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Assessment of frontline demonstrations of Isabgol in Banaskantha district, Gujarat

[1]Pushpraj Singh, [2]CK Desai, [1]VK Patel and [1]PH Rabari

[1]Krishi Vigyan Kendra, Banakantha-II, SDAU, Tharad, Gujarat, India

[2]Regional Dry Land Crop Research Centre, SDAU, Radhanpur, Gujarat, India

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Corresponding Author: Pushpraj Singh

Abstract

The present study was conducted to assess the performance of isabgol varty GI-4 with the improved production practices and to identify yield gap in the district. The results revealed that the no. of tillers/ plant 24.39 cm, no. of spikes/plant 12.11, seeds spike/plant 6.99 and spike length 4.38 recorded higher in the improved practices compare to the farmers practices. Further the average yields were recorded 8.35 q/ha across the two years with a 24.01% increase compare to the farmers practices. The mean extension gap, technology gap and technology index were 1.61 q/ha, 4.66 q/ha and 35.81 percent respectively. Which indicates the needs of enhance extension services, effective dissemination of knowledge and better adoption of improved technology to the farmers. In term of economics improved practices obtained the highest average net income of Rs 47899 /ha and B: C ratio 1.71 as compared to farmers practices Rs 33428 ha and 1.09 respectively. Therefore, the higher B: C ratio indicates economic feasibility of the improved practices demonstrated in the district.

Keywords: Isabgol, yield gap, constraints, extension gap

Introduction

Isabgol, scientifically known as *Plantago ovate*. It is popularly known as "Psyllium husk" Josh and Kumar (2022). [15] Isabgol is native to the Mediterranean region and West Asia, cultivated extensively in the Gujarat particularly in the Northern Gujarat, as well as adjoining parts of Western Rajasthan and Madhya Pradesh in India Eraqui *et al*. (2023). [10]. Its significance lies not only in its economic contribution but also in its substantial health benefits. Apart from its economic importance, Isabgol holds immense health benefits Sharma and bhattacharya (2024). [24]. The husk of the Isabgol plant is rich in soluble fiber, making it an effective natural laxative. It is widely used in the pharmaceutical and healthcare industries for its digestive and therapeutic properties Ullah and Hassan, (2022) [28]. The soluble fiber in psyllium helps absorb excess water in the intestines, providing relief from loose or watery stools Garg (2021). [11] Regular consumption of psyllium husk has been associated with reduced levels of LDL (bad) cholesterol Anderson *et al*. (2020). [1] India is the largest producer and exporter of isabgol in the world, and 93% of the isabgol produced in the country is exported worldwide. The area under isabgol cultivation in India is 4.5 lakh ha, with a production of 4.32 lakh MT. Das and Trivedi, (2023). [8] Gujarat shares the largest area, 13303 ha under isabgol cultivation with the production of 12952 MT. fallowed by Rajasthan. Banaskantha, Kutch, Patan, Mehsana, and Sabarkantha are the major Isabgol-producing districts in Gujarat. Banaskantha district produces the highest volume of Isabgol, which accounts for 47% of the fallow by Kutch Anonymous (2024). [2]. The average productivity of the state is 1.03 kg/ha. Whereas, the Banaskantha districts have a productivity of 1.01 kg/ha Anonymous, (2023). [3] The districts provide an ideal sandy soil and environment for its growth which has created a great potential for this crop. Isabgol plays a pivotal role in the state's agricultural economy. It has gained prominence as one of the most valuable cash crops. Farmers of the district have shown a keen interest in cultivating Isabgol due to its high demand both domestically and internationally. The cultivation of Isabgol has contributed significantly to the income of farmers in district due to its high market value and consistent demand make. But the productivity of the district is still poor due to the awareness of new improve practices and varieties.

Frontline demonstrations (FLDs) are an essential component of agricultural extension services. These involve the testing and demonstration of new and improved agricultural technologies or practices directly in the fields of farmers. These demonstrations are conducted on selected farmers' fields to showcase the benefits and effectiveness of the technology. The demonstration of new Isabgol varieties on farmers' fields allows for assessing how well they adapt to specific local conditions. This ensures that farmers are provided with varieties that are most suitable for their region. It is crucial to evaluate the yield potential of new Isabgol varieties. Higher-yielding varieties and improved production practices can significantly impact the income of farmer.

Materials and Methods

The present study of Front line demonstration on cultivation of Isabgol was done at Krishi Vigyan Kendra Banaskantha - II Gujarat during rabi seasons of 2018-19 and 2019-20. The demonstration was conducted to assess the performance and profitability of the new isabgol verity (GI-4) at farmer's field. The demonstration was conducted in the four villages Sanval, Kolava, Suigam and Devpura) of Vav and Suigam taluka, located at 24°22'06"N 71°30'50"E and 24°10'03"N 71°22'29"E. The demonstration was laid out in an area of 0.4 ha and adjacent 0.4 ha was considered as control (Farmers 'practice) variety (Gujarat Isabgol -2) for comparison studies. Total thirty demonstrations over 12 ha. areas were conducted in two consecutive years. Interested farmers were identified with the help of group meetings and dissucussion and after selection of farmer and their fields the demonstration were conducted with the active participation of farmers and scientists of KVK. The crop was shown on first week of November. The field was preparing with the application of 15 tonne FYM. Diffract growth and yield observation was measure. The growth observation was taken from 5 plants and average was done while the yield and shattering percent was recorded at harvest. The yield samples were taken from randomly selected 5 x 5 meter squire area form three place of the entire field and average was done. Shattering percent was measured as per suggested by Singh *et al.* (2005). [27] Assessment of gap in adoption of recommended technology by the farmers was taken before laying out the FLDs through personal discussion with selected farmers. The per cent increase yield, extension gap, technology gap, and technology index were calculated using the following formula as suggested by Samui *et al.* (2000) [23] and Kumar *et al.* (2020). [16]

$$\text{Per cent Increase yield} = \frac{\text{Demonstration yield} - \text{local check yield}}{\text{Local check yield}} \times 100$$

Extension gap (q/ha) = Demonstration yield (q/ha) - Yield of local check (q/ha.)

Technology gap (q/ha) = Potential yield (q/ha) - Demonstration yield (q/ha)

$$\text{Technology index (\%)} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potentail Yield}} \times 100$$

Henry Garrett Technique was used to analyze the constraint faced by the farmers. The Farmers were asked to rank the constraints and the obtained frequencies were converted in to the percent position. The obtained respective percent was scored as per Garrett score tables Garrett and Woodworth (1969) and the rank was allocated. The factors having highest mean value is considered to be the most important factor. Sharma *et, al.* (2020) [25] and Ao and Jamir (2020) [4]

Percent position = 100*(Rij - 0.5)/ Nj.

Where,
Rij = Rank given for i_{th} factor by j_{th} individual
Nj = Number of factors ranked by j_{th} individual

Result and Discussion

Comparison of Production Practices

It was found that majority of farmers did not use Improved production practices, which caused large gap in Isabgol production Table 1. Farmers used higher seed rate than what was ideal and suggested which increased the cost of seed input. Additionally, farmers did not treat their seeds, which is a practice that protects seeds from soil and seed-borne diseases as well as emerging seedlings from pest insects that wreak havoc on crop emergence and early growth. Despite the various efforts of agriculture scientists and officials from the line departments, many farmers in the district are neither familiar with nor adhere to the practice. The information Table 1 showed that farmers either did not apply any suggested fertilizers based on soil tests or, when they did, applied either higher or lower doses of fertilizers without top dressing, which resulted in poorer yields. Similar findings were also recorded by the Jain (2014) [13] in isabgol and Chauhan *et. al.* (2020) [6] in mustard.

Table 1: Details of treatments in Demonstration and Farmers' Practice.

Parameter	Improved practices	Farmers Practice	GAP
Variety	Gujarat Isabgol 4	Gujarat Isabgol 2	Full
Seed rate	4 kg/ha	5 kg/ha	Partial
Seed treatment	Insecticide followed by Fungicide	No seed Treatment	Full
Method of sowing	Line sowing	Broadcasting	Full
Fertilizer dose	20:40 N: P_2O_5 (Based on soil test values)	High dose or low dose of fertilizers	Partial
Weed management	Application of isoproturon @500 g/ha as pre emergence and interculturing followed by hand weeding at 35 DAS.	Pre emergence application of pendimethalin along with one need-based hand weeding	Nil
Plant protection	Two foliar sprays of flonicamid 50WG @ 0.015% (75 g a.i./ha; 3 g/10 lit water)	No monitoring of pests and applying higher doses of pesticides and fungicides based on input dealer recommendation.	Partial
Irrigation	Five irrigations (at sowing time, 28 DAS and remaining three at 15 -20 days intervals)	Three irrigation (at sowing, 28-30 DAS and 45-50 DAS	Partial

Comparison of growth performance

The data illustrated in Table 2 indicated that the maximum average plant height 24.39 cm was recorded in the Improve practices with variety (Gujarat Isabgol -4) plot compared to Farmer practices variety (Gujarat Isabgol -2) it was 21.01 cm. However the average number of tillers per plant was 12.11 and 7.15 in improve practices and farmer practices respectively. Moreover number of spikes per plant and the spike length was also found maximum in the improved practices plot. The results are conformity with the findings of Patel *et al.* (2018) [18], Pagaria and Kantwa (2014) [17] and Choudhary and Kumari (2022). [7]

Table 2: Performance on growth of isabgol on improved and Famers practices

Years	Plant height (cm)		No of tillers/plant		No of spikes/plants		Spike length	
	FP	IP	FP	IP	FP	IP	FP	IP
2018-19	21.34	25.32	7.90	12.43	4.22	6.76	3.92	4.23
2019-20	20.67	23.45	6.40	11.78	4.44	7.21	4.27	4.52
Mean	21.01	24.39	7.15	12.11	4.33	6.99	4.10	4.38

Yield Gap

The data presented in the table 3 shows the effectiveness of improved practices and in enhancing of yield. During 2018-19, the yield was recorded 8.23 q/ha in the improved practices with a 19.45% increase in the yield attributed compare to the farmer's practices. However, during 2019-20, the yield recorded 8.46 q/ha. with 28.57% increases compare to the farmers practices. The average yield across the two years was 8.35 q/ha, with a consistent 24.01% increase compre to the farmers practices. The results are agreement with the Ramnivas *et al*. (2021), [22] Jain (2014) [13] and Jain (2017). [14]

Table 3: Productivity, Technology gap, Technology index and extension gap of Demonstration and Farmers' practice.

Year	Area (ha)	No. of Farmers	Yield (q/ha)			Increase in yield (%)	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
			Potential yield	FP	IP				
2018-19	6	15	13.00	6.89	8.23	19.45	1.34	4.77	36.69
2019-20	6	15	13.00	6.58	8.46	28.57	1.88	4.54	34.92
Mean	6	15	13.00	6.74	8.35	24.01	1.61	4.66	35.81

Technology Gap

The technology gap, measured in quintals per hectare (q/ha), reflects the difference between the attainable yield using recommended practices and the yield actually achieved in the demonstration plot by the farmers. Data indicates a slight increase in the technology gap from 4.77 q/ha in 2018-19 to 4.54 q/ha in 2019-20, with an overall average technology gap of 4.66 q/ha. Table 3. This persistent gap underscores the need for enhanced extension services, effective dissemination of knowledge to farmers. Addressing these gaps is crucial for optimizing Isabgol productivity. The slight increase in the technology gap from 2018-19 to 2019-20 suggests the effective strategies may include enhancing farmer education programs, improving access to high-quality inputs, and ensuring better implementation of recommended practices can reduce the technology gap and increase the crop yields. Similar findings were also reported by Pagaria and Kantwa (2014), [17] Jain (2017) [14] and (Ramnivas *et al*. (2021) [22].

Extension Gap

The extension gap is a measure of the difference between the potential yield achieved through recommended agricultural practices and the actual yield obtained by farmers. Our findings indicate a minor variation in the extension gap over the analyzed period, with values of 1.34 q/ha and 1.88 q/ha for the years 2018-19 and 2019-20, respectively Table 3. These results underscore the need for enhanced extension services and the adoption of improved agricultural practices to bridge the gap and increase the Isabgol production. The extension gap values suggest that there is a consistent, albeit small, difference between the potential and actual yields. The average extension gap 1.61 indicates a modest improvement in yield performance, potentially due to better implementation of recommended practices and adoption of improved verity. The results were also accordance with Ramnivas *et al*. (2021) [22] and Jain (2014) [13].

Technology index

The technology index is a measure used to assess the adoption of improved agricultural practices and technologies among farmers. The data illustrated in table 3 reveals a slight lower in the technology index from 36.69% in 2018-19 to 34.92% in 2019-20, and average technology index of 35.81% over the two years. This indicates more feasibility of the technology with a gradual improvement in the adoption of advanced technologies and practices in Isabgol cultivation. The lower the value of technology index more is the feasibility of the technology, Raj *et. al*. (2013), [20] Dhillon (2016) [9], Chudhary and Kumari (2022), [7] Singh (2020) [26] and Prasad *et. al*. (2022). [19] The more the technology index values are lower, the more likely it is that it will be able to pass through a farmer's field. The probable reason that could be attributed to the high feasibility of isabgol production technology was that the participant farmers were given opportunity for higher and sustainable yield.

Economic performance

The Data on Economic performance of isabgol FLD are illustrated in Table 4 reveals higher Average cost of cultivation (Rs.28000/ha) of demonstrated technology as compared to cost involved in local check (Rs.30600/ha) but the demonstration plots fetched higher mean gross returns (Rs.75899/ha) and mean net returns (Rs.47899/ha) with higher benefit: cost ratio (1.09) as compared to mean gross returns (Rs.64028/ ha), mean net returns (Rs.33428/ha) and benefit: cost ratio (1.71) of local check. The results are coinciding with the finding of Jain, (2014) [13] and Pagaria and Kantwa, (2014) [17].

Table 4: Economic analysis of Improved and Farmers practice of isabgol

Year	Cost of cultivation (Rs/ha)		Gross Returns (Rs/ha)		Net Returns (Rs/ha)		Additional Cost (Rs)	Additional return (Rs)	B:C Ratio	
	Demo	Check	Demo	Check	Demo	Check			Demo	Check
2018-19	26,500	29,700	73,247	60,632	46,747	30,932	3,200	12,615	1.76	1.04
2019-20	29,500	31,500	78,551	67,424	49,051	35,924	2,000	11,127	1.66	1.14
Average	28,000	30,600	75,899	64,028	47,899	33,428	2,600	11,871	1.71	1.09

Constraints faced in Isabgol production

The constraints were analysed using (Henry Garrett) score techniques; Table 5 shows the key constants affecting isabgol production in the study area based on Garrett rank score. The highest ranked constraints was the unavailability of quality, non-shattering seeds, with a mean rank score of 76.0 followed by the shattering of seeds under climatic adversity 71.9 and the lack of appropriate knowledge on production practices 62.3 which rank second and third respectively. The lack of quality seed availability holds the fourth rank with a mean score of 64.0. Higher labour cost ranks fifth 60.9 while, more expenditure and low yield are ranked sixth and seventh with scores of 46.2 and 38.1 respectively. The factor with the lowest rank is the lack of transport, with a mean rank score of 33.9. This ranking provides insights into the primary challenges faced in agricultural production, highlighting critical areas for intervention to improve productivity. The data are also agreement with the Rathore and Matur (2020), [21] Jain, (2014). [13]

Table 5: Constraints faced in *Isabgol* production by the farmers in the study area

Factors	Respondents	Garrett per cent	Garrett Table score	Garrett rank score	Rank
Lack of quality seed availability	30	6.3	80	64.0	IV
Lack of appropriate knowledge on production practices	30	18.8	68	62.3	III
Shattering of seeds under climatic adversity	30	31.3	60	71.9	II
Unavailability of quality, non-shattering variety seed	30	43.8	53	76.0	I
Low yield	30	56.3	47	38.1	VII
More expenditure	30	68.8	41	46.2	VI
Lack of transport	30	81.3	32	33.9	VIII
Higher labour cost	30	93.8	20	60.9	V

Conclusion

The study concludes that adopting improved farming practices can boost farmers' yields and income. Over the years, improved practices have consistently yielded higher averages compared to traditional methods, especially when farmers adopt a comprehensive approach including improved seeds, proper fertilization, and timely pest control. However, The Front Line Demonstration program proved effective, particularly in addressing seed shattering issues in crops like isabgol. Timely availability of seeds and inputs. The introduction of shatter-resistant varieties has minimized losses and increased yields. Improved production technology gave higher net returns Rs. 47,899 higher and benefit ratio (1.71) compared to farmers' practice Rs 33,428/ha and 1.09 respectively.

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