Alfalfa Water Requirement and Water Use Efficiency

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The water requirement regular and water use efficiency research of alfalfa are the basis of reasonable irrigation and high efficient of water utilizing. To control to the water shortage of China, the lower efficiency of water using and the key problems of Alfalfa cultivation, the regular pattern of water requirement, evapotranspiration, transpiration, water using efficiency and transpiration ratio for different alfalfa varieties were studied in this paper. The experiment was conducted in cultivating-pool, under the conditions of full irrigation and high-yield cultivation. The results showed:

The amount of water consumption and evapotranspiration of alfalfa is different in different growing periods, but they were convergent in sometimes. The amount of water consumption and evapotranspiration in the period from sowing to emerging are the smallest, only 10mm and 0.01mm, As the plant growing, those two data were developed. From branching to squaring, the amount of water consumption and evapotranspiration were most biggest, 150mm and 66mm respectively, about 40% to 50% of the all. In the period of squaring to blooming of Alfalfa, the amount of evapotranspiration and transpiration were decreased, but the intensity were most biggest, this showed that this period was the peak time of water requirement, and key period for dry matter yield.

The amount of evapotranspiration, dry matter yield, evapotranspiration coefficient and water using efficiency of alfalfa in the first year (May, 6 to Oct., 22) were, on average, 581.3mm, 7095kg/hm^2, 819 and 12.2kg/hm^2.mm.The amount of transpiration and dry matter yield, transpiration coefficient and transpiration ratio of the six varieties in the research, on average, 418.9mm, 6367kg/hm^2, 658 and 1.52g/kg. The transpiration is the main form of alfalfa water consumption, about 72% in all. The amount of water consumption of the first-cutting of Alfalfa sown in Spring was the highest, the second-cutting alfalfa had the maximum dry matter yield and Water-use efficiency.

The transpiration coefficient and transpiration efficiency of different varieties of alfalfa were different. The statistical analysis showed that the differences between the varieties of alfalfa are extremely significant. In the sowing year, the transpiration coefficient of Zhongmu No.1 and Qinglai are lower, on average, 612 and 619. But the transpiration coefficient of Aohan was higher, 699. Both Zhongmu No.1 and Qinglai are significantly different ($p<0.01$) with other varieties. The result showed that transpiration efficiency of Zhongmu No.1 and Qinglai were higher, but Aohan and Shouling were lower.

In a word, the water requirement regular, the amount of water requirement and water using efficiency of alfalfa are comprehensively affected by alfalfa-self growing regularity and climate. The daily average air temperature had most influence on the water consumption. So, the water requirement and using efficiency were varied with the different variety, different growth period of alfalfa.