Some forage characteristics of barley produced under low and high input systems

Maleki Farahani, S

Department of Crop Production and Plant Breeding, Shahed University, Postal/ ZIP 3319118651 , Iran

Abstract

Grain or whole barley is used as feed in poultry or dairy. The aim of this research was to study the effect of various combinations of organic, biological and chemical fertilizers along with water deficit regimes on *in vitro* forage characteristics of barley crop. Experimental design was a split plot arrangement based on a randomized complete block design with four replications. The treatments consisted of three irrigation regimes (main plots) of: non-stressed (NS, normal irrigation until the end of the plant physiological maturity), moderate stress (MS, ceased irrigation from inflorescence to the beginning of grain filling stage and severe stress (SS, ceased irrigation from inflorescence to the end of the physiological maturity) and six fertilizer treatments consisting of 1. No fertilizer (control) (NF), 2. biofertilizer (BF), 3. 100% chemical fertilizer (CF), 4. Vermicompost (VC), 5. 50% chemical fertilizer (NPK) + 50% Vermicompost (CV), and 6. 50% chemical fertilizer + biofertilizer (CB), assigned to the sub plots. Water stress reduced dry matter digestibility (DMD), but increased acid detergent fibre (ADF). However, the effect of water deficit on DMD depended on the fertilizer treatment. With BF (containing biofertizer) and CV (containing Vermicompost) fertilizing treatments, the barley forage had the highest DMD under both MS and SS water deficit conditions. These results suggest that integrated fertilizing systems are

more reliable than conventional to produce high quality forage barley in arid environments with late water stress or water deficit irrigation system.

Key words: biofertilizer, integrated fertilizing system, forage quality

1. Introduction

Grain or whole barley is used as feed in poultry or dairy. Nutrient content of barley can vary somewhat within an eco-region due to variation in soil fertility or rainfall or other factors. There is evidence that application of chemical fertilizer especially nitrogen causes increment in digestibility (Peers and Taylor, 1976). Valja et al (1997) described that soil type had little effect on feeding value of barley while plant variety highly affect barley forage quality.

Climate change scares sustainable production of food and feed for increasing world population especially in countries with limited production sources. Adequate healthy forage production for livestock in areas with low soil fertility and water limitation is an essential factor to reach sustainability in agriculture.

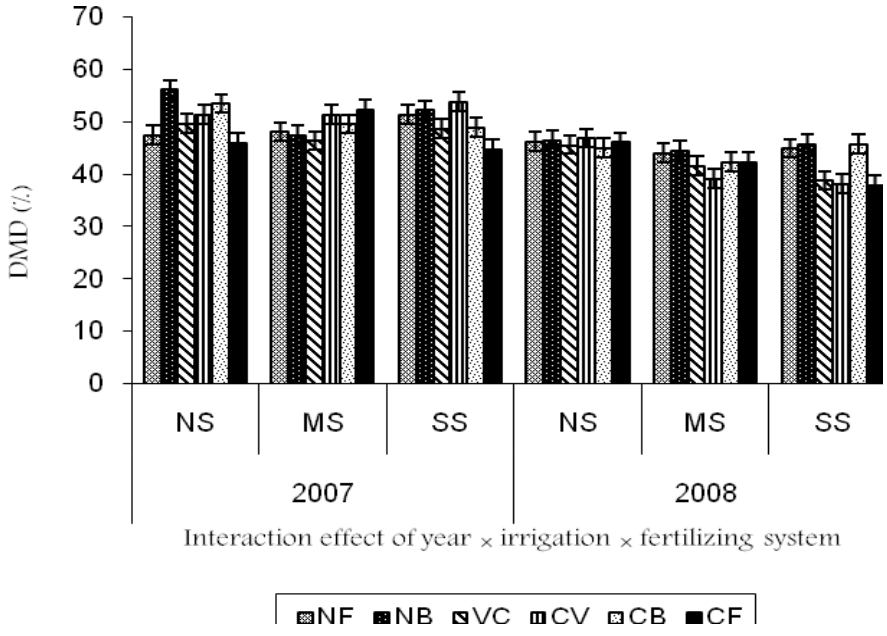
2. Materials and methods

Field studies were conducted at the Experimental Farm of the College of Agriculture, University of Tehran, Karaj, Iran (35^{o} 56' N and 50^{o} 58' E with an altitude of 1312 m) during the 2006-2007 and the 2007-2008 cropping seasons. The soil was a clay loam with a pH of 8.4 and 1.02 EC. Karaj has an average annual rainfall of 400 mm. The experimental design was a split plot arrangement based on a randomized complete block design with four replications The treatments consisted of three irrigation regimes (main plots) of: non-stressed (NS, normal irrigation until the end of the plant physiological maturity), moderate stress (MS, ceased irrigation from inflorescence to the beginning of grain filling stage and severe stress (SS, ceased irrigation from inflorescence to the end of the physiological maturity) and six

fertilizer treatments consisting of 1. No fertilizer (control) (NF), 2. biofertilizer (BF), 3. 100% chemical fertilizer (CF), 4. Vermicompost (VC), 5. 50% chemical fertilizer (NPK) + 50% Vermicompost (CV), and 6. 50% chemical fertilizer + biofertilizer (CB), assigned to the sub plots. At soft dough stage (Zadoks 84) plants were harvested from the two central rows of each plot. Feed samples were weighed, dried at 70 °C for 48 h and ground to pass through a 1 mm sieve. For forage quality assessment the oven dried samples were analyzed by near infrared reflectance spectroscopy and DMD and ADF were measured.

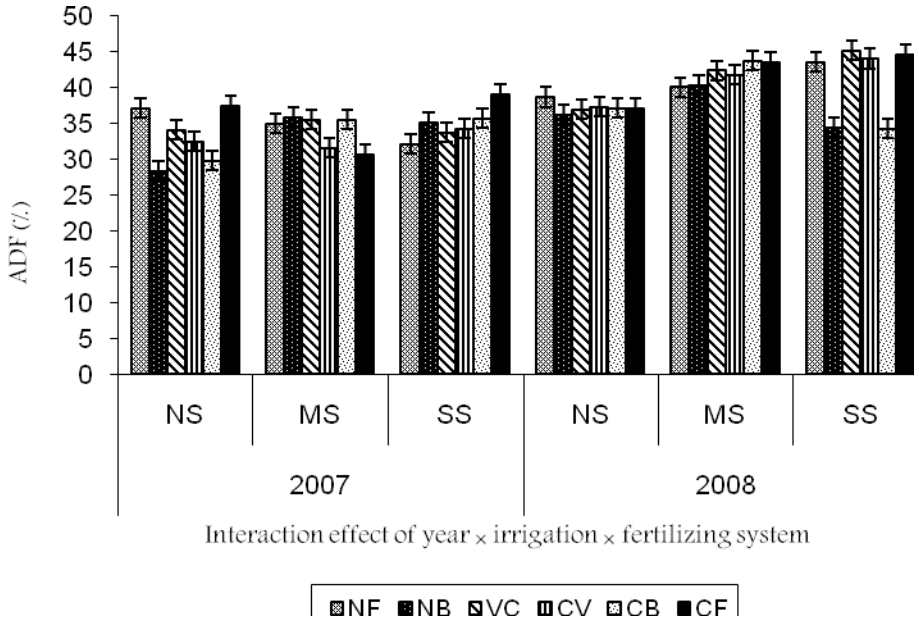
3. Results

The effects of all factors and their interaction except year* irrigation system were significant on DMD ($P<0.01$). Water stress reduced dry matter digestibility (DMD) however, the effect of water deficit on DMD depended on the fertilizer treatment (Figure 1). With BF (containing biofertizer) and CV (containing Vermicompost) fertilizing treatments, the barley forage had the highest DMD under both MS and SS water deficit conditions.



Peers and Taylore (1976) have described that increase in nitrogen content tended to increase the DMD

The ADF was significantly (P<0.01) affected by all treatments and their interactions. ADF increased with water stress in both years except for treatments fertilized with biofertilizer under SS condition (Figure 2).



These results suggest that integrated fertilizing systems are more reliable than conventional to produce high quality forage barley in arid environments with late water stress or water deficit irrigation system.

References

Peers, D. G. and Taylor, A. G. 1976. The influence of the variety of barley and level of nitrogen fertilisation on the digestibility and metabolisable energy value of barley meal in the pig. Journal of the Science of Food and Agriculture, 28: 602-606.

Valaja, J., Suomi, K., Alaviuhkola, T. and Mela, T. 1997. Effects of variety, soil type and nitrogen fertilizer supply on the nutritive value of barley for growing pigs. Agricultural and Food Science in Finland, 4: 295-303.