

# **Yield Performance of Foxtail Millet (*Setaria italica*) at BAPARD Agricultural Farm**

**Action Research Report  
2023-2024**



**Bangabandhu Academy for Poverty Alleviation and Rural  
Development (BAPARD)  
Kotalipara, Gopalganj-8110**

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## **Action Research Report Submitted By-**

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## **Yield Performance of Foxtail Millet (*Setaria italica*) at BAPARD Agricultural Farm**

### **Introduction**

Millets are small-seeded annual cereals grown for food, feed, forage, and fuel (Kothari et al., 2005). Foxtail millet (*Setaria italica*) is one of the world's oldest cultivated crop and ranks second in the world's total production of millets. It was domesticated in China dating back to 8700 years (Liu et al., 2009). It is an important staple food for millions of people in southern Europe and Asia (Marathe, 1993). It is widely cultivated in Asia, Europe, North America, Australia and North Africa for grain or forage (Austin, 2006). The area under Cheena & Kaon production in Bangladesh is about 1541 acres with a production of 617 m tons (BBS, 2019). Foxtail millet is grown in cooler, droughtier regions than other millets (Koch, 2002). Millets are known to possess unique features of resilience to adverse environments, especially during drought and infertile soil conditions (Nadeem et al., 2020). Millet crops are grown on marginal lands and under low-input agricultural conditions situations in which major cereal crops often produce low yields (Amadou et al., 2013). Foxtail millet has attracted international research attention due to its high salinity stress tolerance, low incidence of pest and diseases, high photosynthetic efficiency and nutritional values (Liu et al., 2011; Vetriventhan et al., 2012). Foxtail millet is a short duration crop which is suitable for different cropping systems in rainfed farming. However, it has a shallow root system that does not easily recover from drought (Hancock Seed, 2014). Foxtail millet grains are rich in starch, proteins and lipids as well as vitamins and minerals, which makes it a good source of nutrients in the human diet in many parts of the world, especially in Africa, China and India where food security has always been the primary concern (Bai *et al.*, 2008). Improvement of yield is necessary to achieve profit which is highly influenced by the high yielding varieties and agro-climatic condition.

The yield of different variety varied significantly due to different Agro-Ecological Zones (AEZs). The productivity and quality of foxtail millet can be improved by detecting the proper variety for proper region. For this reason, BARI (Bangladesh Agricultural Research Institute) released three important foxtail millet varieties was selected for the experiment to find out the best variety for the Gopalganj district of Bangladesh. The specific objectives of the action research were as follows-

**Objectives of study:**

1. To estimate and compare the yield performance important foxtail millet varieties in this region (AEZ-14).
2. To find out the best foxtail millet variety for this region (AEZ-14).
3. To extend the foxtail millet cultivation at local area.

**Materials and Methods**

The field experiment was conducted at Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD) Agricultural Farm, Kotalipara, Gopalganj during 01 November, 2023 to 21 April, 2024. The location of the site is between  $21^{\circ}51'$  and  $23^{\circ}10'$  north latitude and between  $89^{\circ}56'$  and  $90^{\circ}10'$  east longitude. This area is under the Agro Ecological Zone (AEZ)-14. The topography of the farm area is medium high land and the soil is sandy loam type. The average temperature of this location varies from  $12.1^{\circ}\text{C}$  to  $36.1^{\circ}\text{C}$ . Heavy rainfall occurs during rainy season. Most of the area of kotalipara upazila is low land area. The land was inundated by water about 6-8 months in a year. Only rice has been cultivated in those areas in boro season. New crop will help to develop the new cropping pattern in kotalipara upazila.

BARI Kaon-2, BARI Kaon-3, and Titas (a BARI released variety) were used for the experiment. Seed was collected from Bangladesh Agriculture Research Institute (BARI), Gazipur, Bangladesh. The four cross ploughing was done by a rotary plough by four times and raised plot was prepared. The seed was sown during 20 November, 2023. Seed was sown in broadcasting method and seed rate was 10 kg/ha. Before sowing the plot was prepared by cleaning the wastage from the field. Total 12 plots were prepared. The size of the plot was (6.5m $\times$ 8m) and about 50 cm drain was kept between two plots. Randomized Completely Block Design (RCBD) was used with 4 replications of three important varieties. Varieties were-

V<sub>1</sub>= BARI Kaon-2

V<sub>2</sub>= BARI Kaon-3

V<sub>3</sub>= Titas (a BARI released variety)

Fertilizer was used as the recommendation of Krishi Projukti Hatboi (2019). Urea 170 kg/ha, TSP 125 kg/ha, MoP 90 kg/ha, Zypsum 55 kg/ha, Zinc Sulphate 4 kg/ha will be the fertilizer dose. All fertilizers and ½ of Urea was applied as a basal dose during land preparation. Rest of Urea will be applied after 35-40 days of seed sowing. Thinning and weeding were done to maintain the optimum population. Irrigation and drainage were done at proper time. The crop was attacked by fungal disease which was controlled by spraying proper fungicide. Harvesting time is a very important and critical for foxtail millet. The symptoms of the maturity of the foxtail millet were: The ear of the foxtail millet was taken the color of the straw and the grain made a sound when threshed with teeth. Harvested crop was taken in the laboratory of the BAPARD.

Data collection was a very important for a research work. In case of the present study data was recorded on the following parameters: Plant height (cm) during harvesting, Crop duration, Total number of tillers per plant, Effective tillers per plant, Ineffective tillers per plant, Ear length (cm), Weight of main ear (gm), Thousand Seed weight (gm), Grain yield (t/ha), Straw yield (t/ha) Biological yield (t/ha), Harvest index (%). All data was taken carefully at proper time. Data was collected from the experimental plot and the laboratory of BAPARD. The collected data was analyzed by using STAR (Statistical Tool for Agricultural Research) software. The mean values for all the parameters were calculated and the analysis of variance was performed. The significance of the difference among the treatment means was estimated by the at 5 % levels of probability.

## Work plan and Activity chart

### Work plan

The following time schedule of activities was maintained by the researchers

Sl. No	Name of Activities	Starting Date	Completion Date
i.	Site selection and Land preparation	01.11.2023	15.11.2023
ii.	Seed collection and seed sowing	15.11.2023	20.11.2023
iii.	Collection of review of literature	21.11.2023	31.12.2023
iv.	Intercultural Operation	20.11.2023	27.03.2024
v.	Harvesting and Data collection	01.03.2024	27.03.2024
vi.	Data analysis and report preparation	28.03.2024	21.04.2024

### Activity chart in month

Activities	Months (Duration)							
	Nov/23	Dec/23	Jan/24	Feb/24	Mar/24	Apr/24	May/24	Jun/24
Site selection and Land preparation	■							
Seed collection and seed sowing		■						
Collection of review of literature		■	■					
Intercultural Operation		■	■	■	■			
Harvesting and Data collection					■			
Data analysis and report preparation						■		

## Result and Discussion

### Plant height during harvesting (cm)

Plant height during harvesting was varied 109.03cm to 47.75cm (Table-1). Maximum plant height during harvesting was recorded with V<sub>1</sub> (109.03cm). The minimum plant height during harvesting was recorded in V<sub>2</sub> (47.75cm). The V<sub>3</sub> gave 71.15cm plant height during harvesting. As a result, the BARI Kaon-2 gave the maximum plant height during harvesting and the BARI Kaon-3 gave the lowest plant height during harvesting.

**Table-1: Plant height (cm) during harvesting, Total number of tillers per plant, Effective tillers per plant, Ineffective tillers per plant, Ear length (cm), Weight of main ear (gm)**

Variety	Plant height (cm) during harvesting	Total number of tillers per plant	Effective tillers per plant	Ineffective tillers per plant	Ear length (cm)	Weight of main ear (gm)
BARI Kaon-2 (V <sub>1</sub> )	109.03a	1.50	1.40	0.15	19.68a	6.24a
BARI Kaon-3 (V <sub>2</sub> )	47.75c	1.55	1.35	0.20	16.07b	5.28b
Titas (a BARI released variety) (V <sub>3</sub> )	71.15b	1.25	1.15	0.10	14.30b	5.39b
CV (%)	4.58	17.56	20.99	91.62	7.21	7.34
F-test	*	NS	NS	NS	*	*

In a column, figure with same letter do not differ significantly; \*Significant at 5% level of significance; NS= Non Significant

Source: Data was collected from the experimental plot and data was analyzed by using STAR (Statistical Tool for Agricultural Research) software.

### Total number of tillers per plant

Total number of tillers per plant was varied 1.55 to 1.25 (Table-1). Maximum number of tillers per plant was recorded with V<sub>2</sub> (1.55) and the minimum number of tillers per plant was recorded with V<sub>3</sub> (1.25) which was statistically similar with each other. The BARI Kaon-2 gave the 1.50

tillers per plant and BARI Kaon-3 gave the 1.55 tillers per plant but there was no significant difference among the varieties at 5% level of significance.

### **Effective tillers per plant**

The number of effective tillers per plant was varied from 1.40 to 1.15 (Table-1). The maximum effective tillers per plant was recorded with  $V_1$  (1.40) and the minimum number of effective tillers per plant was recorded with  $V_3$  (1.15) which was statistically identical with each other. BARI Kaon-2 gave the maximum total number of effective tillers per plant and titas variety gave the minimum total number of effective tillers per plant but there was no significant difference among the varieties at 5% level of significance.

### **Ineffective tillers per plant**

The number of ineffective tillers per plant was varied from 0.20 to 0.10 (Table-1). The maximum ineffective tillers per plant was recorded with  $V_2$  (0.20) and the minimum number of ineffective tillers per plant was recorded with  $V_3$  (0.10) which was statistically similar. BARI Kaon-2 gave 0.15 ineffective tillers per plant and there was no significant difference among the varieties at 5% level of significance.

### **Ear length (cm)**

Ear length was investigated from 19.68cm to 14.30cm (Table-1). The Maximum ear length was found in  $V_1$  (19.68cm) and the minimum ear length was found in  $V_3$  (14.30cm) which was statistically similar with  $V_2$  (16.07cm). As a result, the BARI Kaon -2 gave the maximum ear length and titas variety gave the minimum ear length.

### **Weight of main ear (gm)**

The weight of main ear was varied from 6.24gm to 5.28gm (Table-1). The maximum weight of main ear was recorded with V<sub>1</sub> (6.24gm) and the minimum weight of main ear was recorded in V<sub>2</sub> (5.28gm). The V<sub>2</sub> (5.28gm) and V<sub>3</sub> (5.39 gm) were statistically identical in case of weight of main ear. As a result, we decided that the BARI Kaon -2 gave the highest weight of main ear and the BARI Kaon -3 gave the lowest weight of main ear.

### **Thousand seed weight (gm)**

The thousand seed weight was varied from 2.54gm to 2.30gm (Table-2). The maximum thousand seed weight was recorded with V<sub>1</sub> (2.54gm). The minimum thousand seed weight was found in V<sub>2</sub> (2.30gm) which was statistically similar with V<sub>3</sub> (2.38gm). It means that the BARI Kaon -2 gave the highest thousand seed weight and the BARI Kaon -3 gave the lowest thousand seed weight.

### **Crop duration (days)**

The duration of crop was varied from 126.50 days to 108.50 days (Table-2). The maximum crop duration was recorded with V<sub>2</sub> (126.50 days) which was statistically identical with V<sub>1</sub> (121.0 days). The minimum crop duration was recorded in V<sub>3</sub> (108.50 days). As a result, titas variety was comparatively short duration crop than other varieties (BARI Kaon-3 and the BARI Kaon-2).

### **Grain yield (t/ha)**

Yield is an important factor in case of crop cultivation. The grain yield was varied from 2.79 t/ha to 2.10 t/ha (Table-2). The maximum grain yield was recorded with V<sub>1</sub> (2.79 t/ha) and the

minimum grain yield was found in V<sub>3</sub> (2.10 t/ha). The V<sub>2</sub> gave 2.44 t/ha in case of grain yield. As a result, it can be concluded that the BARI Kaon -2 was the best variety in terms of grain yield.

**Table-2: Thousand Seed weight (gm), Crop duration (days after sowing), Grain yield (t/ha), Straw yield (t/ha), Biological yield (t/ha), Harvest index (%).**

Variety	Thousand Seed weight (gm)	Crop duration (days after sowing)	Grain yield (t/ha)	Straw yield (t/ha)	Biological yield (ton/ha)	Harvest index (%)
BARI Kaon-2 (V <sub>1</sub> )	2.54a	121.0a	2.79a	5.72a	8.51a	32.79
BARI Kaon-3 (V <sub>2</sub> )	2.30c	126.50a	2.44b	4.58b	7.02b	34.76
Titas (a BARI released variety) (V <sub>3</sub> )	2.38b	108.50b	2.10c	4.80b	6.90b	30.44
CV (%)	1.73	4.74	3.73	11.67	15.78	14.73
F-test	*	*	*	*	*	NS

In a column, figure with same letter do not differ significantly; \*Significant at 5% level of significance; NS= Non Significant

Source: Data was collected from the experimental plot and data was analyzed by using STAR (Statistical Tool for Agricultural Research) software

### **Straw yield (t/ha)**

The straw yield was varied from 5.72 t/ha to 4.58 t/ha (Table-2). The maximum straw yield was recorded with V<sub>1</sub> (5.72 t/ha). The minimum straw yield was found in V<sub>2</sub> (4.58 t/ha) which was statistically identical with V<sub>3</sub> (4.80 t/ha). As a result, the BARI Kaon-2 produced the highest straw yield and BARI Kaon -3 produced the lowest straw yield.

### **Biological yield (t/ha)**

Biological yield is the total biomass production. It comprises with grain yield and straw yield. The biological yield was varied from 8.51 t/ha to 6.90 t/ha (Table-2). The maximum biological

yield was recorded with V<sub>1</sub> (8.51 t/ha). The minimum biological yield was found in V<sub>3</sub> (6.90 t/ha) which was statistically identical with V<sub>2</sub> (7.02 t/ha). As a result, it can be said that the BARI Kaon-2 produced the maximum biomass.

### **Harvest Index (%)**

Harvest index is the ratio of economic yield and biological yield. The harvest index was varied from 34.76% to 30.44% (Table-2). The maximum harvest index was recorded with V<sub>2</sub> (34.76%) which was statistically similar with V<sub>1</sub> (32.79%) and V<sub>3</sub> (30.44%). There was no significant different among the varieties at 5% level of significance.

### **Conclusion**

The result of the present study showed that the BARI Kaon-2 gave the maximum plant height (109.03cm) during harvesting, maximum ear length 19.68cm), highest weight of main ear (6.24gm) and highest thousand seed weight (2.54gm). But the titas variety was comparatively short duration crop than other varieties (BARI Kaon-3 and the BARI Kaon-2). In case of total number of tillers per plant, effective tillers per plant, ineffective tillers per plant and harvest index there was no significant different among the varieties. BARI Kaon -2 was the best variety in terms of grain yield (2.79 t/ha). BARI Kaon-2 also produced the highest straw yield and maximum biomass (8.51 t/ha). As a result, it can be concluded that the BARI Kaon-2 was the best variety for this AEZ-14 and it can be extended to the local area of gopaganj district.

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