SHORT COMMUNICATION

WEED DIVERSITY IN RICE CROP FIELDS OF FATEHGARH SAHIB DISTRICT, PUNJAB, INDIA

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WEED DIVERSITY IN RICE CROP FIELDS OF FATEHGHARH SAHIB DISTRICT, PUNJAB, INDIA

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Abstract: A total of 31 species of weeds belonging to 11 families was collected from rice fields in Fatehgarh District of Punjab between June and November 2017. Of the 31 species, 15 were dicots and 16 were monocots. Of the 11 families, six (Portulacaceae, Lythraceae, Solanaceae, Scrophulariaceae, Polygonaceae, and Commelinaceae) were represented by only one species each. Poaceae was the largest family represented by 10 species, followed by Asteraceae and Cyperaceae with five species each. The largest genus was Cyperus with four species, followed by Euphorbia, Echinochloa, and Eragrostis with two species each. Of the 31 weed species, 29 were annual and only two, Cyperus rotundus and Parthenium hysterophorus, were perennials. More detailed survey work is required on a regular basis to identify possible problematic weeds and new or improved control measures.

Keywords: Documentation, ethnobotany, identification.

Researches indicate that more than 10% of the global agriculture production is reduced as a result of the competition of weeds with crop species mainly for space, nutrients, light, and water (Parker & Fryer 1975). Weeds tolerate adverse edaphic, climatic, and biotic factors as compared to other plants. They have characteristic modifications that help in their perpetuation, multiplication, dissemination, stabilization, and overall adaptation (Vasic et al. 2012). Many weeds bear special structural modifications to reduce water loss during drought conditions, such as thick cuticle, sunken stomata, and waxy coating (Ram & Gupta 1997). The root system of Convolvulus microphyllus is coiled to increase its surface area and length for increased absorption efficiency. Grass such as Cyanodon dactylon and sedges like Cyperus spp. are known to survive under very dry conditions. Some weeds like Parthenium hysterophorus are photo-periodically and thermo-periodically neutral. Parthenium hysterophorus contains allelochemicals that inhibit the germination of the seeds of other plants; an invasive, it grows mainly in wastelands, and is reported to infest crop fields (Kumar & Varshney 2010).

For better management of weeds, it is necessary to study their morphology, physiology, systematics, ecology, and ethnobotany. The study of weed plants also provides knowledge about their importance as some of them have a large number of ethnobotanic uses and can be used to develop new products for pharmaceutical and food industries (Kendler et al. 1992). Eclipta alba, a common weed of the Punjab plains, is widely used as a medicinal plant. Echinochloa crus-galli, Cynodon dactylon, Cyperus rotundus, Amaranthus viridis, and Poa annua are commonly used as fodder for animals. Some weed species are threatened and their purging affects the biologic diversity of the area. Biodiversity is strongly related to the survival and function of the ecosystem.
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(Hooper et al. 2005). Integrated management method is very helpful to control weeds without loss of biodiversity.

Many reports are available on the flora of Punjab (Sharma 1990; Sidhu & Singh 1993; Kaur et al. 2017). No report, however, is available on the diversity of weeds in the rice fields of Fatehgarh Sahib District in Punjab. The main objective of this study was to gain knowledge about the availability of the total number of weeds during the rice season of the area. Identification and documentation of weed species from rice fields will be helpful to prepare effective strategies for weed management.

**Materials and Methods**

**Study area**

Collection of weed plants was done from seven rice growing regions (Sirhind, BassiPathana, MandiGobindgarh, Khamanon, Charnarthal, Amloh, and Chunnikalan) of Fatehgarh Sahib (Fig. 1) District in Punjab. The selected sites were surveyed periodically for the collection of weeds. The specimens were collected from within as well as the edges of crop fields. Local people were interviewed to obtain the common or vernacular names of weeds.

**Collection of weeds**

The study was conducted during the rice growing season of 2017, i.e., between June and November, to explore the weed diversity of the selected area. The standard methods for collection of plant specimens and preservation and preparation of herbarium (Jain & Rao 1977) were followed. Small herbs were collected as a whole with roots, stems, leaves, flowers, and fruits, while larger shrubs were sampled as twigs that included stems, leaves, flowers, and fruits.

**Herbarium preparation**

After collection, plant specimens were dried using blotters and then pressed using a herbarium press. The blotting papers were changed at regular intervals. After proper drying and pressing, the plant specimens were mounted on sheets for preparation of herbarium specimens. Herbarium sheets were protected against damages from insect and fungal attack by poisoning them with a saturated solution of mercuric chloride in ethyl alcohol. Naphthalene balls were also placed to protect the specimens from insects.

**Identification**

The collected plant specimens were identified using the available literature, i.e., Bentham & Hooker (1876), Sidhu & Singh (1993), and Kaur et al. (2017), and various websites. The herbarium specimens of identified plant species were arranged on the basis of plant classification.

![Figure 1. Collection sites in Fatehgarh Sahib District, Punjab, India. (Source: www.google.com).](image-url)
of Bentham & Hooker (1876) and kept in the Herbarium, Department of Botany and Environmental Science, Sri Guru Granth Sahib World University, Fatehgarh Sahib.

RESULTS AND DISCUSSION

During the present study, a total of 31 weed species were collected and identified from rice crop fields of selected localities in the district of Fatehgarh Sahib (Table 1; Images 1 & 2). Collected weed species belong to 25 genera under 11 families of angiosperms (Table 2). Of the 31 species, 15 belong to dicot families (Portulacaceae, Lythraceae, Asteraceae, Solanaceae, Scrophulariaceae, Amaranthaceae, Polygonaceae, and Euphorbiaceae) and 16 belong to monocot families (Commelinaceae, Cyperaceae, and Poaceae). Only one representative species per family was found for six families, namely, Portulacaceae, Lythraceae, Solanaceae, Scrophulariaceae, Polygonaceae, and Commelinaeae. Poaceae was the largest family containing 10 species, followed by Asteraceae and Cyperaceae with five species each. The largest genera were Cyperus represented by four species, followed by Euphorbia, Echinochloa, and Eragosris with two species each. The genera such as Portulaca, Ammannia, Eclipta, Parthenium, Tridax, Vernonia, Vicoa, Physalis, Mazus, Polygonum, Amaranthus, Digera, Phyllanthus, Commelina, Fimbriyisylis, Digitaria, Paspalum, Ischaemum, Setaria, Acrachne, and Dactylctenium were represented by one species each (Table 1). Of the 31 weed species, 29 were annuals and two species, namely, Cyperus rotundus and Parthenium hysterophorus, were perennials (Table 1).

Table 1. Taxonomic position, life form, and habit of weeds identified in the study from rice crop fields in Fatehgarh Sahib District, Punjab, India.

| Botanical name                  | Family             | Local name | Life form | Habit           | Image | Voucher number |
|---------------------------------|--------------------|------------|-----------|-----------------|-------|----------------|
| Portulaca oleracea L.           | Portulacaceae      | Annual     | Herb      | 1a WU-101       |       |
| Ammannia baccifera L.           | Lythraceae         | Annual     | Herb      | 1b WU-102       |       |
| Eclipta alba L.                 | Asteraceae         | Annual     | Herb      | 1c WU-103       |       |
| Parthenium hysterophorus L.     | Asteraceae         | Annual     | Herb      | 1d WU-104       |       |
| Tridax procumbens L.            | Asteraceae         | Annual     | Herb      | 1e WU-105       |       |
| Vernonia cinerea (L.) Less.     | Solanaceae         | Annual     | Herb      | 1f WU-106       |       |
| Vicoa indica (L.) DC.           | Solanaceae         | Annual     | Herb      | 1g WU-107       |       |
| Physalis minima L.              | Solanaceae         | Annual     | Herb      | 1h WU-108       |       |
| Mazus japonicus (Thunb) Kuntze  | Scrophulariaceae   | Annual     | Herb      | 1i WU-109       |       |
| Polygonum plebeium R. Br.       | Polygonaceae       | Annual     | Herb      | 1j WU-110       |       |
| Amaranthus vindis L.            | Amaranthaceae      | Annual     | Herb      | 1k WU-111       |       |
| Digera arvensis Forsk.          | Asteraceae         | Annual     | Herb      | 1l WU-112       |       |
| Euphorbia hirta L.              | Euphorbiaceae      | Annual     | Herb      | 1m WU-113       |       |
| E. microphylla Lam.             | Euphorbiaceae      | Annual     | Herb      | 1n WU-114       |       |
| Phyllanthus nriott L.           | Euphorbiaceae      | Annual     | Herb      | 1o WU-115       |       |
| Commelina benghalensis L.       | Commelinaceae      | Annual     | Herb      | 1p WU-116       |       |
| Cyperus rotundus L.             | Cyperaceae         | Annual     | Herb      | 1q WU-117       |       |
| C. ino L.                      | Cyperaceae         | Annual     | Herb      | 1r WU-118       |       |
| C. differtis L.                 | Cyperaceae         | Annual     | Herb      | 1s WU-119       |       |
| C. compressus L.                | Cyperaceae         | Annual     | Herb      | 1t WU-120       |       |
| Fimbriyisylis tenera Schult.    | Poaceae            | Annual     | Herb      | 2a WU-121       |       |
| Digitaria sanguinalis (L) Scop. | Poaceae            | Annual     | Herb      | 2b WU-122       |       |
| Echinochloa colona (L) Link     | Poaceae            | Annual     | Herb      | 2c WU-123       |       |
| E. crus-galli (L.) P. Beauv     | Poaceae            | Annual     | Herb      | 2d WU-124       |       |
| Paspalum conjugatum P.J. Bergius| Poaceae            | Annual     | Herb      | 2e WU-125       |       |
| Eragosris japonica (Thunb.) Trin.| Poaceae          | Annual     | Herb      | 2f WU-126       |       |
| E. tenella (L.) P. Beauv. ex Rom. & Schult. | Poaceae | Annual | Herb      | 2g WU-127       |       |
| Ischaemum rugosum Salisb.       | Poaceae            | Annual     | Herb      | 2h WU-128       |       |
| Setaria glauca (L) P. Beauv.    | Poaceae            | Annual     | Herb      | 2i WU-129       |       |
| Acrachne sp.                    | Poaceae            | Annual     | Herb      | 2j WU-130       |       |
| Dactylctenium oegyptum (L) Willll. | Poaceae          | Annual     | Herb      | 2k WU-131       |       |
Image 1. Weed plants of rice crop fields in Fatehgarh Sahib District, Punjab, India: a - Portulaca oleracea | b - Ammannia baccifera | c - Eclipta alba | d - Parthenium hysterophorus | e - Tridex procumbens | f - Vernonia cinerea | g - Vicoa indica | h - Physalis minima | i - Mazus japonicas | j - Polygonum plebeium | k - Amaranthus viridis | l - Dighera arvensis | m - Euphorbia hirta | n - E. microphylla | o - Phyllanthus niruri | p - Commelina benghalensis | q - Cyperus rotundus | r - C. iria | s - C. difformis | t - C. compressus. © Mr. Rai Singh.
Table 2. Taxonomic data of weed plants identified from rice crop fields in Fatehgarh Sahib District, Punjab, India, with their families, genera, and species.

| Family          | Genera | Species |
|-----------------|--------|---------|
| Portulacaceae   | 01     | 01      |
| Lythraceae      | 01     | 01      |
| Asteraceae      | 05     | 05      |
| Solanaceae      | 01     | 01      |
| Scrophulariaceae| 01     | 01      |
| Amaranthaceae   | 02     | 02      |
| Polygonaceae    | 01     | 01      |
| Euphorbiaceae   | 02     | 03      |
| Commelinaceae   | 01     | 01      |
| Cyperaceae      | 02     | 05      |
| Poaceae         | 08     | 10      |
| **Total**       | **25** | **31**  |

During the present study, *Cyperus rotundus* was reported from all the localities of rice crop fields. *Portulaca oleracea, Euphorbia microphylla*, and *Tridax procumbens* were commonly found on the bunds of the crop fields. *Cyperus iria, C. difformis, C. compressus, Ammannia baccifera*, and *Eclipta alba* were found in the crop fields. These plant species commonly occur in aquatic habitats. Rabbani & Bajwa (2001) surveyed the rice fields of five districts of Punjab, namely, Gujarnawala, Sialkot, Gujrat, Kasur, and Sheikhupura, and reported *Cynodon dactylon, Cyperus rotundus, C. difformis, Echinochloa colona, and E. glabrescens* as highly abundant and widely distributed throughout the surveyed areas. *Parthenium hysterophorus* was also found on the edges of the studied rice fields. There are reports that *Parthenium hysterophorus* has become a region of peninsular Tanjong Karang in West Malaysia.
problem in crop fields in India (Evans 1997). *Parthenium hysterophorus* was reported in rice fields from different districts of India (Oudhia 2000). *Cyperus rotundus* is a common weed species in the study area. This species attains dominance in cultivated land and poses a serious problem for rice crops. It appears immediately after rice sowing and competes heavily with the crop for nutrients and water. *Cyperus rotundus* is recognized as the world's worst weed (Holm et al. 1977). In the Indo-Gangetic plains, adoption of zero tillage has resulted in an increase in the population of globally-significant perennial weeds such as Purple Nut Sedge *Cyperus rotundus* and Bermuda Grass *Cynodon dactylon* (Malik & Kumar 2014). Some of the weeds reported from the study area also have some positive aspects. *Eclipta alba* is good for hair and is used for commercial purposes nowadays. *Cyperus rotundus*, *C. iria*, *C. difformis*, *Fimbristylis tenera*, *Digitaria sanguinalis*, *Echinochloa colona*, *E. crus-galli*, *Paspalum conjugatum*, *Eragrostis fimbriatula*, *Dactyloltenium aegyptium*, and *Acrachne spp.* are commonly used as fodder for animals. *Amaranthus viridis* is used as a vegetable commonly called 'Sagg' by local people. Some previous studies also reported medicinal, industrial, and allelopathic uses of obnoxious weeds (Chopra et al. 1956; Memon & Shahani 1986; Hassan & Marwat 2001; Ibrar et al. 2003).

**CONCLUSION**

The present study was a first from the region to explore and identify the weeds present in rice crop fields. This study will help the farmers and agriculturists of the study area to identify weeds and thus help in planning a suitable strategy for their control.

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