



RESEARCH ARTICLE

A New Approach of Canopy Temperature based Irrigation Scheduling of Wheat in Humid Subtropical Climate of India

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Abstract The aim of the study is to develop a new canopy temperature based index named plant stress index (PSI) as an irrigation schedule tool and to develop a relationship between soil water depletion and PSI at different threshold values for wheat crop in humid subtropical climate. The experiments were conducted in two growing seasons 2008–2009 and 2009–2010 in Roorkee, India. Irrigations were scheduled as and when PSI reached to 0.25 (T_2), 0.5 (T_3) and 0.75 (T_4). Two treatments, one fully irrigated (T_1) and one fully stressed (T_5), were maintained to measure the reference minimum and maximum canopy temperatures. Canopy temperatures were measured with infrared radiometers. Soil moisture contents were measured with soil moisture sensors buried at 20 cm interval up to 100 cm. An automatic weather station was installed to measure the net radiation, wind speed, relative humidity and air temperature etc. concurrently at half an hour interval on the study field. To maintain PSI below corresponding threshold values, a total irrigation amount of 280, 252, 224, 214 and 50 mm during season 2008–2009 and 275, 240, 224, 201 and 50 mm during season 2009–2010 were applied in T_1 , T_2 , T_3 , T_4 and T_5 treatments, respectively. The experimental results gave an exponential relationship between percentage depletion of available soil moisture and threshold values of PSI. The results suggested that PSI may be maintained at 0.5 for getting optimum production of wheat. Corresponding to 0.5 PSI, the

percentage depletion of available soil moisture was found to be approximately equal to 32 %.

Keywords Canopy temperature · Crop water stress · Infrared thermometer · Irrigation scheduling · Wheat

Introduction

Water is a vital natural resource for mankind which is depleting at a very fast rate. It is of a great concern and calls for optimal use of water in every sector. Major portion of fresh water is consumed in agriculture. Therefore, a small saving of water in this sector can make a huge difference in conservation agriculture. Proper irrigation scheduling is an important task for any irrigation water management project. The purpose of irrigation scheduling is to provide needed water to crop at the right time for higher water and yield productivity. Various irrigation scheduling methods based on soil water balance, plant growth stages and meteorological conditions are available. Soil water balance and meteorological condition based methods are the conventional and their implementations in the field conditions are difficult because of the large data requirements. If soil moisture based schedules are replaced by plant based schedules, it would be important to consider what measures might be most appropriate for irrigation scheduling purposes. It has been found that the canopy and