



Performance of Improved and Local Finger Millet (*Eleusine coracana* L.) Varieties under Rainfed Conditions in Jalingo, Taraba State, Nigeria

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ABSTRACT

Finger millet (*Eleusine coracana*) is a nutritionally rich and climate-resilient cereal with considerable potential for enhancing food security in marginal environments. Despite its importance, productivity in Nigeria remains low due to the predominance of poorly adapted local varieties and limited adoption of improved cultivars. This study evaluated the performance and adaptability of four finger millet varieties (ACC14, KNE1149, KNE688, and Red Local) across two agro-ecological zones of Taraba State, namely Jalingo (Northern Guinea Savanna) and Wukari (Southern Guinea Savanna). Split-plot design with three replications under a $2 \times 2 \times 4$ factorial combination of two planting dates and two sowing methods was used in the study. Growth and blast disease parameters were systematically tracked across 48 plots. Data was analyzed using ANOVA and Duncan's Multiple Range. The results revealed significant varietal differences in growth, yield, and disease response. Improved varieties, particularly ACC14 and KNE1149, recorded superior grain yields (650.49 and 647.99 kg ha⁻¹, respectively) and demonstrated greater stability across locations, reflecting enhanced genetic potential for adaptation and productivity. In contrast, the local variety (Red Local) produced the lowest yield (420.78 kg ha⁻¹) and exhibited relatively higher susceptibility to lodging and blast disease. Varietal performance is strongly influenced by genotype–environment interaction, with improved varieties showing superior adaptability across diverse agro-ecological conditions. The study highlights the importance of adopting high-performing cultivars and location-specific production strategies to enhance finger millet productivity. It is therefore recommended that ACC14 and KNE1149 be promoted for cultivation in Taraba State and similar agro-ecological zones to improve yield, strengthen food security, and increase farmers' income.

Keywords: Finger millet, *Eleusine coracana*, improved varieties, grain yield, blast disease.

INTRODUCTION

Finger millet (*Eleusine coracana*) is an important cereal crop widely cultivated in semi-arid and tropical regions due to its remarkable adaptability to harsh environmental conditions and its superior nutritional composition. The crop is particularly rich in calcium, iron, dietary fiber, and essential amino acids, making it a valuable component of food systems in developing countries where

nutritional deficiencies are prevalent (Bandyopadhyay *et al.*, 2017; Tadele, 2019). In addition to its nutritional benefits, finger millet is highly resilient to drought and poor soil fertility, which makes it a strategic crop for climate-smart agriculture and sustainable food production in marginal environments (Upadhyaya *et al.*, 2016).

Despite these advantages, finger millet production in Nigeria remains low and largely subsistence-oriented, with yields far below its genetic potential. This low productivity has been attributed to several factors, including poor agronomic practices, limited access to improved seed, and the continued reliance on traditional landraces (Owere *et al.*, 2014). Local varieties, although well adapted to specific environments, are generally characterized by low yield potential, susceptibility to pests and diseases, and poor response to improved management practices.

Improved finger millet varieties developed through conventional and modern breeding approaches have demonstrated higher yield potential, enhanced resistance to biotic and abiotic stresses, improved tillering ability, early and uniform maturity, superior grain quality, and wider adaptation across diverse agro-ecological environments. These traits contribute significantly to increased productivity, climate resilience, and food security in finger millet-growing regions (Gebreyohannes *et al.*, 2024; Kayastha *et al.*, 2024). However, the adoption of these improved varieties among farmers remains limited due to inadequate awareness, poor seed distribution systems, and lack of location-specific performance information (Tadele, 2019). Consequently, there is a need to generate empirical data on the adaptability and performance of these varieties under different environmental conditions.

Agro-ecological variability is a key factor influencing crop performance, as variations in rainfall patterns, soil characteristics, temperature, and other environmental conditions significantly affect plant growth, phenological development, and yield formation. In Taraba State, Nigeria, distinct agro-ecological zones exist, notably Jalingo in the Northern Guinea Savanna and Wukari in the Southern Guinea Savanna. These zones differ in terms of rainfall distribution, length of growing season, and soil fertility status, thereby providing contrasting environments for evaluating varietal performance. Understanding how finger millet varieties respond to these environmental differences is

essential for identifying stable, high-yielding, and adaptable cultivars suitable for large-scale cultivation.

Furthermore, evaluation of key agronomic traits such as lodging resistance, tillering ability, and disease tolerance particularly resistance to blast disease is critical for ensuring sustainable production under farmer-managed conditions. Such traits not only influence yield stability but also determine the overall suitability of varieties for different agro-ecological zones (Bandyopadhyay *et al.*, 2017).

Therefore, this study was conducted to evaluate the performance and adaptability of improved and local finger millet varieties across the Northern and Southern Guinea Savanna zones of Taraba State. The objective was to identify superior varieties with high yield potential, stability, and resilience for enhanced productivity, improved food security, and increased farmer income in the region.

MATERIALS AND METHODS

Study Area

The study was conducted at two locations representing distinct agro-ecological zones of Taraba State, Nigeria. The first experimental site was located at the Teaching and Research Farm of Taraba State University, Ardo-Kola Local Government Area, situated within latitude 8°52'N and longitude 11°18'E in the Northern Guinea Savanna zone of northeastern Nigeria. The area is characterized by a tropical wet-and-dry climate with distinct rainy and dry seasons. Annual rainfall ranges between 800 and 1,100 mm, occurring mainly between April and October, while mean annual temperatures range from 28°C to 35°C. The topography is generally gently undulating with well-drained sandy loam to sandy clay loam soils that support arable crop production (Ardo & Bitrus, 2015; Kefas, 2016). The location lies within the Benue Valley agro-ecological system and is characterized by a mixture of upland and lowland (fadama) areas suitable for both rainfed and irrigated agriculture. Agricultural activities in the area include the

cultivation of cereals, legumes, vegetables, and

root crops, as well as livestock production.

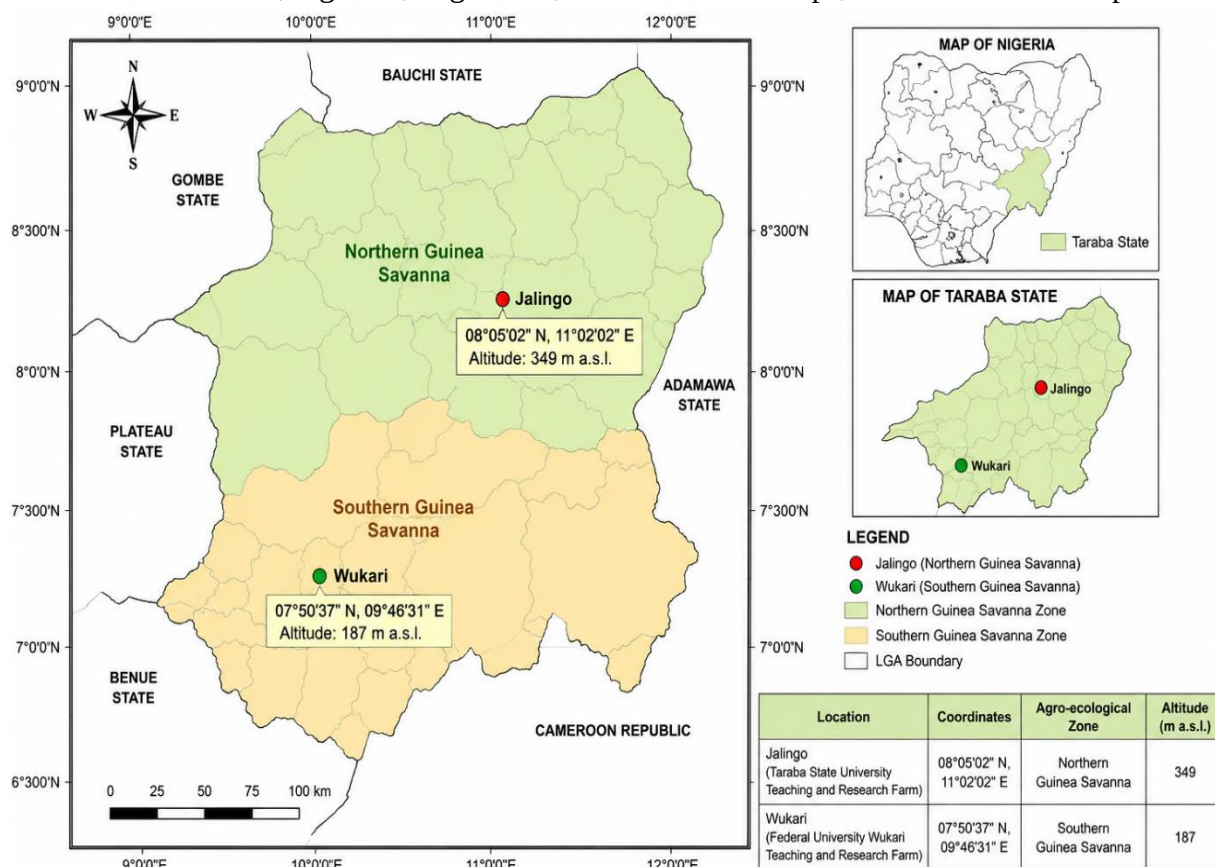


Figure 1: Map of Taraba State, Nigeria showing the study locations

Figure 1: Map of Taraba State, Nigeria showing the study location

Source: Adapted from the Administrative Map of Taraba State obtained from the Office of the Surveyor General of the Federation (OSGOF), Nigeria, and modified by the researcher using ArcGIS 10.8 (2025).

Source of Planting Materials

Three improved finger millet varieties (ACC14, KNE1149, and KNE688) were obtained from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Kano. A local variety (Red Local) was sourced from the local market within the study area.

Experimental Design and Treatments

The experiment consisted of two planting dates, two sowing methods and four finger millet varieties. This resulted in a $2 \times 2 \times 4$ factorial combination, giving a total of 16 treatment combinations. The treatments were arranged in a split-plot design with three replications. Planting dates were assigned to the main plots, while sowing methods and varieties were allocated to subplots.

Experimental Layout

The experimental field measured $21.1 \text{ m} \times 6.8 \text{ m}$ (143.48 m^2). Each replicate contained all 16

treatment combinations, resulting in a total of 48 plots across the experiment. Plots were arranged systematically within each block to minimize experimental error and field variability.

Each plot measured $2.2 \text{ m} \times 0.55 \text{ m}$, with 1 m spacing between main plots, subplots, and replications.

Seed Preparation

Seeds of all varieties (ACC14, KNE1149, KNE688, and Red Local) were treated with Apron Plus prior to planting to enhance germination and protect against seed-borne pests and diseases.

Land Preparation

The experimental field was ploughed twice to achieve a fine tilth suitable for seed establishment. The land was then leveled and divided into plots according to the experimental layout.

Crop Establishment and Agronomic Practices

Sowing Methods

Two sowing methods were used. Broadcasting – seeds were evenly spread across the soil surface and dibbling – seeds were planted at a spacing of 40 cm × 10 cm. Also, two planting dates were adopted 6th July and 27th July.

The spacing used in dibbling ensured adequate air circulation, sunlight penetration, and root development, thereby promoting optimal crop growth.

Weed Control

Weeds were controlled manually through regular hand weeding using simple farm tools to minimize competition for nutrients, water, and light.

Data Collection

Data were collected on the following growth parameters:

Stand Count (3 Weeks After Sowing - WAS)

Number of established plants per plot to assess early growth and establishment.

Number of Leaves

Counted at 3, 6, and 9 WAS when leaves were fully expanded.

Plant Height (cm)

Measured at 3, 6, and 9 WAS using a graduated meter rule on five randomly selected plants per plot.

Number of Tillers

Counted at 6 WAS, 9 WAS, and at harvest.

Days to 50% Heading

Recorded as the number of days from sowing to when 50% of plants in a plot reached the heading stage.

Blast Disease Score

Assessed at 3, 6, and 9 WAS to evaluate disease severity using standard scoring methods.

Data Analysis

The data collected on growth, phenological, yield, and disease parameters were subjected to statistical analysis using the Analysis of Variance (ANOVA) procedure appropriate for a split-plot experimental design. The analysis was carried out using GenStat (18th Edition) (or SPSS/SAS/R, depending on what you used). Treatment means were separated using Duncan's Multiple Range Test (DMRT) at the 5% level of probability ($P \leq 0.05$) whenever significant differences were detected.

RESULTS AND DISCUSSION

Yield Components of Finger Millet Evaluated During the 2024 Wet Season in Jalingo Metropolis

The results presented in Table 1 showed that sowing date had no significant ($P > 0.05$) effect on 1000-seed weight, panicle weight per plant, panicle weight per hectare, and grain weight per hectare. However, Early July sowing recorded higher panicle weight per plant (6.60), panicle weight per hectare (936.06 kg/ha), and grain weight per hectare (482.43 kg/ha) compared with Late July sowing, which recorded 5.98, 653.37 kg/ha, and 453.44 kg/ha, respectively. Conversely, Late July sowing produced a slightly higher 1000-seed weight (0.30 g) than Early July sowing (0.28 g), although the difference was not significant. The relatively better performance of the early sowing date may be attributed to improved utilization of available rainfall and a longer vegetative growth period, which enhanced biomass accumulation and yield formation. Similar observations were reported by Upadhyaya et al. (2021), who noted that timely planting improves growth and productivity of finger millet through better synchronization with prevailing environmental conditions.

Planting method also had no significant ($P > 0.05$) effect on all the yield parameters measured. Broadcasting recorded a higher panicle weight per plant (6.46), panicle weight per hectare (709.15 kg/ha), and grain weight per hectare (469.67 kg/ha) than dibbling, which produced 6.12, 637.28 kg/ha, and 466.20 kg/ha, respectively. Both planting methods recorded the same 1000-seed weight (0.29 g), indicating comparable performance. The absence of significant differences suggests that both planting methods provided similar growing conditions for crop establishment and development under the study environment. This agrees with the findings of Pradhan et al. (2020), who reported that planting method may not significantly influence yield attributes of finger millet when environmental and management conditions are favorable.

Significant differences ($P \leq 0.05$) were observed among the varieties for panicle weight per plant, while no significant differences were recorded for 1000-seed weight, panicle weight per hectare, and grain weight per hectare. KNE1149 recorded the highest panicle weight per plant (7.13), which was comparable to ACC14 (6.46) and KNE688 (6.23), but significantly higher than Red Local (5.34), which recorded the lowest value. The superior performance of KNE1149 indicates a greater capacity for assimilate accumulation and partitioning into reproductive structures. Similar varietal differences in finger millet have been reported by Dida et al. (2018), who attributed variations in panicle development and yield traits to genetic differences among genotypes.

For 1000-seed weight, KNE1149 and Red Local recorded the highest value (0.30 g),

while ACC14 and KNE688 recorded the lowest value (0.28 g), although the differences were not significant. Likewise, ACC14 recorded the highest panicle weight per hectare (706.79 kg/ha), followed by KNE688 (684.04 kg/ha), while Red Local recorded the lowest value (649.07 kg/ha). KNE688 produced the highest grain weight per hectare (468.42 kg/ha), followed by Red Local (447.33 kg/ha) and KNE1149 (443.17 kg/ha), though the differences were not statistically significant. Overall, KNE1149 exhibited superior performance in panicle weight per plant, whereas ACC14 and KNE688 showed better performance in panicle weight and grain yield per hectare under Jalingo conditions. The observed varietal differences demonstrate the importance of genotype selection in improving finger millet productivity, as previously reported by Goron and Raizada (2015).

Table 1: Effect of Sowing Date, Planting Method and Variety on Yield Components of Finger Millet Evaluated during the 2024 Wet Season in, Jalingo

Treatment	1000 Seed Weight (G)	Panicle Weight/Plant	Panicle Weight (Kg/Ha)	Grain Weight (Kg/Ha)
Sowing Date				
Early July	0.28a	6.60a	936.06a	482.43a
Late July	0.30a	5.98a	653.37a	453.44a
Planting Method				
Dibbling	0.29a	6.12a	637.28a	466.20a
Broadcasting	0.29a	6.46a	709.15a	469.67a
Variety				
ACC14	0.28a	6.46a	706.79a	12.82a
KNE688	0.28a	6.23ab	684.04a	468.42a
KNE1149	0.30a	7.13a	652.96a	443.17a
Red Local	0.30a	5.34b	649.07a	447.33a
	0.04a	0.33	34.96	30.80
SXPXV	NS	S	NS	NS

Key: Means in a column followed by different letters are significantly different at 5% probability level ($p \leq 0.05$) according to the appropriate test. SE+ = Standard Error of Mean. "Not significant" denotes no statistical difference among treatment means.

Number of Leaves of Finger Millet as Influenced by Sowing Date, Planting Method and Variety in Jalingo

The results presented in Table 2 showed that sowing date significantly ($P \leq 0.05$) influenced the number of leaves per plant from 6 weeks after sowing (WAS) up to harvest, while no significant difference was observed at 3 WAS. At 3 WAS, Early July and Late July sowing recorded comparable leaf numbers of 9.86 and 9.87, respectively. However, from 6 WAS onwards, Early July sowing consistently

produced significantly higher leaf numbers than Late July sowing. At harvest, Early July sowing recorded the highest number of leaves (23.40), compared to 20.00 leaves for Late July sowing. The superior performance of Early July sowing may be attributed to favourable moisture availability and a longer growth period, which promoted vegetative development and leaf production. Similar findings were reported by Upadhyaya et al. (2021), who observed that timely sowing

enhances vegetative growth and canopy development in finger millet.

Planting method significantly ($P \leq 0.05$) affected leaf production from 6 WAS to harvest, whereas no significant difference was observed at 3 WAS. Broadcasting recorded significantly higher leaf numbers than dibbling at all subsequent growth stages. At harvest, broadcasting produced 22.80 leaves compared with 20.58 leaves under dibbling. The higher leaf production under broadcasting may be associated with better plant establishment and canopy development under the prevailing environmental conditions. This result agrees with Pradhan et al. (2020), who reported that crop establishment methods can influence vegetative growth and canopy expansion in finger millet.

Significant varietal differences ($P \leq 0.05$) were observed for number of leaves at all growth stages. At 3 WAS, KNE1149 recorded the highest number of leaves (11.74), which was significantly higher than the other varieties, while KNE688 recorded the lowest value (7.86). A similar trend was observed at 6, 9, 12

WAS and at harvest, where KNE1149 consistently maintained the highest leaf numbers of 14.59, 18.24, 19.79 and 24.79, respectively. KNE688 consistently recorded the lowest values throughout the growth period. ACC14 and Red Local exhibited intermediate performance and were comparable at some stages. The superior leaf production observed in KNE1149 suggests greater genetic vigour and canopy development, which may enhance photosynthetic efficiency and biomass accumulation. This finding is consistent with the report of Dida et al. (2018), who attributed differences in vegetative growth among finger millet genotypes to inherent genetic characteristics.

The significant $S \times P \times V$ interaction observed at 9 WAS, 12 WAS and harvest indicates that the response of the varieties to sowing date and planting method varied at later growth stages. This suggests that leaf production in finger millet is influenced not only by genotype but also by the interaction between management practices and environmental conditions.

Table 2: Effect of Sowing Date, Planting Method and Variety on Number of Leaves of Finger Millet Evaluated during the 2024 Wet Season in, Jalingo

Treatment	3 WAS	6 WAS	9 WAS	12 WAS	At Harvest
Sowing Date					
Early July	9.86a	12.74a	15.59a	19.80a	23.40a
Late July	9.87a	12.15b	14.57b	18.10b	20.00b
Planting Method					
Dibbling	9.27a	11.84b	15.29b	18.46b	20.58b
Broadcasting	10.06a	13.04a	15.99a	19.79a	22.80a
Variety					
ACC14	10.06a	12.66b	15.26b	18.24b	22.40a
KNE688	7.86c	10.56c	12.52d	15.86c	18.18c
KNE1149	11.74a	14.59a	18.24a	19.79a	24.79a
Red Local	9.81b	12.16bc	14.20c	18.36b	21.26b
$S \times P \times V$	NS	NS	S	S	S

Key: Means followed by the same letter(s) within a column are not significantly different ($P \leq 0.05$) according to Duncan's Multiple Range Test (DMRT). NS = Not significant; S = Significant; WAS = Weeks After Sowing.

Number of Tillers of Finger Millet as Influenced by Sowing Date, Planting Method and Variety in Jalingo

The results presented in Table 3 showed that sowing date had no significant ($P > 0.05$) effect on the number of tillers at 6 weeks after sowing (WAS). Early July and Late July sowing recorded comparable tiller numbers of 1.46 and 1.39, respectively. However, significant differences ($P \leq 0.05$) were observed at 9 and 12 WAS. Early July sowing

produced significantly higher tiller numbers at 9 WAS (2.40) and 12 WAS (3.20) compared with Late July sowing, which recorded 1.08 and 2.66 tillers, respectively. The higher tiller production observed under Early July sowing may be attributed to favourable rainfall distribution and a longer vegetative growth period, which enhanced tiller initiation and development. This finding agrees with the report of Upadhyaya et al. (2021), who observed that timely sowing promoted

vegetative growth and increased tillering capacity in finger millet under tropical conditions. Similarly, Rao et al. (2019) reported that delayed planting reduced tiller production due to shortened growth duration and reduced moisture availability during the vegetative phase.

Planting method did not significantly ($P > 0.05$) influence tiller production at 6 and 9 WAS. At 6 WAS, broadcasting (1.50) and dibbling (1.34) recorded comparable tiller numbers, while at 9 WAS, broadcasting (2.37) was statistically comparable to dibbling (2.10). However, significant differences ($P \leq 0.05$) were observed at 12 WAS, where dibbling produced the highest number of tillers (3.01), although it was statistically comparable to broadcasting (2.79). The slight advantage observed under dibbling at the later growth stage may be due to better plant spacing and reduced competition among plants, which favoured tiller survival and development. This finding agrees with Pradhan et al. (2020), who reported that crop establishment methods significantly influence tiller retention and productivity in finger millet. Likewise, Kumar et al. (2018) observed that line sowing and dibbling methods enhanced tiller survival and biomass accumulation compared with broadcasting due to improved resource utilization.

Significant varietal differences ($P \leq 0.05$) were observed at 9 and 12 WAS, whereas no significant differences were recorded at 6 WAS. At 6 WAS, all varieties exhibited comparable performance, with tiller numbers ranging from 1.37 in KNE1149 to 1.54 in KNE688 and Red Local. At 9 WAS, KNE1149 recorded the highest number of tillers (2.73), which differed significantly from the other varieties. ACC14 (2.40) showed comparable performance to KNE1149, while KNE688 (1.89) recorded the lowest value. A similar trend was observed at 12 WAS, where KNE1149 produced the highest number of tillers (3.74), followed by ACC14 (3.30). Red Local (2.51) and KNE688 (2.26) recorded significantly lower values. The superior tillering ability of KNE1149 and ACC14 suggests greater genetic potential for vegetative growth and biomass accumulation, which could contribute positively to grain yield. These findings agree with Dida et al. (2018), who attributed differences in tillering ability among finger millet varieties to inherent genetic variability. Similarly, Ramashia et al. (2021) reported that improved finger millet genotypes generally exhibit superior tillering capacity and biomass accumulation compared with local landraces due to enhanced breeding and selection.

Table 3: Effect of Sowing Date, Planting Method and Variety on Number of Tillers of Finger Millet Evaluated during the 2024 Wet Season in, Jalingo

Treatment	Tillers 6WAS	Tillers 9WAS	Tillers 12WAS
Sowing date			
Early July	1.46a	2.40a	3.20a
Late July	1.39a	1.08b	2.66b
Planting Method			
Dibbling	1.34a	2.10a	3.01b
Broadcasting	1.50a	2.37a	2.79ba
Variety			
ACC14	1.43a	2.40ab	3.30b
KNE688	1.54a	1.89c	2.26d
KNE1149	1.37a	2.73a	3.74a
Red Local	1.54a	1.93bc	2.51c
	0.09	0.35	0.41
SxPxV	NS	S	S

Key: Means in a column followed by different letters are significantly different at 5% probability level ($p \leq 0.05$) according to the appropriate test. SE+ = Standard Error of Mean. "Not significant" denotes no statistical difference among treatment means. SxPxV = Interaction

Blast Disease Score of Finger Millet as Influenced by Sowing Date, Planting Method and Variety in Jalingo

The results presented in Table 4 showed that sowing date had no significant ($P > 0.05$) effect on blast disease score at both 6 and 9 weeks after sowing (WAS). At 6 WAS, Late July sowing recorded a slightly higher disease score (1.69) than Early July sowing (1.59), although the difference was not significant. A similar trend was observed at 9 WAS, where disease scores remained unchanged at 1.69 and 1.59 for Late July and Early July sowing, respectively. The absence of significant differences suggests that the sowing dates provided similar environmental conditions for disease development under the study area. This finding is consistent with the report of Takan et al. (2012), who noted that blast disease severity may not differ significantly when environmental conditions remain favourable across planting periods. Planting method also had no significant ($P > 0.05$) effect on blast disease score at both assessment periods. At 6 WAS and 9 WAS, broadcasting recorded slightly higher disease scores (1.89) compared with dibbling (1.84), but the differences were statistically insignificant. This indicates that both planting methods offered comparable conditions for disease occurrence and spread. Similar observations were reported by Mgonja et al. (2017), who found that crop establishment methods may have limited

influence on blast incidence when disease pressure is generally low.

Varietal differences in blast disease score were not significant ($P > 0.05$) at 6 WAS. Disease scores ranged from 1.69 in Red Local to 1.99 in KNE1149, indicating that all varieties exhibited comparable responses to blast infection during the early stage of disease development. However, significant differences ($P \leq 0.05$) were observed at 9 WAS. KNE1149 recorded the highest blast disease score (2.09), indicating greater susceptibility to blast disease, and differed significantly from the other varieties. ACC14, KNE688, and Red Local recorded the lowest and comparable disease scores (1.36), suggesting better tolerance or resistance to blast infection under the prevailing environmental conditions. The lower disease scores recorded by ACC14, KNE688, and Red Local indicate their potential as relatively blast-tolerant varieties, while the higher score observed in KNE1149 suggests increased susceptibility. According to Mgonja et al. (2017), varietal resistance remains one of the most effective and economical approaches for managing finger millet blast disease. The non-significant $S \times P \times V$ interaction at both 6 and 9 WAS further indicates that the combined effects of sowing date, planting method, and variety did not significantly influence blast disease development under Jalingo conditions.

Table 4: Blast Disease Score of Finger Millet at 6 WAS and 9 WAS (2024 Wet Season, Jalingo)

Treatment	6 WAS	9 WAS
Sowing Date		
Early July	1.59a	1.59a
Late July	1.69a	1.69a
Planting Method		
Dibbling	1.84a	1.84a
Broadcasting	1.89a	1.89a
Variety		
ACC14	1.72a	1.36b
KNE688	1.84a	1.36b
KNE1149	1.99a	2.09a
Red Local	1.69a	1.36b
$S \times P \times V$	NS	NS

Key: Means followed by the same letter(s) within a column are not significantly different ($P \leq 0.05$) according to Duncan's Multiple Range Test (DMRT). NS = Not significant; WAS = Weeks After Sowing.

Phenological and Yield Traits of Finger Millet as Influenced by Sowing Date, Planting Method and Variety in Jalingo

The results presented in Table 5 showed that sowing date significantly ($P \leq 0.05$) influenced days to 50% heading and the number of productive tillers per plant, while lodging score was not significantly affected. Early July

sowing recorded significantly more days to 50% heading (77.6 days) compared with Late July sowing (75.4 days). Similarly, Early July sowing produced a significantly higher number of productive tillers per plant (3.3) than Late July sowing (2.6).

The delayed heading and increased productive tiller formation observed under Early July sowing may be attributed to a longer vegetative growth period and favourable moisture conditions, which enhanced plant development and assimilate accumulation. This finding agrees with Upadhyaya et al. (2021), who reported that timely sowing promotes better vegetative growth and reproductive development in finger millet. Although Early July sowing recorded a slightly higher lodging score (1.6) than Late July sowing (1.5), the difference was not significant, indicating comparable lodging resistance between the sowing dates. Planting method significantly ($P \leq 0.05$) affected days to 50% heading, whereas productive tillers per plant and lodging score were not significantly influenced. Broadcasting recorded significantly more days to 50% heading (77.3 days) than dibbling (75.7 days). For productive tillers per plant, broadcasting produced a higher value (3.1) than dibbling (2.7), although the difference was not statistically significant. Similarly, lodging scores of 1.7 and 1.5 were recorded for broadcasting and dibbling, respectively, indicating comparable performance. The delayed heading observed under broadcasting may be due to increased plant competition associated with higher plant density, which could slightly prolong

vegetative growth before reproductive development. Significant varietal differences ($P \leq 0.05$) were observed for days to 50% heading and productive tillers per plant, while lodging score did not differ significantly among varieties. ACC14 recorded the highest days to 50% heading (77.1 days), which was comparable to KNE1149 (76.9 days) and Red Local (76.8 days), but significantly higher than KNE688 (75.2 days). For productive tillers per plant, KNE1149 recorded the highest value (3.4), which was comparable to ACC14 (3.3) but significantly higher than KNE688 (2.6) and Red Local (2.5). The superior performance of KNE1149 and ACC14 in productive tiller production suggests greater genetic potential for yield formation. Lodging scores ranged from 1.4 in ACC14 and Red Local to 1.8 in KNE1149, but these differences were not statistically significant, indicating similar lodging tolerance among the varieties. The significant $S \times P \times V$ interaction observed for days to 50% heading and productive tillers per plant indicates that the response of the varieties to sowing date and planting method varied for these traits. However, the non-significant interaction for lodging score suggests that lodging resistance was relatively stable across treatment combinations under Jalingo conditions.

Table 5: Effect of Sowing Date, Planting Method and Variety on Phenological and Yield Traits of Finger Millet Evaluated during the 2024 Wet Season in, Jalingo

Treatment	Days to 50% Heading	Productive Tillers/Plant Harvest	Lodging Score
Sowing date			
Early July	77.6a	3.3a	1.6a
Late July	75.4b	2.6b	1.5a
Planting Method			
Dibbling	75.7b	2.7	1.5a
Broadcasting	77.3a	3.1a	1.7a
Variety			
ACC14	77.1a	3.3a	1.4a
KNE688	75.2b	2.6b	1.6a
KNE1149	76.9a	3.4a	1.8a
Red Local	76.8a	2.5b	1.4a
SxPxV	0.65	0.19	0.14
	S	S	NS

Key: Means in a column followed by different letters are significantly different at 5% probability level ($p \leq 0.05$) according to the appropriate test. SE+ = Standard Error of Mean. "Not significant" denotes no statistical difference among treatment means. SxPxV = Interaction

CONCLUSION

This study demonstrated that sowing date, planting method, and varietal differences significantly influenced the growth, phenological development, yield components, and disease response of finger millet under the Northern Guinea Savanna conditions of Jalingo. The results revealed that early sowing in July generally enhanced vegetative growth, increased productive tillers, and improved yield-related traits such as panicle weight and grain yield compared to late sowing. This suggests that timely planting allows the crop to fully utilize available rainfall and favorable environmental conditions, thereby improving productivity. Planting method showed relatively limited but important effects on crop performance. Broadcasting slightly enhanced leaf production and productive tillers compared to dibbling, likely due to higher plant population density, although both methods produced comparable grain yield. This indicates that farmers can adopt either method depending on resource availability without substantial yield penalties, provided proper crop management practices are maintained. Significant varietal differences were observed across all parameters, highlighting the strong role of genetic factors in determining crop performance. Improved varieties, particularly KNE1149 and ACC14, consistently demonstrated superior performance in terms of leaf production, tillering ability, and yield components. KNE1149, in particular, exhibited the highest number of productive tillers and strong growth characteristics, making it highly adaptable to the study environment. In contrast, the local variety recorded comparatively lower performance in several traits, indicating limited genetic potential for high productivity. The study further showed that blast disease incidence was generally low and not significantly influenced by agronomic factors, although

varietal differences existed. Most varieties exhibited moderate tolerance, suggesting that the tested genotypes are relatively resilient under the prevailing environmental conditions. Overall, the findings confirm that finger millet productivity in the Northern Guinea Savanna is largely determined by the interaction of sowing time, varietal characteristics, and agronomic practices. Early planting combined with high-performing varieties offers the greatest potential for improving yield and ensuring stable production.

RECOMMENDATIONS

Farmers should adopt early July planting to maximize growth duration, enhance tiller formation, and improve grain yield, especially under rainfed conditions where moisture availability is critical. High-performing varieties such as KNE1149 and ACC14 should be promoted for cultivation due to their superior growth, higher productive tillers, and better yield performance.

Both broadcasting and dibbling methods can be used effectively; however, broadcasting may be preferred where higher plant density and better canopy coverage are desired, provided proper nutrient and weed management are ensured. Agricultural extension agents should intensify farmer education on optimal sowing time, varietal selection, and best agronomic practices to enhance finger millet productivity in the region.

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