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IN-SEASON ASSESSMENT OF WHEAT CROP HEALTH USING VEGETATION INDICES BASED ON GROUND MEASURED HYPER SPECTRAL DATA

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ABSTRACT

An experiment on a 50 ha center pivot field was conducted to determine the Vegetation Indices (VI's) that were helpful in assessing the in-season performance of wheat crop treated with graded levels of irrigation water and fertilizers. The irrigation levels were at 100, 90, 80 and 70% Evapotranspiration (ETc); however, the fertilizer levels of N: P: K kg^{-1}ha included 300:150:200 (low); 400:250:300 (medium) and 500:300:300 (High). The crop was sown on January 1st and harvested on May 9th, 2012. Temporal data on biophysical parameters and reflectance of the crop in hyper spectral bands (350-2500 nm) were collected at booting and ripening growth stages (February 17th and April 5th, 2012). Results of the study revealed that many of the tested spectral indices showed significant response to irrigation levels. Out of those, only two spectral indices (Plant Senescence Reflectance Index 'PSRI' and Photochemical Reflectance Index 'PRI') also exhibited significant response to fertilizer levels. The Middle Infrared-Based Vegetation Index (MIVI) showed a significant response to the irrigation levels for both sampling dates. Among the tested spectral indices, Normalized Difference Infrared Index (NDII) and Normalized Difference Nitrogen Index (NDNI) exhibited the highest correlation to crop Leaf Area Index (LAI). Five indices showed the most response to wheat grain yield. These indices included Near Infrared band (NIR), Water Band Index (WBI), Normalized Water Index-1 (NWI-1), Normalized Water Index-3 (NWI-3) and Normalized Water Index-4 (NWI-4).

Keywords: Remote Sensing, Spectral Reflectance, Vegetation Indices, Wheat

1. INTRODUCTION

The use of remote sensing applications for crop growth monitoring is becoming an essential part of today's agriculture as it enhances the efficient management of agricultural resources. Because of the strong impact of deficiencies in the essential nutrients on crop growth and yield, assessment of biophysical parameters is necessary for monitoring crop performance and improving crop yield by site specific application of crop chemicals (Haboudane *et al*., 2007). According to the fact that crop phonological stages and growth period vary in different areas and cropping seasons and to the fact that crop phenology is affected by both weather variations and regional planting habits, determination of the important crop phonological stages is a key factor for modeling crop performance as well as improving the accuracy of crop type classification and yield estimation (Meng *et al*., 2009). The key factor for precision crop growth monitoring is the selection of the efficient devices and methods for the accurate measurements of crop growth parameters.

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