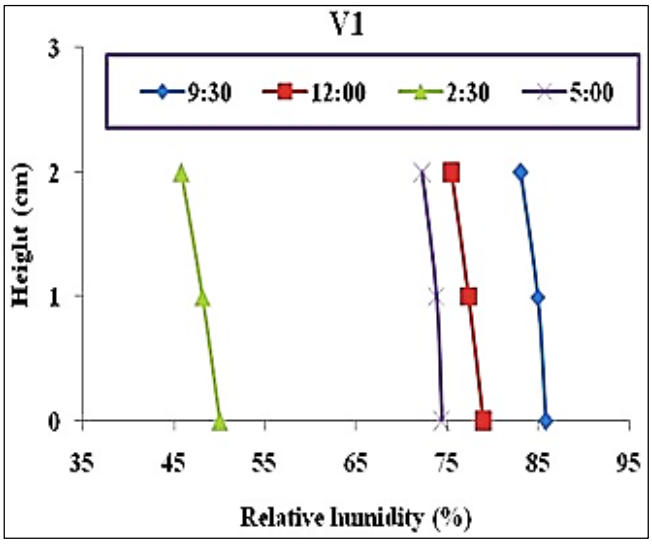


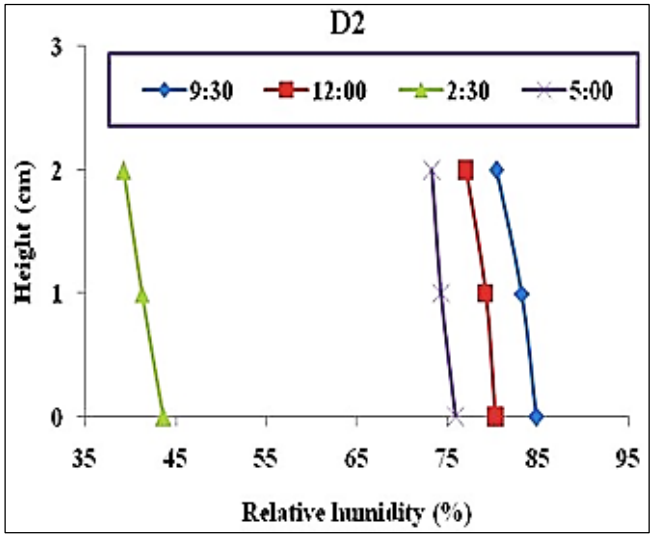


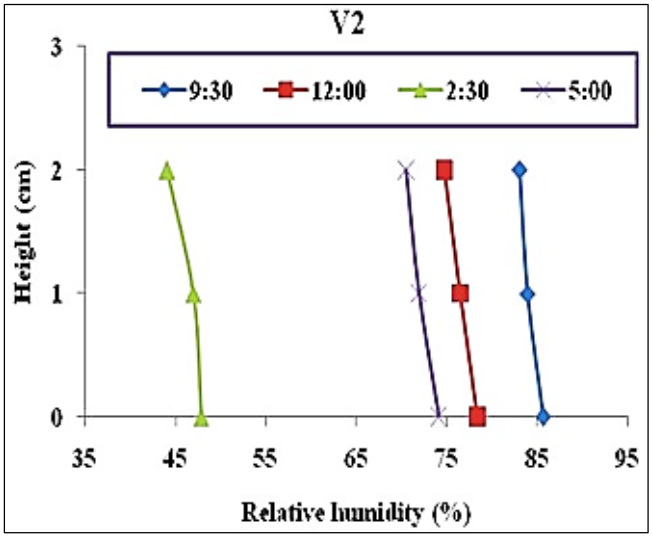
Whereas 0 is bottom of canopy, 1 is middle of canopy, 2 is top of canopy and 3 is above the canopy

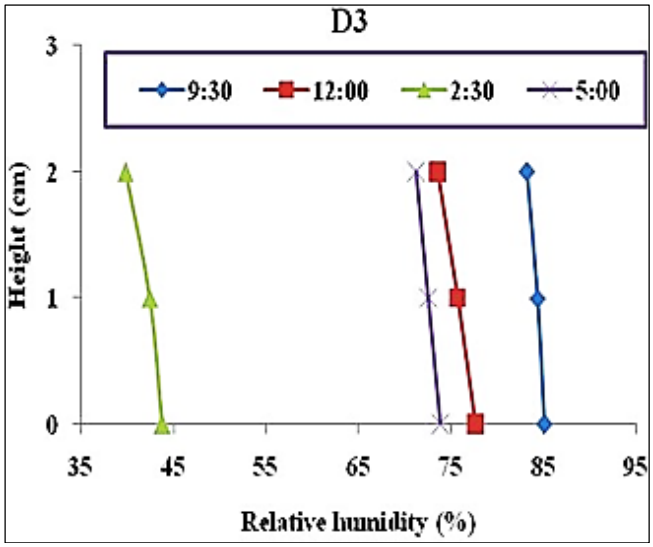
Fig 2: Relative humidity profile at booting under different growing environments and varieties of wheat crop and bare soil during 2017-18

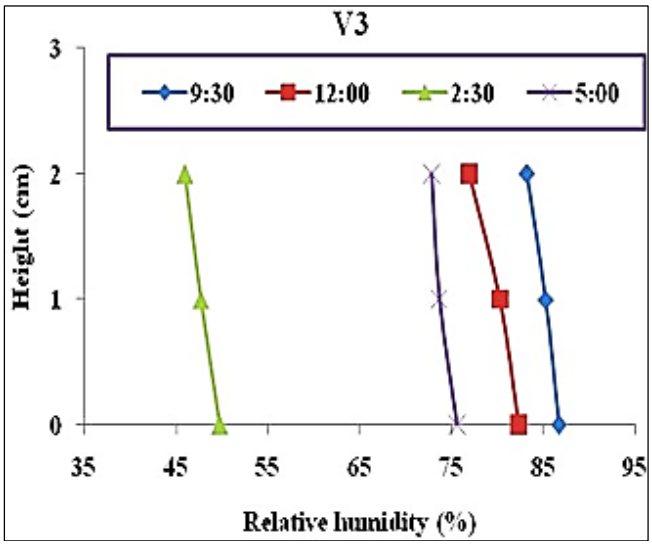

D1
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)

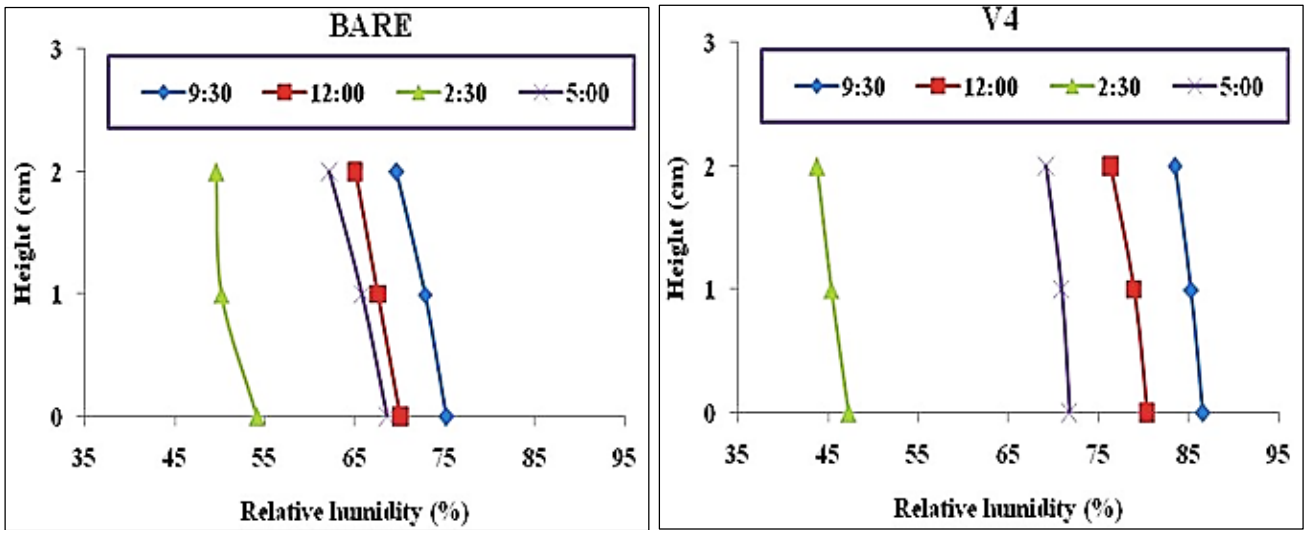

V1
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)


D2
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)


V2
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)

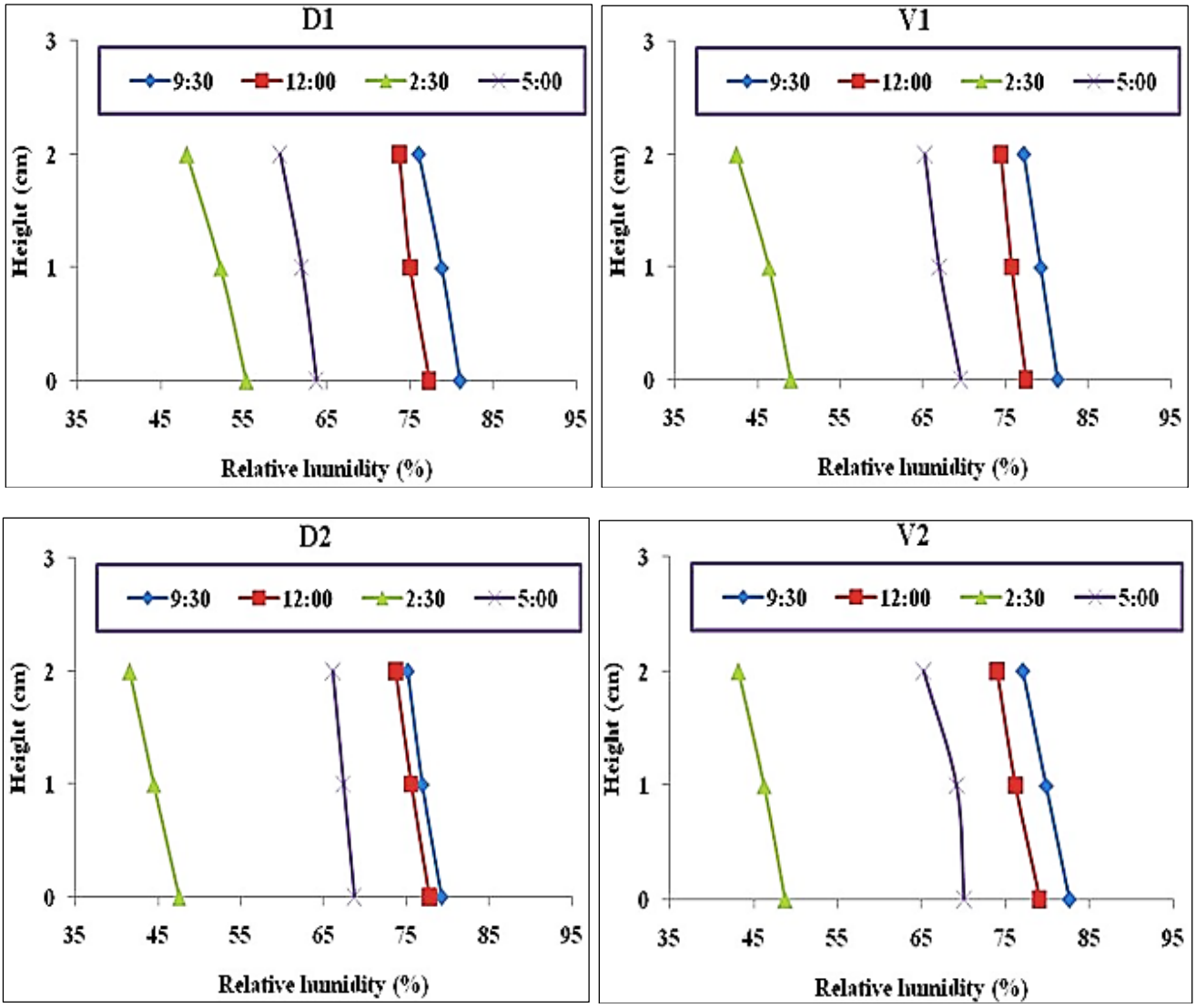

D3
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)

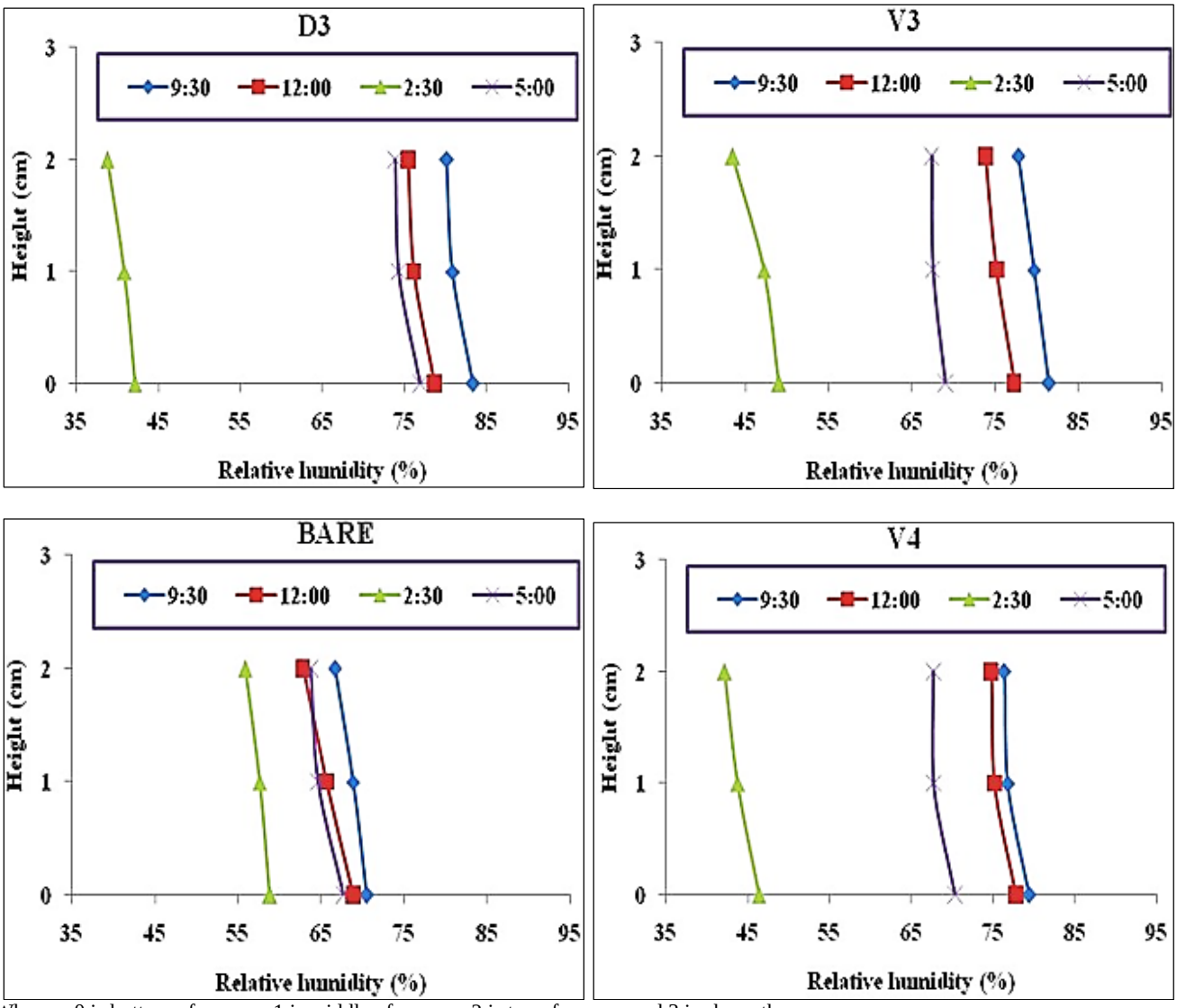

V3
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)



Whereas 0 is bottom of canopy, 1 is middle of canopy, 2 is top of canopy and 3 is above the canopy

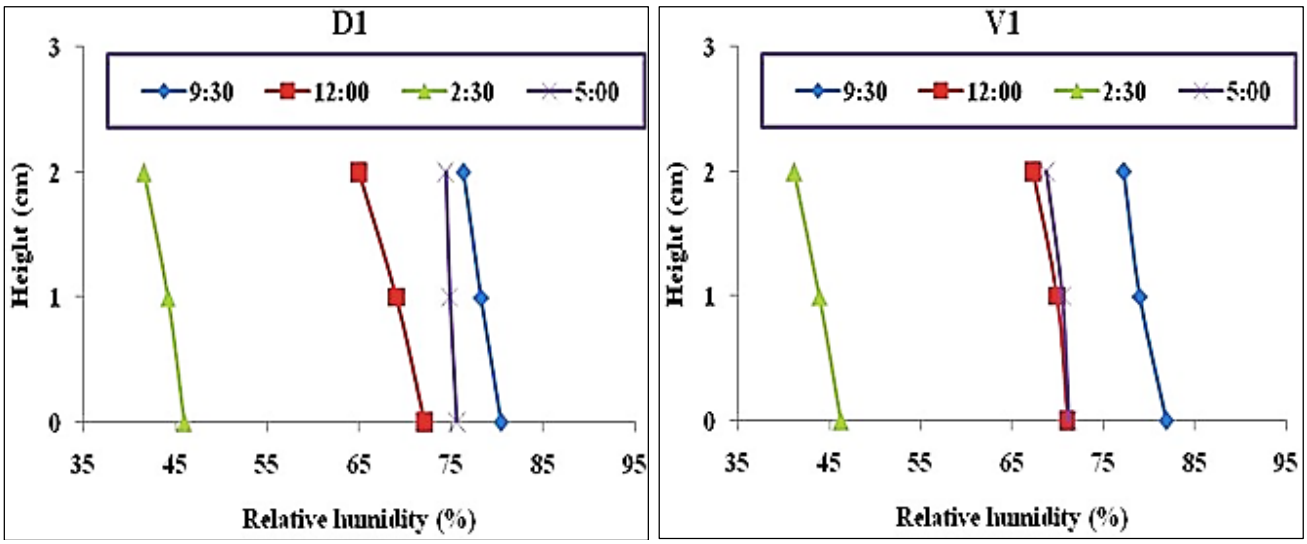
Fig 3: Relative humidity profile at Heading under different growing environments and varieties of wheat crop and bare soil during 2017-18

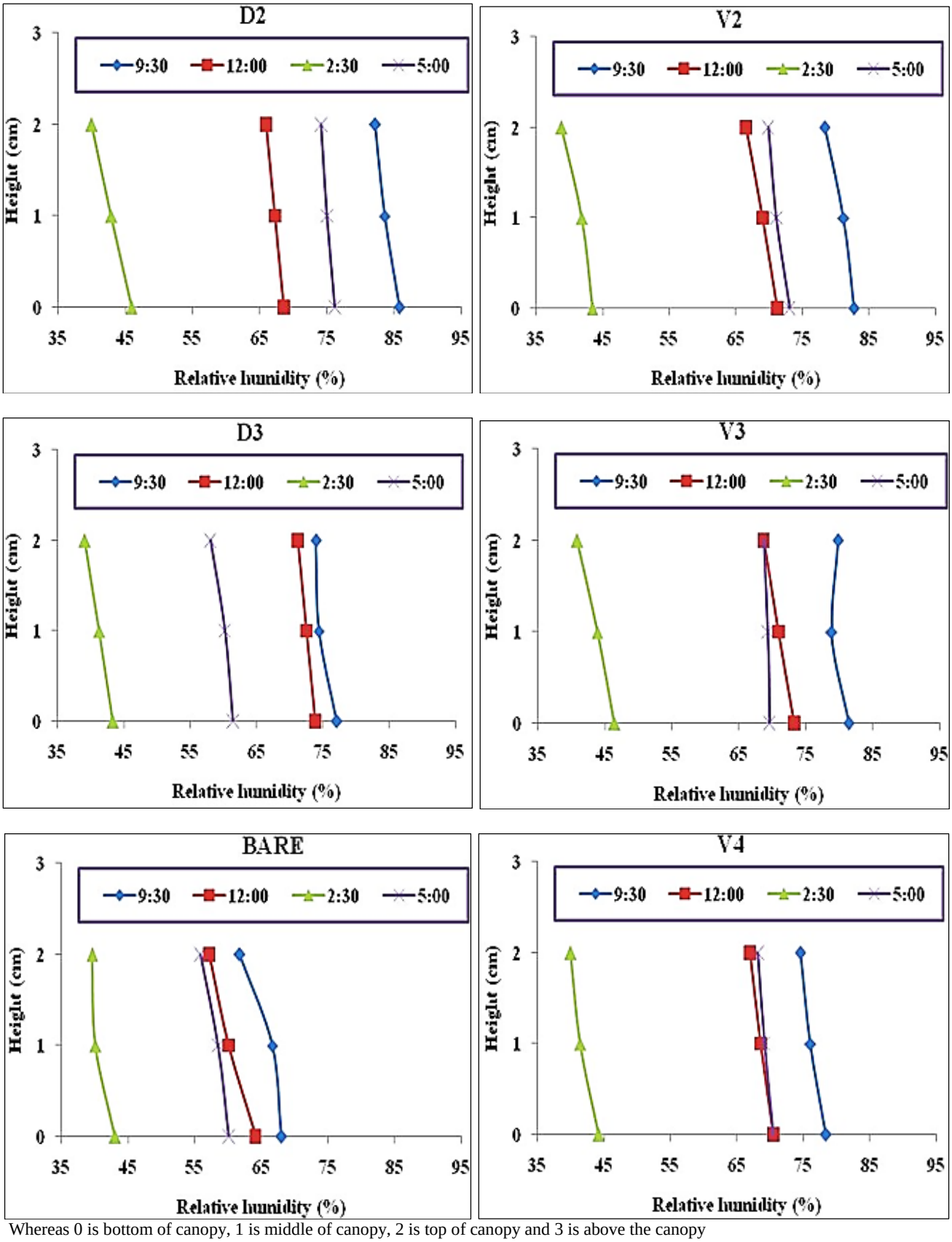




Whereas 0 is bottom of canopy, 1 is middle of canopy, 2 is top of canopy and 3 is above the canopy

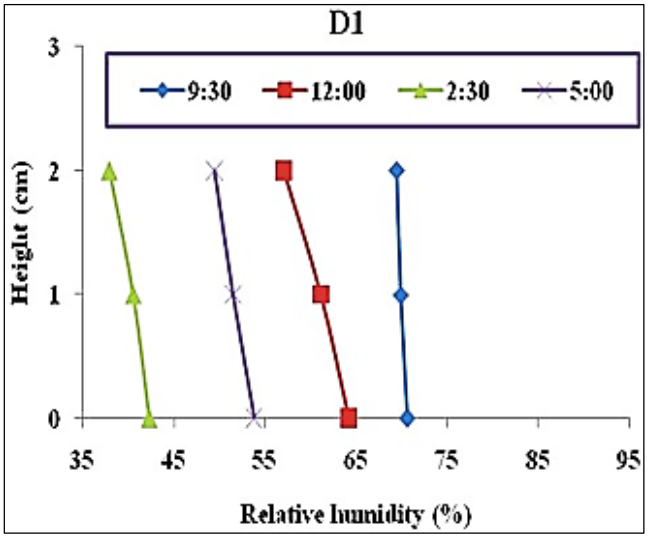
Fig 4: Relative humidity profile at anthesis under different growing environments and varieties of wheat crop and bare soil during 2017-18

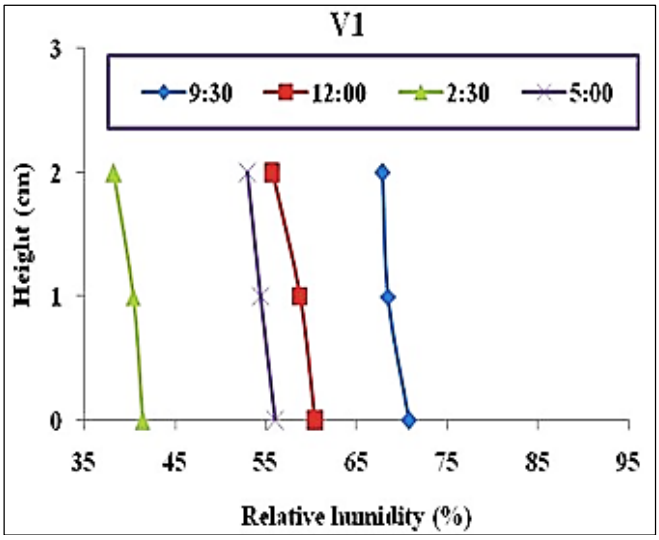


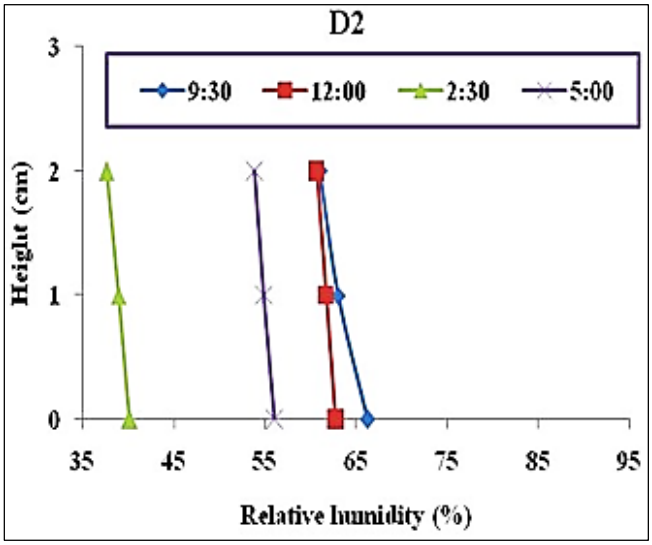


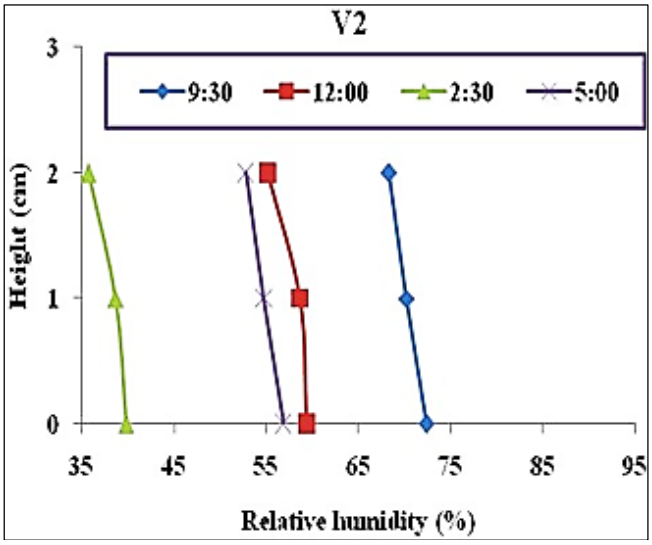
Whereas 0 is bottom of canopy, 1 is middle of canopy, 2 is top of canopy and 3 is above the canopy

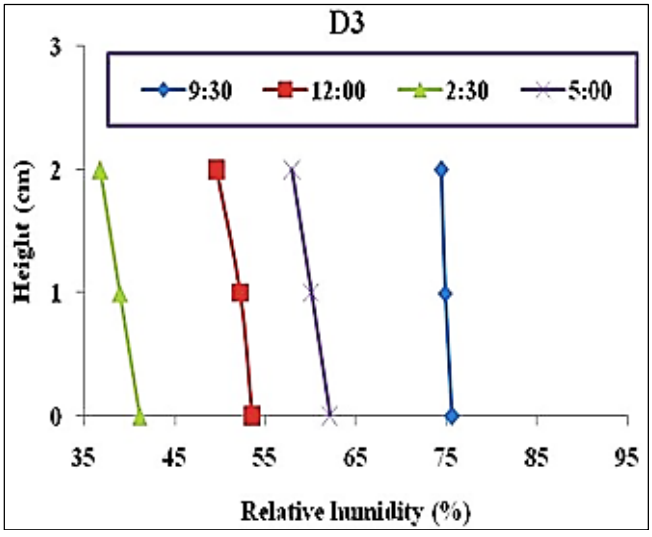
Fig 5: Relative humidity profile at milking stage under different growing environments and varieties of wheat crop and bare soil during 2017-18

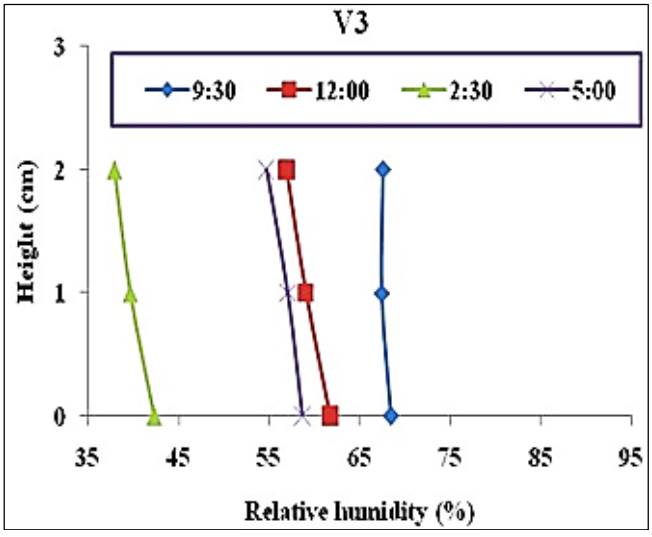

D1
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)

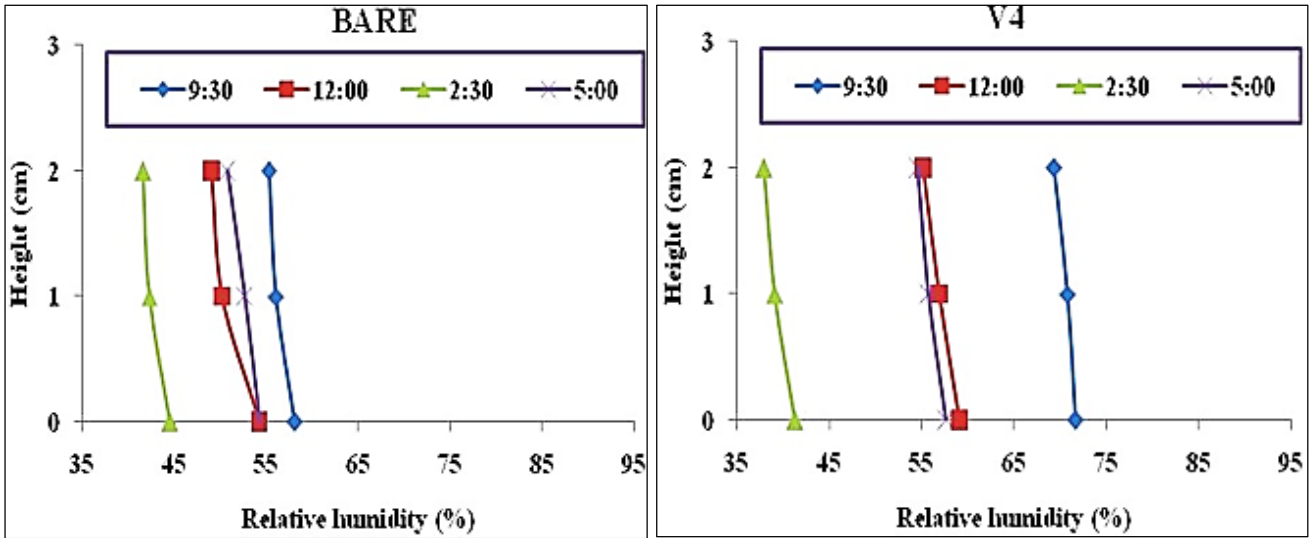

V1
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)


D2
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)


V2
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)


D3
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)


V3
9:30
12:00
2:30
5:00
Height (cm)
Relative humidity (%)



Whereas 0 is bottom of canopy, 1 is middle of canopy, 2 is top of canopy and 3 is above the canopy

Fig 6: Relative humidity profile at PM stage under different growing environments and varieties of wheat crop and bare soil during 2017-18

The humidity profiles was higher inside the crop canopy than above the canopy in all the treatments *i.e.* the relative humidity profiles were lapse inside the crop canopy throughout the day while profiles were near iso-humic at 9:30 hours at different growth stages during both crop seasons. The relative humidity decreased with height under all treatments.

4. Conclusion

When conditions are too humid, it may promote the growth of mold and bacteria that cause plants to die and crops to fail, as well as conditions like root or crown rot. Humid conditions also invite the presence of pests, such as fungus gnats, whose larva feed on plant roots and thrive in moist soil. The relative humidity profiles were lapse inside the crop canopy throughout the day but profiles were near iso-humic at 0930 hours in all treatments during both the crop seasons. Decrease in relative humidity with height from the ground. At morning time when humidity shown maximum with height. At the time of maturity there is decrease in humidity. The maximum relative humidity during the day was observed at 9:30 hours. Due to higher in air temperature, the relative humidity was lowest at noon time.

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