International Journal of Agricultural Sciences ☞DOI:10.15740/HAS/IJAS/19.1/235-238
Volume 19 | Issue 1 | January, 2023 | 235-238 ■ ISSN : 0973-130X Visit us : *www.researchjournal.co.in*

RESEARCH PAPER

Nutrient management in pearl millet (*Pennisetum glaucum*)

K. P. Adharsh*, Bommidi Kishore **and** Kavita Bhadu[1]
Bachelors of Agriculture (Hons.), Lovely Professional University, Phagwara (Punjab) India
(Email : adharshkp.693@gmail.com)

Abstract : As a primary dual-purpose crop, pearl millet serves as both food for humans and animal fodder. Its ability to resist high temperatures surpasses that of all other cereals, making it a crop with exceptional climate resilience. The average yield of pearl millet is low when compared to its potential yields because of insufficient soil fertility, a lack of effective soil nutrient replenishment procedures, erratic rainfall patterns, and other factors. Farmers in dry regions are unable to afford the expensive fertilisers because of their poor economic conditions. Additionally, the continuous and exclusive use of chemical fertilisers has given rise to a number of issues; therefore, nutrient management which has been suggested as a possible approach to overcoming such difficulties, helps in resolving these concerns. To preserve a healthy soil's physical and chemical environment and to act as an energy source for the biomass of soil-microbial organisms, it is crucial to utilise organic, inorganic and biofertilizers in moderation.

Key Words : Chemical fertilizer, Integrated nutrient management, Nutrient, Organic manure, Pearl millet

View Point Article : Adharsh, K.P., Kishore, Bommidi and Bhadu, Kavita (2023). Nutrient management in pearl millet (*Pennisetum glaucum*). *Internat. J. agric. Sci.*, **19** (1) : 235-238, **DOI:10.15740/HAS/IJAS/19.1/235-238.**

Article History : Received : 29.09.2022**; Revised :** 12.11.2022**; Accepted :** 14.12.2022

INTRODUCTION

Pearl millet (*Pennisetum glaucum*) also known as bajra, bulrush millet, spiked millet and poor man's crop is the most important coarse grain crop native to Africa, belongs to the Gramineae (poaceae) family. It is typically grown in semi-arid to arid regions with soils that are predominantly sandy in texture, have low levels of organic matter and nutrients and are hot and dry. The growing season is also short and varies greatly between years (Manson *et al*., 2015). It is more nutritious than many cereals since it is a good source of protein (12.6%), minerals, especially iron (2.8%) and fat (5%). After rice, wheat, maize and sorghum, pearl millet is India's fifth most important multipurpose grain, and it is a staple diet for millions of people living in dry areas. India's major pearl millet growing states are Rajasthan (4.28 million tonnes), Uttar Pradesh (1.302 MT), Haryana (1.079 MT), Gujarat (0.961MT), Maharashtra (0.66 MT) and Tamil Nadu (0.084 MT) accounting for more than 90% of pearl millet acreage in the area in the country (ICAR-AICRP on pearl millet, Jodhpur-2021).

In India majority of pearl millet cultivation is depended on rainfall. The lack of mineral nutrients and low organic content are the main reason of soil fertility loss (Suzuki *et al.*, 2017). The application of mineral

***Author for correspondence:**
[1]Department of Agronomy, Lovely Professional University, Phagwara (Punjab) India

fertiliser has been suggested as a potential remedy for enhancing soil fertility and raising agricultural output. It may be possible to increase soil fertility and crop output while using less resources by combining mineral fertiliser with organic resources according to Thumar *et al.* (2016). Production without fertilizer application occurs at the expense of soil stored nutrient levels, resulting in a low yield. This needs the incorporation of organic manures, which serve as a reservoir of nutrients (both macro and micro) for boosting pearl millet's long-term productivity. Combining chemical and organic fertilisers had a higher positive impact on microbial biomass and, consequently, soil health than using organic fertilizers alone (Dutta *et al.,* 2003). It has been shown that integrated nutrient management is effective for stabilising agricultural production by increasing soil microbial load as well as productivity. Poor economic conditions and irregular rains in dryland areas prevent farmers from using expensive fertilisers. Additionally, the continued and only use of chemical fertilisers has led to several problems, including soil health decline, a lack of micronutrients, nutritional imbalances in soil and plant systems, pest infestations, environmental damage, and pest infestations (Kumar *et al.*, 2012). Therefore, for dryland areas, combining inorganic and organic fertilizers may be greater effective than the usage of them alone.

Sources of nutrients :

A major source of nutrients for plant growth is soil. Mineral nutrients are nutrients that are supplied by the earth. During photosynthesis, the non-mineral nutrients like carbon (C), hydrogen (H), and oxygen (O) are obtained from air and water (Kathpalia *et al*., 2018). Soil mineral nutrients are divided into two groups the macronutrients and micronutrients. Macro nutrients are again divided into two, which are primary and secondary nutrients. Nitrogen(N), Phosphorus (P) and Potassium (K) are known as primary nutrients and these nutrients are required in larger quantity. Secondary nutrients are required by plants in medium quantities, these are Calcium (Ca), Magnesium (Mg) and Sulphur (S). The amounts of the micronutrients required are quite minimal. They consist of the elements Chlorine (Cl), Iron (Fe), Boron (B), Manganese (Mn), Copper (Cu), Zinc (Zn), Molybdenum (Mo) and Nickel (Ni) (Wirth *et al*., 2021).

Normally these nutrients will present in the soil naturally. Organic matter decomposition, Precipitation, Biological nitrogen fixation and Weathering of soil rocks and minerals are the sources of nutrients in soil (Kaviya *et al.,* 2019). In some cases, the soil may be deficient of these nutrients. Because of the deficiency of these nutrients the plant will unable perform well. The plants will show the deficiency symptoms. To overcome this, we need provide these nutrients additionally. By the application of organic manures and chemical fertilizers can provide sufficient dose of nutrients (Tran *et al.*, 2019).

Organic manures :

Organic manures are animal and plant wastes that are used as nutrition sources for plants. After they break down, they release nutrients. In addition to improving

Table 1: Nutritional value of pearl millet

Protein (g)	Fat (g)	Minerals (g)	Fibre (g)	Carbo (g)	Calcium (mg)	Phos (mg)	Iron (mg)	Thayamin (mg)
11.6	1.3	2.3	1.3	67.5	42	283	16.9	420

Source: Millets-reservoir of nutrients: one world one life

Table 2: Difference between chemical fertilizer and organic manure

Chemical fertilizer	Organic manure
These fertilizers are manufactured from synthetic materials	Organic manures are obtained from dead and decaying materials
Examples: urea, ammonia, ssp, mop etc.	Examples: farm yard manure, vermicompost, blood meal, oil cakes etc
Provides nutrients in large quantity, required in less amount	Provides low amount of nutrients thus required in large quantity
Chemical fertilizers are costly	Cheaply available
Chemical fertilisers increase soil fertility so that agricultural yields are not limited by insufficient levels of plant nutrients(Aleminew *et al*., 2020)	Organic manures increase the quality and yield of agricultural crops as same as chemical fertilizers (Bulluck and Ristaino, 2002)
Total reliance on inorganic fertilisers results in decreased soil organic matter, increased acidity, deterioration of the physical characteristics and structure of the soil, and increased erosion(Sharma *et al*.,2017).	Because organic manures have a low nutritional content and there is typically difficulty meeting crop nutrient demands using purely organic manures due to the restricted availability of organic material in many places (Morris *et al.,* 2007).

the physical characteristics of the soil, manures with low nutrient content per unit quantity have a long-lasting effect than fertilizers with high nutritional content (Diacono *et al.,* 2011). Based on the concentration of the nutrients, manures can also be divided into bulky organic manures and concentrated organic manures.Although bulky organic manures only provide a small amount of nutrients, they are used extensively (Moller 2018). The three most significant and often utilised bulky organic manures are farmyard manure (FYM), compost, and green manure. Concentrated organic manures contain more nutrients than bulky organic manures. Oilcakes, blood meal, fish dung, etc are commonly used concentrated organic manures.

Chemical fertilizers :

Chemical fertilizers are made synthetically. These fertilizers will provide more amount of nutrients in limited quantity. Chemical fertilizers are divided into three.

Straight fertilisers :

Straight fertilisers, such as those that give solely nitrogen, phosphorous, or potassium, are ones that do not contain any other secondary plant nutrients. Example: potassium chloride, potassium sulphate, ammonium sulphate, and urea (Delgado *et al.*, 2016).

Complex fertilisers :

Complex fertilisers are made up of two or three major plant nutrients, two of which are combined chemically. Typically, these fertilisers are made in granular form. Example: nitro phosphates, ammonium phosphate and diammonium phosphate (Kumar *et al.,* 2019).

Physical mixes of pure fertilisers are known as mixed fertilisers :

Two or three essential plant nutrients are present in them. In order to create mixed fertilisers, the elements must be fully combined, either mechanically or manually.

Integrated nutrient management and its concepts:

Integrated nutrient management primarily refers to the combining of traditional and modern nutrient management strategies into an agricultural system that is both environmentally sound and economically optimal and that judiciously, efficiently and interestedly makes use of the advantages of all possible sources of organic, inorganic, and biological elements (Sarkar *et al.,* 2021). In order to balance crop nutrient demand, it optimises all aspects of the nutrient cycle, including N, P, K, and other macro- and micronutrient inputs and outputs.

According to Bijarnia *et al.* (2020), the addition of FYM and biofertilizers to the recommended fertilizer dose significantly improved growth and yield of *Bajra.* According to Choudhary *et al.* (2014), adding more vermicompost and RDF to pearl millet enhanced the plants height and the number of tillers per metre of row length. This is because vermicompost supplies vital plant nutrients while also enhancing the physical and biological characteristics of the soil.

Conclusion :

The increased nutritional requirements of pearl millet may be met with good nutrient management practice, which also promises to boost soil health and maintain greater levels of yield. To maintain a favourable soil physical and chemical environment and to provide energy for the soil microbial biomass, it is crucial to apply organic, inorganic, and biofertilizers in a balanced manner.

INTRODUCTION

Aleminew, A. and Alemayehu, M. (2020). Soil fertility depletion and its management options under crop production perspectives in Ethiopia: A review. *Agricultural Reviews*, **41** (2) : 91-105.

Bijarnia, A.L., Singh, U. and Sutaliya, R. (2020). Influence of integrated nutrient management on fodder pearl millet in transitional plain of Luni Basin. *Internat. J. Econ. Plants*, **7** (4) : 193-196.

Bulluck, L.R., Brosius, M., Evanylo, G.K. and Ristaino, J.B. (2002). Organic and synthetic fertility amendments influence soil microbial, physical and chemical properties on organic and conventional farms. *Appl. Soil Ecol*., **19** (2) : 147-160.

Choudhary, R., Yadav, L.R. and Parihar, S. (2014). Studies on the interactive effect between vermicompost and fertility levels on pearl millet (*Pennisetum glaucum* L.). *Annals of Agri. Bio. Res*.,**19** (3) : 430-433.

Delgado, A., Quemada, M. and Villalobos, F.J. (2016). Fertilizers. *Principles of agronomy for sustainable agriculture* (Springer). 321-339 .

Diacono, M. and Montemurro, F. (2011). Long-term effects of organic amendments on soil fertility. *Sustainable Agriculture,* **2** (Springer) : 761-786.

Dutta, S., Pal, R., Chakeraborty, A. and Chakrabarti, K.

(2003). Influence of integrated plant nutrient supply system on soil quality restoration in a red and laterite soil. *Archives of Agronomy & Soil Science*, **49** : 631-637.

Kathpalia, R. and Satish, C. B. (2018). Plant mineral nutrition. *Plant physiology, development and metabolism.*(Springer). 37-81.

Kaviya, N., Upadhayay, V. K., Singh, J., Khan, A., Panwar, M., and Singh, A. V. (2019). Role of microorganisms in soil genesis and functions. *Mycorrhizosphere and pedogenesis.*(Springer) 25-52.

Kumar, P., Singh, K., Sharma, S., Kumar, S. and Sewhag, M. (2012). Biofertilizers supplement to chemical fertilizers in pearlmillet: A review. *Forage Research*, **37**(4) : 205- 209.

Kumar, R., Kumar, R. and Prakash, O. (2019). Chapter-5 the impact of chemical fertilizers on our environment and ecosystem. *Chief Ed,* **35** : 69.

Mason, S.C., Maman, N. and Pale, S. (2015). Pearl millet production practices in semi-arid West Africa: A review. *Experimental Agriculture*, **51** (4) : 501-521.

Moller, K. (2018). Soil fertility status and nutrient input–output flows of specialised organic cropping systems: a review. *Nutrient Cycling in Agroecosystems*, **112** (2) : 147-164.

Morris, M., Kelly, V.A., Kopicki, R.J. and Byerlee, D. (2007). Fertilizer use in African Agriculture: Lessons learned and good practice guidelines. Washington,DC: The World Bank. The Rain Forest Area of Nigeria. *Applied Tropical Agriculture,* **5** : 20-23.

Millets-reservoir of nutrients: *one world one life* (Malayalam edition).

Sarkar, D., Rakshit, A., Al-Turki, A. I., Sayyed, R. Z. and Datta, R. (2021). Connecting bio-priming approach with integrated nutrient management for improved nutrient use efficiency in crop species. *Agriculture*, **11**(4) : 372.

Sharma, A. and Chetani, R. (2017). A review on the effect of organic and chemical fertilizers on plants. *Int. J. Res. Appl. Sci. Eng. Technol*, **5** : 677-680.

Suzuki, K., Matsunaga, R., Hayashi, K., Matsumoto, N., Tobita, S. and Bationo, A. (2017). Effects of long-term application of mineral and organic fertilizers on dynamics of nitrogen pools in the sandy soil of the Sahel region, Niger. *Agriculture, Ecosystems & Environment*., **24** (2) : 76-88.

Thumar, C.M., Dudhat, M.S., Chaudhari, N.N., Hadiya, N.J. and Ahir, N.B. (2016). Growth, yield attributes, yield and economics of summer pearl millet (*Pennisetum glaucum* L.) as influenced by integrated nutrient management. *International J. Agriculture Sciences*, **59** (8) : 3344-3346.

Tran, T. T., Choi, J. W., Le, T. T. H. and Kim, J. W. (2019). A comparative study of deep CNN in forecasting and classifying the macronutrient deficiencies on development of tomato plant. *Applied Sciences*, **9** (8) : 1601.

Wirth, M., Vobruba, T., Hartl, M. and Kisser, J. (2021). Potential nutrient conversion using nature-based solutions in cities and utilization concepts to create circular urban food systems. *Circular Economy & Sustainability*, **1**(3) : 1147-1164.