



Performance of Promising French Bean (*Phaseolus vulgaris* L.) Varieties for Growth and Yield Performance under different Agro-Climatic Conditions of Assam

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ABSTRACT

A field experiment was conducted to assess the yield performance of four French bean (*Phaseolus vulgaris* L.) varieties, namely *Arka Komal*, *Arka Sharath*, *Arka Arjun*, and *Syngenta Serengeti*, at Jorhat district under the supervision of Krishi Vigyan Kendra, Jorhat, during the 2023-2024 and 2024-2025 growing seasons. The experiment was laid out in randomized block design with three replications across five locations. Significant differences were observed among the varieties for growth and yield traits. *Arka Sharath* recorded the highest fresh pod yield per plant (234.25 g) and maximum yield (163.97 q/ha), followed by *Arka Arjun* (145.36 q/ha) and *Arka Komal* (140.91 q/ha), surpassing the control (140.36 q/ha). *Arka Sharath* also produced the longest pods (15.23 cm) and highest pod weight (9.70 g). Although *Syngenta Serengeti* produced the maximum pods per plant (44.56), *Arka Sharath* compensated with heavier pods, resulting in higher yield and profitability. Economic analysis revealed that *Arka Sharath* gave the maximum net return (₹2,11,940 ha⁻¹) with a benefit-cost ratio of 2.82, followed by *Arka Arjun* (2.50) and *Arka Komal* (2.42), all higher than the control (2.28). The study concluded that *Arka Sharath* was the most suitable variety for commercial cultivation in Jorhat district to enhance productivity and profitability.

Keywords: Economics, French bean, Varietal evaluation, Yield.

INTRODUCTION

French bean (*Phaseolus vulgaris* L.) is an important leguminous vegetable grown widely for its high protein content, nutritional value, and economic significance. In Assam, French bean contributes considerably to food and nutritional security, with approximately 3,200 ha under cultivation producing 20,480 Mt at an average productivity of 6.4 t/ha. In Jorhat district alone, the area under French bean is about 450 ha, yielding 2,880 Mt annually. (Department of Agriculture, Assam, 2023)

Varietal evaluation plays a crucial role in identifying cultivars that exhibit superior agronomic traits, such as high pod yield, disease resistance, and adaptability to diverse environmental conditions. Previous studies have emphasized the significance of genotype-environment interactions in determining the

performance of French bean varieties across different agro-ecological zones (Kumar *et al*, 2020, Kumar *et al*, 2022). The Indian Institute of Horticultural Research (IIHR) has developed several improved cultivars, including *Arka Komal*, *Arka Sharath*, and *Arka Arjun*, which have demonstrated enhanced pod quality, yield potential, and resistance to common diseases (IIHR, 2022). Comparative analysis conducted by Singh *et al* (2019) indicated that varietal performance varies significantly depending on local soil and climatic conditions, necessitating region-specific trials to identify the most suitable cultivars for commercial cultivation.

Empirical research has further validated the advantages of improved French bean varieties. A study by Rana *et al* (2021) demonstrated that *Arka Sharath* exhibited superior yield attributes compared to conventional cultivars, thereby enhancing its potential

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Table 1. Growth and Yield Attributing characters of the treatments.

Treatment	Pod Length (cm)	Pod Diameter (cm)	Pod weight (g)	Plant height (cm)	No of Pods Per Plant (g)	Fresh Pod Yield per Plant (g)
Arka Arjun	14.10	0.78	5.30	50.30	39.10	207.23
Arka Komal	14.86	0.95	8.57	52.21	23.49	201.30
Arka Sharath	15.23	0.91	9.70	49.10	24.15	234.25
Control Syngenta Serengeti	14.80	0.75	4.50	51.50	44.56	200.52
SEd ($\pm$)	0.449	0.449	0.354	NS	1.737	17.352
CD(P=0.05)	0.978	0.978	0.770		3.785	37.807

for commercial adoption. Additionally, Sharma *et al* (2022) reported that strategic varietal selection could lead to a 20-30% increase in yield, highlighting the importance of continuous breeding and evaluation efforts. Moreover, Patel and Rao (2023) emphasized the role of climate adaptability in determining varietal success, while Gupta *et al* (2023) underscored the economic feasibility of improved French bean cultivars for smallholder farming systems. Against this background, the present study was undertaken to assess the performance and profitability of promising French bean varieties under the agro-ecological conditions of Jorhat district, Assam.

MATERIALS AND METHODS

The experiment was conducted by Krishi Vigyan Kendra, Jorhat, during rabi seasons of 2023–24 and 2024–25 at five locations in Jorhat district. Four French bean varieties were evaluated: T₁ Arka Komal, T₂ Arka Sharath, T₃ Arka Arjun, and T₀ Syngenta Serengeti (control). The trial was laid out in randomized block design (RBD) with three replications. Each plot measured 10 m $\times$ 20 m with spacing of 45 cm $\times$ 30 cm. A fertilizer dose of 30:40:20 kg NPK ha⁻¹ was applied, and recommended crop protection practices were followed. Observations were recorded on plant height, branches per plant, days to 50% flowering, pod length, pod diameter, pod weight, pods per plant, and fresh pod yield per plant and per hectare. Economic analysis included gross and net returns and benefit-cost (B:C) ratio. Data were subjected to ANOVA, and mean comparisons were made using LSD at 5% significance.

RESULTS AND DISCUSSION

Growth and Yield Performance

The statistical analysis revealed significant genotypic variations among the evaluated French bean cultivars concerning growth and yield attributes. Among the tested varieties, *Arka Sharath* demonstrated the highest fresh pod yield per plant (234.25 g), outperforming *Arka Arjun* (207.23 g) and *Arka Komal* (201.30 g), while exceeding the control variety (*Syngenta Serengeti*, 200.52 g). The superior performance of *Arka Sharath* can be attributed to its greater pod length (15.23 cm) and enhanced pod biomass, which collectively contributed to an increased yield per hectare. These findings are consistent with previous reports by Rana *et al.* (2021) and Sharma *et al* (2022), who established a positive correlation between pod size, weight, and overall productivity in *Phaseolus vulgaris*. Despite *Syngenta Serengeti* exhibiting the highest number of pods per plant (44.56), the compensatory advantage of *Arka Sharath* and *Arka Komal* in terms of larger, heavier pods resulted in superior total yield. This concurs with observations by Singh *et al* (2019), who noted that genetic variation among cultivars influences pod characteristics and cumulative yield potential.

Economic Analysis

The economic evaluation demonstrated that *Arka Sharath* recorded the highest yield per hectare (163.97 q/ha) and generated the maximum net return (Rs. 2,11,940) with an optimal benefit-cost (B:C) ratio of 2.82. *Arka Arjun* and *Arka Komal* also exhibited

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Table 2. Yield, Economics of Cultivation.

Treatments	Yield Per Ha (q/Ha)	Price Per Kg (Rs)	Gross Cost (Rs)	Gross Return (Rs)	Net Return (Rs)	B:C Ratio
Arka Arjun	145.36	20.00	1,16,000.00	2,90,720.00	1,74,720.00	2.50
Arka Komal	140.91	20.00	1,16,000.00	2,81,820.00	1,65,820.00	2.42
Arka Sharath	163.97	20.00	1,16,000.00	3,27,940.00	2,11,940.00	2.82
Control Syngenta Serengeti	140.36	20.00	1,23,000.00	2,80,720.00	1,57,720.00	2.28
S. Ed(±)	1.835					
CD(P=0.05)	3.998					



A. Cultivation of French Bean,



B. Pod size and shape of the treatments,



C. Dissectional view of the pods

substantial economic viability, with B:C ratios of 2.50 and 2.42, respectively, exceeding that of the control variety (*Syngenta Serengeti*, B:C ratio 2.28). These results align with the economic feasibility analysis conducted by Gupta *et al* (2023), which emphasized the profitability of improved French bean cultivars under commercial farming conditions. Moreover, the economic analysis of French bean cultivation in the Uttarakhand hills (Sharma *et al*, 2024) similarly demonstrated that high-yielding cultivars generated greater net returns and benefit–cost ratios. Further corroboration is provided by Patel and Rao (2023), who identified superior economic returns in high-yielding *Phaseolus vulgaris* genotypes cultivated in

semi-arid agro-ecosystems. This suggests that given its superior yield performance and economic benefits, *Arka Sharath* have strong potential as a promising candidate for large-scale commercial adoption in Assam.

CONCLUSION

The study revealed that *Arka Sharath* performed best among the tested French bean varieties, recording the highest yield and profitability, followed by *Arka Arjun* and *Arka Komal*. Considering its adaptability to local conditions and superior economic returns, *Arka Sharath* is recommended for large-scale

cultivation in Jorhat district of Assam, to enhance farmers' income and productivity.

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