P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating: 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 7; Issue 5; May 2024; Page No. 262-265

Received: 02-03-2024
Accepted: 09-04-2024

Indexed Journal
Peer Reviewed Journal

Constraints in production of finger millet

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DOI: https://doi.org/10.33545/26180723.2024.v7.i5d.639

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Abstract

Finger millet is one of the significant minor crops. This grain has high nutritional content and is commonly eaten as porridge. It is also used as a staple food. The cultivation of finger millets, processing, value addition, marketing and consumption have all presented significant hurdles for the millet industry in the current environment. It can thrive under unfavourable agro climatic conditions and drought. The production and productivity of finger millet can be increased by implementing nutrient management strategies. Farmers are hesitant to implement nutrient management techniques in finger millet farming for a number of reasons. The main constraints that finger millet growers faced are lack of awareness, shortage of labor during the busiest time of year, spreading of diseases, attack of insects and pests. By making further efforts to address the issues encountered across the value chain of finger millets, the hurdles can be lessened. India is not the only place in the globe where these difficulties exist. Before we discuss the prospects in the finger millet sector, let's first explore the obstacles faced by the farmers. Based on these findings it was recommended to train farmers about the adoption of management practices.

Keywords: Finger millet, constraints, awareness

Introduction

Although cereals are a staple food for a significance section of the world's population, achieving optimal production has been a cause for concern. The most popular cereals have historically been paddy, maize and wheat; on the other hand, millet has been significantly underappreciated in many nations. Millet is a broad category of small seeded grasses that are grown for feed, nourishment or fodder (Lata *et al*., 2013) [21]. Millets are two types – major millets and minor millets. Finger millet comes under the major millets. A significant staple food crop, finger millet (*Eleusine coracana* L. Gaertn.) is farmed in the semi-arid tropical regions of Southern Asia and Eastern and Southern Africa (FAOSTAT, 2022) [14]. The annual finger millet plant, which may grow up to 170 cm tall, is a member of the grass family and grows aggressively (de Wet, 2006) [9]. One of the major food crops, finger millet, also recognised as ragi, is mostly grown and eaten in Africa and India. It has a higher energy level than other cereals and is rich in iron, fiber and calcium. It grows in a variety of soil types, including tropical lateritic soils that have been heavily worn. Additionally, it can withstand a certain amount of salt in soil. Finger millets have a limited capability to withstand water logging, so proper soil drainage and a moderate water-holding capacity are ideal (Adhikary, 2012) [1]. Although it is commonly thought of as a drought-tolerant crop, it actually prefers moderate rainfall (500mm yearly) in comparison to other millets like sorghum and pearl millet.

More than 400 million farmers worldwide cultivate the crop on marginal land for livelihood (FAO, 2019) [13]. Finger millet is also called mandua or ragi in India, koddo in Nepal, fingerhirse in Germany, wimbi in Kenya, African millet in England, and so on are some of the regional names for finger millet that are used in different countries (Fuller, 2014) [15]. Finger millet is widely known by a number of names in India, including ragi in Kannada, Telegu and Hindi, also mandua in Hindi, kodra in Himachal Pradesh, mandia in Odia, taidalu in Telengana, kezhvaragu in Tamil, etc. After the sorghum (*Sorghum bicolour* L.), pearl millet (*Pennisetum glaucum* L.) and foxtail millet (*Setaria italic* L.), finger millet is the fourth most produced millet globally (Maharajan *et al*., 2019). In India, the states of Karnataka, Andhra Pradesh, Tamil Nadu, Odisha, Maharashtra, the Kumaon region of Uttarakhand, and Goa are the places where finger millet is farmed and consumed. In India, there are 1004 thousand hectares of finger millet planted as of 2019-2020; the majority of this land is contributed by the states of Karnataka, Maharashtra, Telangana, and Tamil Nadu. As of 2019-2020, Tumakuru, Hassan, and Ramanagara provided the majority of the 64100 hectares of land in Karnataka covered by finger millet. In 2019-20, 1164 thousand metric tons of finger millet were produced in this region. The production of finger millet during this time was 1816 kg/ha (Anonymous, 2020) [5]. A critical food crop for rural populations' sustenance is finger millet. 'Poor man's cereals' is another name for it. With 4.2 grams of amino acids per 16 grams of N, protein is the most abundant source of amino acids in finger millet. For 7000 years,

people have been eating Finger millet, it is also known as one of the oldest cereal (Cherfas, 20150) [7]. Finger millet is essential children's meals, the economics of marginal farmers, and the diets of expectant and nursing mothers. Compared to other cereals, its grains are greater in calories, fiber, protein and vitamins and minerals (Vadivoo *et al*., 1998) [31].

But during the cultivation of finger millet farmers faced many difficulties. Many biotic and abiotic factors affect the finger millet production. The subsistence farming practices of low yielding variety usage, farmer negligence and smallholder farming, diseases, insect-pests, poor agronomic practices and declining soil fertility, etc. are some of the obstacles to finger millet production.

Socio-economic constraints

The primary socio-economic reasons contributing to low yields are the adoption of low yielding, unimproved cultivars, inadequate agronomic methods, insufficient post-harvest management, limited research input, and declining farm sizes. The food and financial security of smallholder farmers who rely on the production of finger millet is threatened by these causes. Furthermore, one major obstacle to the production of finger millet is the absence of technology aimed at minimizing drudgery in farming operations (Kidoido *et al*., 2002) [20]. Finger millet still requires a lot of work to produce, especially when weeding and its tiny seed size has kept many farmers from cultivating it (Wanyera, 2005) [32].

Furthermore, due to a lack of knowledge about the enhanced varieties and poor seed dissemination procedures, farmers have not been able to obtain finger millet varieties that have been released, which has resulted in higher losses in both quality of grain and quantity of grain (Ojiewo *et al*., 2020) [24]. Thus by addressing the aforementioned socio-economic issues, finger millet productivity can be increased, leading to a decrease in hunger and poverty (Dawson *et al*., 2019) [8]. In addition, policy factors that approve funding for the use of finger millet are necessary due to the increases of dry and semi-arid territories as well as their vulnerability to climate change (Wanyera, 2005) [32].

Disease as a biotic constraint

The most significant biotic barrier in the production of finger millet, with significant yield reduction ranging from 50-90%, is blast disease, thic is caused by the fungus *Pyricularia grisea* (teleomorph: *Magnaporthe grisea*). From seedlings to the flowering stage, the blast pathogen infects every aerial portion of the crop, creating leaf, neck, and finger blasts that reduce the biomass, yield and physiological maturity of the crop (Lenne *et al*., 2007) [18]. With the neck and finger blast types, the illness can result in significant yield losses of upto 90%, which are the most damaging (Babu *et al*., 2013) [6]. Grey elliptical or diamond shaped lesions are present on infected leaves and the peduncle and fingers began to show signs during the blossoming period, resulting in finger and neck blasts (Takan, 2004) [30]. Efforts to identify and create resistant cultivars suitable to local agro-ecological circumstances are hampered by an ignorance regarding the pathogen responsible for the adaptation of finger millet.

Affects of weed

Striga, sometimes referred to as witch weed. The two main Striga species that prey on cereals are *Striga asiatica* (L.) Kuntze and *Striga hermonthica* (Del.) Benth. These species primarily target cereals like pearl millet, finger millet, sorghum, maize (Spallek *et al*., 2013) [29]. The most common and damaging witch weed that affects finger millet is benth, which results in low yields and requires a lot of labor to eradicate (Ejeta, 2007) [7]. Climate, host crop vulnerability, ecotypes, virulence, degree of infestation and cultural practices all influence how severe a *Striga* outbreak is (Rodenburg *et al*., 2015) [26]. It has been suggested that implement a number of phyto-sanitation techniques to control *S. Hermonthica*. Crop rotations, the application of manure, the imposition of quarantines on infected regions, among these are the restrictions on the movement of farm equipment between contaminated and uncontaminated areas, the extensive use of pesticides, the manual weeding, uprooting and burning of *Striga* plants in contaminated fields (Haussmann *et al*., 2000) [17]. Small farmers typically cannot afford these tactics due to their high cost. Thus, the most sustainable approach for farmers with limited resources is to prevent *Striga* through breeding for resistance. Determining reliable sources of resistance and taking use of them are necessary for the development of better cultivars with *Striga* resistance (Ejeta, 2007) [12].

Insects and pests

Key pests of finger millet are ear head caterpillars, leaf aphids, army worms, stem borers, cut worms and autumn armyworms (Adikini *et al*., 2021) [2]. Common insects that nourishment on millet are *Schizaphis graminum* (Green bug) and *Blissus leucopterus leucopterus* (chinch bug), which cause wilting or death of plants as well as yellowing and deformation of foliage by suckling sap from newly formed whorls and leaves (Akhtar *et al*., 2012) [3]. A variety of management techniques, such as the use of resistant varieties, synthetic insecticides, biological control agents and cultural practices are advised to control stem borers (Gahukar and Reddy, 2019) [16]. Stem borers are a major concern for finger millet growers because these insect-pests also feed on other crops like pearl millet, sorghum and maize, which makes their control methods more challenging (Adikini *et al*., 2021) [2].

Drought: Drought or insufficient precipitation is the main abiotic constraint influencing finger millet productivity in semi-arid and arid regions (Anitha *et al*., 2019) [4]. Even though finger millet can withstand droughts better than other cereals like maize, simulation models indicate that drought stress will globally lower finger millet grain yield by 40% (Sakamma *et al*., 2018) [27]. In finger millet, drought stress causes a decrease in a number of plant characteristics, including plant height, panicle length, biomass and grain weight. Drought also causes a notable decrease in yield, seed weight, radiation use efficiency, dry matter accumulation and chlorophyll content (Mude *et al*., 2020) [23]. The effects of drought stress on finger millet are compounded by variations in temperature and climate. Droughts have been more frequent and intense in recent years (Selvaraju and Baas, 2007) [28].

Low soil fertility

One of the main abiotic restraints on smallholder farmers' crop output is poor soil fertility, which affects the productivity of finger millet by not replenishing nutrients in the soil (Ebanyat, 2009) [10]. A number of factors, including continuous cropping, sparing or nonexistent use of mineral fertilizers, inadequate recycling of wastes and low rates of applying organic matter, reduce the potential yield of finger millet crops. The majority of these soils are lacking in major and micronutrients (Ebanyat *et al*., 2021) [11].

Finger millet needs nitrogen, phosphorus, potassium for early establishment. Co applying N, P and K fertilizers has been shown to boost crop performance; it is believed that these interactions increase yield and fertilizer use efficiency (Kang *et al*., 2020) [19]. The primary causes of the persistently low finger millet productivity are the soil's major and micronutrient deficiencies as well as the infrequent application of organic manures. Therefore, maintaining soil fertility and increasing productivity depend on balanced nutrient management (Rao *et al*., 2012) [25].

Conclusion

The finger millet growers faced several major challenges, including low knowledge of soil testing, challenges in collecting soil samples and comprehending the recommendations for fertilizer based on soil tests, bulkiness of organic inputs, ignorance of fertilizers, micronutrient fertilizers and bio nutrient fertilizers, shortage of labor during peak season and high labor costs. The main restriction was thought to be the stress caused by drought. To overcome the constraints, we have to improve the knowledge of finger millet farmers and also aware them regarding the Government schemes, millet mission programmes, etc. So that farmers can improve a lot in future in finger millet production and their income will increases.

Reference

1. Adhikary RK. Economic of finger millet (*Eleusine coracana* G.) production and marketing in peri urban area of Pokhara valley of Nepal. J Dev Agric Econ. 2012;4(6):151-157. [Online] Available from: https://www.researchgate.net/publication/272910280_Economics_of_finger_millet_Elecusine_coracana_G_production_and_marketing_in_peri_urban_area_of_Pokhara_valley_of_Nepal
2. Adikini S, Roggers G, Ojulong H, Aita A, Opie H, Wandulu JA, *et al*. Finger Millet Production Manual for Uganda. National Agricultural Research Organization. 2021. [Online] Available from: https://www.linkedin.com/posts/scovia-adikini-02a1a76a_finger-millet-production-manual-for-uganda-activity-7003984471880265728-fp_E/?originalSubdomain=ug
3. Akhtar N, Ahmad Y, Shakeel M, Gillani WA, Khan J, Yasmin T, *et al*. Resistance in pearl millet germplasm to greenbug, *Schizaphis graminum* (Rondani). Pakistan J Agric Res. 2012;25(3). [Online] Available from: https://www.cabidigitallibrary.org/doi/pdf/10.5555/20133358767
4. Anitha K, Sritharan N, Ravikesavan R, Djanaguiraman M, Senthil A. Melatonin alters photosynthesis related traits in finger millet (*Eleusine coracana* L.) under drought condition. Int. J Chem Stud. 2019;7(3):2750-2754. [Online] Available from: https://www.chemijournal.com/archives/2019/vol7issue3/PartAR/7-3-154-230.pdf
5. Anonymous. Agriculture Statistics at a Glance. Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India. 2020. [Online] Available from: https://foodprocessingindia.gov.in/uploads/publication/Agricultural-statistics-at-a-Glance-2020.pdf
6. Babu TK, Sharma R, Upadhyaya HD, Reddy PN, Deshpande SP, Senthilvel S, *et al*. Evaluation of genetic diversity in Magnaporthe grisea populations adapted to finger millet using simple sequence repeats (SSRs) markers. Physiol Mol Plant Pathol. 2013;84:10-18. [Online] Available from: https://doi.org/10.1016/j.pmpp.2013.06.001
7. Cherfas J. Millet: How a trendy ancient grain turned nomads into farmers. 2015. Retrieved 4 May 2018. [Online] Available from: https://www.npr.org/sections/thesalt/2015/12/23/460559052/millet-how-a-trendy-ancient-grain-turned-nomads-into-farmers
8. Dawson N, Martin A, Camfield L. Can agricultural intensification help attain sustainable development goals? Evidence from Africa and Asia. Third World Quarterly. 2019;40(5):926-946. [Online] Available from: https://doi.org/10.1080/01436597.2019.1568190
9. de Wet JMJ. *Eleusine coracana* (L.) Gaertn. Record from Protabase. In: Brink M, Belay G, editors. PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale). Wageningen, Netherlands. 2006. [Online] Available from: https://www.feedipedia.org/node/14446
10. Ebanyat P. A road to food: Efficacy of nutrient management options targeted to heterogeneous soilscapes in the Teso farming system, Uganda. 2009. [Online] Available from: https://phd.pps.wur.nl/road-food-efficacy-nutrient-management-options-targeted-heterogeneous-soilscapes-teso-farming
11. Ebanyat P, de Ridder N, Bekunda M, Delve RJ, Giller KE. Efficacy of nutrient management options for finger millet production on degraded smallholder farms in eastern Uganda. Front Sustain Food Syst. 2021;5:674926. [Online] Available from: https://doi.org/10.3389/fsufs.2021.674926
12. Ejeta G. The Striga scourge in Africa: A growing pandemic. In: Integrating new technologies for Striga control: Towards ending the witch-hunt. World Scientific; 2007. pp. 3-16. [Online] Available from: https://doi.org/10.1142/9789812771506_0001
13. FAO. Strengthening seed delivery systems for dryland cereals and legumes in drought-prone areas of Uganda. The cluster granary Eastern Uganda. Afr Crop Sci J. 2019;10(1). [Online] Available from: https://doi.org/10.4314/acsj.v10i1.27561
14. FAOSTAT. Food and Agriculture Organization of the United Nation (FAO). FAOSTAT Statistical database. Rome, Italy. 2022. [Online] Available from: https://www.fao.org/faostat/en/#data/RL
15. Fuller DQ. Finger millet: Origins and development. In: Smith C, editor. Encyclopedia of global archaeology.

2014. pp. 2783-2785. [Online] Available from: https://doi.org/10.1007/978-1-4419-0465-2_2314
16. Gahukar RT, Reddy GV. Management of economically important insect pests of millet. J Integr Pest Manag. 2019;10(1):28. [Online] Available from: https://doi.org/10.1093/jipm/pmz026
17. Haussmann BI, Hess DE, Welz HG, Geiger HH. Improved methodologies for breeding Striga-resistant sorghums. Field Crops Res. 2000;66(3):195-211. [Online] Available from: https://doi.org/10.1016/S0378-4290(00)00076-9
18. Lenne JM, Takan JP, Mgonja MA, Manyasa EO, Kaloki P, Wanyera N, *et al*. Finger millet blast disease management: A key entry point for fighting malnutrition and poverty in East Africa. Outlook Agric. 2007;36(2):101-108. [Online] Available from: https://doi.org/10.5367/00000000778115
19. Kang F, Yang B, Yang X, Wang L, Guo J, Sun W, *et al*. Arbuscular mycorrhizal fungi alleviate the negative effect of nitrogen deposition on ecosystem functions in meadow grassland. Land Degrad Dev. 2020;31(6):748-759. [Online] Available from: https://doi.org/10.1002/ldr.3491
20. Kidoido M, Kasenge V, Mbowa S, Tenywa J, Nyende P. Socioeconomic factors associated with finger millet production in eastern Uganda. Afr. Crop Sci. J. 2002;10(1). [Online] Available from: https://doi.org/10.4314/acsj.v10i1.27561
21. Lata C, Gupta S, Prasad M. Foxtail millet: a model crop for genetic and genomic studies in bioenergy grasses. Crit Rev Biotechnol. 2013;33:328–343. [Online] Available from: https://pubmed.ncbi.nlm.nih.gov/22985089/
22. Maharajan T, Ceasar SA, Krishna TPA, Ignacimuthu S. Phosphate supply influenced the growth, yield and expression of PHT1 family phosphate transporters in seven millets. Planta. 2019;250(5):1433-1448. [Online] Available from: https://doi.org/10.1007/s00425-019-03237-9
23. Mude LN, Mondam M, Gujjula V, Jinka S, Pinjari OB, Reddy NYA, *et al*. Morpho-physiological and biochemical changes in finger millet [*Eleusine coracana* (L.) Gaertn.] under drought stress. Physiol Mol Biol. Plants. 2020;26:2151-2171. [Online] Available from: https://doi.org/10.1007/s12298-020-00909-9
24. Ojiewo CO, Omoigui LO, Pasupuleti J, Lenné JM. Grain legume seed systems for smallholder farmers: Perspectives on successful innovations. Outlook Agric. 2020;49(4):286-292. [Online] Available from: https://doi.org/10.1177/0030727020953868
25. Rao BKR, Krishnappa K, Srinivasarao C, Wani SP, Sahrawat KL, Pardhasaradhi G. Alleviation of multinutrient deficiency for productivity enhancement of rain-fed soybean and finger millet in the semi-arid region of India. Commun Soil Sci. Plant Anal. 2012;43:1427–35. DOI: 10.1080/00103624.2012.670344
26. Rodenburg J, Cissoko M, Kayeke J, Dieng I, Khan ZR, Midega CA, *et al*. Do NERICA rice cultivars express resistance to *Striga hermonthica* (Del.) Benth. and *Striga asiatica* (L.) Kuntze under field conditions? Field Crops Res. 2015;170:83-94. [Online] Available from: https://doi.org/10.1016/j.fcr.2014.10.010
27. Sakamma S, Umesh K, Girish M, Ravi S, Satishkumar M, Bellundagi V. Finger millet (*Eleusine coracana* L. Gaertn.) production system: Status, potential, constraints and implications for improving small farmer's welfare. J Agric Sci. 2018;10(1):162-179. [Online] Available from: https://ccsenet.org/journal/index.php/jas/article/view/70477
28. Selvaraju R, Baas S. Climate variability and change: Adaptation to drought in Bangladesh: A resource book and training guide (Vol. 9). Food & Agriculture Org. 2007. [Online] Available from: https://books.google.com/books?hl=en&lr=&id=kYzWr1EqJu4C&oi=fnd&pg=PR4&dq=Climate+variability+and+change:+adaptation+to+drought+in+Ban%E2%80%90+gladesh:+A+resource+book+and+training+guide.+Rome:+Food+and+Agriculture+Organization+of+the+United+Nations&ots=aCeVnTwWvE&sig=w3kBOgnvP0JnX1pfk2qOIufyyqA
29. Spallek T, Mutuku M, Shirasu K. The genus Striga: A witch profile. Mol Plant Pathol. 2013;14(9):861-869. [Online] Available from: https://doi.org/10.1111/mpp.12058
30. Takan JP. Finger millet blast pathogen diversity and management in East Africa: A summary of project activities and outputs. Int. Sorghum Millets Newsl. 2004;45:66-69. [Online] Available from: https://cgspace.cgiar.org/items/805d376c-05f3-4f7c-961d-d6779398c206
31. Vadivoo AS, Joseph R, Ganesan NM. Genetic variability and diversity for protein and calcium contents in finger millet (*Eleusine coracana* (L.) Gaertn) in relation to grain color. Plant Foods Hum Nutr. 1998;52:353–364. [Online] Available from: https://pubmed.ncbi.nlm.nih.gov/10426122/
32. Wanyera N. Finger Millet (*Eleusine coracana*) (L.) Gaertn) in Uganda. Finger Millet Blast Management in East Africa. Creating Opportunities for Improving Production and Utilization of Finger Millet. 2005. [Online] Available from: https://oar.icrisat.org/307/1/CO_0002.pdf