Towards a Water and Nutrient Efficient Forages Production in Pakistan

Sami Ul-Allah[1], Asif Ali Khan[2], Thomas Fricke[1], Michael Wachendorf[1]

[1] University of Kassel, Grassland Science and Renewable Plant Resources, Germany
[2] University of Agriculture Faisalabad, Plant Breeding and Genetics, Pakistan

Abstract

Agriculture is a major sector of Pakistan's economy providing food and employment to fast growing population. Livestock farming, the most important sub sector of agriculture, contributes more than 50 % in agricultural value added. Sustainable availability of green forage is critical to livestock farmers, as it is the most valued and economic source of feedstock. Pakistan's forage production is highly affected by non-availability of sufficient irrigation water and high costs of fertilisers.

To evaluate different forage crops with respect to water and nutrient efficiency, an experiment was conducted at the research farm of the University of Agriculture Faisalabad, Pakistan, during 2010-12. The experiment was conducted as a split plot design whereby main plots comprised three levels of fertiliser *i.e.* control (C), farm yard manure (FYM) and mineral fertiliser (MF), factorially combined with two irrigation intervals *i.e.* recommended irrigation (RI) and half recommended irrigation (HRI). Subplots randomised within each mainplot were assigned to the two cropping systems *i.e.* Egyptian clover + Maize (CS-1) and Oat + Sudan grass (CS-2). Data was recorded for dry matter yield (DMY), water use efficiency (WUE) and chlorophyll content (SPAD value). Data obtained (two years average) was analysed by statistical software MSTAT-C. DMY and WUE showed significant differences ($p < 0.05$) for all treatments and interactions except three way interaction of DMY that was not significant. Highest DMY (27.59 t ha^{-1}) was obtained for CS-2 in RI with MF, whereas maximum WUE (29.16 kg ha^{-1} mm^{-1}) was expressed by the same cropping system with FYM in HRI. Regression coefficient for SPAD at time "t" vs. DMY at time "t+1" was significant ($p < 0.05$) for all crops which revealed that SPAD value can be used to predict the yield during growth of the crops. It is concluded from the results that CS-2 is more water and nutrient efficient, while WUE of the crops in HRI is much better than for RI indicating the ability of crops to use limited water more efficiently. CS-2 can be suggested in the areas with limited water and fertiliser availability to improve the feedstock production.

Keywords: Chlorophyll content, dry matter yield, forages production, water and nutrient efficiency

Contact Address: Sami Ul-Allah, University of Kassel, Grassland Science and Renewable Plant Resources, Steinstrasse 19, 37213 Witzenhausen, Germany, e-mail: sami_llh@yahoo.com