

## Fodder Production Comparison of *Cenchrus Ciliaris* Varieties, *Panicum Antidotale* and Local *Medicago Sativa*

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### Abstract

The experiment has been conducted at Swairy Research Farm which included; *Cenchrus varieties* (Biloela, Gyandah, USA, Local Libid ), *Panicum antidotale* ( Blue panic ) and *Medicago sativa* ( Local Berseem ). The analysis of the experiment for the first year revealed that the forage species showed no significant differences between them for green fodder production except Berseem at 5%. At the second year they showed significant differences between Berseem and each one of Blue panic, Gyandah, Biloela and USA and between Libid and each one of Gyandah, Biloela and USA at 5%. Combined analysis for the two years are revealed that significant differences within treatments, years, and interaction are found between treatments with years at 5% level. Berseem showed significant difference with each one of the forage varieties and species. No significant differences between varieties and species of Gyandah, USA, Biloela, Local Libid, and Blue Panic at the same level. The highest mean annual green fodder production for the combined two years is obtained from Gyandah 81.47 T/ha/y with a mean cut of 10.86 T/ha while the Lowest mean annual yield obtained from local Berseem 35.03 T/ha/y and a mean cut of 4.67 T/ha.

**Key words:** Fodder, Species, Varieties, Significant difference, Production, *Cenchrus*.

### Introduction:

Green fodders of gramineae and legume species are the most important forage crops for feeding animals. In Hadramout, the high yielding varieties of fodder have given attention in agricultural production due to the growth of animal population and low fodder production. *Cenchrus ciliaris* is widely naturalized in sub-humid and semi-arid tropics and subtropics which is the most drought tolerant of the commonly sown grasses [8]. Some exotic forage species have been introduced to the Wadi Hadramout. Since 20 years. Local libid (*Cenchrus*) is cultivated in Wadi Hadramout at the eastern part of the Wadi and it is more palatable to animals (Photo 1)[2], while Blue panic and Rhodes grass were introduced to the Wadi before 34 years [4].



Photo 1: Goats and sheep

Other exotic forage species were introduced in Wadi Hadramout such as Hybrid Napier, Napier grass and Hamil grass [3]. From rapid survey we found 4 farmers are still cultivating local

*Cenchrus* at Tarim District with a total area of 15120 m<sup>2</sup> [2]. Local Berseem is the most cultivated fodder crop in the Wadi among the farmers. The farmers are in need of high yielding forage varieties, hence *Cenchrus* varieties have been introduced to Yemen recently. Finding out better forage production species is the main tragic of the agricultural research and this study.

### Materials and methods:

Experiment of randomized complete block design has been conducted at Swairy Research Farm (Photo 2) on forages included four blocks, four replications and six treatments of forage varieties and species; *Cenchrus ciliaris varieties* (Biloela, Gyandah, USA and Local Libid), *Panicum antidotale* (Blue panic ) and *Medicago sativa* ( Local Berseem ).



Photo 2 : Experiment

The forages were cultivated in February/2010. The soil has been ploughed, leveled and divided to basin plots of a size 2.7 x 4.7 meters while the seeds of varieties and species were scattered by hand on each plot. Seed rate of 60 gm/ plot for *Cenchrus*, 6 gm/ plot for *Panicum* and 43 gm/ plot for local *Medicago* have been applied. Seeds have been covered by fine soil layer using the rake. In April first cut of the forages have been

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harvested. Approximately monthly cut of forage is followed up and fifteen cuts during the two years were collected which fodder of each cut is weighted. The fertilizer of urea manure has been applied in a dose of 25 kg/ h to forages after each cut while the irrigation intervals were 8 – 10 days with a total of 26 irrigations per a year. At the eighth cut, plant density and water application were calculated. Chemical analysis for nitrogen and crude protein contents in forages were worked at Seiyun Research Station. Al-Rawi and Khalafa-Allah explained that experiments replication in locations or in years may be analyzed separately or can be combined [1]. In this case the forage experiment has been analyzed each year, then the combine analysis of the two years have been executed.

#### Results and discussions:

**Separately analysis for the two years:** The analysis of the experiment for the first year revealed that the forages varieties and species showed no significant differences between them for green fodder production except Berseem at 5% level. At the second year they showed significant differences between Berseem and each one of Blue panic, Gyandah, Biloela and USA and between Libid and each one of Gyandah, Biloela and USA but there are no significant differences between Blue panic and each one of Gyandah, Biloela, USA, and Libid, also between Gyandah and each one of Biloela and USA, besides no significant differences between Biloela and USA and between Libid and Berseem at 5% level (Table1).

#### Combine analysis for two years:

The experiment has been continued for subsequent year, then combine analysis has been computed. Significant differences are showed within treatments, years, and interaction between them at the 5% level (Table1). Berseem showed significant difference with each one of the forages varieties and no significant differences between varieties of Gyandah, USA, Biloela, Blue Panic, and Local Libid at the same level. There is significant differences between the first year and the second at 5% level which the first year was the best. The interaction between Gyandah treatment and year has no significant difference rather than other treatments at 5% level.



The Gyandah (Photo 3) and USA are exhibited a high degree of consistency and perform extremely well in the first and second year, 230.2 Kg/ Plot and 183.3 Kg/ Plot as well as 235.3 Kg/ Plot and 177.4 Kg/ Plot respectively while Blue Panic, and Local Libid produced high yield at first year (Table 1).

**Table (1) Means variances analysis of green fodder production ( kg/plot )**

Type of analysis	Treatments means						L.S. D 5%
First year ( T )	1	2	3	4	5	6	52.90
	Blue panic	Gyandah	Biloela	USA	Libid	Berseem	
	262.0	230.2	234.8	235.3	255.5	115.6	
Second year ( T )	1	2	3	4	5	6	56.27
	Blue panic	Gyandah	Biloela	USA	Libid	Berseem	
	132.3	183.3	174.9	177.4	95.2	62.2	
Combine of two years Years	Y1	Y2					22.60
	222.	137.6					
Treatments	1	2	3	4	5	6	39.14
	Blue panic	Gyandah	Biloela	USA	Libid	Berseem	
	197.1	206.8	204.8	206.4	175.4	88.9	
Interaction ( T x Y ) Treatments	1	2	3	4	5	6	55.36
	Blue panic	Gyandah	Biloela	USA	Libid	Berseem	
Y1	262.0	230.2	234.8	235.3	255.5	115.6	
Y2	132.3	183.3	174.9	177.4	95.2	62.2	

**Cuttings, green and dry fodder production for two years:**

In Wadi Hadramout, mean annual forage production for Hybrid napier, Napier and Hamil was 187, 154 and 72 ton / ha / year, respectively [3]. Hybrid Napier and Napier grass produced high forage better than *Cenchrus* varieties, that it may be differed in plant characteristics. From 15 cuttings of the varieties and species, the best mean cut of fodder is for Gyandah which yielded 10.86 ton/ha/cut as well as 81.47 ton/ha/y. The low fodder yield is obtained from local Berseem which yielded mean cut of 4.67 ton/ha and 35.03 ton/ha/y (Table 2). In the prevailing climate under arid zone CAZRI 358 and CAZRI 2221 proved to be the best genotypes for fodder production.

Twelve cuts of green fodder have been harvested from them during 2011 – 2014 with annual mean yield 9219.4 k/ha and 8731.5 k/ha respectively [9]. The Australian accession Biloela produced a dry matter yield of 7160 Kg/h and 4930 K/h at year 1 and 2 respectively [8]. The Indian CAZRI genotypes of *Cenchrus* and Australian accession Biloela showed low fodder production annually when compared to the production yield of green or dry fodder produced from Blue panic, Gyandah, Biloela, USA, Local Lebid and Local Berseem (Table 5), The variations of fodder production may be due to different types of irrigation system, plant density, number of cuts per a year and environmental factors, etc.

**Table (2) Mean cut, annual production of green and dry fodder for two years of forages varieties and species**

Varieties	Mean cut Ton / ha	Annual mean of green fodder T / ha / y	Annual mean of dry matter T / ha / y
Blue panic	10.36	77.67 ( 77670 kg )	17.09 (17090 kg )
Gyandah	10.86	81.47 ( 81470 kg )	17.11 ( 17110 kg )
Biloela	10.76	80.70 ( 80700 kg )	14.53 ( 14530 kg )
USA	10.84	81.31 ( 81310 kg )	17.89 ( 17890 kg )
Local Lebid	9.21	69.10 ( 69100 kg )	10.36 ( 10360 kg )
Local Berseem	4.67	35.03 ( 35030 kg )	8.06 ( 8060 kg )

**Water use efficiency and green fodder production at first year :**

Buffel grass (*Cenchrus ciliaris*) is one of the most important plant of high water use efficiency and animal palatability, and can be a very good alternative species to other forages which consume large amounts of irrigation water [5]. The traditional basin or surface irrigation system is used in the experiment and approximately 28287.36 m<sup>3</sup> / ha / y of water has been applied. Drip irrigation system is used In Saudia Arabia using 12831m<sup>3</sup>/ha/year of water irrigated gramineae species such as *Cenchrus ciliaris*, *pennisetum divisum* and *Lsiurus scindicus* [6]. The quantity of water applied to forage experiment was higher than the applied water to *Cenchrus ciliaris* and other gramineae species mainly because of the variation between the two irrigation systems. In general drip irrigation system is reduced irrigation water quantity to about the half which the system is more suitable for dry area. At first year, the cubic meter of water use may produce 6.4 – 6.5 kg green fodder for the varieties of Gyandah, Biloela and USA while 7.3 – 7.8 kg green fodder for Blue panic

and local Libid and the lowest green fodder production 4.2 kg is obtained from local Berseem (Table 3). In lahj Gov of Yemen the variety Gyandah recorded 3.872 kg green fodder per cubic meter of water application [7]. The experiment showed high forage production per cubic meter of water better than obtained in Lahj and it may be due to water application quantity and irrigation intervals as well as plant density. The plant density of the forages in the experiment is varied between 33 – 96 plant/m<sup>2</sup> which seems to be a high number and may be affected species for fodder production (Table 3). In Lahj the plant density of *Cenchrus ciliaris* was 4 plant/m<sup>2</sup> only [7]. At the first year forage production of Hybrid napier, Napier grass and Hamil was generally higher than the second year for all three grasses ( 179 ton / ha and 97 ton / ha ), and at the same first year of seasonal growth, Hybrid napier and Napier grass were gained high forage production, 261.6 ton / ha and 200.8 ton / ha respectively [3]. The high forage production at first year for Hybrid napier and Napier grass was similar to *Cenchrus varieties*, Blue panic and local Berseem but Hybrid napier is a little bit higher.

**Table (3) plant density, green fodder production per year, green fodder production per cubic meter of irrigation water application and dry matter percent at first year**

Varieties	Plant density mean/m <sup>2</sup>	Green Fodder mean production ton/ha	Green fodder mean production/ kg / m <sup>3</sup> water	Dry matter%
Local Libid	96	220.9	7.8	15
Blue panic	57	206.3	7.3	22
USA	33	185.3	6.5	22
Biloela	58	184.8	6.5	18
Gyandah	57	182.1	6.4	21
Local Berseem	88	117.6	4.2	20

**The nitrogen and protein content in the forages:**

At the flowering stage, chemical analysis for nitrogen and crude protein content in the forage varieties and species have been worked at

Agricultural Research station/ Seiyun. The highest crude protein content in plant leaves is found in Blue panic (12.9%) followed by *Cenchrus* varieties (9.0 – 10.1 %) and the lowest for local Berseem (7.7%) (Table 4).

**Table (4) Crude protein and nitrogen content in the forages**

Variety/species	Total nitrogen %	Crude protein %
Biloela	1.58	9.8
Gyandah	1.62	10.1
USA	1.44	9.0
Local Libid	1.52	9.5
Blue panic	2.07	12.9
Local Berseem	1.23	7.7

**Conclusion:**

Wadi Hadramout is in need of high yielding forages to face deficit in fodder production and accommodate animal health growth. Species and varieties [*Cenchrus varieties* (Biloela, Gyandah, USA, Local Libid ),*Panicum antidotale* and

*Medicago sativa* ( Local Berseem ) of fodder have been compared in a trial conducted at Sawairy research farm. The experiment revealed that exotic species, varieties and local libid have yielded high fodder production better than local Berseem.

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## مقارنة إنتاج العلف لأصناف من الليبد والثمام والبرسيم المحلي

أحمد سالم باطاهر

### الملخص

نفذت تجربة أصناف الليبد والثمام والبرسيم المحلي في المزرعة البحثية بالسويدي. وأظهر التحليل الإحصائي للسنة الأولى عدم وجود فروق معنوية عند مستوى 5% وذلك بين أصناف وأنواع الأعلاف في إنتاج العلف الأخضر ما عدا البرسيم. في السنة الثانية أظهر التحليل وجود فروق معنوية بين البرسيم وكل من Blue panic, Gyandah, Biloela and USA وبين الليبد وكل من Gyandah, Biloela and USA عند مستوى 5%. أشارت نتائج التحليل التجميعي للسنتين وجود فروق معنوية بين معاملات الأصناف والأنواع وبين السنوات وبين المعاملات والسنوات ( التفاعل ) عند المستوى نفسه. وأظهر البرسيم المحلي فروقاً معنوية مع كل من معاملات أعلاف الأصناف والأنواع كما لا توجد فروق معنوية بين الأصناف والأنواع لكل من Gyandah, USA, Biloela, Local Libid and Blue panic عند المستوى نفسه. إن أعلى متوسط سنوي لإنتاج العلف الأخضر خلال السنتين قد أعطاه الصنف Gyandah بمعدل 81.47 طن/ هكتار / سنة وبمتوسط 10.86 طن/ هكتار/ للحشة الواحدة بينما أعطى البرسيم المحلي أدنى مستوى للإنتاج السنوي من العلف الأخضر إذ بلغ 35.03 طن/ هكتار/ السنة ومتوسط الحشة الواحدة من العلف الأخضر بلغ 4.67 طن/ هكتار.

**الكلمات المفتاحية:** علف، أنواع، أصناف، فرق معنوي، إنتاج، ليبد.