

DESCRIPTION OF GRASS SPECIES

This section includes short descriptions of grasses that are of special interest to scientists, particularly in the context of desertification control and biodiversity; all are found in the Lake Chad Basin. Other species collected for *kreb* in different ecological conditions include: *Eragrostis pilosa* (wild tef), *Setaria sphacelata*, *Cenchrus leptacanthus* and *C. prieurii*, *Echinochloa stagnina* and *E. colona*, *Tribulus terrestris* and *Oryza breviligulata*.

LOCAL NAMES

The grass known in Arabic as *drinn* (*Aristida pungens*) was once the foremost wild grain found in the northern Sahara ^[4,3]. *Panicum turgidum* (*afezu*, or *altumam* in Arabic) was a very important perennial grass adapted to very dry conditions with a

rainfall as low as 250 mm per year and much collected for *kreb* production. Table 3 lists a selection of *kreb* species with their Arabic and botanical names.

It is interesting to note that local names often refer to the typical use of the plants, thereby highlighting the links between the environment, the people and the ways in which they use the plant. For example, the Peul use the following words:

- > *fagg* (to collect, to put aside)
- > *hudo* (herbs) refers to all grasses with the exception of cereals
- > *lekki* (tree) refers to all other phanerogams
- > *pagguri* refers to all grasses used for *kreb* production
- > *pagguri-jaawle* (famine grass) refers to *Brachiaria* sp.
- > *pagguri-gertoodè* (famine grass) refers to *Setaria sphacelata*.

More examples of the links between local names of plants and their appearance, qualities, uses, origin and biotope are given by Tourneux and Seignobos ^[4,4]. For example:

- > *haako-ndiyam* (water vegetables) refers to *Amaranthus caudatus*
- > *li'eere-leeno* (local cotton) refers to *Gossypium hirsutum punctatum*
- > *sawru-gawri* (millet guardian), so called because it is not removed from millet fields, refers to *Amorphophallus aphyllus*
- > *senkello-bafeere* (black-soil *Alysicarpus*) refers to a combination of *Alysicarpus* spp.
- > *senkello-yoolde* (sandy-soil plant) refers to *Alysicarpus vaginalis*
- > *tuppe-degol* (weed from General de Gaulle) is the Peul name for *Achantospermum hispidum*, which was introduced by animals migrating from the north after the war with General de Gaulle in the 1950s.



ALYSICARPUS VAGINALIS [PLATE 1]



CENCHRUS PRIEURII [PLATE 8]



ECHINOCHLOA STAGNINA [PLATE 9]

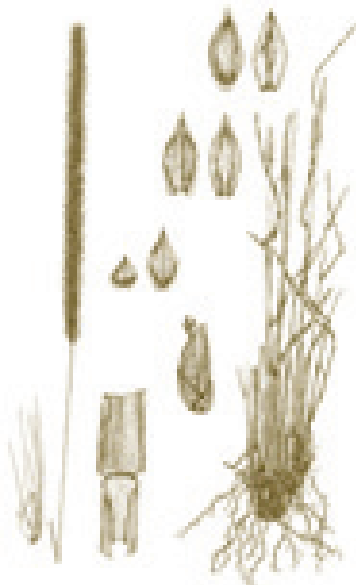
TABLE 3 ARABIC AND BOTANICAL NAMES OF *KREB* SPECIES AND THEIR PREFERRED SOIL TYPES

ARABIC NAME	TYPE OF SOIL			BOTANICAL NAME
	BLACK	CLAY	SANDY	
<i>abu asabé</i> (father of fingers)		X	X	<i>Dactyloctenium aegyptium</i> Wild.
<i>abu béilé</i>		X		-
<i>abu layo</i> (father of porridge)		X	X	-
<i>adar</i> (pond shores)	X			<i>Sorghum sudanicus</i> (wild sorghum)
<i>al fula</i> (pond shores)	X			<i>Echinochloa pyramidalis</i>
<i>am dijankga</i>			X	<i>Eragrostis tremula</i>
<i>am sakiné</i> (knife mother)	X	X		<i>Echinochloa stagnina</i>
<i>am surmo</i> (swamp)				-
<i>ascanit abu shock</i> (spiny <i>cram cram</i>)		X	X	<i>Cenchrus catharticus</i>
<i>diffré</i>		X		<i>Urochloa</i> sp., <i>Echinochloa colona</i>
<i>kalassindra</i>		X		<i>Eleusine indica</i>
<i>kamdallah</i>		X		<i>Brachiaria regularis</i>
<i>timan</i> (twins)		X		<i>Panicum turgidum</i> , <i>Panicum laetum</i>

Source: P. Créac'h, 1993^[4,5].



ELEUSINE INDICA [PLATE 10]



SETARIA SPHACELATA [PLATE 11]



ERAGROSTIS PILOSA [PLATE 12]

SELECTED GRASSES IN LAKE CHAD BASIN ECOSYSTEMS

Panicum laetum

Known as *baya* in Haoussa and *timan* in Arabic ^{[4.5], [4.8]}, this plant is found in a broad swathe across sub-Saharan Africa, from Mauritania to the Sudan. It is an annual that frequently grows in black clayey soils in areas that are seasonally flooded.

Its seeds are relatively easy to harvest and are used as the basis for porridge. The seeds are eaten in Kano state, northern Nigeria, and in central Chad.

The plant is also particularly appreciated by animals and is well suited to the production of hay and silage.



PANICUM LAETUM ^[PLATE 13]

TABLE 4 PANICUM LAETUM

CEREAL	Protein content ¹	
<i>Panicum laetum</i> (mixed with <i>Echinochloa colona</i>)	11.10	
Wheat	9.85	
Oat	9.70	
AMINO ACID ²	<i>Panicum laetum</i>	Wheat
Valine	4.49	5.1
Isoleucine	3.75	3.7
Leucine	7.96	6.8
Phenylalanine	4.59	4.5
Methionine	1.78	1.45

¹% of dry matter
²g for 100 g protein

Source: FAO, 1997 ^[4.7]

Panicum turgidum

This perennial grass is known as *afezu* or *markouba* in the Sahel and *taman* or *tuman* in the Sudan and grows as dense bushes up to 1 m tall. It bends over and roots at the nodes, the leaves are few and the stems hard and bamboo-like.

The grass grows from Pakistan west through the Arabian peninsula to northern Africa largely within the 250 mm isohyet. These remarkable drought-tolerant plants survive by dissociating themselves from one another rather than growing in association.

The root hairs bind particles of fine sand by the extrusion of a glue that allows them to absorb more moisture from the soil.

Panicum turgidum is usually found on deep dune sand, but will grow well in wadis.

It grows where few crops can and is a good colonizing species that is extremely useful for erosion control because it spreads by long stolons building up mats of vegetation. Young leaves and shoots are very palatable; even in the dry state the plant is still eaten



PANICUM TURGIDUM ^[PLATE 14]

by camels and donkeys. It produces large quantities of seed that closely resembles *proso* millet; the Tuareg inhabitants of the Ahaggar Mountains in the central Sahara eat it ground into a flour and made into porridge. The ashes are added to tobacco for chewing, and the powder from ground stems is used for healing wounds.

Cenchrus biflorus

This annual, also known as *cram cram* ^[4.9], is particularly well adapted to sandy soils. Its Latin name comes from the Greek word *kengchros*, meaning "millet". In the past, it was the main cereal of the Sahel and the Sahara.

Cram cram is harvested slightly differently from other *kreb* grasses: the ears are cut off with a knife instead of being swept up in a basket. The seeds are then dried, threshed and winnowed like other *kreb* grasses.

The grains contain over 10 percent crude protein ^[4.10] and are mixed with *bajra* (millet)

TABLE 5 **CENCHRUS BIFLORUS**

COMPOSITION*	
Energy (kcal)	325.0
Protein (g)	19.2
Carbohydrate (g)	56.0
Fat (g)	2.9
Fibre (g)	2.3
Ash (g)	10.2
AMINO ACID CONTENT**	
Cystine	1.7
Leucine	15.5
Phenylalanine	5.2
Lysine	1.1

* per 100 g seed
 ** g for 100 g protein

Source: NRC, 1996^[4,3]

for making bread and also eaten raw. In the Sudan (Kordofan, Darfur), the grains are removed from the husks by rubbing the seed heads between two pieces of leather. They are then pounded and either eaten raw or made into porridge. They may also be mixed with other foods. A thin bread (*kisra*) is also made from the seeds. In Kano state, Nigeria, seeds are only occasionally eaten.



CENCHRUS BIFLORUS [PLATE 15]

Dactyloctenium aegyptium

The name of this plant comes from the Greek word *dactylos*, meaning "finger", and *ktenion*, "a little comb", and alludes to the digitate inflorescences. Soil types favoured by the plant include clayey soil, sandy soil and the black soil along the borders of ponds, swamps and bogs.

An excellent food and feed resource^[4,11], the rugose grains are either cooked into a thick porridge or the husked seeds are boiled in water to a thick mush. Mixed with semiground *Phaseolus aconitifolius*, the grains are used to prepare a dish called *keech*. They are also reportedly mixed with *bajra* (millet), and other grains (for making bread).

Church^[4,12] reports two grain samples, each from a different area, which he states are identical but that have different vernacular names: *anchu manchu* and *mali* or *manebhi*. The first is described as unsavoury, causing constipation and urine retention. The second is made into bread and much appreciated.

In central Chad, grains are eaten. In extreme famine conditions the grain, which is also collected by ants, has been dug from the ground and eaten^[4,13].

TABLE 6 **DACTYLOCTENIUM AEGYPTIUM**

COMPOSITION*	
Energy (kcal)	323.0
Protein (g)	11.8
Carbohydrate (g)	65.0
Fat (g)	1.7
Fibre (g)	4.0
Ash (g)	7.5
AMINO ACID CONTENT**	
Isoleucine	4.8
Leucine	9.9
Phenylalanine	6.8
Valine	5.8

* per 100 g seed
 ** g for 100 g protein

Source: NRC, 1996^[4,3]

DACTYLOCTENIUM AEGYPTIUM [PLATE 16]

Using grasses for food and fodder in the Sudan

by Mahgoub Zaroug, Babo Fadlallah, Ali Hasab-Alkarim and Jadcakareem Madibo, 2002

Kreb is also harvested in other sub-Saharan regions, including the Sudan. Here, several grass species are used as traditional and emergency food. These include *Brachiaria obtusiflora* (*unchir*) and *B. xantholeuca* (*abugigra* or *kereib*), *Cenchrus biflorus* (*haskaneet khishin*), *Dactyloctenium aegyptium* (*abuasabee*), *Echinochloa colona* (*diffra* or *kereib*), and *Oryza barthii* and *O. breviligulata* (*ruz*). Grains of some of these grasses are collected from ant hills or termite mounds, or from the ground where they have fallen; others are harvested manually from standing grasses, which are dried and threshed.

Kereib is the name given to grasses such as *Brachiaria* spp. and *Echinochloa colona*. In most cases, these grasses are associated with areas that are temporarily flooded and are found in shallow rainwater pools and depressions, known in the Sudan as *rahads*. These species are forage plants and their grains may be used as emergency food. In the Buram and Al-Dein provinces of southern Darfur state, in the Sudan, grains are collected from partially submerged plants in a basket with a special opening. The basket is dragged through the grass stands with a beating rhythm and the grains fall into the basket. The dry grains are then ground and the resulting flour is used for the preparation of a kind of porridge, called *madida*, which is eaten with milk, ghee and sugar, or sometimes with cooked meat.

Ruz (wild rice) is the name given to *Oryza* spp., which are associated with swamps and seasonally flooded areas in western and southern Sudan. *O. barthii* grows in the beds of *raqabas* (local natural water channels)



ORYZA BARTHII [PLATE 17]



BRACHIARIA XANTHOLEUCA [PLATE 18]

while *O. breviligulata* grows at a medium depth in *rahads*. There are two ways of harvesting the grains of *ruz*.

1. When seed heads mature they fall on to the surface of the swamp. They are collected, dried and threshed, and the grains are stored for subsequent use.
2. Some people use small boats to move through the swamps where the wild rice plants grow, shaking seed-bearing culms on the side of the boat. When the boat has a full load of grains it is moved to the edge of the swamp, where it is unloaded; the trip is then repeated. Collected grains are dried and stored for subsequent use. Some surplus grains are marketed locally. The grains are cooked with milk and consumed by pastoralists and other local communities.

Abuasabee is the name given to *Dactyloctenium aegyptium*, an annual forage species, which grows on *atmur* soils in the Kass and eastern Zalinji provinces of Darfur. *Atmur* is the slightly elevated area of stabilized sand dunes. Seed heads are cut manually when they turn yellow, which indicates maturity. The harvested material is left to dry, then threshed by beating it inside a wooden container, or *funduk*. The seeds are cleaned and mixed with millet (two parts of *abusabee* to one part of millet) and the mixture is ground to produce flour. This flour is used during emergency periods to prepare a porridge called *asida* and, on occasion, to make the traditional thin bread known as *kisra*. Pure *abusabee* flour is used to treat diarrhoea.

THE NEED FOR MORE RESEARCH

The evidence so far points strongly to the value of *kreb* as a foodstuff, a forage source and a way of protecting the environment. However, more investigation is urgently needed in order to obtain scientific information about its benefits so that promotion can begin in earnest. Without this, there is a serious risk that this exceptional resource will be lost to future generations.

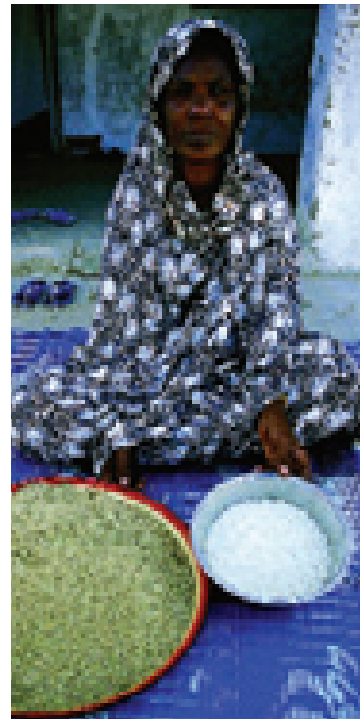
Much more needs to be known about the nutritional properties (e.g. the quality and quantity of starch and protein) of the different wild grasses that make up *kreb*, as well as pest and disease control and resistance, resistance to drought and salinity, and geographic adaptability. *In situ* and *ex situ* collections should be made in order to preserve genetic diversity for the future.

Evaluations, tests and studies should include germplasm evaluation, cytological studies and the production of tetraploid specimens in order to increase the size of the seeds. The different germplasms should be characterized and their important qualities noted, such as variation in colour,

sensitivity to day length, uniformity of maturation, susceptibility to pests, yield, and adaptation to heat and cold. If the grasses are to be selected for food production, characteristics such as non-shattering and easily husked seeds are desirable. Seed shape and seed coat, preferably inelastic, should be defined and selected. Genetic research will enable efficient plant-breeding strategies to be set in place.

As far as germplasm collection is concerned, particular attention should be paid to collection in harsh environments, where many relict cultivars are present and could be threatened. One basic need is for ethnobotanical investigations related to plant production and uses. The range and ecological requirements of the plants must be studied to enable the identification and protection of the different types of germplasm.

Agronomic analyses need to be carried out in order to determine cultural practices, plant behaviour, population dynamics, plant density and sequences. Crop-handling studies should focus on harvesting, cleaning, storing and processing methodologies.



NDJAMENA, CHAD

SCIENTIFIC METHODS SHOULD BE COMBINED WITH ORALLY TRANSMITTED KNOWLEDGE

THE FUTURE

It is most important that any future benefits from the use and improvement of *kreb* are returned to the people who have used and preserved it for centuries.

These people who, through observation, experience, agreement and error, have developed techniques of harvesting *kreb* and maintaining the grasslands for their animals, must remain the direct beneficiaries of their knowledge and work.

THE WELL NEAR KABELWA VILLAGE, THE NIGER



THE PROTEIN CONTENT OF GRAINS IS OFTEN HIGHER THAN THAT FOUND IN FARMED CEREALS

Analysis of *kreb* species

by **Attilio Lovato** and **Enrico Noli** *

A sample of *kreb* collected around N'Djamena by a woman from the Ati tribe was brought to Italy where it was analysed at the LaRAS in April 2003. The results are given below.

COMPOSITION OF *KREB* SAMPLE

SPECIES	% OF SAMPLE
<i>Echinochloa colona</i> (L.) Link	79.4
<i>Panicum coloratum</i> L.	10.7
<i>Panicum antidotale</i> Retz.	0.5
<i>Cyperus</i> sp.	0.2
<i>Eragrostis abyssinica</i> Link	0.2
Impurities	9.0

In this case the dominant species were *Echinochloa colona* and *Panicum coloratum*. These two species should receive special attention in future activities related to the breeding of grasses for food production.

Nutritional analysis of *kreb*

by **Marina Carcea** **

A sample of *kreb* collected in Chad, near N'Djamena, by local women, was analysed at INRAN on 2 July 2003 with the results given below.

NUTRITIONAL ANALYSIS OF *KREB* SAMPLE

CONSTITUENT	% OF SAMPLE
Water	12.00
Protein	8.80
Ash	0.95 (dry matter)
Lipids	1.43 (dry matter)

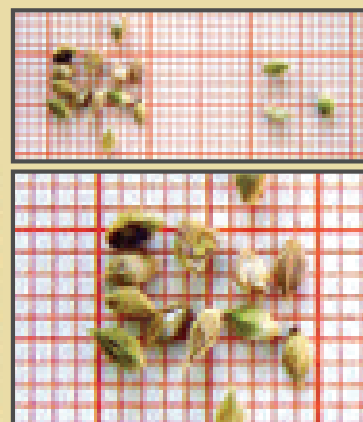
This analysis confirms the good protein content of *kreb*.

* Laboratorio di Ricerca e Analisi delle Sementi (LaRAS), Bologna, Italy, 2003

** Istituto Nazionale di Ricerca Alimentazione e Nutrizione (INRAN), Rome, Italy, 2003

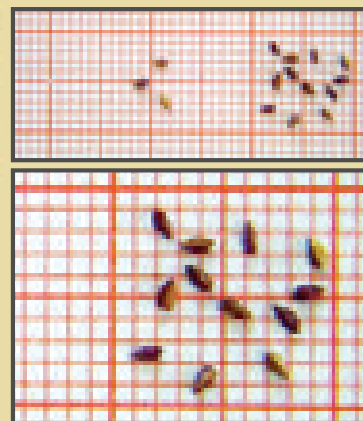


ECHINOCHLOA COLONA [PLATE 19]



ECHINOCHLOA SEEDS

PHOTOS: COURTESY OF E. NOLI

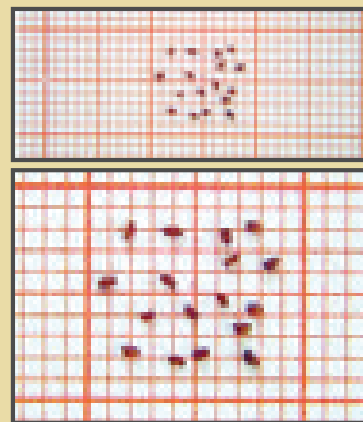


CYPERUS SEEDS

PHOTOS: COURTESY OF E. NOLI



PANICUM COLORATUM [PLATE 20]



ERAGROSTIS SEEDS

PHOTOS: COURTESY OF E. NOLI

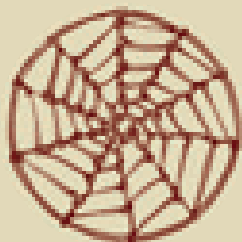
An annual miracle

14 December 2002
N'Djamena, Chad

It was a surprise to find *kreb* right here in N'Djamena since, as far as we knew, this cereal belonged more to the northern culture of the Sahel. However, in N'Djamena we meet Madame Fatimé Mahamat Terap, who annually repeats the ritual of gathering *kreb*. The mystery is explained when we learn that Madame Fatimé belongs to the Ati ethnic group; as an "immigrant" from the northeast she brought the tradition with her.

With great courtesy and patience, Madame Fatimé explains all she knows about *kreb* and, what's more, she presents us with a small bag of it, which we will later have analysed by a specialist laboratory.

So we begin to verify what very few books report exhaustively.



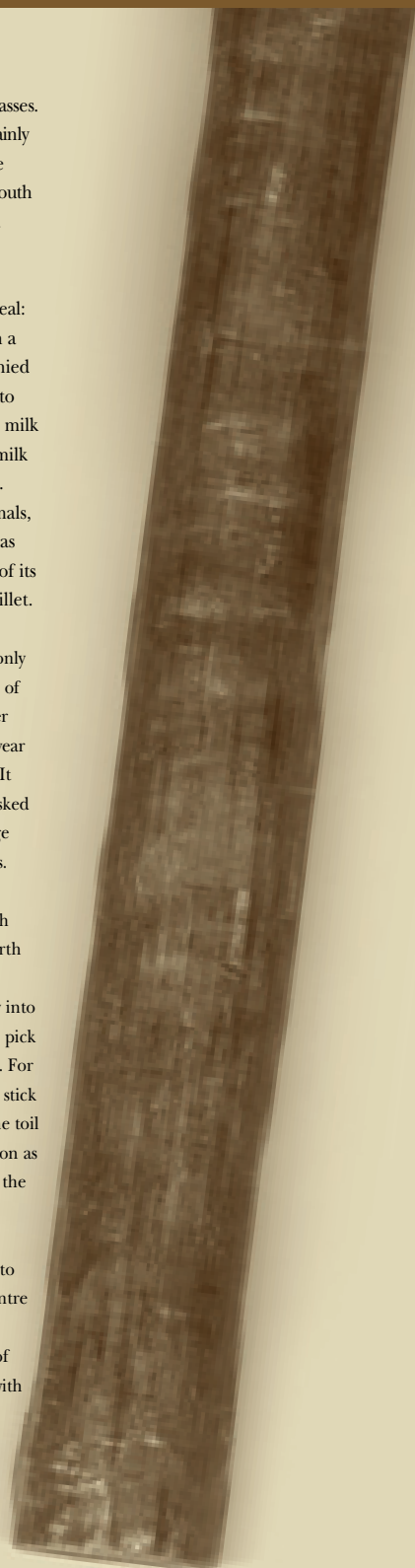
>> RIGHT: BASKET AND STICK ARE STILL THE TRADITIONAL TOOLS USED SPECIFICALLY FOR *KREB* COLLECTION

- > *Kreb* is a mixture of grains from wild grasses.
- > Its use is very ancient and widespread mainly in the northern villages of the Sahel. The Kanembu, for example, who live to the south of the Sahel, rarely consume or gather it.
- > *Kreb* is not cultivated, but grows spontaneously.
- > It may be substituted for any other cereal: cooked, it can be eaten like *cuscus* with a sauce or, as a soup, it can be accompanied by any condiment. It can also be used to make *basisa*, a kind of pasta eaten with milk and sugar, or *bouillie*, also mixed with milk and sugar and accompanied by *polenta*.
- > It is a choice food for all kinds of animals, including birds. Even the bird known as the *mange-mille* (millet-eater), in spite of its nickname, prefers *kreb* to cultivated millet.

Kreb is found at the market in N'Djamena only during the harvest season, towards the end of September, at the price of 2 000 CFAF * per *coreau*, the equivalent of 1.5 kg. In a given year Madame Fatimé may gather a *coreau* a day. It takes eight *coreaux* to produce 1.5 kg of husked *kreb*. But it is difficult to calculate an average yearly yield; it depends on too many factors. To gather *kreb*, Ati women use a basket especially made for that purpose. Held with one hand, the basket is swung back and forth under the ripened spikes, shaking the dry grass. If the *kreb* is ripe, the seeds fall easily into the basket. Many will fall to the ground; to pick them up, small as they are, is no easy work. For support each woman leans on a decorated stick traditionally made for that purpose. But the toil is worth it: *kreb* provides a source of nutrition as well as extra cash for the household, since the surplus is sold at the market.

Later we will also go with Madame Fatimé to her "field" of *kreb*, about 6 km from the centre of N'Djamena. At the time of our visit, in December, the area is a desolate expanse of land, punctuated by a few mud huts. But with the first rains, the grasses will grow again, renewing this annual miracle.

* 1 000 CFAF are equivalent to 1.52 euros .





NDJAMENA, CHAD