



# Dissemination of Elite Brinjal Variety-HZKB-1 under Organic Cultivation in Uttarakhand and Jammu & Kashmir through Farmers' Participation

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

With the aim to disseminate the farmer's potential brinjal variety in a new region, the brinjal variety HZKB-1 in comparison with three check varieties *Pant Rituraj*, *Hisar Shyamal* and BR-112 was evaluated for its performance and suitability through farmers' participation using researcher-managed farmer-implemented trials (RMFITs) during summer-rainy season 2021. Across the 28 farmer's fields, it was replicated seven times covering Uttarakhand (Dehradun and Almora) and Jammu & Kashmir (Rajouri). The data revealed the superiority of HZKB-1 in terms of fruit yield (335.00 q/ha) which was 10.45 %, 16.15 % and 9.74 % higher over the checks BR-112, *Pant Rituraj* and *Hisar Syamal*. It took 122.86 days for the first picking and recorded superior in yield-related traits viz. fruit weight (240.49 g), fruit diameter (12.11 cm) and fruit length (13.94 cm). Apart from that the farmer-managed trials (FMTs) conducted at 23 farmer's fields covering the same

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target area revealed Rajouri as the most suitable district for the cultivation of HZKB-1 variety. As per the growers' feedback, the variety has a shelf life of 5-7 days and negligible pest damage was observed. The desirable traits of the variety exhibited in new areas under organic cultivation make the cultivar suitable for cultivation and dissemination in targeted areas.

**Keywords:** *Solanum melongena*; eggplant; participatory evaluation; Researcher-managed Farmer-implemented Trials (RMFITs); Farmer-managed Trials (FMTs).

## 1. INTRODUCTION

Brinjal (*Solanum melongena* L.) is an important vegetable crop in India and is grown throughout the year. However, it is widely cultivated in both temperate and tropical regions of the globe mainly for its immature fruits as vegetables [1].

Farmers need improved eggplant varieties for sustainable production and adaptation to climate change challenges [2]. Landraces are crop varieties that have been differentiated by farmers through a historical selection process and they represent a great genetic heritage as a source of agricultural biodiversity. These local varieties are better adapted to specific agro climatic conditions, and they are suitable for new agriculture kinds, such as organic production [3].

The brinjal variety HZKB-1 was developed by grassroots woman farmer Smt. Laxmibai Zulapi, (Bagalkot, Karnataka) in the year 2010 through continuous selection method from locally grown brinjal variety having farmer preferred traits viz., high yield potential up to 40 t/ha, big size of fruits, round, glossy, dark purple colour with good taste and most suitable to organic cultivation. This variety received recognition at National Innovation Foundation for the 8<sup>th</sup> National Grassroots Innovation Awards. The temperature ranges between 13<sup>o</sup> to 30<sup>o</sup> C is most suitable for the cultivation of HZKB-1, brinjal variety [4]. Brinjal is also cultivated in hilly areas (Uttarakhand), mainly by small farmers as the source of cash income [5].

Keeping in view the above facts, the investigation to evaluate the performance and suitability of farmer's variety under organic cultivation, the researcher managed farmers implemented trials (RMFITs) and farmer-managed trials (FMTs) were carried out at the farmers' fields in Rajouri (Jammu & Kashmir), Almora and Dehradun (Uttarakhand) districts. As per the contingency plan for districts, Department of Agriculture and Farmers Welfare, Government of India, according to Agro-Ecological Sub Region (ICAR), Rajouri and Almora falls under Western Himalayas, Warm Sub-humid (To Humid with

Inclusion of Per-humid) Eco-sub region (14.2) while Dehradun comes under Western Himalayas, Warm Sub-humid (To Humid with Inclusion of Per-humid) Eco-sub region. (14.4). However, according to the Agro-Climatic Zone (Planning Commission), the target areas identified for the RMFITs and FMTs falls under Western Himalayan Region (I). Thus, all the target area has similarity and appears suitable for cultivating farmer's brinjal variety.

## 2. MATERIALS AND METHODS

The criteria defined by Norman et al. [6] and Witcombe et al. [7] for the researcher-managed farmers-implemented trials (RMFITs) and farmer-managed trials (FMTs) with slight modifications and insertion of applicable statistical design were adopted for performance and suitability assessment of the variety.

The RMFITs were conducted on farmer's traditional brinjal variety HZKB-1 (*Hulyal Zulapi Kari Badane-1*) under organic cultivation in Uttarakhand (Dehradun and Almora) and Jammu & Kashmir (Rajouri) during the summer-rainy season (April to October) 2021. A total of four varieties including three check varieties *Pant Rituraj*, *Hisar Shyamal* and BR-112 were replicated seven times across the 28 farmer's fields covering targeted areas. Farmers grew the varieties in their fields using their own resources except for the seeds of test varieties provided by researchers. The observations on yield and yield attributing traits, i.e. plant height, leaf length, leaf width, number of branches per plant, days to first picking, fruit length, fruit diameter, and fruit weight were recorded from ten randomly selected plants. The data thus recorded were subjected to statistical analysis following Randomised Block Design (RBD) using TNAU-STAT-Statistical package developed by Manivannan [8].

Apart from this, the farmer-managed trials (FMTs) on HZKB-1 variety were also undertaken at 23 farmer's fields covering same target locations and organic cultivation to find out the most suitable area for the cultivation of variety. The data thus recorded for the same parameters

were analysed using simple mathematical calculations using a Microsoft Excel spreadsheet developed by Microsoft for Windows.

### 3. RESULTS AND DISCUSSION

#### 3.1 Researcher-managed farmer-implemented trials (RMFITs)

The data analyzed using standard statistical protocols for Randomised Block Design (RBD) and presented in Table 1 indicated a significant difference among all the varieties for the parameters observed i.e. Plant height, Leaf length, Leaf width, Days to first picking, Fruit length, Fruit diameter, Single Fruit weight and Yield except number of branches per plant. It reveals that all the test and check varieties differ from each other shows variations in their performance. However, the data recorded for number of branches per plant reported no significant difference and variation in branch numbers among the varieties.

##### 3.1.1 Plant growth-related traits

It was revealed from the data (Table 1) that the HZKB-1 recorded higher plant height (73.88 cm) than the BR-112 (75.37 cm) and at par with the *Hisar Shyamal* (81.74 cm). Whereas *Pant Rituraj* (89.59 cm) recorded highest plant height among all the test varieties. It showed variation in plant height among the different varieties might be due to variation of genotypes. Similar findings were earlier reported by Hossain et al. [9] and Rahman et al. [10]. The optimum plant height and medium branches are the most desirable character for the vegetative growth of brinjal crop found appropriate in the present test variety.

The variety BR-112 was recorded with the highest leaf length (21.74 cm) and leaf width (17.70 cm). However, the HZKB-1 exhibited the next best leaf length (17.51 cm) which was found higher than the *Pant Rituraj* and *Hisar Shyamal*. While in the case of leaf width, HZKB-1 reported at par leaf width (14.07 cm) to *Pant Rituraj* (14.60 cm). The varieties HZKB-1, *Pant Rituraj*, BR-112 and *Hisar Shyamal* reported 6.66, 6.18, 7.01 and 7.19 branches per plant respectively. However, data presented showed no statistical difference among the varieties. Rani et al. [11] at Jammu, Parida et al. [12] and Mehraj et al. [13] also reported similar findings in terms of number of branches. Similarly, HZKB-1 took lesser days (122.86) for the first picking as compared to BR-

112 and at par to *Hisar Shyamal*. Whereas, *Pant Rituraj* noted with lesser 108.98 days to first fruit picking. BR-112 reported with minimum days to first fruit picking at West Bengal during *Kharif* season by Parida et al. [12]. However, Koundinya et al. [14] reported a delay in first and fifty percent flowering during spring summer, and autumn-winter in West Bengal which clearly indicated the season and climatic effect on delayed fruiting and harvesting of the variety. Thus, it supports the present result obtained.

##### 3.1.2 Yield and yield-related traits

Fruit length and fruit diameter are an important parameter from the consumers' point of view. The variety HZKB-1 was recorded with a significant and superior fruit length (13.94 cm) and fruit diameter (12.11 cm) over all the tested check. The observation of phenotypic characters viz. plant height, number of primary branches, fruit length and fruit diameter for the variety *Pant Rituraj* recorded at Uttarakhand by Singh et al. [15] and Panwar et al. [5] is in partial confirmation with the present result obtained. Moreover, the HZKB-1 variety showed a significantly higher fruit weight of 240.49 g as compared to check *Pant Rituraj*, BR-112, *Hisar Shyamal* recorded with 83.38 g, 120.62 g and 99.19 g of fruit weight respectively. Tripathi et al., [16], Munnipian et al., [17], Chattopadhyay et al., [18] and Lokesh et al., [19] recorded variations in fruit length, width and average fruit weight in brinjal which supports the present result obtained.

The data presented indicated the statistically significant variation between all selected varieties (Table 1). The brinjal variety HZKB-1 (335.00 q/ha) showed significant and 9.74%, 10.45% and 16.15% higher fruit yield as compared to check varieties *Hisar Shyamal* (302.36 q/ha), *Pant Rituraj* (300.00 q/ha) and BR-112 (280.90 q/ha) respectively. The present yield obtained by *Hisar Shyamal*, BR-112 and *Pant Rituraj* is in line with the yield range revealed by Singh [20]. The higher yield of HZKB-1 might be due to the higher fruit length, width and average fruit weight. The positive and significant correlation between fruit length, width and average fruit weight with yield was earlier reported by Nayak and Nagre [21] which completely supports the present findings. The similar direct effect and positive correlation between fruit weight and fruit yield were also recorded by Sujin et al. [22].

**Table 1. Comparative study of traditional brinjal variety HZKB-1 in researcher managed at farmers' implemented trials in Uttarakhand & Jammu and Kashmir**

Treatment No.	Name of varieties	Plant height (cm)	Leaf length (cm)	Leaf width (cm)	No. of branches per plant	Days to first picking	Fruit length (cm)	Fruit diameter (cm)	Single Fruit weight (gm)	Yield (q/ ha)
T1	HZKB-1	75.37	17.51	14.07	6.66	122.86	13.94	12.11	240.49	335.00
T2	<i>Pant Rituraj</i>	89.59	17.17	14.60	6.18	108.98	7.86	6.49	83.38	300.00
T3	BR-112	73.88	21.74	17.70	7.01	126.00	8.04	7.30	120.62	280.90
T4	<i>Hisar Shyamal</i>	81.74	15.49	13.87	7.19	115.57	8.29	7.00	99.19	302.36
S.Em. ±		3.51	0.86	0.81	0.34	3.73	0.78	0.70	34.96	3.93
CD		10.43	2.55	2.41	1.00*	11.09	2.32	2.09	103.87	11.67
CV%		11.59	12.63	14.28	13.17	8.34	21.70	22.61	68.05	3.41

Note: \* = Non-significant

**Table 2. Performance of traditional brinjal variety HZKB-1 under farmer-managed trials (FMTs) conducted at farmers' fields in Uttarakhand & Jammu and Kashmir**

Target areas (locations)	Plant height (cm)	Leaf length (cm)	Leaf width (cm)	No. of branches per plant	Days to first picking	Fruit length (cm)	Fruit diameter (cm)	Single Fruit weight (gm)	Yield (q/ ha)
Almora (10)	87.24	16.43	13.64	5.80	106.30	10.77	10.29	189.72	318.00
Dehradun (08)	79.35	17.60	15.23	7.71	124.13	9.19	9.46	127.18	324.13
Rajouri (05)	81.13	16.16	8.74	8.64	129.20	18.36	14.90	625.40	350.00

### 3.2 Farmer-managed trials

Simultaneously, the farmers-managed trials (FMTs) were also conducted at Almora (10 locations), Dehradun (08 locations), Rajouri (05 locations) districts covering two states Uttarakhand and Jammu & Kashmir under organic cultivation to check the best suitability of the variety. The mean of different parameters observed from all the locations of respective districts was presented in Table 2 above.

The highest plant height of 87.24 cm was recorded at Almora. Where the maximum leaf length (17.60 cm) and leaf width (15.23 cm) was recorded at Dehradun. The highest number of branches (8.64 branches/ plant) at Rajouri and lower days taken to first fruit picking (106.30 days) were recorded at Almora. Whereas in Rajouri highest fruit length (18.36 cm) and fruit diameter (14.90 cm) were recorded. Similarly, the highest fruit yield (350.00 q/ha) was also recorded at Rajouri. The agro-ecological factors may be affecting the performance of a variety under different agro-climatic conditions [23]. The conclusion revealed after the study of vegetable cultivation in north-west Himalayan region by Sharma [24] supports the present findings. As per the growers' feedback, the variety has purple-colored fruits with a shelf life of 5-7 days after harvesting. It also found negligible pest and disease occurrence which might support higher fruit-yielding of variety. The result revealed by Vethamonai et al. [25] is in coordination with the present findings.

### 4. CONCLUSION

The study concluded that the farmer's traditional brinjal variety HZKB-1 under organic cultivation reported with higher fruit size and yield observed during RMFITs compared to the checks. The superior performance of the HZKB-1 variety reflects its suitability for cultivation at the target areas of Uttarakhand (almora and Dehradun districts) and Jammu & Kashmir (Rajouri district). However, based on FMTs it was found most suitable to cultivate at Jammu & Kashmir (Rajouri district). The participation of farmers through RMFITs and FMTs can play an important role in disseminating of farmers' variety in the target areas. Adopting such traditional variety that yielded higher under organic cultivation might generate additional income for the small farmers in hilly areas. As visual observation noticed negligible insect pest and disease occurrences on HZKB-1, therefore it can be a future thrust to

study the effects of abiotic factors and host plant resistance considering the scopes of plant protection.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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