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Yield and Economic Assessment of Different French bean Varieties under Organic Conditions

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ABSTRACT

An assessment of different french bean varieties under organic conditions of hills was carried out at KVK (ICAR-VPKAS), Kafligair, Bageshwar, Uttarakhand during spring- summer of 2022 and 2023, which is most suitable season for the growth, yield and marketing of french bean in hills. Six french bean varieties namely CITH- FB-1, PFB- 135, VL Bean- 2, Arka Suvidha, Komal Private and Pant Anupama with 3 replications were assessed in Randomized Block Design (RBD). The sowing was done in third week of March in both the years. PFB 135 was the first to flower 50 percent (36.5 days in 2022 and 39.4 days in 2023) and gave first harvest (55.3 days in 2022 and 61.0 days in 2023) in both the years, which was statistically *at par* to VL Bean 2. Significant differences were found in yield among different varieties of french bean and CITH FB 1 gave significantly highest yield. For quality attributes depending on consumer preference, Komal Private gained highest points and ranked as excellent. VL Bean 2 and Pant Amupama scored 4 and ranked as very good. Maximum gross return, net return and B:C was calculated for VL Bean 2.

Key Words: Consumer preference, Economic analysis, Organic conditions, Yield ,Quality.

INTRODUCTION

French bean (*Phaseolus vulgaris*) is an important off season vegetable crop of hills, generally used as cooked vegetable when the pods are tender and green. It is considered as food and nutritional security crop of hill farmers (Noopur *et al*, 2019) French bean is very particular about climate and its seeds do not germinate below 15 ^{0}C and pod setting and filling is hampered in hot or rainy weather. Moreover, it cannot tolerate frost. A mean air temperature of 20 ^{0}C to 25 ^{0}C is very congenial for its growth and high pod yield. Considering these climatic requirements, french bean is sown at different times in different parts of India. In northern plains and central India, it is sown during September to November. However, in hills, the best time of sowing is from March to mid-April. Thus, the crop from hills enjoys the high market price due to off season availability. Moreover, the production of french bean under organic conditions may have the potential of better price realization for the farmers and maintenance of soil health.

Organic farming is a method which primarily aims at cultivating the land and raising crops to keep the soil alive and in good health without adding any synthetically produced chemicals or fertilizers. Generally, for small and marginal farmers of India and particularly of hills, organic farming is most relevant as they are resource poor to provide costly inputs for enhancing yield. The inclusion of legume crops in the cropping sequence has added advantage of fixing atmospheric nitrogen into the soil and make it available for companion or succeeding crops and will also help to sustain organic matter levels and promote good soil tilth (Seaman, 2011). This also helps in protecting soil from soil erosion. Farmers should select the crops which are easy to grow, according to their needs, marketing opportunities and season for the organic farming. French bean is a good leguminous vegetable crop for the organic farming especially in hills, which helps in sustaining the soil fertility, fits well in cropping sequence for its short growth period and also gives good economic yield to fetch good price in the market due to off season availability.

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Sr. No.	Quality preference	Marks	Expected Price (Above or Below percentage of average market rates)
1.	Excellent	5	Above 30 %
2.	Very good	4	Above 20 %
3.	Good	3	Average market price
4.	Fair	2	Below 20 %
5.	Poor	1	Below 30 %

Table 1. Duration of flowering and first harvest and yield of different varieties of french bean.

S. No.	Entry	Flowering (50%) duration (Days)			Duration of first harvesting (Days)			Yield (kg/ plot)			Yield (q / ha)		
		2022	2023	Mean	2022	2023	Mean	2022	2023	Mean	2022	2023	Mean
1	CITH FB1	41.3^{b*}	45.3^{b*}	43.3	59.8^{b*}	65.7^{b*}	62.7	5.662^{c*}	5.833^{c*}	5.748	89.87^{c*}	92.59^{c*}	91.23
2	PFB 135	36.5^{a}	39.7^{a}	38.1	55.3^{a}	61.0^{a}	58.2	4.525^{a}	4.733^{a}	4.629	71.83^{a}	75.13^{a}	73.48
3	VL Bean 2	38.0^{a}	40.3^{a}	39.2	56.3^{a}	62.3^{a}	59.3	5.212^{b}	5.323^{b}	5.268	82.73^{b}	84.49^{b}	83.61
4	Arka Suvidha	40.3^{b}	44.3^{b}	42.3	61.2 ^{bc}	66.0^{b}	63.6	5.434^{bc}	5.233^{b}	5.334	86.25^{b}	83.07^{b}	84.66
5	Komal Private	42.4^{bc}	46.3^{c}	44.3	61.4 ^{bc}	67.1 ^{bc}	64.3	4.681^{a}	4.900^{a}	4.791	74.30^{a}	77.78^{a}	76.04
6	Pant Anupama	43.3^{c}	47.2^{c}	45.3	62.3^{c}	68.5^{c}	65.4	4.532^{a}	4.833^{a}	4.683	71.94^{a}	76.71^{a}	74.33
CD		2.1	1.3	--	1.9	1.5	--	0.378	0.443	--	5.90	7.02	--

*Values within columns having common letter are statistically *at par*.

Table 2. Quality characteristics and expected price based on consumer preference for different varieties of french bean.

Variety	Pod shape, texture and Colour	Photo	Pod Length (cm)		No. of pods per kg		Consumer preference and Marks		Expected Price (Rs./ q)	
			2022	2023	2022	2023	2022	2023	2022	2023
CITH FB1	Flat, slightly curved, rough textured and light green		16.58^{c*}	16.53^{c*}	138^{a*}	143^{a*}	Poor - 1	Poor - 1	2,268.00	2,569.00
PFB 135	Flat, straight, semi-coarse textured and light green		14.75^{b}	14.60b	162^{b}	170^{b}	Good - 3	Good - 3	3,240.00	3,670.00
VL Bean 2	Round, slightly curved, smooth textured and green		14.18^{ab}	14.07^{ab}	198^{c}	196^{c}	Very Good- 4	Very Good- 4	3,888.00	4,404.00
Arka Suvidha	Flat, straight, rough textured and light green		14.58^{b}	14.50^{b}	164^{b}	171^{b}	Fair - 2	Fair - 2	2,592.00	2,936.00
Komal Private	Round, slightly curved, very smooth textured and dark green		13.43^{a}	13.20^{a}	232^{d}	237^{d}	Excellent- 5	Excellent- 5	4,212.00	4,771.00
Pant Anupama	Round, slightly curved, smooth textured and dark green		14.21^{ab}	14.17^{ab}	205^{c}	204^{c}	Very Good- 4	Very Good - 4	3,888.00	4,404.00
CD	--	--	1.10	1.01	14	11	--	--	--	--

*Values within columns having common letter are statistically *at par*.

Table 3. Economic analysis for different varieties of french bean.

Variety	Cost of cultivation (Rs./ ha)			Gross return (Yield x Expected price) (Rs./ ha)			Net return (Rs./ ha)			B: C		
	2022	2023	Average	2022	2023	Average	2022	2023	Average	2022	2023	Average
CITH FB1	98,546	1,04,255	1,01,400	2,03,825	2,37,864	2,20,844	1,05,279	1,33,609	1,19,444	2.07	2.28	2.18
PFB 135	97,638	1,03,642	1,00,640	2,32,729	2,75,727	2,54,228	1,35,091	1,72,085	1,53,588	2.38	2.66	2.53
VL Bean 2	1,12,765	1,20,354	1,16,559	3,21,654	3,72,094	3,46,874	2,08,889	2,51,740	2,30,315	2.85	3.09	2.98
Arka Suvidha	98,105	1,00,396	99,250	2,23,560	2,43,894	2,33,727	1,25,455	1,43,498	1,34,476	2.28	2.43	2.35
Komal Private	1,23,452	1,32,387	1,40,419	3,12,952	3,71,088	3,42,020	1,89,500	2,38,701	2,01,600	2.54	2.80	2.44
Pant Anupama	1,05,468	1,12,432	1,08,950	2,79,703	3,37,831	3,08,767	1,74,235	2,25,399	1,99,817	2.65	3.00	2.83

However, the studies on performance of different french bean varieties under organic conditions of hills including consumer preference and economic analysis was required.

MATERIAL AND METHODS

Krishi Vigyan Kendra (ICAR-VPKAS), Kafligair- Bageshwar is situated in the mid Himalayas between 29º45'07" N latitude and 79º44'03" E longitude at an altitude of 1245 meters above the mean sea level and represents humid sub- temperate climate with average annual rainfall of 1256 mm.

The experiment was conducted during spring- summer of 2022 and 2023, which is most suitable season for the growth, yield and marketing of french bean in hills. Six french bean varieties namely CITH- FB-1, PFB- 135, VL Bean- 2, Arka Suvidha, Komal Private and Pant Anupama with 3 replications were assessed in Randomized Block Design (RBD). The sowing was done during third week of March in both the years. The selected field had not received any chemical or synthesized fertilizer for last 5 years. The preceding crop was mustard and the succeeding crop was buckwheat. Well rotten compost was applied @ 25 t/ ha during ploughing.

Seed treatment of all the varieties was done with *Trichoderma harzianum*@ 10 g/ kg seed and regular prophylactic sprays of *Neem* oil (2 ml/L) at 15 days interval were also applied equally. The sowing geometry was 45 cm x 10 cm and the plot size was 3.15 m x 2.00 m (6.30 m^2). All the intercultural operations including weeding and hoeing were similar for all the plots.

Observations for flowering and harvesting duration, yield attributes and marketing related quality characteristics including pod shape, pod length and number of pods per kg were recorded and analysed statistically. Consumer preference along with expected price and economic analysis were also documented. For consumer preference and expected price a panel of ten-woman judges ranked the overall acceptability of pods on five-point scale and according the expected price was assigned depending on prevailing average market rates, which was as follows;

RESULTS AND DISCUSSION

Flowering duration and yield

The data (Table 1) clearly showed that PFB 135 was the first to flower 50 percent (36.5 days in 2022 and 39.4 days in 2023) and gave first harvest (55.3 days in 2022 and 61.0 days in 2023) in both the years, which was statistically *at par* to VL Bean 2. Pant Anupama came last at 50 percent flowering (43.3 days 2022 and 47.2 days in 2023) and fruiting (62.3 days in 2022 and 68.5 days in 2023) and was statistically *at par* to Komal Private. VL Bean 2 has also been documented as early maturity variety by Joshi *et al* (2019). Das *et al* (2014) has also observed significant differences in flowering and harvesting duration for various french bean varieties.

Significant differences were found in yield among different varieties of french bean. CITH FB 1 gave significantly highest yield of 89.87 q/ ha and 92.59 q/ha in 2022 and 2023, respectively. It was followed by Arka Suvidha that remained statistically at par to VL Bean 2, while the lowest yield was recorded for PFB 135 that was statistically non-significant to Komal Private and Pant Anupama. Rana and Kumar (2008), Muthuramu *et al* (2015), Pachiappan *et al* (2020), Noopur *et al* (2021) and Kumar A (2022) have also reported differences in yield attributes of various french bean varieties.

Quality characteristics

Quality is the most important parameter

that decides the value of vegetables, especially of french bean. Size, shape, texture and colour are the major factors that plays significant role in valuing the price of french bean. Wide range of price differentiation has been observed in market for french bean. The data (Table 2) showed that the assessed varieties had great quality differences. This eventually influenced the consumer preference and accordingly the expected price was assigned depending on average market price. CITH FB 1 scored least during both the years and ranked poor due to its flat shape, rough texture and light green colour. It was also having maximum pod length (16.58 cm and 16.53 cm in 2022 and 2023, respectively) and minimum number of pods per kg (138 in 2022 and 143 in 2023). Komal Private gained highest points and ranked as excellent. VL Bean 2 and Pant Amupama scored 4 and ranked as very good. Arka Suvidha was good and average market price was assigned to it and accordingly expected price for other varieties were calculated. Komal Private was awarded with highest price of Rs. 4,212.00/ q and Rs. 4,771.00/ q for the year 2022 and 2023, followed by VL Bean 2 and Pant Anupama (Rs. 3,888.00/ q in 2022 and Rs. 4404.00/ q in 2023). While, CITH FB 1 received the least expected price of Rs. 2,268.00/ q in 2022 and Rs. 2,569.00/ q in 2023.

Economic analysis

Economic analysis is the culminative stage to find out the suitability and applicability of tested treatments. It was found that cost of cultivation was highest for Komal Private (Rs. 123452/ ha in 2022 and Rs. 132387/ ha in 2023) followed by PFB 135, Arka Suvidha, Pant Anupama, VL Bean 2, whereas, it was lowest for CITH FB 1 (Rs. 98,546/ ha in 2022 and 1,04,255/ ha in 2023). This disparity was primarily due to differences of seed price. Seed of french bean was available at wide price range. Moreover, the seed rate of french bean was also high (75 kg/ ha), that create great difference in cost of cultivation. Second important factor was the care of harvesting and packaging. Smooth textured varieties are harvested more carefully that require more time and packaged delicately.

Not only yield but price depending on quality and consumer preference also played the major role for fetching the gross returns. Maximum gross return, net return and B:C was calculated for VL Bean 2. The average gross return was Rs. 3,72,094/ ha, net return was Rs. 2,30,315/ ha and B:C was 2.98 for VL Bean 2. Though, Komal Private gave higher average net return of Rs. 2,38,701.38 per ha than Pant Anupama, its average B:C (2.44) was less than Pant Anumapa (2.83). CITH FB 1 remained least profitable with average net return of Rs.1,19444/ ha and its B:C was 2.18. Muthuramu *et al* (2015) and Pachiappan *et al* (2020) also recorded differences among various french bean varieties.

CONCLUSION

The present study opened new vistas for assessing the french bean varieties and signified the quality over yield. The performance of food commodities in general and vegetables and fruits in particular, need to be analysed in a holistic way. This should encompass yield, quality and economic analysis. Though, CITH FB 1 significantly over passed all other varieties for yield, it could not perform up to the mark on quality parameters, hence the net return and B:C was lowest. However, Komal Private ranked excellent in terms of quality, its cost of cultivation and yield did not support it to become the top most choice among the assessed varieties. VL Bean 2 showed very good balance of yield, quality and cost of cultivation and gave highest profitability under organic production conditions of hills.

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