Preliminary results on the effect of seeding methods on production and botanical composition of perennial mixtures of alfalfa-grasses

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Summary - In order to get perennial mixtures of legume-grasses highly yielding, suitable and with better nutritive value, a serial of trials were undertaken since 1992 at Tunis, under semi-arid conditions. These trials aimed firstly to compare the production and the botanical and chemical composition of some alfalfa-grasses combinations and secondly to compare the production and behavior of these combinations to their pure stands. Results of the first serial of trials (1991-1993) showed that there was no significant difference between the 3 tested mixtures in terms of total annual production and chemical and botanical composition (Zoghlami *et al.*, 1995). At the contrary, saisonnal production was different from one combinaison to another. According to these results, 4 combinations were tested and compared to their pure stands (1993-1996). Results showed that mixtures were higher than pure stands and had a good yield distribution in the year (Zoghlami et Seklani, 1997). In this case, we intended to study the effect of technical practices, the seeding mode (single alternate rows or mixture on the rows) on the production and botanical composition of 3 mixtures of alfalfa-*Phalaris*, or fescue or ray-grass using local varieties. Preliminary results showed that from a total of 15 cuts carried out from april 1998, there is no significant effect of the seeding mode on the total annual production of the mixtures. The contribution of alfalfa in the forage is also the same whatever the seeding mode but it differs from one association to another.

Key-words: seeding methods, perennial grasses, alfalfa, semi-arid, mixtures

Résumé - *Dans le but de trouver des associations légumineuses-graminées hautement productives, adpatées et de bonne valeur alimentaire, une série d'essais a été entreprise depuis 1991 en conditions pluvilaes semi-aride. ces essais avaient pour objectifs 1) de comparer la production et la composition chimique et botanique de quelques associations luzerne-graminées pérennes et 2) comparer les associations avec leurs cultures en pur. Les résultats de la première série d'essais (1991-93) ont montré qu'il n'y a pas de différence significative entre les associations étudiées de point de vur production totale annuelle; au contraire, la production saisonnière diffère d'une association à l'autre (Zoghlami et al 1995). La deuxième série d'essais (1993-96) a montré la supériorité des associations par rapport aux cultures pures ainsi que la bonne répartition de celle-ci dans l'année (Zoghlami et Hassen, 1997). Dans ce cas, nous avons essayé d'étudier l'effet des techniques culturales, en l'occurence, le mode de semis (alterné simple ou mélange sur la ligne) sur la production et la proportion de la luzerne de 3 associations luzerne-fétuque, ou ray-grass ou phalaris en utilisant des variétés locales. Les résultats préléminaires ont montré que sur un total de 15 coupes effectuées depuis avril 1998 (avec une 1ère coupe tardive), il n'y a pas d'effet significatif du mode de semis sur la production des associations. La contribution de la luzerne dans le fourrage est la même quelque soit le mode de semis mais différente d'une association à une autre.*

Mots-clés: *mode de semis, graminées pérennes, luzerne, semi-aride, associations*

Introduction

The important rôle of legumes in the production of pasture and hay crops has been very documented (Tewari and Schmid, 1960). Significant amounts of nitrogen are transferred from the legume to the grass component in the mixture (Brophy *et al.*, 1981, cited by Asay *et al.*, 1989) and this can have significant economic impact. But one of the problems often encoutered is the control of the legume-grass balance to obtain high forage production of

good nutritive value. However, several approaches to the problem were tested in France (ITCF, 1968, 1976; Lelièvre *et al.*, 1994, etc) and in Europe (Tewari and Schmid, 1960):

* change the seeding rate to include more grasses and less legumes or vice versa
* grow the legumes in rows amongst the vigourous grass species
* apply nitrogenous fertillizer to the mixture to control the legume growth,...

The experiment reported in this paper is designed to provide more information about the effect of seeding mode on the production and botanical composition of some alfalfa-perennial grasses mixtures using local material.

Materials and Methods

Two seeding modes (alternate single rows and mixture on the row) are tested on 3 mixtures of alfalfa-perennial grasses composed of: 1 local alfalfa (*Medicago sativa L.* var Gabès) and 3 local grasses (*Festuca arundinacea*, var Mornag, *Phalaris tuberosa*, var Soukra and *Lolium perenne*, var Thibar). All these 4 species were selected at INRAT station using massal selection. Gabès is low dormant variety with good tolerance to salinity, Mornag is a drought and hydromorphic tolerant variety and Soukra has a good winter growth with high seed production.

The sowing was done in december 1997 on sandy soil at Bouchrik station, located at 40km SE of Tunis (semi-arid area). The trial was conducted under rainfed conditions with some supplementary irrigations carried at critical period of the year (May-September) with a frequency of 1 irrigation/week.

The experimental design was a split plot with 3 replications. Each plot is composed of 10 rows, 25 cm spaced and 4 m long for each of the seeding mode. The seeding rate was 20kg/ha (50% alfalfa+50% grass).

The first cut was late (april 98), at the flowering stage of the grass and the following cuts were 4-5 weeks spaced. A total of 15 cuts were reached up to now (7 cuts in 1998 and 8 cuts in 1999). Eight rows/10 are harvested handly at 7cm height, weighed on the field for fresh yield and a sample of 500g is taken from each plot for hand separation to determine the botanical composition as well as the dry matter yield after dried on a hoven during 48h at 105°C.

Data was statistically analysed each year separately using the ANOVA analysis (SAS program). When the «F» value exceeded the 5% level of significance, the treatment means were further analysed by the Duncan test.

Results and discussion

Yield and botanical composition data from the seeding mode studies are shown in the following tables and figures.

Figure 1 shows that during the first year (year of establishment), The mixture yielded more forage than the alternate single row although the difference is not significant. Exception occured for alfalfa-fescue where the contrary is observed. Also, yield is the same for all the mixtures (14t/ha) but the proportion of alfalfa is variable: it is highe in the mixture with phalaris and ray-grass (respectively 75 and 72%) and low in that with fescue (55%).

Table 1 shows that at the first cut, yield and dry matter content differ significantly from one mixture to another.

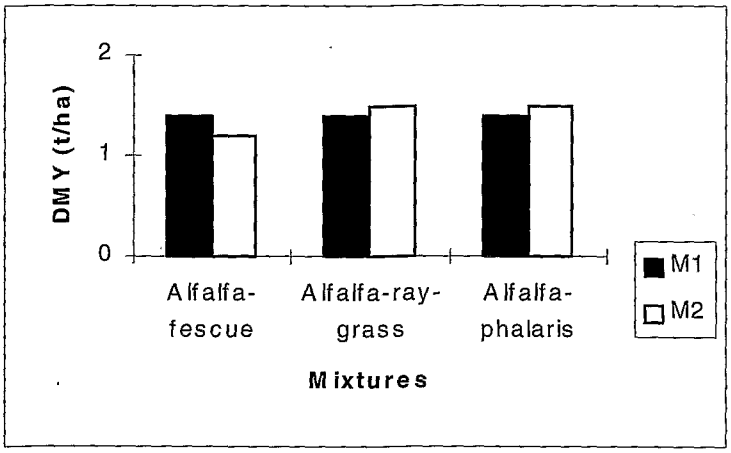

Figure 1: Total production (t/ha) of the mixtures according to the seeding mode at the first year.

Table 1: Dry matter yield (t/ha), dry matter content(%) and % alfalfa according to the first cut whatever the seeding mode.

First cut	early (1998)			late (1999)		
Mixtures	dmy	dmc	% alfalfa	dmy	dmc	% alfalfa
Alfalfa-fescue	0,3b	29ab	25a	0,1b	13a	40b
Alfalfa-ray-grass	0,6a	31a	14a	0,2a	11a	100a
Alfalfa-*Phalaris*	0,4b	25b	0,5a	0,1b	12a	54b

Values with the same letters are not signicantly different at 5% .

Table 2: Total yield (t/ha) and % of alfalfa for the 2 seasons and for 2 seeding modes.

	Mode 1		Mode 2	
	Year 1	Year 2	Year 1	Year 2
Alfalfa-fescue	14	15	12	16
% alfalfa.....	*(46)*	*(84)*	*(41)*	*(85)*
Alfalfa-ray-grass	14	17	15	16
% alfalfa.....	*(48)*	*(92)*	*(53)*	*(93)*
Alfalfa-*Phalaris*	14	15	15	16
% alfalfa.....	(42)	(87)	(38)	(87)

M1=alternate single row, M2=mixture on the row; year 1= year of establishment; year2= first exploitation year

With an early cut, production is high but the proportion of alfalfa is low and vice versa when the first cut is late. The dry matter content follows the same trend than the dry matter production.

During the second year (Table 2), an increase of yield was observed for all the crops. The proportion of the grass decreased and alfalfa dominate specially in association with ray-grass. It is important to indicate that the dormancy of the grass starts in early summer (July-September some times in May for ray-grass and *Phalaris*) when temperature increases and this allowed a high proportion of alfalfa in the forage.

Conclusions

The seeding mode had a small affect on the production and proportion of alfalfa during the 2 years.

At the first year, when the first cut is late, the proportion of alfalfa was lower in all the crops.

At the second year, the first cut was early and alfalfa was higher in the forage.

Whatever the year and the seeding mode, there is a small difference between the mixtures in terms of total production.

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