Journal of Oilseed Brassica, 17 (1) : 78-82, January 2026

Quantitative and qualitative appraisal of constraints inhibiting the diffusion and adoption of optimized gobhi sarson agronomic practices on heavy soil agro-ecosystems in South-Eastern Punjab

Vipan Kumar Rampal, Amanpreet Singh* and Amit Kaul[1]

PAU-Krishi Vigyan Kendra, Ludhiana (Samrala) 141 001, Punjab
[1]Department of Agronomy, Punjab Agricultural University, Ludhiana 141 001, Punjab
**Corresponding author : amanpreet-agr@pau.edu*
https://doi.org/10.56093/job.v17i1.13
Received date : 26 November 2025 *Accepted date : 30 December 2025*

Abstract

Gobhi Sarson is an important winter oilseed crop, offers a viable diversification option in Punjab's rice–wheat cropping system. Despite its potential, the adoption of recommended production technologies remains limited in the south-eastern region of Punjab, particularly in Fatehgarh Sahib district characterized by heavy-textured soils. The present study assessed the extent of adoption of agronomic practices and identified major constraints faced by farmers in Gobhi Sarson cultivation. A structured survey was conducted over two consecutive *rabi* seasons, covering 150 farmers from two blocks- Khamano, and Khera. The results revealed higher adoption of time of sowing (70%), plant protection practices (74%), and varietal selection (68%), while fertilizer application (38%) showed lower adoption. Major constraints included weed infestation (MPS: 80.0), non-availability of phosphorus fertilizers (74.6), difficulties in manual harvesting and threshing (82.0), and fluctuating market prices (75.3). A significant negative relationship (r = –0.29) was observed between constraints and adoption levels. The study emphasizes the need for timely input availability, mechanization support, and effective price stabilization. Strengthening extension services and improving access to quality inputs can significantly enhance Gobhi Sarson adoption and productivity in the region.

Keywords: *Gobhi sarson, agronomic practices, constraints, heavy soils, technology adoption*

Introduction

Oilseeds play a pivotal role in the Indian agricultural economy, with rapeseed-mustard ranking among the most important due to its wide range of edible and industrial uses. In India, rapeseed-mustard occupies a significant position, contributing approximately 22 percent of the total oilseed acreage (Vinod *et al*., 2019). Despite this, India lags in global productivity rankings, standing at 28th position in terms of rapeseed-mustard yield (Bhardwaj, 2013). Among the various oilseed types cultivated, *Gobhi Sarson* has emerged as a suitable *rabi* oilseed crop, particularly in the northern and northwestern agro-climatic regions. In Punjab, the rice-wheat system dominates the cropping pattern, but its long-term sustainability has been challenged by the declining agroecosystem. These concerns have propelled diversification initiatives, with oilseeds like *Gobhi Sarson* being promoted as alternative *rabi* crop. However, its successful adoption remains constrained, especially in the south-eastern districts of Punjab characterized by heavy soils, such as Fatehgarh Sahib. Despite the availability of scientifically recommended agronomic practices, their on-ground adoption remains suboptimal, leading to productivity gaps. Technological adoption in oilseed farming is often influenced by multiple factors, ranging from farmers' socio-economic status, awareness levels, availability of inputs, and extension support to field-level challenges such as pest incidence, and climatic unpredictability (Deshmukh *et al*., 2014 and Asiwal *et al*., 2013). In regions like south-eastern Punjab, these barriers are compounded by specific agro-ecological limitations of heavy soils, which affect field operations and nutrient dynamics critical to *Gobhi Sarson's* performance. Understanding the constraints that hinder the adoption of best agronomic practices is essential for tailoring region-specific extension strategies and policy interventions. A gap often exists between the technological potential and what is realized at the farm level-termed as the "adoption gap" (Dubolia and Jaiswal, 2000). Hence, identifying and addressing these gaps through farmer-centric research is necessary to enhance rapeseed-mustard cultivation, productivity and sustainability. With this backdrop, the present study aims to assess the limitations farmers face in adopting recommended agronomic practices for *Gobhi Sarson* in the heavy soils of south eastern region of

Punjab. The insights derived from this research will inform region-specific extension strategies and policy interventions to promote sustainable cultivation.

Materials and Methods

The present investigation was conducted during the *rabi* season of 2023-24 to assess the constraints faced by farmers in the adoption of recommended *Gobhi Sarson* production technologies in the Fatehgarh Sahib district of Punjab, India. The study adopted a survey research design to ensure systematic data collection and analysis. Fatehgarh Sahib comprises five administrative blocks, out of which two blocks—Khamano and Khera—were selected purposively due to their relatively large area under *Gobhi Sarson* cultivation. Within each block, five villages were chosen, and from each village, 15 Gobhi Sarson growers were selected using simple random sampling, resulting in a total sample size of 150 farmers. Data were collected through personal interviews using a structured and pre-tested interview schedule, which included questions about the extent of adoption of recommended practices (such as variety selection, seed rate, sowing time, fertilizer use, weed and pest management) and the constraints perceived by the farmers in adopting those practices. Responses were carefully recorded and validated for completeness. The collected data were compiled and analyzed using descriptive statistics, including frequency, percentage, and mean percent score (MPS), to rank the constraints based on severity. Data were averaged over the two years to obtain a representative mean basis. Furthermore, Pearson's correlation coefficient was computed to explore the relationship between the extent of adoption of specific production practices and the corresponding constraints faced. This methodological framework ensured a robust and reliable understanding of the adoption behavior and challenges encountered by *Gobhi Sarson* growers in the study area.

Results and Discussion

The distribution of *Gobhi Sarson* growers according to their land holding size in Fatehgarh Sahib district is presented in Table 1. Out of the 150 farmers surveyed, the majority (54.6%) were classified as small farmers. This group was followed by semi-medium farmers (26.4%), while marginal farmers with land holdings up to 2.5 hectares constituted 10.0% of the respondents. Medium farmers formed a smaller segment, accounting for 8.0% of the total respondents. No farmers were recorded in the large category (above 25 hectares). The results clearly reveal that *Gobhi Sarson* cultivation is predominantly undertaken by small and semi-medium farmers, reflecting their central role in the crop's production system and the associated variations in resource access, technology adoption, and management constraints.

Table 1: Distribution of Gobhi Sarson growers according to their land holdings

Categories	No. of farmers (150)	Percent
Marginal farmers (up to 2.5 ha)	15	10.0
Small farmers (2.51 to 5.0 ha)	82	54.6
Semi-medium farmers (5.01 to 10.0 ha)	41	27.4
Medium farmers (10.01 to 25 ha)	12	8.0
Total	150	100.0

Adoption trend

The empirical analysis of the year 2023-2024 data about the adoption of recommended agronomic practices in *Gobhi Sarson* cultivation by farmers elucidates a variegated landscape of technological assimilation (Table 2). The data underscores a nuanced interplay between advisory compliance and agronomic behavior, revealing both commendable adherence and discernible lacunae in the dissemination-uptake continuum. Concerning varietal selection, 68% of the cultivators had transitioned towards PAU-endorsed cultivars, signifying a good level of varietal diffusion. Nevertheless, the 32% of respondents' adherence to non-recommended genotypes raises pertinent questions regarding the efficacy of varietal outreach mechanisms, farmer trust in institutional recommendations, and possibly entrenched socio-cultural seed preferences. The persistence of obsolete or non-standard cultivars may also reflect localized adaptation or anecdotal yield perceptions, which often supersede formal advisories in small holder systems. Seed rate adoption figures further corroborate a relatively high congruence with recommended benchmarks, with 68% of respondents deploying agronomically optimal seeding densities. Conversely, the 32% of them deploying sub-optimal seed rates may be due to being constrained by economic considerations or harboring misconceptions regarding plant population dynamics, thus compromising potential yield realizations through inadequate crop stand establishment. The present results are in line with the findings of Rai *et al*. (2012), who also reported similar

Table 2: Extent of adoption of recommended technologies in *Gobhi sarson* cultivation

Extent of adoption	No. of farmers (150)	Percent (%)
Varieties		
PAU Recommended	102	68
Non-recommended	48	32
Seed Rate		
Less than Recommended	48	32
Recommended	102	68
Time of sowing		
Early sowing	0	0
In the recommended Time	105	70
Late sowing	44	30
Chemical Fertilizers (P-based)		
Recommended dose	57	38
Un-recommended dose	93	62
Plant Protection Measures		
Recommended	111	74
Un-recommended	39	26

trends in the adoption behavior and associated constraints among oilseed growers.

Temporal alignment with sowing recommendations emerged as another axis of differential compliance. The 70% of farmers adhered to the prescribed sowing window, while 30% exhibited temporal lag. The absence of early sowing events is indicative of risk-averse behavior vis-à-vis climatic variability, whereas delayed planting likely reflects systemic bottlenecks such as labor unavailability, irrigation constraints, or precedence of competing crops, and also delayed harvesting of previous crops. Fertilizer application patterns revealed the weakest compliance. Only 38% of the farmers reported adherence to the recommended nutrient regime, while a significant 62% applied P fertilizer doses either in excess or deficit. This divergence highlights the chronic deficit in site-specific nutrient management. The higher adoption rate in plant protection management is likely because farmers can easily see the damage caused by pests, which pushes them to take quick action. However, the 26% gap from full adoption shows that some problems still exist such as difficulties in identifying pest issues correctly, limited availability of products, or high costs. In addition, most farmers rely on locally available agro-input dealers for insecticides, often following shop-based recommendations rather than scientific advisories, which may lead to partial or improper adoption of recommended plant protection practices.

Overall, the results depicted that farmers have only partly adopted the new farming practices. They tend to follow recommendations that give quick and visible results, like pest or weed control, but are less likely to adopt long-term practices such as using balanced fertilizers. This difference suggests that extension services need to focus more on practical farmer involvement—encouraging farmer-to-farmer learning, ensuring that inputs are easily available locally, and collecting regular feedback from the field. These steps can help in improving the adoption of *Gobhi Sarson* production technologies in a lasting way. Similar findings were also reported by Rai *et al*. (2012) and Deshmukh *et al*. (2014), who observed the same challenges and trends among oilseed farmers.

Constraints

The detailed analysis of the constraints as given in Table 3, perceived by 150 farmers, regarding the adoption of *Gobhi Sarson* production technology. The constraints were categorized into three broad domains: technological, agro-climatic, and socio-economic, each evaluated based on the number of respondents, the calculated mean percent score (MPS), and their respective rankings.

Within the technological factors, the problem of weed infestation emerged as the most severe constraint, ranked I, with the highest MPS of 80.0, reported by 120 respondents, indicating serious challenges in effective and timely weed management. This was followed by the non-availability of phosphorus fertilizers, ranked II (MPS: 74.6; 112 respondents), highlighting deficiencies in input supply during critical crop growth stages. The non-availability of a suitable variety was ranked III (MPS: 56.0; 84 respondents), suggesting limitations in access to high-yielding or location-specific varieties. Lack of awareness of improved production technologies ranked IV (MPS: 52.0; 78 respondents). The incidence of insect

Table 3: Constraints faced by farmers in the adoption of *Gobhi sarson* production technology

Categories	Number of farmers (150)	Mean Percent Score	Rank
A) Technological factors			
Non-availability of a suitable variety	84	56.0	III
Lack of awareness of improved production technologies	78	52.0	IV
Non-availability of P fertilizers	112	74.6	II
Problem of weed infestation	120	80.0	I
Incidence of insect pests and diseases	66	44.0	V
B) Agro-climatic factors			
Heat stress at critical stages of crop growth	13	13.0	III
Excessive rains/hailstorms	99	66.0	I
Strong winds at ripening time damage the crop	32	21.3	II
C) Socio-economic factors			
Small land holding	66	44.0	V
Manual harvesting and threshing are difficult	123	82.0	I
High cost of production	48	32.0	VI
Fluctuating prices	113	75.3	II
Oilseeds are less profitable as compared to other crops	84	56.0	IV
Shortage of labor	105	70.0	III

pests and diseases was ranked V (MPS: 44.0; 66 respondents), indicating that although pest problems exist, they are perceived as relatively less constraining compared to other technological issues. Among the agro-climatic factors, excessive rainfall and hailstorms were the most pressing issues (MPS: 66.0), affecting 99 farmers. These events, often unpredictable, lead to physical damage, lodging, and delayed harvesting, directly impacting yield and quality. The occurrence of strong winds at the ripening stage (MPS: 21.3) was identified as the second most impactful factor, followed by heat stress during critical stages of crop growth (MPS: 13.0), which was the least cited agro-climatic constraint. Despite its lower rank, heat stress may gain significance under changing climatic conditions, particularly affecting the flowering and pod formation stages.

Socio-economic constraints significantly influenced the adoption of recommended practices. Difficulties associated with manual harvesting and threshing emerged as the most severe constraint, ranking first with the highest MPS of 82.0 and reported by 123 respondents, highlighting acute mechanization and labour-related challenges. Fluctuating market prices were the second most critical factor (MPS: 75.3), indicating that price uncertainty discourages farmers from making sustained investments in oilseed cultivation. Shortage of labour ranked third (MPS: 70.0), further compounding operational difficulties, particularly during peak agricultural operations. The perception that oilseeds are less profitable compared to other crops was ranked fourth (MPS: 56.0), reflecting farmers' preference for alternative crops with assured returns. Small land holdings (MPS: 44.0) also constrained adoption by limiting economies of scale. In contrast, high input cost was ranked lowest among socio-economic factors (MPS: 32.0), suggesting that although costs are a concern, operational and market-related issues pose greater barriers to adoption. Collectively, these findings indicate that while technological gaps—particularly in knowledge dissemination are primary bottlenecks, socio-economic and climatic vulnerabilities significantly compound the reluctance of farmers to adopt *Gobhi Sarson* production technology. Addressing these constraints requires an integrated approach involving varietal development, strengthened extension services, market support mechanisms, and targeted interventions to enhance climate resilience and reduce production risks. These findings are consistent with previous studies by Yadav *et al*. (2020), who reported knowledge and input gaps among mustard growers in Uttar Pradesh, and Kumar *et al*. (2018), who emphasized varietal non-availability and climatic barriers in Jammu and Kashmir. Similarly, Barad *et al.* (2023) observed that economic factors such as market price instability and input costs were significant deterrents for mustard growers in Gujarat.

Correlation

The scatter plot illustrates the relationship between the extent of adoption of recommended *Gobhi Sarson* technologies and their associated constraint severity (measured as mean percent score). A moderate negative correlation (Pearson's r = -0.29) was observed, indicating that as the severity of constraints increases, the adoption

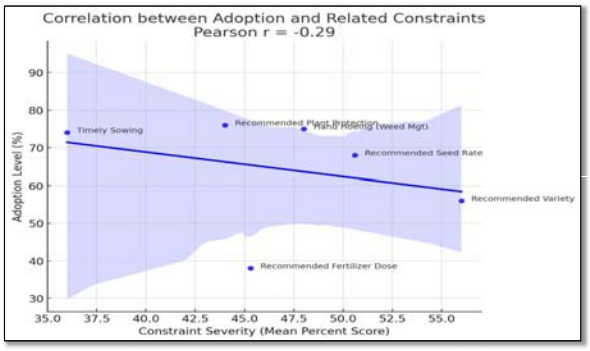

Fig. 1: Correlation between the extent of adoption of Gobhi Sarson production technologies and severity of related constraints among farmers in Fatehgarh Sahib district. A moderate negative correlation (Pearson r = –0.29) indicates that higher constraint severity is generally associated with lower adoption levels.

of the corresponding technology tends to decline. This trend emphasizes the need to mitigate specific production barriers, such as input availability and technical awareness, to improve overall adoption levels and foster greater adoption and productivity of *Gobhi Sarson* cultivation among farmers.

Conclusion

The study reveals that *Gobhi Sarson* cultivation in Fatehgarh Sahib district is constrained by a combination of technological, agro-climatic, and socio-economic constraints. While farmers adopt visible beneficial practices like timely sowing and pest management, significant gaps persist in varietal selection and balanced fertilizer use. Inadequate awareness and high cost of production risks were key barriers. The moderate negative correlation between adoption and constraint severity confirms that overcoming these challenges is crucial. Therefore, integrated efforts involving localized research, dynamic extension services, assured input supply, and price stabilization policies are essential to improve adoption rates and ensure sustainable mustard production in heavy soil regions of Punjab.

References

Anonymous. 2019. Agricultural statistics at a glance. Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi.

Asiwal BL, Singh S and Sharma NK. 2013. Adoption gap and constraints in the adoption of improved mustard production technology in the semi-arid region of Rajasthan. *Ind J Ext Edu Rural Dev* **21**: 105–108.

Barad KR, Prajapati RS and Chaudhary KV. 2023. Constraints faced by mustard growers in adoption of improved production technologies. *The Pharma Innov J* **12**: 1494–1496.

Bhardwaj V. 2013. Overview of the Indian oilseed sector: How to increase rapeseed production to reach 10 million tonnes [Presentation]. National Council of Applied Economic Research (NCAER), The Solvent Extractors' Association of India (SEA).

Deshmukh G, Patel HB and Patel MR. 2014. Frontline demonstration influences on knowledge and adoption of mustard growers. *Guj J Ext Edu* **25**: 27–30.

Dubolia SR and Jaiswal PK. 2000. Technological gap of groundnut cultivation among groundnut growers in Maharashtra. *J Agric Sci* **19**: 216–217.

Kumar R, Slathia PS and Paul N. 2018. Constraints in adoption of recommended rapeseed-mustard production technology in sub-tropical and temperate regions of Jammu and Kashmir. *Ind J Ext Edu Rural Dev* **26**: 18–23.

Rai DP, Singh SK and Pandey SK. 2012. Extent of knowledge and adoption of mustard production technology by the farmers. *Ind Res J Ext Edu* **12**: 108–111.

Kumar V, Sharma AK, Meena PD and Rai PK. 2018. Design and implementation of web-based expert tool for the selection of climate-resilient rapeseed-mustard varieties. *J Oilseed Brassica* **9**: 168–175.

Yadav S, Mazahar SH and Brahma U. 2020. Technological gap faced by mustard growers in Firozabad district, Uttar Pradesh. *Ind Res J Ext Edu* **20**: 93–97.