

# TECHNICAL SHEET

## Economic Couscous made with millet and corn

### Presentation of millet

The common name millet refers, in a broad sense, to several grass species including, among others, *Pennisetum glaucum*, *Eleusine coracana*, *Panicum miliaceum*, *Setaria italica*, *Echinochloa crusgalli* (Saïdou, 2011 cited by Kadri et al, 2019). Pearl millet or candle millet, *Pennisetum glaucum*, represents 40% of the world's millet production (Yang et al., 2012 cited by Kadri et al, 2019). It is also, the most commonly grown species for human consumption and produces the largest grains (Mariac et al., 2006 cited by Kadri et al, 2019).

Millet is an upright plant with thick stems and heights ranging from 1.5 to 3 m, but millets of nearly 4 meters can be found (Moumouni, 2014 cited by Kadri et al, 2019). The root system is fasciculated with a single main seminal root followed by numerous adventitious roots. One of the causes of millet's good adaptation to the pedoclimatic conditions of the semi-arid zone is its extensive root development, which can reach 300 cm in depth at harvest (Ahmadi et al., 2002; ROCAFREMI, 2002 cited by Kadri et al, 2019).

Millet, *Pennisetum glaucum*, is the most drought tolerant cereal. It is grown in regions where rainfall is between 150 and 800 millimeters (Besançon et al, 1997). In Africa, 70% of production comes from the west of the continent. The main producing countries are, in decreasing order of importance: Nigeria, Niger, Burkina, Chad, Mali, Mauritania and Senegal (Besançon et al, 1997). It is often the staple food and is consumed in the form of paste, porridge, couscous or pancakes (Besançon et al, 1997). It can also be used to make alcoholic beverages such as millet beer (Besançon et al, 1997).

### Présentation du maïs

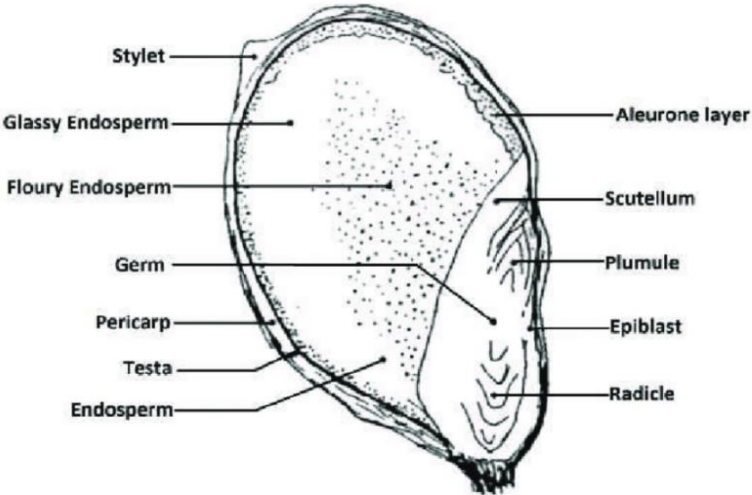
Maize has the scientific name *Zea Mays* L. and is in the Poaceae family of the Andropogoneae tribe (Yapi and De, 2017). Maize belongs to the grass family like rice, millet, and sorghum (Yapi and De, 2017).

It is an annual herbaceous cereal with generally little or no tillering and an abundant fibrous root system (CMA/AOC, 2005). It has a wide morphological diversity depending on the variety (CMA/AOC, 2005). It is a cross-pollinated species, where female (spikes) and male (panicles) inflorescences occupy distinct locations on the plant (CMA/AOC, 2005). The ears are the structures where approximately 12-16 rows of kernels develop (CMA/AOC, 2005). There are several varieties of corn grown for food: sweet corn, pearl corn, dent corn, floury corn, and glassy corn, which is also used as a forage (CMA/AOC, 2005). Ordinary immature corn, on the cob, is widely consumed, either boiled or roasted (CMA/AOC, 2005). Floury corn, on the other hand, has a soft albumen grain, which is widely used in the diet of Mexico, Guatemala and the Andean countries (CMA/AOC, 2005). More recently, other varieties have appeared: oil-rich maize (appreciated in human food because of the presence of antioxidants that make it more

stable), waxy maize (high amylopectin content, used by some food industries or paper mills as a thickener), amyloid maize (high amylose content, used by industry as film for food packaging), etc. (CMA/AOC, 2005).

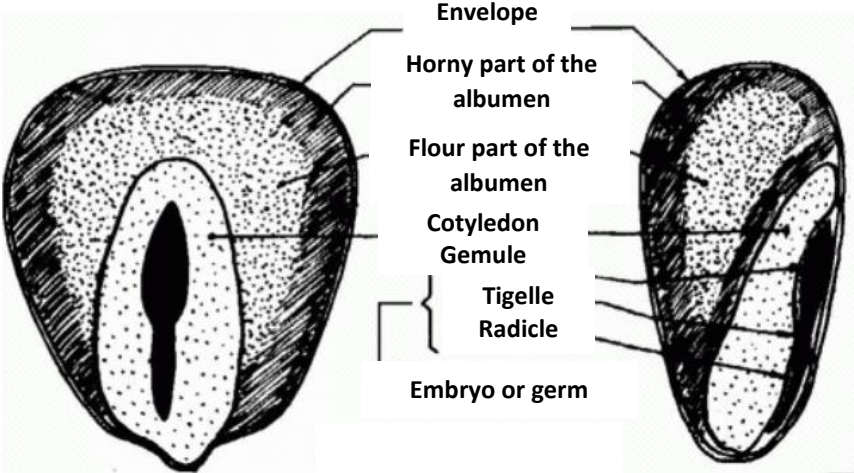
The use of maize generally varies according to the economic level of countries. In developing countries, it is a staple food, the seed is consumed directly, in the form of roasted or boiled immature cobs, or processed into flour and meal (CMA/AOC, 2005).

**Millet seed**



**Figure 1** : Cutting of a millet seed (source : Rao and *al*, 2017)

**Grain de maïs**



**Figure 2** : cutting of a corn kernel (source : <http://tpepopcorn.eklablog.fr/premiere-partie-le-mais-et-sa-transformation-en-pop-corn-c17605868>)

## **Definition of couscous**

According to the Larousse dictionary 2016, couscous is a traditional dish consisting of this steamed semolina, accompanied by meat and vegetables, all of which is then served with broth, harissa, meatballs, merguez, etc.

It is a dish of North African origin, made of wheat semolina with vegetables and a spicy sauce, which can be served with chicken, mutton, lamb or beef (source: <https://www.cordial.fr/dictionnaire/definition/couscous.php>).

Couscous is a North African dish made of wheat semolina served with meat and vegetables (<https://www.linternaute.fr/dictionnaire/fr/definition/couscous/>).

In this specific case, the semolina used in the cooking is obtained from a mixture of millet and corn.

## **Characteristics of the technology**

A process to produce millet or corn couscous that eliminates the rolling stage and therefore considerably reduces the time and drudgery of work.

## **Bibliographic references**

Ahmadi N, Chantereau J, Hekimian Lethève C, Marchand JL., Ouendeba B, (2002) : Le mil. In Mémento de l'agronome : Les céréales. CIRAD-GRET (ed). Ministère des Affaires étrangères ; 17-23 p.

Besançon G., Renno J-F., Kumar K.A. (1997) : L'amélioration des plantes tropicales ; CIRAD ; ORSTOM ; 457-478p.

CMA/AOC (2005) : NOTE TECHNIQUE SUR LA FILIERE MAÏS DANS LA ZONE CMA/AOC ; 15p.

KADRI A., HALILOU H., KARIMOU I. (2019) : Culture du mil [*Pennisetum glaucum* (L) R. Br.] et ses contraintes à la production : une revue ; 524p.

LOUMEREM M. (2004) : Etude de la variabilité des populations de mil (*Pennisetum glaucum* (L.) R. Br.) cultivé dans les régions arides tunisiennes et sélection de variétés plus performantes. Thèse, Université de Gen, Gen, p. 266.

Mariac C, Luong V, Kapran I, Mamadou A, Sagnard F, Deu M, Chantereau J, Gerard B, Ndjeunga J, Bezancon G, Pham J, Vigouroux Y. (2006) : Diversity of wild and cultivated pearl millet accessions [*Pennisetum glaucum* (L.) R. Br.] in Niger assessed by microsatellite markers. Theor. Appl. Genet, 114: 49–58. DOI: <http://dx.doi.org/10.1007/s00122-006-0409-9>.

MAITI RK, BIDINGER FR. (1981) : Growth and development of the pearl millet plant. Research Bulletin N°6, ICRISAT Patancheru, Patancheru, 19 p.

MOUMOUNI KH. (2014) : Construction d'une carte génétique pour le mil, *Pennisetum glaucum* (L.) R.Br, par une approche de génotypage par séquençage (GBS). Mémoire, Université de Laval de Québec, Québec, 111 p.

PASSOT S. (2016) : Exploration du système racinaire du mil et ses conséquences pour la tolérance à la sécheresse ; thèse de Doctorat ; Spécialité : Biologie, Interactions, Diversité Adaptative des Plantes CNU : Physiologie ; Université Montpellier ; 140p.

ROCAFREMI. (2002) : Sélection et Mise à Disposition des Paysans de Variétés et de Semences Appropriées. Des Résultats du Projet P1 : 1991-1996.

SAÏDOU A. (2011) : Etude moléculaire, évolution et caractérisation de gènes impliqués dans l'adaptation du mil [*Pennisetum glaucum* (L.) R. Br.] aux changements climatiques. Thèse de doctorat, Montpellier SupAgro, Montpellier, 236 p.

Yang X, Wan Z, Perry L, Lu H, Wang Q, Zhao C, Li J, Xie F, Yu J, Cui T, Wang T, Li M, Ge Q. (2012) : Early millet use in northern China. *Proc. Nat. Acad. Sci. USA*, 109(10) : 3726-3730. DOI: <http://www.pnas.org/cgi/doi/10.1073/pna.s.1115430109>.

Yapi M., De K. (2017) : Fiche technicoéconomique du Maïs ; ANADER ; Direction d'Appui aux filières Agricoles ; 5p.

### Web sites consulted

<https://agritrop.cirad.fr/582726/1/th%C3%A8seSixtinePassot.pdf> ; 11/08/2021 à 15h33  
[https://horizon.documentation.ird.fr/exl-doc/pleins\\_textes/divers09-03/010012930.pdf](https://horizon.documentation.ird.fr/exl-doc/pleins_textes/divers09-03/010012930.pdf) ;  
11/08/2021 à 15h43  
<https://www.ajol.info/index.php/ijbcs/article/view/186797> ; 11/08/2021 à 16h01  
<http://tpepopcorn.eklablog.fr/premiere-partie-le-mais-et-sa-transformation-en-pop-corn-c17605868> ; 17/08/2021 à 14h30  
<https://www.superprof.fr/ressources/scolaire/svt/schema-svt15/tous-niveaux-svt15/plante-etude-scientifique.html> ; 17/08/2021 à 14h30  
<http://www.anader.ci/anader/fichetech/Fiche%20technico-economique%20du%20Mais.pdf> ; 17/08/2021 à 14h43  
[https://www.doc-developpement-durable.org/file/Culture/Culture-plantes-alimentaires/FICHES\\_PLANTES/mais/Fiche%20mais.pdf](https://www.doc-developpement-durable.org/file/Culture/Culture-plantes-alimentaires/FICHES_PLANTES/mais/Fiche%20mais.pdf) ; 17/08/2021 à 14h55  
[http://www.hubrural.org/IMG/pdf/cmaaoc\\_mais.pdf](http://www.hubrural.org/IMG/pdf/cmaaoc_mais.pdf) ; 17/08/2021 à 15h07

### Other references

Regional Center of Excellency on Dry Cerals and Associated Crops ; HOST INSTITUTION: CENTRE D'ETUDES RÉGIONAL POUR L'AMÉLIORATION DE L'ADAPTATION À LA SECHERESSE (CERAAS) ; Host country: Senegal; Coordinator: Ndjido KANE; Email: [ndjido.Kane@isra.sn](mailto:ndjido.Kane@isra.sn); [ndjido.Kane@isra.sn](mailto:ndjido.Kane@isra.sn); Telephone: +221 777232019 / +221 339514693