Journal of Oilseed Brassica, 17 (1) : 63-67, January 2026

Characterization of weed flora and farmer perspectives in Gobhi sarson cultivation on heavy-textured soils of Punjab

Vipan Kumar Rampal[1], Amanpreet Singh[2]* and Amit Kaul[3]

[1&2]*PAU-Krishi Vigyan Kendra, Ludhiana (Samrala) 141 001, Punjab, India*
[3]*Department of Agronomy, Punjab Agricultural University, Ludhiana 141 001, Punjab, India*
**Corresponding author: amanpreet-agr@pau.edu*
https://doi.org/10.56093/job.v17i1.10
Received date : 10 October 2025 *Accepted date : 15 December 2025*

Abstract

A field–cum–farmer investigation was executed during the r*abi* 2024-25 season in the southeastern agro-climatic tract of Punjab (Fatehgarh Sahib) to elucidate the phytosociological composition of weed flora and to diagnose operational constraints to weed management in g*obhi sarson* systems. Stratified quadrate sampling across 30 geo-referenced sites in 10 villages enabled quantitative estimation of population density, fresh biomass, relative frequency, relative density, relative dominance, and the composite Importance Value Index (IVI) of weed flora. Phytosociological metrics unequivocally established *Phalaris minor* and *Chenopodium album* as the pre-eminent species in terms of density and competitive potential. A concomitant socio-agronomic survey of 60 representative growers, employing structured personal interviews and descriptive analytics, revealed that weed pressure was generally rated moderate to severe, with the critical interference window identified at 16–30 days after planting. Hand hoeing persisted as the dominant control modality, although chemical and integrated strategies are increasingly incorporated. Principal impediments to optimal weed suppression comprised erratic herbicide availability, high input costs, inadequate technical cognizance of herbicidal protocols, and acute labor shortage. Collectively, these findings signify the imperative for species-specific and temporally targeted interventions, coupled with intensive farmer capacity-building in integrated weed management, to attenuate crop–weed competition and enhance mustard productivity within this agro-ecological niche.

Keywords: *Gobhi sarson, importance value index, Phalaris minor, phytosociology, weed management*

Introduction

Oilseeds hold a vital position in Indian farming, with rapeseed-mustard being among the most important due to its multiple edible and industrial uses. Rapeseed-mustard accounts for about 22 percent of India's total oilseed acreage (Vinod *et al*., 2019), yet India ranks 28th globally in rapeseed-mustard productivity (Bhardwaj, 2013). *Gobhi Sarson*, a prominent r*abi* oilseed crop, is particularly suited to northern and northwestern agro-climatic zones. In Punjab, the dominant rice-wheat system's sustainability is threatened by declining agro-ecosystem health, promoting diversification with alternative crops such as Oilseeds. However, adoption of recommended agronomic practices for *Gobhi sarson* remains suboptimal in southeastern Punjab's heavy soils, like those in Fatehgarh Sahib District. Weed management is a critical aspect limiting productivity due to labor-intensive manual control, herbicide availability issues, and knowledge gaps among farmers. Various socio-economic and agro-ecological factors including pest pressure, climatic variability, and soil constraints compound challenges in technology adoption. Poor weed management is a major constraint in achieving the crop's maximum yield potential (Dubolia and Jaiswal, 2000). Addressing these constraints requires understanding farmers' perceptions, practice-wise adoption rates, and barriers specific to weed management in *Gobhi sarson* fields under heavy soil conditions. This study aims to assess these factors through farmer surveys and field assessments to inform targeted extension strategies, strengthen integrated weed management adoption, and ultimately enhance the productivity and sustainability of *Gobhi sarson* cultivation in southeastern Punjab.

Material and Methods

a) Field survey

The study was conducted in the Fatehgarh Sahib District of the southeastern region of Punjab, located at approximately 30.6438° N latitude and 76.3479° E longitude, with an elevation of roughly 254 meters (833 feet) above sea level. The survey took place in *Gobhi sarson*-growing areas during late October to mid-November of 2024-25 *rabi* season under the ICAR-ATARI Oilseed Model Village project. A quantitative weed survey following the

methodology described by Thomas (1985) was implemented. Data collection took place in 10 villages, with three separate locations sampled per village, resulting in a total of 30 locations. At each site, 50 cm x 50 cm quadrates were randomly placed within the fields. All weeds within each quadrate were uprooted, sorted by species, identified, and counted. The collected data underwent thorough quantitative analysis, including measures such as population density, fresh weight, relative frequency, relative density, relative dominance, and the Importance Value Index (IVI). These parameters were calculated using formulas developed by Curtis and McIntosh (1950) and Jehangir *et al*. (2019). The IVI was employed to assess the overall significance of each weed species within the community structure, highlighting their roles in the field ecosystem. This methodical and statistically robust approach enabled a precise characterization of the weed flora and their relative importance in the *Gobhi sarson* crop environment.

$$Population\ (density) = \frac{Total\ number\ of\ weeds\ (individuals) of\ a\ species}{Total\ area\ sampled\ (m^2)}$$

In this case, density is expressed as population per square meter.

Fresh weight (g/m²): Total fresh weight of species in g per m²

$$Relative\ Density\ (\%) = \frac{Density\ of\ species}{Total\ density\ of\ all\ species} x\ 100$$

$$Relative\ Frequency\ (\%) = \frac{Frequency\ of\ species}{Sum\ of\ frequencies\ of\ all\ species} x\ 100$$

$$Relative\ dominance\ (\%) = \frac{Dominance\ of\ species}{Sum\ of\ Dominance\ of\ all\ species} x\ 100$$

$$Importance\ Value\ Index\ (IVI) = Relative\ Density + Relative\ Frequency + Relative\ Dominance$$

b) Farmer survey

The present investigation was conducted during the *rabi* season (2024-25) to assess the constraints faced by farmers in the adoption of recommended weed management in *Gobhi sarson* (*Brassica napus* L.) 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, six *Gobhi sarson* growers were selected using simple random sampling, resulting in a total sample size of 60 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 weed management practices 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. Data were arranged to obtain a representative mean basis. This methodological framework ensured a robust and reliable understanding of the adoption behavior and challenges encountered by *Gobhi sarson* growers in weed management in the study area.

Result and Discussion

Field survey

The *Phalaris minor* exhibited the greatest weed abundance, with a population density of 25-32 plants m^{-2}, fresh biomass of 85-110 g m^{-2}, relative density and dominance each ranging from 30–35%, frequency of 25–30%, and an importance value index (IVI) of 80–95% (Table 1). *Chenopodium album* was next prominent weed, showing 18–25 plants m^{-2}, 70–95 g m^{-2} fresh weight, 20–30% relative density and dominance, and an IVI of 65–75%. Another weed *Rumex dentatus* registered moderate infestation (10–15 plants m^{-2}, IVI 45–55%), comparable to *Cronopus didymus* and *Medicago denticulata*, which recorded 8–12 plants m^{-2} with an IVI of 30–35%, but all were clearly less abundant than *Phalaris minor* and *Chenopodium album*. A phyto-sociological assessment of weeds in Gobhi sarson fields revealed that *Phalaris minor* was the most dominant species, exhibiting the highest population density, fresh biomass, and importance value index. *Chenopodium album* also registered high values, reflecting strong competitive ability. In contrast, *Rumex dentatus*, *Cronopus didymus*, and *Medicago denticulata* occurred at moderate levels and exerted comparatively less ecological influence. These findings indicate that the weed community is largely driven by a few highly aggressive species, underscoring the need for targeted management practices to suppress these dominant weeds and enhance mustard productivity (Kaur *et al*., 2015). Farmers generally grow Gobhi sarson in the rice–wheat cropping system and as a result, many dominant wheat-associated weeds tend to persist and exhibit similar dominance in mustard fields as well (Singh *et al*., 2007).

Farmer survey

A majority of farmers (53.6%) reported experiencing a moderate weed problem in their fields, indicating that weed infestation is a significant issue affecting *Gobhi sarson* cultivation (Fig. 1). About 25.0% of farmers described the weed problem as low, while 12.5% reported severe weed problems. Only a small fraction (8.9%) indicated no weed

Table 1: Phytosociological attributes of weed species in *Gobhi sarson* (mustard) fields

Weed Species	Population (per m²)	Fresh Weight (g/m²)	Relative Density (%)	Relative Frequency (%)	Relative Dominance (%)	Importance Value (%)	IVI (%)
Phalaris minor	25–32	85–110	30–35	25–30	25–30	80–95	80–95
Rumex dentatus	10–15	20–35	15–20	15–20	15–20	45–55	45–55
Cronopus didymus	8–12	15–28	10–15	10–15	10–15	30–35	30–35
Medicago denticulata	8–12	15–25	10–15	10–15	10–15	30–35	30–35
Chenopodium album	18–25	70–95	20–25	20–25	25–30	65–75	65–75

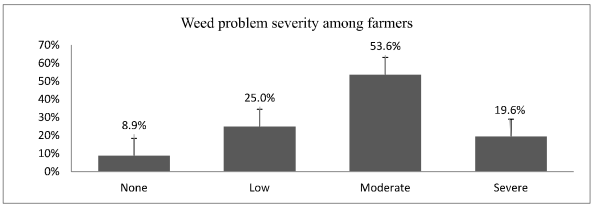

Fig1: Percentage distribution of farmers according to weed-problem severity in *Gobhi sarson* fields (n=60)

issues. This pattern highlights that effective weed management remains crucial in *Gobhi sarson* cultivation, with most farmers perceiving at least moderate impact from weeds during the season (Kumar et al 2012).

The Fig 2 presents farmers' perception of the *Gobhi sarson* crop growth stage most affected by weed infestation. The majority of farmers (71.4%) identified the 16–30 days after sowing (DAS) period as the most critical for weed interference in *Gobhi sarson* fields. A smaller proportion (19.7%) ranked the 31–60 DAS stage as most affected, while only 8.9% noted weed problems primarily within the first 0–15 DAS. Virtually no farmers indicated serious weed impacts beyond 60 DAS, as the rapidly developing foliage of *Gobhi sarson* effectively

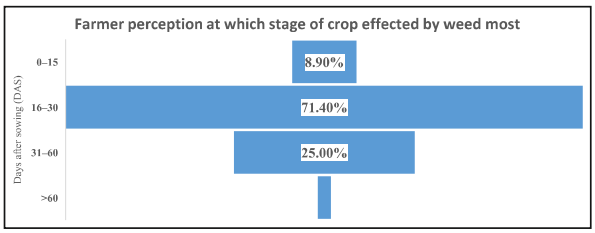

Fig 2: Farmers' perception of crop growth stage most affected by weed infestation (n=60)

suppresses further weed emergence and competition. This pattern confirms that weed control efforts are most vital within the first month after sowing for optimal crop performance in oilseed crops (Chopra and Saini, 2007).

The pie chart (Fig. 3) displays the weed control methods adopted by *Gobhi sarson* farmers. The largest segment, 49.9%, represents hand hoeing, indicating it is the most widely used approach for managing weeds in mustard fields. Cultural practices account for 14.3%, while chemical

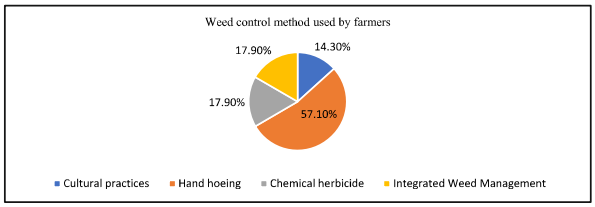

Fig 3: Weed-control methods adopted by *Gobhi sarson* farmers

Table 2: Farmers' perceptions and attitudes toward weed management
(Likert scale: 1 = Strongly Disagree … 5 = Strongly Agree; n = 60)

	Statement (technical phrasing)	Mean Score
1	Perceived reliability of manual weeding relative to herbicidal control	2.7
2	Efficiency of chemical weed control in reducing labour and time requirements	4.2
3	Preference for an integrated weed-management approach (cultural + mechanical + chemical)	3.5
4	Perceived negative impact of herbicides on soil health and beneficial organisms	3.1
5	Self-reported ability to identify predominant weed species in one's own fields	3.8
6	Perception of weed-control cost as a major constraint to adoption	2.0
7	Willingness to adopt improved weed-management practices following on-farm demonstration	4.6

Table 3: Agronomic constraints in weed management of *Gobhi sarson* (n = 60)

S. No.	Agronomic Constraint (technical phrasing)	Farmers reporting (%)
1	Emergence of herbicide-resistant weed biotypes	25
2	Elevated procurement cost of recommended herbicide formulations	60
3	Insufficient farmer knowledge and training on herbicide selection, timing, and application technique	50
4	Scarcity of agricultural labour for timely manual or mechanical weeding	40
5	Lack of Recommended Herbicide Options	65

herbicides and integrated weed management each make up 17.9%. This distribution highlights farmer reliance on manual methods but also demonstrates a meaningful shift towards chemical and integrated strategies for effective weed control in *Gobhi sarson* cultivation (Sharma *et al*., 2007).

Farmers rated chemical weed control highly effective (mean score 4.2), citing clear advantages in saving labor and time (Table 2). They showed moderate agreement on adopting integrated weed-management strategies (3.5) and reported a fairly good ability to identify major weed species (3.8). In contrast, confidence in manual weeding compared with herbicides was low (2.7), and concern about herbicide impacts on soil health was moderate (3.1). Cost was not considered a significant barrier (2.0). Notably, willingness to adopt improved practices following on-farm demonstrations was strong (4.6). Key agronomic constraints (Table 3) included lack of recommended herbicide options (65%), high procurement costs (60%), and inadequate farmer knowledge on proper herbicide use (50%). Labor scarcity for manual or mechanical weeding was also reported (40%), and 25% of respondents noted the emergence of herbicide-resistant weed biotypes. Overall, while farmers favor chemical control for its efficiency, adoption is restricted by availability, cost, and knowledge gaps. Expanding farmer training and promoting integrated weed-management approaches could alleviate these limitations, while labor shortages underscore the need for reliable herbicide-based or integrated solutions in *Gobhi sarson* cultivation. Similar results were also reported by Rai *et al*. (2012) and Deshmukh *et al*. (2014), who found the same challenges and adoption trends among oilseed farmers.

Conclusion

Combined field observations and farmer surveys identified *Phalaris minor* and *Chenopodium album* as the most prevalent and competitive weeds in *gobhi sarson*, highlighting the need for targeted management to safeguard mustard yields. Farmers reported that weed pressure is moderate overall but peaks 16–30 days after sowing, underscoring this period as critical for timely control. Hand hoeing remains the primary control method, though chemical and integrated strategies are gaining traction. While growers recognize the efficiency of herbicidal control, they face challenges including limited herbicide availability, high costs, knowledge gaps, and labor shortages. Strengthening farmer training and expanding integrated weed-management practices can help overcome these constraints and enhance *Gobhi sarson* productivity.

References

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

Chopra P, Saini JP. 2007. Effect of post-emergence weed control on production and economics of Gobhi sarson (*Brassica napus* L.). *Res Crops* **8**: 107–109.

Curtis JT, McIntosh RP. 1950. The interrelations of certain

analytic and synthetic phytosociological characters. *Ecolo* **31**: 434–455.

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

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

Jehangir IA, Hussain A, Ganai MA, Bhat MA, Mahdi SS, Shabir H. 2019. Phytosociological attributes of weed flora in brown mustard growing areas of the temperate Kashmir valley. *Ind J Weed Sci* **51**: 381–384.

Kaur S, Bhullar MS, Singh S, Singh T. 2015. Control of weeds in canola Gobhi sarson cultivars and their tolerance to herbicides. *Ind J Weed Sci* **47**: 376–378.

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

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

Sharma R, Rana MC, Angiras NN, Chopra P. 2007. Efficacy of clodinafop and row spacing in controlling weeds in Gobhi sarson (*Brassica napus* var. *oleracea*). *Ind J Weed Sci* **39**: 219–222.

Singh KN, Ara S, Wani GA, Hasan B, Khanday BA. 2007. A phytosociological association of weeds in winter crops of the Kashmir valley. *Ind J Weed Sci* **39**: 74–77.

Thomas AG. 1985. Weed survey system used in Saskatchewan for cereal and oilseed crops. *Weed Sci* **33**: 34–43.

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