*Journal of Experimental Agriculture International*

***Volume 46, Issue 8, Page 236-242, 2024; Article no.JEAI.120122***
***ISSN: 2457-0591***
*(Past name: American Journal of Experimental Agriculture, Past ISSN: 2231-0606)*

# Sugarcane Growers' Knowledge Level about Integrated Weed Management Practices in Meerut, UP, India

**Ashish Singh [a], Akanksha Singh [b++], Ankit Pal [c#*] and Ananda K.R [c#]**

*[a] Sardar Vallabh Bhai Patel University of Agricultural and Technology, Meerut, India.*
*[b] IIAST, Integral university, Lucknow, India.*
*[c] ICAR-IARI, New Delhi, India.*

***Authors' contributions***

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

***Article Information***

DOI: https://doi.org/10.9734/jeai/2024/v46i82700

**Open Peer Review History:**
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/120122

***Original Research Article***

***Received: 09/05/2024***
***Accepted: 13/07/2024***
***Published: 22/07/2024***

## ABSTRACT

The study examines the knowledge of Integrated Weed Management (IWM) among sugarcane growers, identifying both positive aspects and areas for improvement. Through survey responses, it was observed that a significant number of respondents were able to identify weeds and common varieties. However, there were noticeable knowledge gaps in specific IWM practices such as intercropping and understanding the critical period for weed control. Furthermore, the study reveals a correlation between certain factors and higher levels of IWM knowledge. Factors like education level, land holding, and access to resources were found to be positively associated with a greater

---

*[++] Assistant Professor;*
*[#] Ph.D. Scholar;*
**Corresponding author: E-mail: ankitpal988968@gmail.com;*

***Cite as:*** *Singh, Ashish, Akanksha Singh, Ankit Pal, and Ananda K.R. 2024. "Sugarcane Growers' Knowledge Level about Integrated Weed Management Practices in Meerut, UP, India". Journal of Experimental Agriculture International 46 (8):236-42. https://doi.org/10.9734/jeai/2024/v46i82700.*

understanding of IWM practices. These findings underscore the importance of targeted extension programs aimed at educating sugarcane growers about best practices for weed control within the framework of Integrated Weed Management. By addressing these knowledge gaps and leveraging key factors that contribute to higher knowledge levels, such programs can significantly enhance weed management strategies in sugarcane production.

*Keywords: Sugarcane; weed management; knowledge.*

## 1. INTRODUCTION

"Sugarcane (*Saccharum officinarum* L.) is an important long duration C4 crop of tropical and subtropical areas which constitutes around 80% of the world's sugar production and 35% ethanol" [1-4]. "India is the second largest producer country after Brazil contributing approximately 430.50 million tons production of millable cane from an area 5.09 million hectares with annual average productivity of 8.44 tons ha-1" [5]. The delayed germination, slow initial growth, wide row space and enough supply of nutrients of the crop provides favorable conditions for different weed species infestation. The weed infestation is always a major problem which seriously reduces the yield of sugarcane. Srivastava et al. [6] reported that "the extent of yield loss may range from 10% to complete crop failure. Being a long duration crop, it is heavily infested with a variety of weeds. Nearly 150 weed species including annuals, perennials and parasitic weeds have been reported in sugarcane fields in different parts of India". "The control of weeds during critical period of crop-weed competition is very important so as to avoid yield loss" [7].

"The major weeds reported in sugarcane field were of sedges (*Cyprus rotundus*), grasses (*Cynodon dactlyon*, *Sorghum halepense*, *Panicum sp*. *Dactyloctenium aegyptium*, *Imperata cylindrica*) and broad leaved weeds (*Chenopodium album, Convolvulus arevensis, Striga asiatica, Portulaca oleraceae, Commelina benghalensis, Trianthema portulacastrum, Amaranthus viridis*). Cultural practices like ploughing, hand weeding and mulching are practiced to control the weeds. However, these methods became cumbersome, time consuming, labour intensive and expensive. Hand weeding is difficult due to non-availability of labour as well as high cost of weeding" [8]. "Herbicides are used extensively in Indian agriculture nowadays to control or kill weeds and to have timely weed management" [9].

Hence, chemical control of weeds offers a good substitute. It has been estimated that chemical management of weeds in sugarcane is considered as economically feasible one [10]. Use of pre emergence or post emergence herbicides or combination of both essential for reduce crop weed interference [11].

## 2. MATERIALS AND METHODS

"Utilising the accepted methods, a knowledge test for integrated weed management was created. The knowledge test included questions (items) pertaining to weed management. A question (items) bank was established by reading literature and consulting textbooks, leading to a thorough examination of the items with the help of subject matter experts. The questions were made to gauge the knowledge of students in rural schools. For the relevance test, a total of 43 knowledge items were created using the methodology outlined" by Kumar et al. (2016). An experienced team of judges examined the item statements to assess their relevance and select those that would be included in the final examination (Kline, 1986). "The 43 items were delivered to a panel of 30 judges who were extension education professionals with the request that they critically assess each item's applicability in gauging the knowledge of rural schoolchildren. According to five-point scale with ratings of 5, 4, 3, and 1, highly relevant, relevant, undecided, less relevant, and not relevant, the judges were asked to respond. The scores on the rating scale for all of the judges' comments were added to determine the relevancy score for each item. For all the items, two sorts of tests—relevancy percentage and frequency were calculated from the data. The items that met the minimum requirements (Relevancy% >70, Relevancy weightage >0.70, and Mean relevancy score > 3.0) were chosen. There were 18 total items chosen" [11].

"The information gathered was in objective form and used to build the knowledge test. The only type of item was multiple choice. Thirty respondents from outside the area of data collection were given the 43 items that had been chosen. Each question on the knowledge test

required the responders to indicate their answers, and the correct answers received a score of "1," while the wrong answers received a score of "0." By adding the responses to each item from each respondent, the overall knowledge score for each item was determined" (Kaur et al., 2020). The difficulty index and discrimination index were computed using this information. In this study, the item difficulty index P was calculated as the proportion of respondents who correctly answered each item [12-14].

$$P = \frac{NC}{N} \times 100$$

"The formula used to determine it was P = Difficulty Index, NC = Number of Correct Responses, and N = Total Number of Respondents. The final knowledge test in the current study took into consideration and included the items with P values between 30 and 80. With the use of the E1/3 approach, the discrimination power of each of the 43 items was calculated. This method separated the 30 respondents into six equal groups, each with five respondents, and sorted them in descending order of the size of the knowledge scores that were received from them. The two groups in the centre were dismissed.The 'Discrimination Index' was calculated using only four extreme groups, those with the highest and lowest scores. The formula used to determine it was as follows:

$$E1/3 = \frac{(S1 + S2) - (S5 + S6)}{N/3}$$

"Where, N stands for the overall number of respondents to whom the items were given. The frequencies of accurate responses for the highest and higher scores, respectively, are S1 and S2. The frequencies of right responses for lower and lower scores, respectively, are S5 and S6, respectively. In the final knowledge test, only items with a discrimination index equal to or higher than 0.3 are chosen. The point-biserial correlation (Rp bis) is the name for a correlation between a continuous and a dichotomous variable" (Demirtas & Hedeker, 2016). Point biserial correlation was estimated to assess an item's internal consistency and how it related to the overall score when a dichotomized response to a particular item was obtained.

$$\text{Rp bis} = \frac{\text{Mp} - \text{Mq}}{Sigma} \times \sqrt{\text{pq}}$$

"Where, Rp bis is the point biserial correlation, in this case. Mp is the mean of the respondents' overall scores when they correctly respond to a question. Mq is the mean of the respondents' overall scores who provided an erroneous response to a question. The standard deviation of the entire sample is called sigma. P is the percentage of respondents who correctly answer a question, while Q is the percentage of respondents who incorrectly answer a question. Statistics were used to test the calculated point biserial correlation values with n-2 degrees of freedom. The final items for the knowledge test were 29 items with a point bi serial correlation value that was significant at the 5% level of significance" [11].

## 3. RESULTS AND DISCUSSION

Table 1 revealed a positive starting point for building IWM knowledge. A significant majority of respondents (80%) recognized weeds and understood their competition with sugarcane. They were also familiar with common weed varieties, with identification rates exceeding 70% for most prevalent weeds like Cyperus rotundus (Motha) and Cynodon dactylon (Doobh Ghas). Encouragingly, a considerable portion of growers (around 90%) acknowledged the importance of preventive measures like deep summer ploughing and field sanitation to minimize weed seed introduction.

However, the survey also identified knowledge gaps in specific IWM practices. While some awareness existed about crop rotation (67.5%) and mulching (53.8%) as weed control methods, the concept of intercropping for weed suppression was unfamiliar to most growers (20%). Similarly, the understanding of how tillage depth impacts weed seed dispersal (60%) and the critical window for weed-free conditions for optimal yield (47.5%) was limited.

Table 2 reveals a concerning trend, with over half of the respondents (52.5%, n=42) exhibiting low knowledge levels. This suggests a significant knowledge gap among sugarcane growers in crucial areas related to best practices, government schemes, and market trends. A positive aspect is that 36.25% (n=29) of the respondents demonstrated medium knowledge levels, indicating some awareness but potential room for improvement. Encouragingly, a small group (11.25%, n=9) displayed high knowledge levels, signifying a strong understanding of relevant topics in sugarcane farming.

**Table 1. Distribution of respondents according to Knowledge of sugarcane growers regarding integrated weed management**

| S. No. | Particulars | Frequency | Percentage |
|---|---|---|---|
| **(A)** | **Basic Knowledge about weeds** | | |
| 1. | Do you know what is weed | 80 | 100 |
| 2. | Do you know whom weed is competing with main crop | 37 | 46.25 |
| 3. | Identify the given weed displayed in the Photograph | | |
| i | *Cyperus rotundus (Motha)* | 79 | 98.80 |
| ii | *Cynodon dactylon (Doobh Ghas)* | 78 | 97.50 |
| iii | *Sorghum halapense (Jungali jwar)* | 70 | 87.50 |
| iv | *Panicum spp. (Gobra Ghas/ kutki)* | 58 | 72.50 |
| v | *Chenopodium album (Bathua)* | 78 | 97.50 |
| vi | *Convovulus arvensis (Hirankhuri)* | 57 | 71.30 |
| vii | *Amranthus virdis (Chauli)* | 53 | 66.25 |
| viii | *Portulaca oleracea (Lohdi)* | 6 | 7.50 |
| ix | *Commelina bengalensis (Kankaua)* | 11 | 13.80 |
| x | *Striga spp. (Missi)* | 25 | 31.30 |
| **(B)** | **Knowledge about Preventive Measures of weed control** | | |
| 1. | Do you know that under composed FYM is a major cause of weed | 42 | 52.50 |
| 2. | Do you know that deep summer ploughing controls the weed infestations | 74 | 92.50 |
| 3. | Do you know field sanitation is also an important factor which prevents the entry of weed seeds in the field | 72 | 90.00 |
| 4. | Do you know soil solarization is an important tool to control the weeds | 63 | 78.80 |
| 5. | Do you know the critical period of weed free condition for higher productivity in sugarcane | 38 | 47.50 |
| **(C)** | **Knowledge about cultural method of weed control** | | |
| 1. | Do you know crop rotation practices help in breaking weed chain | 54 | 67.50 |
| 2. | Do you know intercropping of sugarcane with soyabean, sunflower, groundnut help in smothering weed | 16 | 20.00 |
| 3. | Do you know Mulching using sugarcane trash can help in suppressing weeds | 43 | 53.80 |
| 4. | Do you know avoiding excess irrigation reduces the buildup of weeds in field | 64 | 80.00 |
| **(D)** | **Knowledge about Mechanical method of weed control** | | |
| 1. | Do you know pre – planting tillage operations is done to control weeds. | 74 | 92.50 |
| 2. | Do you know primary and secondary tillage operation help in burying the weed seeds deep in the soil | 48 | 60.00 |
| 3. | Do you know hand weeding and hand hoeing are very effective in early stages to control weed | 67 | 83.80 |
| 4. | Do you know the optimum time in which hand weeding should be done | 69 | 86.30 |
| 5. | Do you know for which type of weed generally hand weeding is effective | 59 | 73.75 |
| **(E)** | **Knowledge about Chemical Method of weed control** | | |
| 1. | Do you know pre -emergence herbicide is essential to control weeds during the germination phase of crop. | 55 | 68.75 |
| 2. | Do you know about following pre-emergence herbicide and their doses | | |
| i | Simazine (2 kg/ha) | 53 | 66.25 |

| S. No. | Particulars | Frequency | Percentage |
|---|---|---|---|
| ii | Atrazine (1.25-2.0 kg/ha) | 44 | 55.00 |
| iii | Metribuzine (1 kg/ha) | 10 | 12.50 |
| iv | Diuron (1kg/ha) | 18 | 22.50 |
| v | Pendimethalin (1 kg/ha) | 51 | 63.75 |
| vi | Alachlor (1.5 kg/ha) | 25 | 31.30 |
| 3. | Do you know about following post-emergence herbicide and their doses | | |
| i | 2,4-D (1-2 Kg/ha) | 67 | 83.75 |
| ii | Paraquat dichloride (0.5- 1.0 kg/ha) | 24 | 30.00 |
| iii | Glyphosate (1.5-2 kg/ha) | 64 | 80.00 |
| 4. | Do you know the appropriate time of application of pre-emergence herbicide is 3-4 DAP | 48 | 60.00 |
| 5. | Do you know the appropriate time of application of post-emergence herbicide is 60 DAP | 47 | 58.80 |
| 6. | Do you know herbicide (Alachlor or Pendimethalin) is used when intercropping of sugarcane is done with gram, potato, groundnut, wheat and sunflower | 12 | 15.00 |
| **(F)** | **Knowledge about safety measures while applying herbicide.** | | |
| 1. | Do you know which care should be taken while spraying herbicide | 41 | 51.20 |
| 2. | Do you know the appropriate time for applying herbicide | 53 | 66.25 |
| 3. | Do you know which type of nozzle is used for spraying purpose. | 28 | 35.00 |
| 4. | Do you know which are care should be taken when toxic herbicide has been inhaled. | 20 | 25.00 |
| 5. | Do you know which care should be taken in case of oral intake of herbicide. | 26 | 32.50 |
| 6. | Do you know the method of disposing of empty container of herbicides | 12 | 15.00 |

**Table 2. Distribution of respondents according to knowledge index**

| S.No. | Particulars | Frequency | Percentage |
|---|---|---|---|
| 1. | Low (score obtained below 33.33%) | 42 | 52.50 |
| 2. | Medium (score obtained between 33.33% to 66.66%) | 29 | 36.25 |
| 3. | High (score obtained above 66.66%) | 9 | 11.25 |
| Total | | 80 | 100 |

*Mean=32.71 S. D.=12.63*

**Table 3. Correlation coefficient between the independent variable and knowledge level of sugarcane growers regarding integrated weed management**

| S. No. | Independent variable | Coefficient of correlation (r) with Knowledge level |
|---|---|---|
| 1. | Age | -0.256* |
| 2. | Education status | 0.448** |
| 3. | Caste | 0.154 |
| 4. | Family type | 0.056 |
| 5. | Family Size | 0.155 |
| 6. | Housing Pattern | 0.294* |
| 7. | Land Holing | 0.542** |
| 8. | Occupation | 0.350** |
| 9. | Home Appliances | 0.143 |
| 10. | Transportation Facilities | 0.667** |
| 11. | Farm machinery | 0.552** |
| 12. | Irrigation facility | 0.433** |
| 13. | Social Participation | 0.617** |
| 14. | Annual Income | 0.543** |
| 15. | Extension Contacts | 0.549** |
| 16. | Mass media contacts | 0.619** |

*** Correlation is significant at the 0.01 level (2-tailed)*
** Correlation is significant at the 0.05 level (2-tailed)*

Significantly positive correlations indicate that higher values of certain variables are linked to greater IWM knowledge. These include education level, land holding, occupation, access to transportation and farm machinery, irrigation facilities, social participation, annual income, and frequent contact with extension services or mass media. These findings suggest that socioeconomic factors, resource availability, and information access all play a role in IWM knowledge.

Age, caste, family type, family size, and home appliance ownership displayed weak or non-significant correlations with IWM knowledge.

## 4. CONCLUSION

The study revealed both positive aspects and areas for improvement in IWM knowledge among sugarcane growers. While a majority of respondents recognized weeds and common varieties, knowledge gaps existed in specific IWM practices like intercropping and understanding the critical period for weed control. The study also found a correlation between factors like education level, land holding, and access to resources with higher IWM knowledge levels. These findings highlight the need for targeted extension programs to educate growers on best practices for weed control in sugarcane production.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Adarsh S, Shilpa S, Ameena M, Susha VS, Sreelekshmi K, Renjan B, Fathima Umkhulzum, Sethulakshmi VS, Shifina Shanavas. A review on nano herbicides: The future of weed management. Journal of Advances in Biology & Biotechnology. 2024;27(7):1244-53. Available:https://doi.org/10.9734/jabb/2024/v27i71085.
2. Adarsh S, Shilpa S, Ameena M, Susha VS, Sreelekshmi K, Renjan B, Fathima Umkhulzum, Sethulakshmi VS, Shifina

Shanavas. A review on nano herbicides: The future of weed management. Journal of Advances in Biology & Biotechnology. 2024;27(7):1244-53.
Available:https://doi.org/10.9734/jabb/2024/v27i71085.

3. Moss S. Integrated weed management (IWM): Why are farmers reluctant to adopt non-chemical alternatives to herbicides?. Pest Management Science. 2019, May;75(5):1205-11.
Available:https://scijournals.onlinelibrary.wiley.com/doi/abs/10.1002/ps.5267
4. Llewellyn RS, Lindner RK, Pannell DJ, Powles SB. Herbicide resistance and the adoption of integrated weed management by Western Australian grain growers. Agricultural Economics. 2007, Jan;36(1): 123-30.
Available:https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1574-0862.2007.00182.x
5. Anonymous; 2021-22.
Available:https://sugarcane.dac.gov.in/pdf/StatisticsAPY.pdf.
6. Srivastava TK. Bio-efficacy of sulfentrazone against nut- sedge (*Cyperus rotundus*) and other weeds in sugarcane. Indian Journal of Weed Science. 2003; 35(1&2):83-86.
7. Ramesh T, Rathika S. Management of emerged weeds in irrigated blackgram (*Vigna mungo* L.) through post emergence herbicides. Legume Research. 2016; 39(2):289-292.
8. Janaki P, Rathika S, Chinnusamy C, Prabhakaran NK. Field dissipation of metamitron in soil and sugar beet crop. Bull Environ Contam Toxicol. 2013;90:116-119.
9. Oscar T, Chatterjee A, Pawan AK, Ansingh N, Bajoriya DK, Khande D. Weed control efficiency of Sulm 70 WG a Triazinone herbicide in sugarcane and its impact upon growth and yield. International Journal of Chemical Studies. 2019;7:1-4.
10. Manisankar G, Ramesh T, Rathika S, Janaki P, Balasubramanian P. Evaluation of sequential herbicide application on transplanted paddy under sodic soil. The Pharma Innovation Journal. 2019;8(5):633-638.
11. Pal A, Lenin V, Dube A, Dixit A, Singh A, Kumar S. Measuring the knowledge of rural school children on nutrition education in Bihar, India. Asian Journal of Agricultural Extension, Economics & Sociology. 2024, Jan 30;42(2):1-8.
12. Begum RA, Hassan G, Ali S. Effect of weed management practices on Sugarcane ratoon; 2016.
Available:https://www.researchgate.net/publication/371830103_Weed_management_in_sugarcane_A_review
13. Raskar VD. Status of weed science research in sugarcane. In: D. P. Singh (Ed.), Challenging problems in Indian agriculture and strategies for their solution. Indian Institute of Sugarcane Research, Lucknow, India. 2004;257-268
14. Roshan MB, Singh RD, Singh SB. Weed flora and their management in sugarcane in western Uttar Pradesh. Indian Journal of Weed Science. 2006;38(3/4):213-216.



*Peer-review history:*
*The peer review history for this paper can be accessed here:*
*https://www.sdiarticle5.com/review-history/120122*