Millet intensification system by increasing sowing density and adjusting fertilization

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 and al., 2012 cited by Kadri and al, 2019). It is also, the most grown species for human consumption and produces the largest grains (Mariac and al., 2006 cited by Kadri and 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 and al, 2019). The root system is fasciculate 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 and al., 2002; ROCAFREMI, 2002 cited by Kadri and 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 and 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 and al., 1997). It is often the staple food and is consumed in the form of paste, porridge, couscous, or pancakes (Besançon and al, 1997). It can also be used to make alcoholic beverages such as millet beer (Besançon and al, 1997).

Millet seed

![Millet seed diagram](source: Rao and al, 2017)
**Development of millet**

1. **VEGETATIVE PHASE**
   - It begins with the initiation of the main stem panicle between 22 and 30 days after emergence (Anonymous, 2004). This phase includes heading, flowering, and fruiting. It is marked by the total development of the leaves and by the senescence of the leaves.

2. **REPRODUCTIVE PHASE**
   - It begins with the initiation of the main stem panicle between 22 and 30 days after emergence (Anonymous, 2004). This phase includes heading, flowering, and fruiting. It is marked by the total development of the leaves and by the senescence of the leaves at the base of the main stem and has a duration of 18 to 25 days depending on the variety (Loumerem, 2004).

3. **MATURATION PHASE**
   - Maturation is the progressive development of the caryopsis or fruit from the top to the base of the spike (Moumouni, 2014). This phase starts with the fertilization of the flowers of the main panicle and continues until the maturity of the whole plant (main stem and tillers), (Loumerem, 2004). The grains reach their maturities in general 22 to 30 days after fertilization depending on the variety.

**Figure 2**: growth and development of millet (source: Kadri and al., 2019)

**Characteristics of the technology**

Increased seeding rate from 12346 bunches per hectare (distance between rows and within row 0.9 m × 0.9 m) to 24692 (0.9 m × 0.45m) combined with fertilization of 150 kg/ha NPK 15-15-15 +50 kg/ha urea at 15-21 days after seeding +50 kg/ha at 45 days after seeding; Increased grain and straw production by over 30%.

**Bibliographic references**


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 Adaptive des Plantes CNU : Physiologie ; Université Montpellier ; 140p.


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 ; 11/08/2021 à 15h43

https://www.ajol.info/index.php/ijbcs/article/view/186797 ; 11/08/2021 à 16h01

Other references

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