
**ISSN Print:** 2394-7500
**ISSN Online:** 2394-5869
**Impact Factor (RJIF):** 8.69
IJAR 2025; 11(9): 293-297
www.allresearchjournal.com
Received: 11-07-2025
Accepted: 14-08-2025

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# Study of the weed species composition in maize field of Chhindwara district, Madhya Pradesh

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**DOI:** https://www.doi.org/10.22271/allresearch.2025.v11.i9d.12893

## Abstract
This work was conducted to study the different weed species in maize crop of Chhindwara district, (M.P.). The composition of weed species within the Asteraceae family was extensively distributed across the fields in this region. The frequency and density of these weeds peaked during November, coinciding with the flowering stage of the crops. Effective weed control relied on a thorough understanding of the biological and ecological traits of both weeds and crops. The interaction between weeds and crops was also affected by the application of herbicides, as certain crops showed sensitivity to specific chemicals. To enhance weed management, farmers should consider adopting advanced techniques, including chemical and biological control strategies.

**Keywords:** Chhindwara district, maize, weed, asteraceae, weedicides

## Introduction
Maize stands as one of the most vital cereal crops in the Chhindwara district, primarily cultivated during the kharif season. The climatic conditions of this region are highly conducive to maize farming. Globally, maize has gained greater prominence compared to other cereals due to its versatile applications across various sectors. It is widely used in industries such as food processing, animal feed production, pharmaceuticals, and manufacturing, along with serving as a major feed source for livestock and a staple food for humans. Its popularity stems from features like low cultivation costs, adaptability to diverse climates, higher productivity, and strong export potential worldwide. In Chhindwara, kharif maize cultivation is heavily reliant on monsoon rainfall. In the southern parts of the district, farmers also grow maize during the Rabi season, often for forage purposes. However, many farmers face challenges in managing weeds and overcoming other obstacles in cultivation. By implementing effective weed control measures and expanding the cultivation area, farmers could significantly boost maize production. This would not only help fulfill domestic animal feed requirements but also increase its use as a staple food crop for human consumption.

Weeds are considered undesirable plants from a human perspective, yet they hold significant importance from an ecological standpoint. In India, numerous weed species can be found growing in various locations, such as crop fields, wastelands, roadsides, forests, and even in or on water reservoirs. Within crop fields, weeds compete with cultivated plants for essential resources like water, soil nutrients, light, and space, ultimately leading to reduced crop yields. Additionally, weeds often serve as vectors for pathogenic microorganisms and provide shelter for insect pests, contributing to the spread of diseases and infestations. Their adaptability allows them to thrive under adverse conditions, successfully completing their life cycle. Weed seeds readily migrate into crop fields, germinate quickly, and occupy available space, further hindering crop production. With their ability to absorb nutrients and water more efficiently than crops, weeds pose a significant challenge, especially in irrigated and well-fertilized fields that tend to have the highest weed population (Sapkota, 2010) [1]. This results in increased expenditure on labor, pest control measures, equipment maintenance, and damage control. Weeds also complicate harvesting operations while diminishing the quality, marketability, and quantity of agricultural produce. In addition to these challenges, they obstruct water pipelines and channels used for irrigation and transport.

The present study aimed to identify the composition of weed species in maize crops and develop effective strategies for their control.

## Materials and Methods

Chhindwara district, established on 1st November 1956, lies in the southwestern region of the Satpura Range. Geographically, it extends from 21.28° to 22.49° North latitude and 78.40° to 79.24° East longitude, covering a total area of 11,815 square kilometers. The district shares its boundaries with the plains of Nagpur in Maharashtra to the south, Hoshangabad and Narsinghpur districts to the north, Pandhurna district to the west, and Seoni district to the east.

The study of weed species was conducted during the maize cultivation season, spanning September to December 2024. Two separate fields, designated as Field 'A' and Field 'B,' were selected for the investigation. In each field, five permanent quadrats measuring 1x1 square meter were established one at each corner and one in the center. Regular visits were made to each field throughout the cultivation process, from sowing to harvesting. Data were systematically collected and documented every two weeks during the cropping period. Key characteristics of the weeds, along with their local names, were recorded. Additionally, information related to sowing techniques, fertilizer application, irrigation, and weed management practices was gathered from the farmers. Weeds were identified by using, the flora of (Hooker, 1872-1897; Cook, 1903; Hains, 1921-1924; Duthi, 1960; Shah, 1978; Verma *et al.*, 1993; Mudgal *et al.*, 1997; Khanna *et al.*, 2001) [2-9] and other taxonomic literature. Later on the density abundance, frequency, frequency classes of each individual species and distribution of weed in the fields were determined.

## Results and Discussion

A total of 45 weed species, distributed across 18 families of dicots and 2 families of monocots, were identified (Table 4) in a maize field located in Chhindwara. The study revealed that dicot weed species were more dominant compared to monocot weeds in the area. Since weeding was restricted in the selected fields, the undisturbed growth of the weeds offered valuable insight for the study. The weeds began emerging seven days after maize seeds were sown. Among the sampling fields, field 'B' showed a greater abundance of weed flora compared to field 'A.' This difference could be attributed to the fertility of the soil in field 'B' and the possibility of weed seeds being transported from nearby forested areas. The frequency and density of the weed species were observed to be highest in November, coinciding with the flowering stage of the crops. Additionally, field 'B' not only demonstrated a higher diversity of weed species but also contained several marshy weeds. This can be explained by its slightly upland terrain, plain structure, and fertile soil conditions. On the basis of frequency percentage, relative frequency, density and abundance (Tables 1 & 2) the *Ageratum conyzoides*, *Amaranthus* spps, *Euphorbia* spps, *Solidago* spps, *Blumea* spps, *Cyathocline* spps and *Sphaeranthus* spps. Grass spps. were more in number in both the fields. The *Ageratum conyzoides* occurred in all 10 quadrates in the field. The *Begonia crenata* (1 spp) *Sesamum indicum* (2 spp), *Chenopodium album* (3 spp), *Cassia tora* (2 spp), *Argemone mexicana* (2 spp) were occasionally occurred in the field. The view point of family; Asteraceae (Table 3 & Fig. 1) was presented with highest number of species (46), Amaranthaceae, Euphorbiaceae and Poaceae were placed on 2nd, 3rd and 4th place (25, 20 and 15 spps. respectively), but family Acanthaceae Nyctaginaeae, Boraginaceae, Oxalidaceae, Papaveraceae had insignificant number of species in the field.

In the study area, members of the families Pedaliaceae, Malvaceae, and Scrophulariaceae were infrequently observed in the field. Most of the weed species exhibited faster growth rates compared to the maize crop. The occurrence of weeds was noted during the flowering stage, prior to crop maturation, and the emergence of a second generation of weed species. As a result, both fields in the Chhindwara district contained a significant number of individual weed species. Another contributing factor is the district's proximity to the Satpura range, which features mixed forests. Wind and animals dispersed forest weed seeds into these regions, leading to a higher prevalence of weeds. In terms of frequency classes, weeds from the family Asteraceae were categorized under the 'E' frequency class, while Euphorbiaceae, Poaceae, and Cyperaceae fell into the 'D' class. Families such as Amaranthaceae, Caesalpinaceae, and Chenopodiaceae were classified under 'C,' whereas Nyctaginaceae, Boraginaceae, and Verbenaceae marked 'B.' Finally, species from Begoniaceae, Pedaliaceae, and Lamiaceae represented the 'A' frequency class (Table 3).

## Weed management

Weed control in maize fields can be achieved through physical, biological, and chemical methods. Effective weed management relies on understanding the biological interaction between weeds and crops. It's important to note that not all weeds in a crop field are harmful. At low densities, weeds may have minimal impact on yield and, in some cases, even promote crop growth. Farmers in the Chhindwara district primarily rely on physical methods for weed control, such as hand weeding, hoeing, tilling, and burning techniques that are considered traditional in agriculture. Modern approaches, including the use of chemical and biological weed control methods, are not commonly practiced in this region. Before applying any weed control measures, it is essential to consider the ecological characteristics of both the crops and weeds. The nature of the weed and the crop plays a significant role in determining the effectiveness of herbicides, as certain crops might be sensitive to specific chemicals. Farmers should also adopt preventive measures to minimize weed infestation; for instance, ensuring maize seeds are free of weed seed contamination during sowing. A variety of biological and chemical herbicides are available that can effectively manage weeds in maize fields. Removing weeds not only simplifies harvesting but also improves the quality and quantity of maize yield.

**Table 1:** Frequency, frequency class*, relative frequency density and abundance of weed species in 'A' field.

| S. No. | Species | Frequency (%) | Frequency class * | Relative Frequency | Density plant/m² | Abundance plant/m² |
|---|---|---|---|---|---|---|
| 1. | *Ageratum conyzoides* | 100 | E | 5.95 | 1.8 | 1.8 |
| 2. | *Cynodon dactylon* | 100 | E | 5.95 | 1.5 | 1.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3. | *Oxalis corniculata* | 100 | E | 5.95 | 1.5 | 1.5 |
| 4. | *Alternanthera sessilis* | 80 | D | 4.76 | 1 | 1 |
| 5. | *Amaranthus viridis* | 80 | D | 4.76 | 1 | 1 |
| 6. | *Blumea lacera* | 80 | D | 4.76 | 1 | 1 |
| 7. | *Euphorbia microphylla* | 80 | D | 4.76 | 1 | 1.5 |
| 8. | *Euphorbia hirta* | 80 | D | 4.76 | 1 | 1 |
| 9. | *Grass* species (unidentified) | 80 | D | 4.76 | 1 | 1.5 |
| 10. | *Phylanthus amarus* | 80 | D | 4.76 | 1 | 1 |
| 11. | *Tridax procunbens* | 80 | D | 4.76 | 1 | 1 |
| 12. | *Amaranthus spinosus* | 60 | C | 3.57 | 1 | 1 |
| 13. | *Cassia tora* | 60 | C | 3.57 | 1 | 1 |
| 14. | *Celosia argentea* | 60 | C | 3.57 | 1 | 1 |
| 15. | *Parthenium hysterophorus* | 60 | C | 3.57 | 1 | 1 |
| 16. | *Smithia sensitive* | 60 | C | 3.57 | 1 | 1 |
| 17. | *Argemone maxicana* | 40 | B | 2.38 | 1 | 1 |
| 18. | *Boerhavia diffusea* | 40 | B | 2.38 | 1 | 1 |
| 19. | *Cyathocline lyrata* | 40 | B | 2.38 | 1.5 | 1.5 |
| 20. | *Lagasca mollis* | 40 | B | 2.38 | 1 | 1 |
| 21. | *Lantana camara* | 40 | B | 2.38 | 1 | 1 |
| 22. | *Physalis minima* | 40 | B | 2.38 | 1 | 1 |
| 23. | *Sesamum indicum* | 40 | B | 2.38 | 1 | 1 |
| 24. | *Sida spinosa* | 40 | B | 2.38 | 1 | 1 |
| 25. | *Xanthium indicum* | 40 | B | 2.38 | 1.3 | 1.3 |
| 26. | *Brachiaria platyphylla* | 20 | A | 1.19 | 1 | 1 |
| 27. | *Leucas aspera* | 20 | A | 1.19 | 1 | 1 |
| 28. | *Solanum nigrum* | 20 | A | 1.19 | 1 | 1 |
| 29. | *Verbascum chinese* | 20 | A | 1.19 | 1 | 1 |

**Table 2:** Frequency, frequency class*, relative frequency density and abundance of weed species in 'B' field.

| S. No. | Species | Frequency (%) | Frequency class * | Relative Frequency | Density plant/m$^2$ | Abundance plant/m$^2$ |
|---|---|---|---|---|---|---|
| 1. | *Ageratum conyzoides* | 100 | E | 5.43 | 1.6 | 1.6 |
| 2. | *Celosia argentea* | 100 | E | 5.43 | 1.2 | 1.5 |
| 3. | *Euphorbia pulcherima* | 100 | E | 5.43 | 1.2 | 1.2 |
| 4. | *Amaranthus spinosus* | 80 | D | 4.35 | 1 | 1 |
| 5. | *Blumea lacera* | 80 | D | 4.35 | 1 | 1 |
| 6. | *Cynodon dactylon* | 80 | D | 4.35 | 1 | 1 |
| 7. | *Cyperus rotundus* | 80 | D | 4.35 | 1.25 | 1.2 |
| 8. | *Euphorbia microphylla* | 80 | D | 4.35 | 1 | 1 |
| 9. | *Euphorbia hirta* | 80 | D | 4.35 | 1 | 1 |
| 10. | *Oxalis corniculata* | 80 | D | 4.35 | 1.25 | 1.2 |
| 11. | *Parthenium hysterophorous* | 80 | D | 4.35 | 1 | 1 |
| 12. | *Portulaca oleracea* | 80 | D | 4.35 | 1.25 | 1.2 |
| 13. | *Alternanthera sessilis* | 60 | C | 3.26 | 1 | 1 |
| 14. | *Amaranthus hybridis* | 60 | C | 3.26 | 1 | 1 |
| 15. | *Amaranthus viridis* | 60 | C | 3.26 | 1 | 1 |
| 16. | *Argemone maxicana* | 60 | C | 3.26 | 1 | 1 |
| 17. | *Cassia tora* | 60 | C | 3.26 | 1 | 1 |
| 18. | *Chenopodium album* | 60 | C | 3.26 | 1 | 1 |
| 19. | *Cyathocline lyrata* | 60 | C | 3.26 | 1 | 1 |
| 20. | *Eclipta prostata* | 60 | C | 3.26 | 1.33 | 1.3 |
| 21. | *Grass* spp. (unknown) | 60 | C | 3.26 | 1.33 | 1.3 |
| 22. | *Phylanthus amarus* | 60 | C | 3.26 | 1 | 1 |
| 23. | *Boerhavia diffusa* | 40 | B | 2.17 | 1 | 1 |
| 24. | *Heliotropium indicum* | 40 | B | 2.17 | 1 | 1 |
| 25. | *Lantana camara* | 40 | B | 2.17 | 1 | 1 |
| 26. | *Panicum* spp. | 40 | B | 2.17 | 1 | 1 |
| 27. | *Achyranthes aspera* | 20 | A | 1.09 | 1 | 1 |
| 28. | *Begonia crenata* | 20 | A | 1.09 | 1 | 1 |
| 29. | *Paspalum scrobiculatum* | 20 | A | 1.09 | 1 | 1 |

*Frequency class based on Raunkier (1934) [10]

**Table 3:** Families of weed species in maize crop of Chhindwara district.

| S.No. | Family | Class Dicot/Monocot | Number of Individual Spp. | | Total species in Maize crop |
|---|---|---|---|---|---|
| | | | Field 'A' | Field 'B' | |
| 1. | Asteraceae | Dicot | 21 | 25 | 46 |
| 2. | Amaranthaceae | Dicot | 15 | 10 | 25 |
| 3. | Euphorbiaceae | Dicot | 08 | 12 | 20 |

| | | | | | |
|---|---|---|---|---|---|
| 4. | Poaceae | Monocot | 10 | 05 | 15 |
| 5. | Lamiaceae | Dicot | 05 | 03 | 08 |
| 6. | Oxalidaceae | Dicot | 04 | 03 | 07 |
| 7. | Caesalpinaceae | Dicot | 03 | 03 | 06 |
| 8. | Cyperaceae | Monocot | - | 05 | 05 |
| 9. | Papavraceae | Dicot | 03 | 02 | 05 |
| 10. | Portulacaceae | Dicot | - | 05 | 05 |
| 11. | Nyctaginaceae | Dicot | 02 | 02 | 04 |
| 12. | Verbanaceae | Dicot | 02 | 02 | 04 |
| 13. | Acanthaceae | Dicot | 01 | 02 | 03 |
| 14. | Chenopodiaceae | Dicot | - | 03 | 03 |
| 15. | Pedaliaceae | Dicot | 02 | 01 | 03 |
| 16. | Solanaceae | Dicot | 03 | - | 03 |
| 17. | Boraginaceae | Dicot | - | 02 | 02 |
| 18. | Malvaceae | Dicot | 02 | - | 02 |
| 19. | Begoniaceae | Dicot | 01 | - | 01 |
| 20. | Scrophulariaceae | Dicot | 01 | - | 01 |

**Table 4:** Weed species composition in 'A' and 'B' Maize (*Zea mays* L.) field.

| S.No. | Name of species | Family | Local name |
|---|---|---|---|
| 1. | *Achyranthes aspera* L. | Acanthaceae | Aghada |
| 2. | *Ageratum conyzoides* L | Asteraceae | Sahadevi |
| 3. | *Alternanthera sessilis* (L.) R.Br. | Lamiaceae | Kanchr |
| 4. | *Amaranthus spinosus* L. | Amaranthaceae | Katemat |
| 5. | *Amaranthus viridis* L. | Amaranthaceae | Tandulja |
| 6. | *Amaranthus hybridis* L. Subsp. | Amaranthaceae | Lal bhaji |
| 7. | *Argemone maxicana* L. | Papavraceae | Piwala dhotra |
| 8. | *Begonia crenata* Dry. (L) | Begoniaceae | |
| 9. | *Blumea lacera* (Burm f.) DC. | Asteraceae | Burando |
| 10. | *Boerhavia diffusa* L. | Nyctaginaceae | Punrnava |
| 11. | *Brachiaria* spp.Griseb. | Poaceae | |
| 12. | *Cassia tora* L. | Caesalpinaceae | Takala |
| 13. | *Celosia argentea* L. | Amaranthaceae | Kurdu |
| 14. | *Chenopodium album* L. | Chenopodiaceae | Chakvat |
| 15. | *Cynodon dactylon* (L.) Pers. | Poaceae | Harti |
| 16. | *Cyperus rotundus* L. | Cyperaceae | Lavala |
| 17. | *Cyathocline lutea* Law. | Asteraceae | Piwala gangotra |
| 18. | *Cyathocline lyrata* Cass. | Asteraceae | Gangotra |
| 19. | *Euphorbia microphylla* Heyne. | Euphorbiaceae | Gondhani |
| 20. | *Euphorbia pulcherrima* Wild. | Euphorbiaceae | Dudhani |
| 21. | *Euphorbia hirta* L | Euphorbiaceae | Dudhi |
| 22. | *Eclipta prostrata* Ait. | Asteraceae | Maka |
| 23. | *Grass species* (unknown) | Poaceae | Gavat |
| 24. | *Heliotropium indicum* L. | Boraginaceae | Bhurundi |
| 25. | *Lagasca mollis* Cav. | Asteraceae | Jharvad |
| 26. | *Lantana camara* L. | Verbanaceae | Ghaneri |
| 27. | *Leucas aspera* (Wild) Link | Lamiaceae | Kumb |
| 28. | *Oxalis corniculata* L. | Oxalidaceae | Ambusi |
| 29. | *Parthenium hysterophorous* L. | Asteraceae | Gajar gavat |
| 30. | *Paspalum scrobiculatum* L. | Poaceae | Lamb gavat |
| 31. | *Physalis minima* L. | Solanaceae | Ran popti |
| 32. | *Phylanthus amarus* Sch. & Thonn. | Euphorbiaceae | Bhuiawala |
| 33. | *Portulaca oleracea* L. | Portulacaceae | Ghol |
| 34. | *Panicum* spp. | Poaceae | Mote gavat |
| 35. | *Sesamum indicum* L. | Pedaliaceae | Ram til |
| 36. | *Sida spinosa* L. | Malvaceae | Jangali methi |
| 37. | *Smithia sensitiva* Ait. | Asteraceae | Lajalu kawla |
| 38. | *Solanum nigrum* L. | Solanaceae | Kanguni |
| 39. | *Sonchus oleraceus* L. | Asteraceae | Mhatara |
| 40. | *Solidago canadensis* L. | Asteraceae | |
| 41. | *Tridax procunbens* L. | Asteraceae | Dagadipala |
| 42. | *Sphaeranthus indicus* L. | Asteraceae | Gorkhmundi |
| 43. | *Tridax procunbens* L. | Asteraceae | Dagadipala |
| 44. | *Verbascum Chinese* (L.) Sant. | Scrophulariaceae | Kutki |
| 45. | *Xanthium indicum* Koen. | Asteraceae | Landaga |

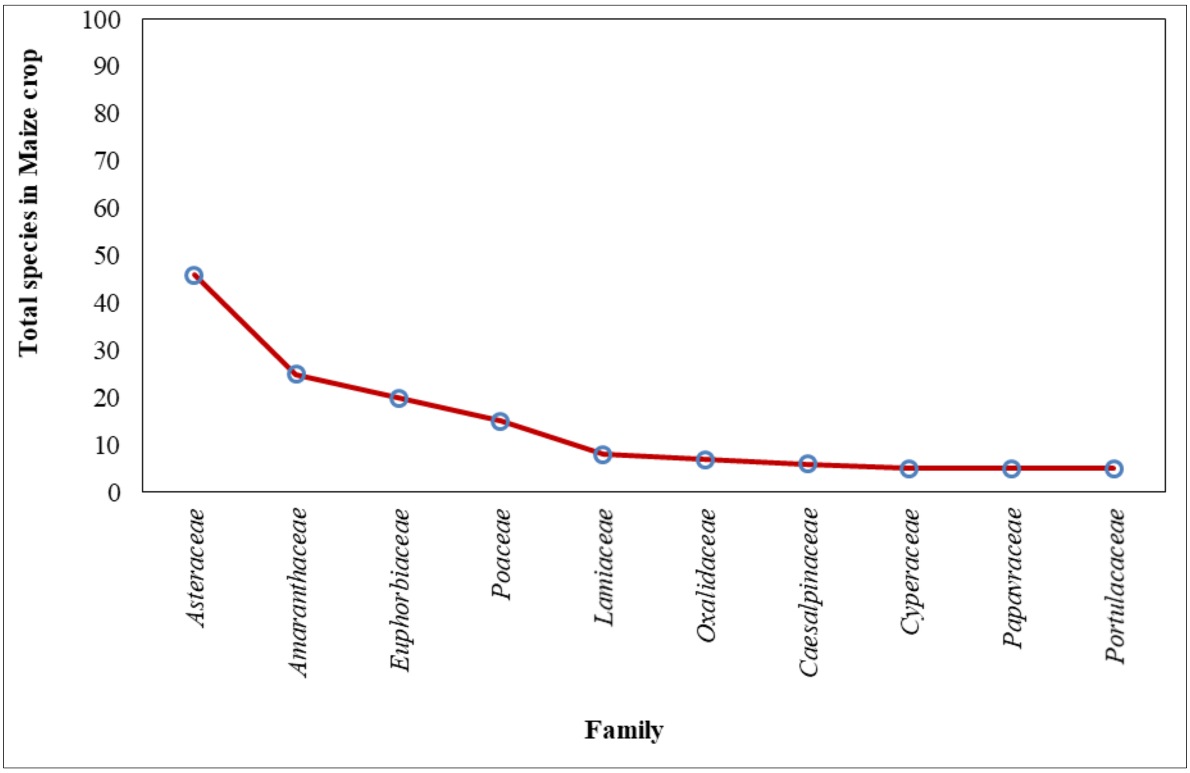


**Fig 1**: Graph Analysis in Descending Order Top Ten Families of Weed Species in Maize Crop of Chhindwara District

## Conclusion

Concluded the Asteraceae family of weed species is prevalent across fields in this region, with its frequency and density reaching a peak during November, aligning with the flowering stage of crops. Effective management of these weeds necessitates a comprehensive understanding of the biological and ecological characteristics of both weeds and crops. Additionally, the interplay between weeds and crops is influenced by herbicide application, as certain crops exhibit sensitivity to specific chemicals. To optimize weed control, farmers are encouraged to integrate advanced strategies such as chemical and biological control methods into their agricultural practices.

## Acknowledgement

The authors are very thankful to authority of Govt. Girls P.G. College Rewa (M.P.) to carry out this work.

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