



LONG TERM PERFORMANCE OF AN ARTIFICIAL PASTURE VEGETATION UNDER MEDITERRANEAN CONDITIONS IN TURKEY



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Abstract

A study on artificial pasture was conducted in the experimental field of a private farm Aydin/Turkey which was under typical Mediterranean climatic conditions, during 2002-2009. Some promising legumes in this environment (*Medicago sativa*, *Lotus corniculatus*, *Trifolium resupinatum*) and some grasses (*Bromus inermis*, *Dactylis glomerata*, *Festuca arundinacea*, *Arrhenatherum elatius*) as well as *Sanguisorba minor* were sown as a mixture. Stand yield characteristics and crop performances of sward were tested for 7 yrs under cattle grazing. The results indicated the adverse effects of Mediterranean climate and to some extent grazing on yield and cover characteristics of some mixture crop material, particularly *T.resupinatum*, *B.inermis* and *D.glomerata*. On the contrary, *F.arundinacea*, *M.sativa*, *A.elatius* and *L.corniculatus* displayed higher contributions to total yield.

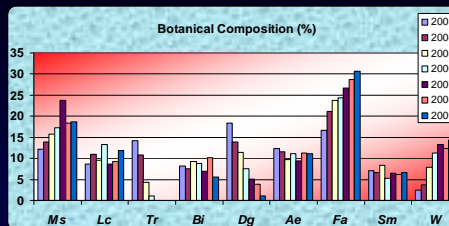
Introduction

The most crucial handicap of the Turkish animal husbandry sector is to provide cheap and high quality roughage to farms. Since the roughage costs are generally 70% of expenditure in animal production, there is an urgent need to improve grasslands. Remembering the Mediterranean conditions of Western Turkey which allows favourable crop growth, it must be emphasized that any attempt to benefit from alternatives of new forage crop introductions is of vital significance. Artificial pasture (rotation pasture) establishments under field conditions in the area may be one of those attempts to promote roughage production. It should be also emphasized that number of alternative warm or cool season grasses productive and persistent under Mediterranean climate are quite limited compared to humid continental climates. The objective of this study was to practice a promising artificial pasture mixture and to test new crop cultivars under a grazing regime for long-term use in the region.

Materials and methods

The experiment was carried out for 7 years on a silty-sand loam soil with 7.1 pH in the area (35 m a.s.l., lat. 37°45'N, long. 27°24'E). Soil properties (soluble salt 0.009%, organic matter 1.13%, total N 0.12%, available P 360 ppm, K 400 ppm, Ca 5400 ppm) indicated that there was not any limiting factor in terms of soil properties to grow crops for herbage under grazing practices. Average annual temperature and precipitation data through experimental years (17.3, 17.9, 17.7, 17.9, 18.9, 18.9, 18.7°C and 579, 392, 699, 745, 487, 427, 1072 mm, in 2004 to 2009 respectively, were generally in accordance with long term average (17.1°C and 633 mm), except 2009. After conventional seed bed preparation, a mixture of *M.sativa* (10%, 3 kg/ha, *L. corniculatus* (15%, 2.5 kg/ha, *T.resupinatum* (5%, 2 kg/ha) and grasses (*B.inermis* (15%, 5 kg/ha, *F. arundinacea* (25%, 5 kg/ha, *D.glomerata* (10%, 5 kg/ha, *A.elatius* (15%, 6.5 kg/ha) and *S.minor* (5%, 1 kg/ha) were sown on a 7 ha lowland field in 15 cm row spacing on November 21, 2002. A total of 200 kg/ha NPK fertilizer was applied prior to sowing in early spring of each year. The experimental design was randomised plots (100x 100m) with 4 reps. Irrigation was applied regularly based on a proper soil tensiometer measurements. Pasture plots were grazed by dairy cattle for a week during each harvest period. Data were collected by 2 portable cages sized 2 x 1 m in each plot. Botanical composition data were collected 3 times a year (April, July, October) prior to grazing. Cover rates were assessed using quadrat (1 x 1 m) technique. Data indicating overall performances of material were statistically analyzed and summarized in Fig.1-2-3. In variation analysis, the least significant difference (LSD) test was performed.

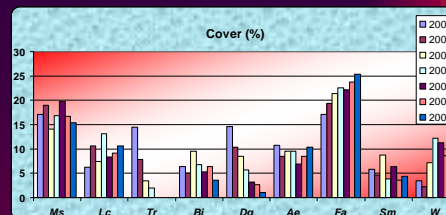
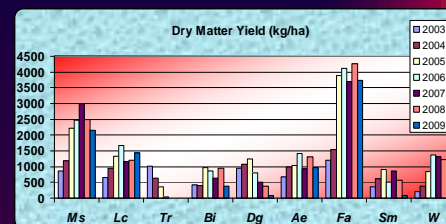
Results and Discussion



There were significant differences among total dry matter yield of experimental years (Fig.2). Sward total DM yields increased until 2006 and decreased in the following years (2007-2009). DM yield data also confirmed that *Ms* and *Fa* performed far better than other crops in sward.

These results maybe attributed to the well-known adaptive capacity of none-hardy *Ms* cultivar and heat resistant *Fa* crops to Mediterranean conditions (Hall *et al.*, 2009). Further, *Lc* and *Ae*, with satisfactory and sustainable DM yields in the course of experimental years, also performed better than *Tr* and *Dg*. The latter species are known as being susceptible to high atmospheric heat, light intensity and low air moisture, which are the essential characteristics of Mediterranean environments (Hall *et al.*, 2009). Our results confirmed related information given by Lacefield *et al.* (2003) and Deak *et al.* (2007). Existing as an indigenous species in the region, *Sm* cultivar maintained a reasonable performance in sward whereas weeds invaded the gaps left by disappearing individuals of *Tr*, *Bi* and *Dg* (Soegaard, 2002). The results of the long-term cover tests in the experiment supported the approach pointing out the promising performances of the sward through the contributions provided particularly by *Fa*, *Ms*, *Ae* and *Lc* in the mixture.

Botanical composition data obtained from the swards were highly variable in terms of legume, grass and weed components (Fig 1). Long term (7 yr) performance of experimental crops indicated the increased rates of *Ms* and *Fa* in the swards, but decreasing rates of *Tr* and *Dg*, which is a grass well-known for its competitive ability (Lacefield *et al.*, 2003). Another striking point among the results was that of a steady increase of weed infestation throughout the experimental years. Warda and Krywiac (2002) and Kadziulis and Kadziuliene (2002) revealed that indigenous species are strong competitive crops and an acceptable rate of existence is unavoidable. *Ae* and *Sm* maintained reasonable percentages in botanical composition.



General cover rates in succeeding years decreased mainly because of weed infestation (Fig.3). In addition to Mediterranean ecological impacts, it is obvious that grazing has to some extent adverse effect on pasture crops, and thinning in the swards is expected. Although the increasing weed infestation and decreasing cover rates, better yield performances were generally recorded during the experimental years. The general performance of the mixture was quite sustainable and suggested to utilize the sward economically for another couple of years.

Conclusion

We concluded that *Ms* and *Fa* were the permanent and most successful legume and grass crops in the mixture, with respect to botanical composition throughout the experimental years. With respect to DM yield and cover characteristics, same components of the mixture also performed well and have been evaluated as recommendable for all resembling Mediterranean environments. It was also suggested that *Lc* and *Ae*, both exhibiting stable and sustainable DM yield and cover contribution to overall performances of the sward, should be included in this type of Mediterranean pasture mixture. General performances of *Tr*, *Bi* and *Dg* in the mixture proved that more attention should be paid to consider these forage crops in mixtures and indicated the necessity for further investigations.

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