

Adaptation, Yield Performance, And Forage Quality Of New Grass And Legumes Species In The Central Region Of Saudi Arabia

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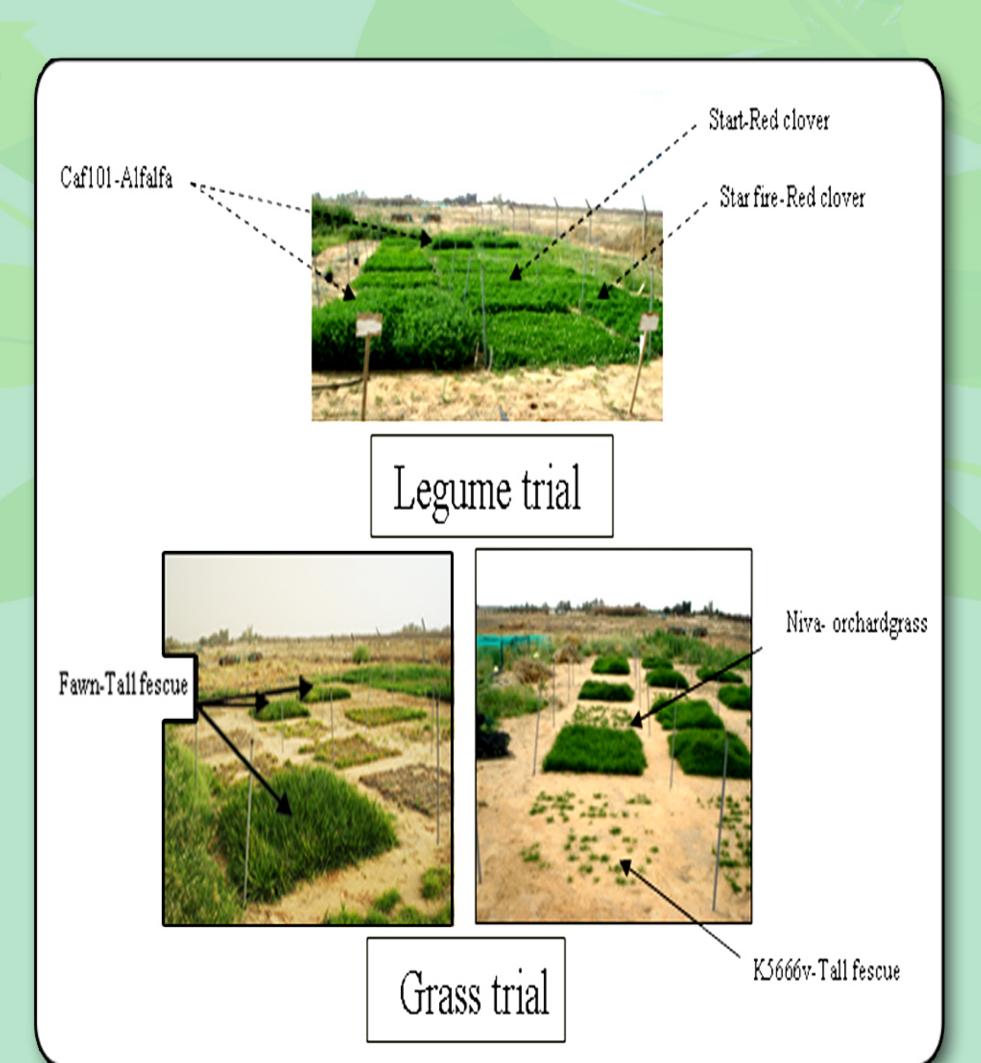
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Abstract

The objective of this study was to evaluate the adaptation, dry matter yield and forage quality of some new imported cool-season grass and legumes under the Saudi Arabian environment. Perennial grass and legume species trials were conducted during 2008-2009 seasons at College of Agriculture in Qassim University in the Qassim Province in central of Saudi Arabia. Three grass species were included: tall fescue (Festuca arundinacea Schreb.), perennial ryegrass (Lolium perenne L.), and orchardgrass (Dactylis glomerata L.). Four legumes species were seeded: red clover (Trifolium pretense L.), white clover (Trifolium repens L.), kura clover (Trifolium ambiguum Bieb.), and birdsfoot trefoil (BFT)(Lotus corniculatus L.). A locally grown alfalfa (Medicago sativa L) cultivar has been seeded as control for the legume trial. Cultivars within species were also included. The first year results showed that red clover, white clover and BFT species may be well adapted to this climate. Significant differences in total yield and forage quality among species were recorded. Moreover, variations among cultivars were also observed. Kura clover was slow to establish and yield was low for all cuts. Grass species were only productive for a short time since there was only one grass cultivar (Fawn-tall fescue) which survived high summer temperatures. Grasses was reseeded and there is no data available for the second year. Forage quality were vary within cultivars.

Introduction

The central region of the Saudi Arabia is dominant with desert environment (extreme summer temperature with mild and dry weather in winter). Forage production in this region is mostly dependent on growing alfalfa and some grass species such as rhodesgrass (Chloris gayana) and sudan grass (Sorghum bicolor). Alfalfa is considered the major forage crops in the country because of its widely adoption, great production of dry matter yield (DMY) and excellent in forage quality. However, since alfalfa has a high water demand, it is wisely to considered introduce alternative species that can be adopted to the Saudi Arabia environment, provide a good DMY, high in forage quality, and less water consumption. The objective of this study was to evaluate some new grass and legume species imported from the US under the environment conditions of the central region of Saudi Arabia.



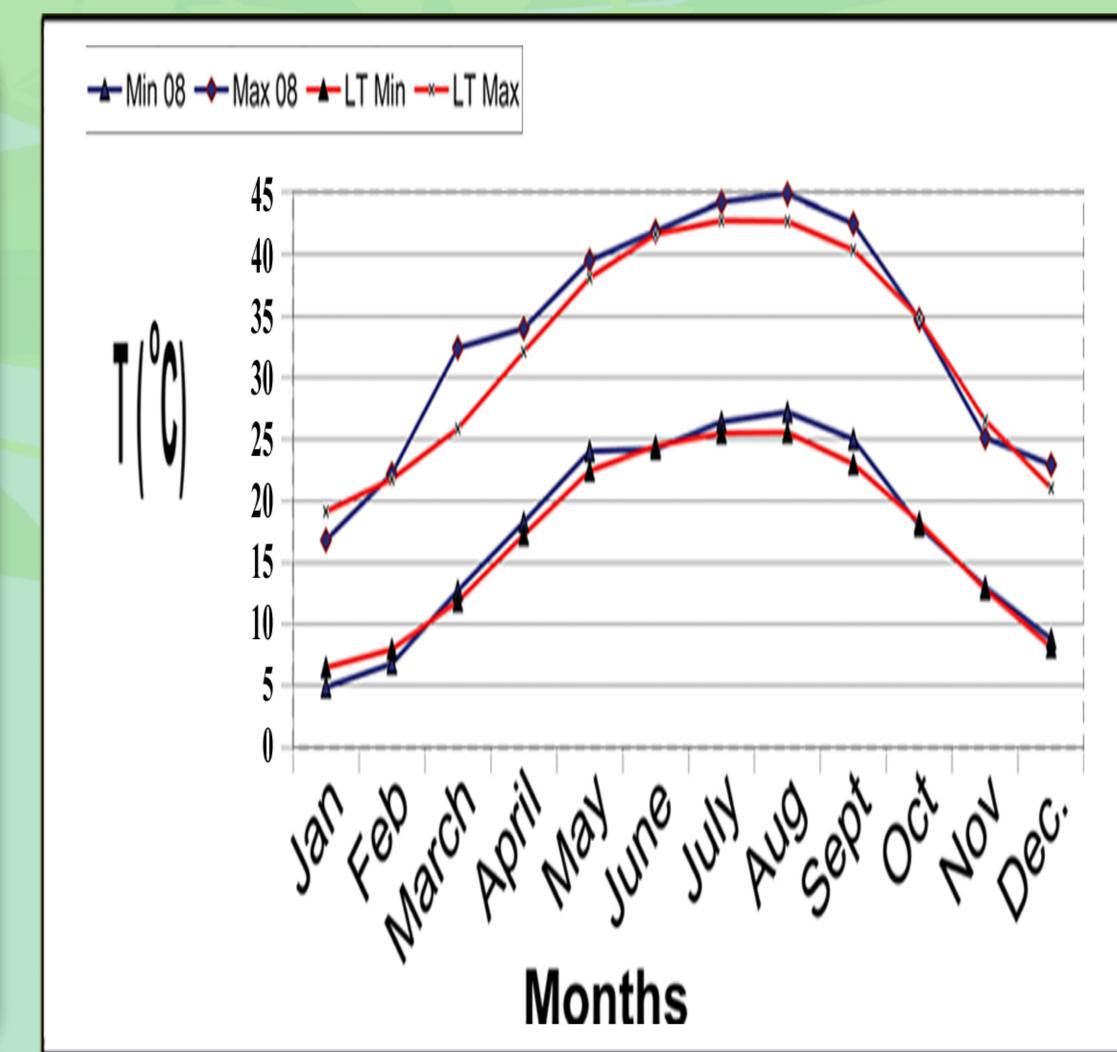


Fig 1. 2008 monthly maximum (max), minimum (min) and long term temperatures (LT) in Qassim province

Materials and Methods

-Two trials of new perennial legume and grass cultivars were established during 2008-2009 growing seasons to be evaluated for (DMY) and forage quality. The trials were conducted at The College of Agriculture and Vet. Med. Research and Experimental Stations in Qassim University at Qassim province (located in the central region of Saudi Arabia) (26 18 28 N, 43 46 E) in sandy soil with soil PH between 8 -8.5. Seeding date for legume trial was in November 6, 2007 and for grass trial was in January 5, 2008.

-The two trials were consisted of eight and six legume and grass cultivars respectively seeded in 1.5 by 2 m plots. Each trial was arranged in a randomized complete block design (RCBD) with three replications. Maximum and minimum air temperatures were recorded during 2008 (Fig1).

-Legumes species were included: Two red clover cultivars (start and stair fire), three white clover cultivars (kopu II, ladino and alice), one kura clover cultivar (endura), one birds foot trefoil (BFT) cultivar (norcen) and one alfalfa cultivar (caf 101) (as a control). Grass species were included: Two perennial ryegrass cultivars (quartet and aries), two tall fescue cultivars (fawn and k5666v), and two orchardgrass cultivars (tekapo and niva). During the season, three to eight cutting events were obtained depending on species with 30 to 40 days interval between each event.

-At each cutting events, samples were hand clipped at 8 cm height within a 0.30 m2 quadrate in each plot and dried at 60 °C for 72 hr. Dry samples were weighted for DM yield then ground for forage quality analyses. Forage quality analyses were completed by the Forage Analyses Lab, department of Animal production-Qassim University.

-All treatment means were compared using Fischer's LSD at p<0.05. Coefficient of variation (CV) was listed to measure the precision of the experiment. All statistical computations were performed using the MSTATC microcomputer program (MSTATC, 1990).

Results and Discussion

Legume trial: There were a significant differences (p<0.05) observed in DMY (tone-h1) among the seven legume cultivars (endura-kura clover was excluded due to poor establishment). Alfalfa had the highest average DMY comparing with the new cultivars (Table1). However, the two red clover cultivars (start and stair fire) demonstrated a good yield production. No significant differences was found among white clover cultivars and norcen-BFT in DMY (Table1). Even though, alfalfa and red clover cultivars presented the highest DMY, results of forage quality shown that these cultivars were the highest in fiber content. No significant differences was found in protein analyses among cultivars with the exception of norcen-BFT, which had the lowest protein content. Sugar content was shown a significant differences among cultivars (Table1). Seasonal differences in DMY occurred across cutting events (Table 2). The optimum DMY for all cultivars was found in the month of July, then began to decline tile the end of the season (Table 2). Kura clover had a poor establishment resulted of low DMY for all cutting events, which was expected as kura grows more slowly during the establishment year than other clover species (Speer and Allinson,1985).

Grass trial: Data analyses of the six grass cultivars have shown that there was a significant differences (p<0.05) observed in DMY among the cultivars (Table3). Results of forage quality components showed there was a significant differences between cultivars in protein, fiber and sugar. Niva-orchard grass had the highest protein content over the other cultivars (Table 3). Unlike legumes, grass cultivars were only productive for a short time as only three cutting events was obtained during the growing season (Table4). Thus, grass cultivars may need to be reseeded more often with the exception of fawn-tall fescue, which was provided more cutting events than other cultivars. Seasonal differences in DMY of species and cultivars occurred across cutting events. For instance, comparing the two perennial ryegrass cultivars, aries was higher in DMY than quarter. Moreover, the two orchard grass cultivars, tekapo was higher in DMY than niva. Fawn-tall fescue demonstrated a greater in DMY comparing to k5666v cultivar (Table 4). This was likely due to genetic background between cultivars within species.

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cool season legume cultivars during 2008 season in central region of Saudi Arabia								cutting during 2008 season in central region of Saudi Arabia										
forage quality components (%)							Dry matter yield (tone-h1)											
Species Cultivars		D3 677 (4 1.1)	YW1	n	0	Spices	Cultivar	20-March	27-Apr.	05-June	24-June	19-July	19-Aug.	16-Sep	30-Oct	Total		
	irs					rad alawar	Stor Eine	2.450	1760	2.700		5 150		3.27ab	2.25b	22.67		
red clover Start Start fire		3.78 b	18.87 b	20.46 a	44.34 b	red clover					-		-	2 10 ch	2.015			
		3.75 b	18.69 b	21.05 a	43.20 b	1.70										22.49		
White clover Ladino KopuII Alice		2.48 c	15.59 c	20.26 a	44.05 b						-		-			14.89		
		2.38 c	14.54 c	19.93 a	45.71 ab	clover	2				-		-			14.31		
											-		-			12.45		
											-		-			13.12		
						Alfalfa	Caf 101	3.84a	5.23a	6.49a	4.24	4.53a	3.73	4.51a	5.02a	37.59		
						Mean		2.18	3.54	3.55	-	3.94	-	3.05	2.24			
CV		22.77	10.52	10.14	6.68	LSD		1.34	1.38	1.11	-	0.97	-	1.34	1.28			
Table 3 .The mean values of dry matter yield (DMY) (tone-h1) and forage quality components of six							Table 4. Dry matter yield (tone-h1) of six cool season grass cultivars under different time of cutting											
cool season grass cultivars during 2008 season in central region of Saudi Arabia.							during 2008 season in central region of Saudi Arabia											
		forage quality components (%)				1	Dry matter yield (tone-h1)											
cultivar	DMY (tone-h1) Fil		er P	rotein	Sugar	Species	cultiv	ar	12-Apr		24-May 14-Jul				ert Total			
Aries	3.03b	26.4	15b 1	1.16b	45.24a	P. ryegrass	Arie		4.01a	3.8	2a 1	1.27b	-	-		9.10		
P ryegrass Quartet		26.0)7b 1	1.42b	44.18ab		Quart	tet :	3.06ab	2.4	4b 1	1.53b	-	-		7.03		
Niva	0.87d	25.5	58b 1	7.42a	38.98c	Orchard G							-	-		2.61		
Tekapo	2.26c	29.3	34a 1	2.46b	40.19c								-	-		6.79		
K5666V	0.93d			3.88b	45.08a		K5666	- 1	0.38c	0.9		1.52b	4 13	4 14		2.80		
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In each table, mean values within columns follow by the same letter are not significantly different at P<0.05 level according to Duncan's Multiple Range Test.

 Fawn
 4.02a
 27.25b
 12.78b
 43.69ab

 CV
 24.78
 6.39
 19.01
 8.28

Conclusions

- Alfalfa provided the highest DMY and exceptional persistence over new imported cool-season legume cultivars. Red clover has a potential success comparing with the other new legume cultivars. However, the three white clover cultivars used in this study and BFT had some successes and can be used as a grazing species. Kura clover unlikely to be a good candidate species in the central region of S.A due to the poor establishment.
- Grass species were only productive for a short time in the season since there was only one grass cultivar (Fawn-tall fescue) showed greater persistence over all other grasses. The poor productivity of niva orchard grass and K5666v-tall fescue was due to low tolerance to heat stress.
- Growers in Saudi Arabia should be considered these grasses as annual species with the exception of fawntall fescue.
- Forage quality components were vary within cultivars for both trials.
- Irrigation study on the above species must be conducted to evaluate water consumption for each cultivar.

References

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Acknowledgments

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