

## Threshing and processing of indigenous species Problems and Solutions

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The forages are the main stay of animals. The productivity of forage crops could be increased considerably with adoption of suitable packages. In addition to common agronomic practices such as sowing time, plant to plant spacing, row spacing, fertilization and irrigation water management, the harvesting schedule/time is also another important aspect needs consideration. Establishing reliable forage depends on the availability of reliable supplies of quality seed at the time of planting. Thus forage development programs need to include local seed production. In many countries seed supply has been the main stumbling block to pasture development. Seed of some species is chronically in short supply, and seed quality of lines have often been poor and with special harvest difficulties.

Seed production is the final stage of a sequence of plant processes, some of which can be more easily controlled by the grower than others. The potential yield is limited by the density of flower produced which depend on the degree of plant branching to form shoots, the proportion of the surviving shoots which are fertile and the extent of inflorescence differentiation to form flowers. Harvest of efficiency of many tropical pasture seed crops is very low indeed, since flowering proceeds over a long period. In addition, seed of many crops drop to the ground soon after ripens. Thus only small proportion of the seed produced may be recoverable by harvest at any one time. These problems may be partly overcome by careful choice of site, good establishment practice and crop husbandry, and by appropriate harvesting and processing techniques. To be useful for planting, these grasses must also have the ability to be separated easily from the floret parts (Palea and lemma) to avoid any inhibitor that may exist in the seed cover (*Cenchrus* spp.) and facilitate establishment. Seed production and seedling establishment was considered crucial characters in the domestication of a species. Seed shattering is also the main reason for low harvest of seed production. Seed of most species of tropical pasture grasses has a reputation for low quality. To improve seed quality, admixture (chaff, straw, and undesirable seed) should be removed.

### Objectives

4. Comparing the efficiency of different threshing machines.
5. Possibilities of removing impurities by Air Screen Cleaner.
6. Determination of best harvest time.

### Problems at Field Level

Seed has special difficulties encountered at field level

1. Species flowers over a long period.
2. Poor synchronization of flowering.  
Gives a low proportion of ripe seeds.
3. Uneven ripening of seed on the individual inflorescence.
4. Rapid shedding of ripe seed.
5. Lodging of some species (*L.scindicus*)

### Problems at Processing Level

1. Fruit not contain true seeds; known as “empty seed”.
2. Strong attachment of palea and lemma.
3. Floret in many cases contain more than one seed
4. Awns or bristles and other appendages.
5. Variation in seed size.
6. Continual adjustments to the equipments.

### Machines Selection

At the beginning of the project from 1998 to 2001 the following attempts were made

1. Manual separation was used by shaking the inflorescence to allow loose seeds to fall into bags.
2. The choice of machines depends on species, quantity of seeds and degree of cleanliness required.

According to the observed results, two different threshers have been tested

1. Kamas Westrup scarifier.

## 2. Kimseed precision thresher.

The moment seeds reach physiological maturity; will start to fall down on the ground and every month sweeping of fallen seeds is made. This will expose fallen seeds to irrigation water and hence affect seed viability and increase seed moisture content (rotten seed) which will need short periods of drying before threshing. Undesirable materials and inert matter (chaff, stones, sand etc..) removed before threshing to facilitate threshing process and avoid machine damage. Raw material prepared for threshing and then weighing to determine the amount of seed produced/g raw material.

### Seed Cleaning

Many different machines were used from the period 1998 to 2001 such as Fractionating Air Aspirator and Air Screen Cleaner to measure the efficiency and degree of cleanliness and Air Screen Cleaner seemed to be relatively efficient in terms of percentage seed recovery.

Seed cleaned using Kamas Westrup Air Screen Cleaner to

- Remove undesirable materials (dust, trash, small stem parts, unthreshed florets)
- Upgrade quality by removing inferior seeds

Pure seed stored at both low temperature and humidity (deep freeze) within a container (polythene bags to reduce moisture absorption, protect from insects

Seed packets and bags were labelled.

### Results

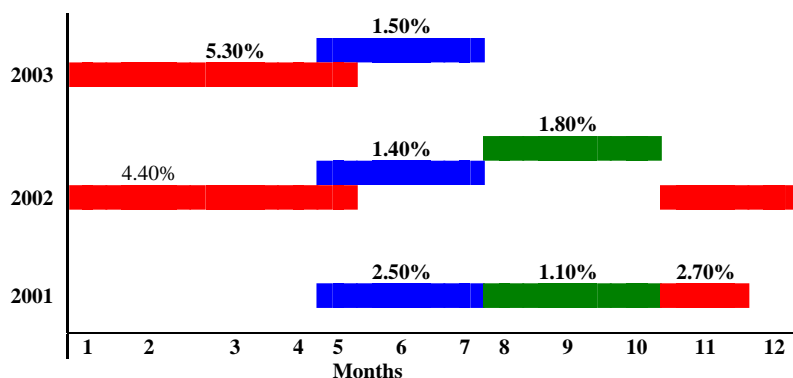


Fig. 1 Collection periods in *Cenchrus ciliaris* L.

Seeds will be tested for

1. Moisture content.
2. Purity.
3. Germination.

### Recommendation

Method of harvesting will improve seed quality; such as sucking, sweeping or rubbing inflorescence keeping the immature seeds on the mother plants.

## Productivity of forage grasses as affected by frequency of harvest and irrigation in UAE

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### Abstract

Under drip irrigation, Labeid (*Cenchrus ciliaris* L.) was more productive than Tomam (*Panicum turgidum* Forssk); Da'ay (*Lasiurus scindicus* Henr.); Dakhna (*Coelachyrum piercei* Hochst.); Alfalfa (*Medicago sativa* L.) and Rhodes grass (*Chloris gayana* kunth). Labeid was affected the least of all species when the level of irrigation was reduced by 50% or 75%. It was the highest in water use efficiency, where the amounts of water to produce one kg of dry matter ranged between 0.81 and 1.88 m<sup>3</sup>. The second best was Rhodes grass where the values ranged between 1.18 and 2.13 m<sup>3</sup>. Alfalfa showed poor performance under the conditions of the study and so was Dhakhna, which did not withstand the repeated, clipping.

### Introduction

Large areas of rangelands in the Arabian Peninsula have been lost due to urban expansion and irrigated agriculture or have been degraded due to overgrazing and other mismanagement. Rangeland degradation has led to feed shortages in the region, and forces livestock owners to rely on irrigated forage production to feed their animals. Today, to make up for the feed shortages, large volumes of the scarce water resources are used to produce exotic forages, such as Rhodes grass and alfalfa, which have relatively high water requirements. Values as high as 48 000 m<sup>3</sup>/ha year have been quoted for the above two forages. Apart from being unsustainable, productions of these forages have resulted in many countries of the Arabian Peninsula in abandoning of cultivated lands, due to problems of salinity.

Water is fundamental to sustainable agricultural development in the Arabian Peninsula. Demand for water greatly exceeds availability and mainly draws on non-renewable underground water reserves and desalinated water. Irrigation consumes by far the largest share of the available water resources and the continued use of ground water to meet agricultural production targets has led to declining water levels and increased salinization

To tackle the problem of rangeland production system of the Arabian Peninsula, the main task is to merge the problem of degradation of natural vegetation, the feed shortages of the existing livestock population and the limited waters resources available for forage production. The main strategies accepted by APRP to tackles these problems consist of

- (1) Conservation and sustainable management of rangeland vegetation
  - Restoration and rehabilitation of rangeland through the collection and active re-establishment of indigenous rangeland vegetation
  - Introducing appropriate grazing management
- (2) Production of stress tolerant and water use efficient irrigated forage crops that provide supplementary feed and reduce pressure on the rangeland vegetation at critical periods.
  - Utilizing indigenous forage and rangeland species that are well adapted to the environmental conditions
  - Introducing alternative forage and rangeland crops, indigenous or exotic that are better adapted than conventional forages which require less water

Indigenous forages and rangeland plants are very much adapted to the harsh arid environment and with high water use efficiency; therefore these are urgently needed to provide feed for livestock. ICARDA's Arabian Peninsula Regional Program, in partnership with the national agricultural research systems (NARS) in the region, has succeeded in identifying a number of indigenous forage and range species that are adapted to the environment in the Arabian Peninsula. The following target species have been identified for United Arab Emirates *Cenchrus ciliaris*, *Coelachyrum piercei*, *Panicum turgidum*, *Lasiurus scindicus*. Unlike the exotic forages, however the productivity of these species as a function of the amount of water is not fully known nor their persistence to frequency of clipping

In the present study, the four indigenous grasses (above) and two exotic species (*Medicago sativa* and *Chloris gayana*) are being compared for their productivity and water use efficiency. The study is also assessing the performance of the different species under different levels of irrigation and their persistence to frequency of clipping

### Materials and Methods

The experiment is conducted at the research farm of the Ministry of Agriculture and Fisheries at Dhaid in the Central region, UAE. The soils are loamy sand with high level of gravel content (50%) in the sub-soil, which decreases with depth (25% at 30 cm). The soil pH ranges between 8.4 and 9.4. The soil is low in mineral nutrients, ranging between 0.9 and 6.4 mg/kg for N; 1.0 and 8 mg/kg for P and 15 and 60 mg/kg for K. Rainfall is low and erratic. Rainfall average for the station (1991/92-2000/2001) was 161 mm and the range was 4 mm to 414 mm occurring mostly in the period December - April. July is the hottest month (mean maximum and mean minimum temperatures are 44.6°C and 29.2°C) and January is the mildest month of the year (26.2°C and 11.8°C).

The grasses tested were native species (Buffel grass) *Labeid* (*Cenchrus ciliaris* L.); *Tomam* (*Panicum turgidum* Forssk); *Da'ay* (*Lasiurus scindicus* Henr.) and *Dakhna* (*Choelachyrum piercei* Hochst.). The exotic species *Alfalfa* (*Medicago sativa* L.) and *Rhodes grass* (*Chloris gayana* kunth). The indigenous species were collected from a protected area of the National History Museum at Sharjah, while the exotic species were obtained from local market at Dhaid. All species were seeded on 2.5 x 2.5-m plots in March 2002. Seeds were placed at 0.5-1-cm depth at 50 cm intervals along the line and 50-cm between lines and irrigated by drip irrigation system, with 50 cm between the drip nozzles and 50 between the drip lines (each plot has 6 drip lines and 33 drip nozzles). All plots were irrigated for 32 minutes (70.3 litres/plot) every other day during establishment. All plots were cut to a 5-cm height on May 20, 2002. Three irrigation regimes were then imposed referred to as T1, T2 and T3 (high, medium and low irrigation treatments) the actual amounts of the water applied in each treatment varied with the season (Table 1). A split-plot experimental design was used with the irrigation as the main plot and forage species as the sub-plot. There were three replications. There are borders of one meter between sub-plots, two meters between the main plots and 3 meters between replications (blocks). Soil moisture was monitored for one-month in summer, fall winter and spring using TDR instrument.

Plots were sampled at interval 4-6 weeks using sampling areas of 1.0 x 1.0-m permanently located in the center of the sub-plot. The sampling area was harvest to a 5-cm height; placed in paper bags then the rest of the plot was harvested to the same height. Fertilizer was applied (NPK 202020) at 25 kg/ha after each harvest. Forage samples were oven-dried at 70°C for 48 hours and weighed.

**Table 1. Estimated water application per plot per day for different irrigation treatments at various seasons**

Irrigation level	Winter (NDJF)	Summer (MJJA)	Spring/Fall (MASO)
T1 (High)	35l/plot per day	105.6l/plot per day	70.3l/plot per day
T2 (Medium)	17.5l/plot per day	52.8l/plot per day	35l/plot per day
T3 (low)	8.9l/plot per day	26.4l/plot per day	17.5l/plot per day

### Results and Discussions

The plots were harvested ten times in the first season 2002/03 (June 2002-May 2003). Where the species showed different performances due to watering regime and frequency of harvest. Buffel grass was the highest producer out of the six forages 15 t/ha followed by *Panicum turgidum* and *Rhodes grass* at 11.97 and 11.90 t/ha respectively (Table 2). *Alfalfa* was the poorest performer of all forages. The plots under this species were totally empty after the second cut at all levels of irrigation. Plots of alfalfa were doing well in a nearby field under flood irrigation. Apart from moisture limitation grasshoppers were observed feeding on plots of alfalfa in the experiment. The maximum forage yield was recorded under T1 (13.86 t/ha) and the yield was reduced by 28% and 65% when irrigation was reduced to T2 and T3 respectively. Individual species showed different performance due to irrigation treatments. Drop in yield due to reduced irrigation was greatest under *Rhodes grass*, amounting to 43% and 73% at T2 and T3 respectively in relation to T1. Similar values for *Labeid* 25% and 55%; *Tomam* 8% and 61%; *Da'ay* 30% and 65%, respectively. *Dakhna* was the lowest forage producer out of all indigenous species. This species seems to suffer from repeated clipping, as the result there was little to harvest in some plots during the second season.

In the second season starting June through October 2003, four harvests were taken so far. Table 3 show that the total cumulative forage out of the four harvests was again highest under *Labeid* (9.89

t/ha) followed by Rhodes grass (7.67 t/ha) with Dakhna being the lowest at 2.66 t/ha. As in the first season Rhodes grass was very much affected by reduction in the irrigation level. Reduction in dry matter amounted to 50% and 71% of the production at T1 as the level of irrigation was reduced to T2 and T3 respectively.

**Table 2. Total forage production during the first season out of ten cuts (t/ha oven dry) under three irrigation treatments**

Forages	T1 (high)	T2 (medium)	T3 (low)	Mean
Labeid (Cc)	20.00	15.00	8.92	15.00
Dakhna (Cp)	13.42	8.92	3.98	8.77
Alfalfa (Ms)	0.48	0.18	0.09	0.25
Rhodes grass (Cg)	19.43	11.05	5.23	11.90
Tomam (Pt)	15.55	14.35	6.00	11.97
Da'ay (Ls)	14.27	9.97	4.90	9.71
Mean	13.86	9.91	4.85	

Similar values for Labeid were 25% and 61%. Those for Tomam were 23% and 49% and for Da'ay 47% and 58% respectively.

**Table 3. Total forage production during the second season out of four cuts (t/ha oven dry) under three irrigation treatments.**

Forages	T1 (high)	T2 (medium)	T3 (low)	Mean
Labeid (Cc)	13.86	10.45	5.36	9.89
Dakhna (Cp)	3.83	2.57	1.57	2.66
Rhodes grass (Cg)	12.86	6.41	3.75	7.67
Tomam (Pt)	6.86	5.20	3.49	5.17
Da'ay (Ls)	7.44	3.97	3.11	4.84
Mean	8.96	5.72	3.46	

Table 4 shows the forage production in relation to water application. Buffel grass (Labeid) was the highest in water use efficiency, where the amounts of water to produce one kg of dry matter ranged between 0.81 and 1.88 m<sup>3</sup>. The second best to Labeid was Rhodes grass, where the values ranged between 1.18 and 2.13 m<sup>3</sup>. The results suggest that Labeid is probably more efficient in dry matter production than all grasses tested. These results will be verified further using additional data from the current season as well as the data of the previous season

**Table 4 Amounts of water (m<sup>3</sup>) per kg dry matter of five forage grasses during different times of the year in 2003 at Dhaid, UAE.**

Date of harvest	Crop age (days)	Labeid	Dakhna	Rhodes grass	Tomam	Da'ay
June-22	32	0.81	2.44	1.18	1.37	1.38
July-28	36	1.64	5.40	1.92	2.85	3.97
September-6	40	1.88	10.95	2.13	3.64	3.82
October-12	36	1.38	6.82	1.80	4.33	3.73