

‘ABV04’ A NEW BAJRA VARIETY SUITABLE TO THE TRIBAL AREAS OF ASR DISTRICT

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Date of Receipt : 18.09.2025

Date of Acceptance : 21.11.2025

ABSTRACT

Frontline demonstrations on the pearl millet variety ABV-04 were conducted over two consecutive years (2023-24 and 2024-25) in the tribal regions of Alluri Sitarama Raju (ASR) district to evaluate its performance under rainfed upland conditions. A total of 20 demonstrations covering 8 hectares were carried out to compare the yield advantage of ABV-04 over the existing local farmer practice, i.e., Pittaganti variety. The results indicated that ABV-04 consistently outperformed local landraces, recording a pooled average grain yield of 1451.3 kg ha⁻¹, compared to 979.9 kg ha⁻¹ from the Pittaganti variety, with a yield advantage of 47.6%. In the first year, the variety showed a 57.7% higher yield, while in the second year, the yield advantage was 37.6%, despite climatic challenges such as reduced rainfall and delayed sowing. In addition, a gap analysis based on these frontline demonstrations was carried out to assess performance and identify yield-limiting factors. The average technology gap was 1176.3 kg ha⁻¹, indicating constraints such as poor soil fertility, erratic rainfall, and low input usage. The extension gap averaged 471.4 kg ha⁻¹, demonstrating the effectiveness of improved practices over traditional methods. The technology index was recorded at 42.0%, suggesting moderate feasibility under field conditions and highlighting the need for enhanced adoption support.

Key words: ASR District, Bajra, Extension gap, Front Line Demonstration, Technology gap, Technology Index, Tribal areas.

INTRODUCTION

Pearl millet (*Pennisetum glaucum.*), commonly known as bajra, is a vital cereal crop ranking next to rice, wheat, maize, and sorghum in terms of importance. It is predominantly cultivated in arid and semi-arid regions, where it thrives under harsh climatic conditions due to its exceptional drought resistance and adaptability to poor soils. Apart from being a nutritious food grain for human consumption,

bajra also serves as an important fodder crop for livestock.

Bajra is especially valuable in dryland agriculture, offering a sustainable livelihood option for farmers in regions with limited water availability. India is the largest producer of pearl millets covering about 8.75 million ha of marginal and sub marginal lands primarily in the states of Rajasthan, Gujarat, Haryana, Uttar Pradesh and Maharashtra ranking 3rd after rice

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and wheat in acreage (Muniratnam and Gautam,2002)

In the tribal-dominated regions of Alluri Sitarama Raju (ASR) district, particularly in the hilly terrains of Paderu and its surrounding mandals, traditional agricultural practices continue to dominate farming systems. One of the staple crops cultivated by tribal farmers in these areas is bajra (*Pearl millet*), primarily using local landraces such as “*Pitta Ganti*”. These indigenous varieties, while naturally adapted to the rugged and moisture-deficient conditions of the region, are characterized by very low productivity due to their limited genetic potential and the absence of scientific crop management practices. Most farmers rely on age-old methods without the application of improved seeds, balanced fertilization, effective pest and weed control, leading to consistently low yields and sub-optimal returns. In this context, there is a growing need to introduce climate-resilient and nutritionally superior crop alternatives that align with the agro-ecological realities of hill agriculture.

Given its minimal input requirements and robust adaptability, pearl millet in general and ABV-04 in particular offers a low-risk, climate-smart alternative to traditional crops. Its dual-purpose nature increases its economic value, while its nutritional profile supports better health and resilience in vulnerable rural households. In regions like Paderu, where conventional crop choices are constrained by topography, rainfall variability and poor infrastructure, ABV-04 emerges as a highly promising option for transforming subsistence farming into a more productive and sustainable system. The ongoing efforts to promote this variety through frontline demonstrations, farmer training and seed distribution will be critical in bridging the technology and extension gaps, thereby enabling tribal farmers to realize

the full potential of their agro-ecosystems. Hence, the present study was conducted with the objective to assess the field performance and yield potential of ABV-04 under tribal farming conditions and compare its performance with local farmer practices i.e., *Pittaganti* variety

MATERIAL AND METHODS

The demonstrations were conducted over two consecutive *Kharif* seasons (2023-24 and 2024-25) in seven tribal villages, including Sirsapalli, Gasabu, Pedabhyalu, Tadigiri, Neelamputtu, Baramasiand Galaganda, which fall under hill zone farming systems characterized by poor soils, erratic rainfall and traditional agricultural practices. A total of 20 frontline demonstrations were conducted across 8 hectares of tribal farmers fields. The objective was to assess the performance of ABV-04 under field conditions and evaluate its superiority over traditional farmer practices, particularly in terms of growth attributes, yield components and overall productivity. The variety ABV-04, developed and released by ANGRAU, is known for its short duration, drought tolerance and dual-purpose utility (grain and fodder), making it suitable for low-input and moisture-stressed areas.

For each demonstration, paired plots were selected: one for the improved practice (ABV-04) and one for the farmer’s traditional practice. The growth and yield observations were recorded at different crop growth stages viz., 30, 60 DAS and at harvest

Similarly the following parameters were recorded from both demonstration and farmer plots:

- Plant population (No m⁻²)
- Plant height (cm)
- Number of tillers m⁻²
- Number of ear heads m⁻²
- Ear head length (cm)

For yield estimation, a 5 m × 5 m (25 m²) area was harvested separately in each plotland the grain weight was recorded and converted to kilograms per hectare (kg ha⁻¹) using standard conversion methods. The average grain weight was taken to ensure uniformity in comparison.

Analytical Tools Used

To analyse the performance of the demonstrated variety and assess the yield gaps, standard methodologies as suggested by Yadav *et al.* (2004) and Verma *et al.* (2014) were followed. The following formulas were applied:

1. Technology Gap (kg ha⁻¹)

Technology Gap = Potential yield - Demonstration yield

This measures the shortfall in achieving the crop's potential under field conditions and reflects environmental and management constraints.

2. Extension Gap (kg ha⁻¹)

Extension gap = Demonstration yield – Farmer's yield

This shows the yield advantage achieved due to improved technology adoption and helps in identifying extension needs.

3. Technology Index (%)

Technology index =

(Potential yield – Demonstration yield)

$$\frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}} \times 100$$

A lower value indicates better performance and feasibility of the technology under real farm conditions.

4. Percent Yield Increase (%)

% Yield Increase =

(Demonstration yield – Farmer's practice yield)

$$\frac{\text{Demonstration yield} - \text{Farmer's practice yield}}{\text{Farmer's practice yield}} \times 100$$

This represents the relative benefit of improved practices over traditional practice.

RESULTS AND DISCUSSION

Growth and Yield Parameters

Growth and yield parameters of ABV 04 and local variety (*Pittaganti*) were presented in Table 1 and revealed that, with regard to growth attributes like plant population was almost similar across both treatments at all stages (30, 60 DAS and harvest), indicating uniform germination and crop establishment under both practices. During crop growth period, ABV-04 maintained a slightly higher plant population at harvest (14.5) compared to the local variety (13.4), indicating better crop stand. Similarly, ABV-04 recorded significantly higher plant height than the local variety at all stages *i.e.* at 30 DAS (59.4 cm & 43.8 cm), at 60 DAS (121.3 cm & 95.6 cm) and at harvest (190.9 cm & 153.1 cm), respectively. This indicates better vegetative growth, likely due to the genetic superiority and responsiveness of ABV-04 to improved management practices.

Likewise, in yield attributing parameters like number of tillers m⁻², number of ear heads m⁻² and ear head length (cm) showed the superior performance. With regard to number of tillers m⁻², ABV-04 consistently recorded more tillers than the local variety at all stages *i.e.* at 30 DAS (18.0 & 15.3), at 60 DAS (19.8 & 16.6) and at harvest (18.3 & 15.2), respectively. Higher tillering contributes to greater yield potential due to more productive shoots plant⁻¹. Likewise the highest number of ear heads m⁻² (17.6 ear heads m⁻²) in ABV 04, while the local variety had 15.0 ear heads m⁻². This demonstrates a direct yield advantage

through better reproductive efficiency. And another important yield attributing parameter i.e.ear head length (cm), in ABV-04 recorded longer ear heads (22.4 cm) compared to the local variety (18.2 cm), indicating higher grainbearing capacity ear head⁻¹.

Grain Yield: Two years pooled data of 20 demonstrations revealed (Table:1a) that the use of high yielding variety (ABV-04) gave an average of 47.6% more grain yield of pearl millet as compared to farmers practice. During the year 2023–24, ten frontline demonstrations were conducted in 4 hectares using the ABV-04 bajra variety in the tribal areas of ASR district. The demonstration yield (DY) recorded was 1620 kg ha⁻¹, significantly higher than the farmers practice yield (FP) of 1027.5 kg ha⁻¹, resulting in a yield increase of 57.7%. This dramatic increase in yield is attributed to the adoption of improved practices such as quality seed use and other agronomic timely management practices. In the subsequent year 2024–25, another ten demonstrations were carried out over 4 hectares, where the average demonstration yield dropped to 1282.5 kg ha⁻¹, while the farmers practice yield was 932.3 kg ha⁻¹. Although the yield advantage was still positive, the percentage increase over FP dropped to 37.6%, potentially due to climatic variability such as lower rainfall and delayed sowing. The overall mean results across 20 demonstrations in 8 hectares revealed that ABV-04 yielded an average of 1451.3 kg ha⁻¹, compared to 979.9 kg ha⁻¹ under traditional farmer practices, marking a mean yield improvement of 47.6%. The results were in similarity with results reported by Kumar *et al.*(2022) and Jayalakshmi *et al.*, (2024).

Gap Analysis: (Technology Gap, Extension Gap and Technology Index)

The technology gap represents the difference between the potential yield and the

yield achieved under improved technology demonstrations. It is considered more significant than other parameters as it reflects the constraints in implementation as well as limitations in the recommended package of practices, which may be environmental or varietal in nature. Despite the improved performance, a mean technology gap of 1176.3 kg ha⁻¹ (Table 2a) was observed when compared to the potential yield of 2500 kg ha⁻¹. This gap may be attributed to several constraints prevalent in tribal farming systems, such as poor soil fertility, uneven rainfall, low input use, and limited access to timely extension services. It also indicates the need for further improvements in adoption and crop management practices to achieve the full yield potential of the variety.

The extension gap is an important parameter used to assess the difference in yield between demonstrated technologies and existing farmers' practices. The mean extension gap of 471.4 kg ha⁻¹ indicates a significant yield advantage of demonstration plots over traditional practices. This gap underscores the need for timely dissemination of improved agricultural technologies, particularly in remote tribal areas where access to information is limited. The observed gap may be attributed to the adoption of improved varieties in demonstration plots, which resulted in higher grain yield compared to farmers' conventional practice. Similarly, the technology index for all demonstrations conducted over different years was found to be consistent with the observed technology gap. The average technology index was 42.0%, indicating the feasibility of the technology under field conditions. This relatively high value suggests that although the variety performed satisfactorily, certain constraints still limit the realization of its full yield potential in tribal hill ecosystems. Factors such as variability in rainfall, lack of irrigation facilities, and reliance on traditional farming

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Plate:1 Seed Distributed to the tribal farmers



Plate :2 Biometric observations



Plate :3 &4 Bajra fields during crop growth period



Plate : 5 Ear heads of ABV-04

Table.1. Growth and yield parameters of ABV 04 and Pittaganti under Front line demonstrations.

Treatments	At 30 DAS				At 60 DAS				At Harvest				
	Plant Population (No/m ²)	Plant height (cm)	No.of Tillers m ⁻² (No.)	No.of Tillers m ⁻² (No.)	Plant Population (No m ⁻²)	Plant height (cm)	No.of Tillers m ⁻² (No.)	No.of Tillers m ⁻² (No.)	Plant Population (No m ⁻²)	Plant height (cm)	No.of Tillers m ⁻² (No.)	No.of Ear heads m ⁻²	Ear Head Length (cm)
T1: Bajra var. ABV04	14.9	59.4	18.0	19.8	14.6	121.3	19.8	18.3	14.5	190.9	18.3	17.6	22.4
T2: farmers Practice (Pitta Ganti)	14.8	43.8	15.3	16.6	14.0	95.6	16.6	15.2	13.4	153.1	15.2	15.0	18.2

Table.1a Performance of Bajra ABV 04 under Front line Demonstrations

Year	Demos	Area	Yield (Kg ha ⁻¹)			% increase Yield Over farmers Practice	Technology gap (Kg ha ⁻¹)	Extension Gap (Kg ha ⁻¹)	Technology Index (%)
			PY	DY	FP				
2023-2024	10	4	2500	1620	1027.5	57.7	880	592.5	35.2
2024-2025	10	4	2500	1282.5	932.3	37.6	1473	350.2	48.7
Total/Mean	20	8	2500	1451.3	979.9	47.6	1176.3	471.4	42.0

practices may have contributed to this index. The higher technology index highlights the need to strengthen farmer awareness and capacity-building through appropriate extension methods, promoting the adoption of improved varieties and recommended production practices to reduce existing gaps. Similar findings were reported by Singh et al. (2020), Jayalakshmi et al. (2022), and Jadhav et al. (2022).

CONCLUSION

The introduction of high-yielding bajra variety ABV 04, combined with timely management practices, significantly enhanced yield and productivity in the tribal regions of ASR district when compared to the traditionally cultivated local variety, Pittaganti. While Pittaganti yielded lower due to poor genetic potential and minimal input use under frontline demonstrations. This improvement highlights the importance of varietal replacement with ABV-04 and scientific management in tribal agriculture. However, to fully realize its potential, it is essential to bridge existing technology and extension gaps through sustained capacity building, timely input support and location-specific advisories. The results reaffirm that strategic varietal introduction and field-level demonstrations are vital for increasing crop productivity, resilience and farmer incomes in under-served and climate-vulnerable regions.

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