Influence of supplemental irrigation on annual ryegrass

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Abstract

The objective of this research was to evaluate the effect of supplemental irrigation on increasing and stabilizing yield and quality of forage produced by annual ryegrass (*Lolium multiflorum* Lam.) in southern Portugal. The following four irrigation treatments were tested: rainfed (control), and irrigation up to 25%, 50% and 100% of soil water holding capacity. The results showed that water irrigation doubled the number of harvests, four instead of two compared to the rainfed treatment, and also doubled the yields of dry matter, crude protein and dry matter digestibility which shows the importance of supplemental irrigation in stabilizing forage availability along the year, even at the lowest level of irrigation used. The differences between the control and the irrigation treatments were more noticeable with respect to crude protein yield.

Keywords**:** productivity, nutritive value, annual ryegrass, irrigation.

Introduction

Annual ryegrass (*Lolium multiflorum* Lam.) yield in southern Portugal is strongly affected by soil water availability in early autumn and especially late spring. This species is usually cultivated under rainfed conditions allowing usually two harvests. Lourenço and Palma (2001) reported total dry matter yield values ranging from 5,274 to 6,790 kg ha^{-1}. However, values lower than 3,500 kg ha^{-1} have been reported by Lourenço and Palma (2005). This shows the great variability of forage production of the region depending mostly on total amount and rainfall distribution along the year. Supplemental irrigation, can increase and stabilize yields, but since water is becoming an expensive and scarce resource, it is important to investigate the response of this species to irrigation.

Material and Methods

The experiment was conducted in 2003/2004 that, in spite of October being very rainy, was a dry year since the amount of rainfall (433 mm) was lower than the normal (634 mm). On the other hand, the temperatures were higher than the normal except in October. The field trial was set up in a Luvissol of the Experimental Center of Currais, located near Évora (14 km), with 82 mg kg^{-1} of P_2O_5, 62 mg kg^{-1} of K_2O, and pH (H_2O) of 5.78. The following four irrigation treatments were tested: rainfed (control), and irrigation up to 25%, 50% and 100% of soil water holding capacity. The seeded area of 8,100 m^2 was divided into four areas, one for each treatment. A sprinkler irrigation system was used with two lines for each of the three irrigation treatments. A profile probe PR1/4 was used to monitor soil water content at different depths (10, 20, 30, and 40 cm). The values measured, usually twice a week, were used to adjust the irrigation requirements, estimated by the Cropwat model (FAO, 1992) using meteorological data and the Penman-Monteith equation (Allen *et al.*, 1994), in order to maintain the soil water content at each desired irrigation treatment level. Planting date was on October 8, 2003, using the Pollanum variety, and seeding at the rate of 750 live seeds m^{-2} (38 kg ha^{-1}). Harvest dates where the following: March 8, May 11, June 15, and July 13. Nine randomised samples, of 1 m^2 each, were harvested in each irrigation treatment to evaluate forage production. After harvests, 50 kg ha^{-1} of nitrogen was applied.
Dry matter yield was determined after oven drying at 65ºC during 48 to 72 hours. Crude protein was analyzed by the Kjeldhal standard procedure (AOAC, 1975), and *in vitro* dry matter digestibility by the Tilley and Terry technique (Tilley and Terry, 1963).