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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 Fatehgarh 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 pharmaceutic 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

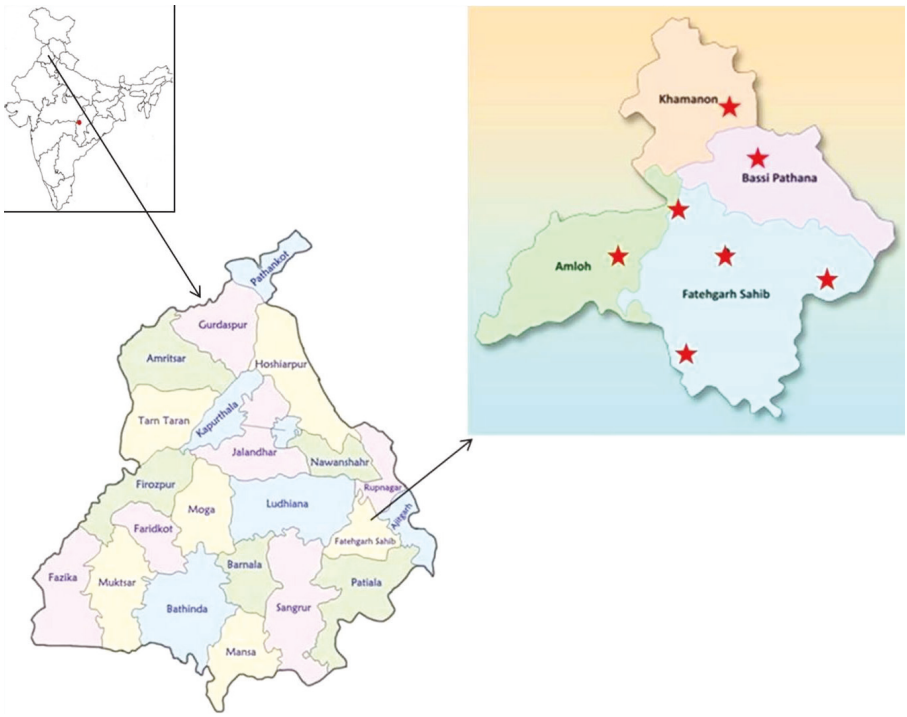

Figure 1. Collection sites in Fatehgarh Sahib District, Punjab, India. (Source: www.google.com).

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 (Potulacaeae, 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, Schrophulariaceae, Polygonaceae, and Commeliaceae. 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 *Eragrostis* with two species each. The genera such as *Portulaca, Ammannia, Eclipta, Parthenium, Tridax, Vernonia, Vicoa, Physalis, Mazus, Polygonum, Amaranthus, Digera, Phyllanthus, Commelina, Fimbristylis, Digitaria, Paspalum, Ischaemum, Setaria, Acrachne*, and *Dactyloctenium* 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). Manandhar et al. (2007) reported 52 weed species (22 dicots and 25 monocots) belonging to 32 genera under 15 families in the paddy fields of Kirtipur, central Nepal. Hakim et al. (2011) recorded 39 weed species belonging to 15 families, of which 23 were annuals and 16 were perennials, 10 grassy weeds, nine sedges, and 20 broad-leaved weeds associated with rice crop in the coastal

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 to shrub	1b	WU-102
Eclipta alba L.	Asteraceae	Bhringraj	Annual	Herb	1c	WU-103
Parthenium hysterophorus L.		Gajjer Ghass	Perennial	Herb to shrub	1d	WU-104
Tridax procumbens L.			Annual	Herb	1e	WU-105
Vernonia cinerea (L.) Less.			Annual	Herb	1f	WU-106
Vicoa indica (L.) DC.			Annual	Herb to shrub	1g	WU-107
Physalis minima L.	Solanaceae	Jungli rusbhari	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 viridis L.	Amaranthaceae	Chauli	Annual	Herb	1k	WU-111
Digera arvensis Forssk.		Tandla	Annual	Herb	1l	WU-112
Euphorbia hirta L.	Euphorbiaceae	Dhohdak	Annual	Herb	1m	WU-113
E. microphylla Lam.			Annual	Herb	1n	WU-114
Phyllanthus niruri L.		Hazardani	Annual	Herb	1o	WU-115
Commelina benghalensis L.	Commelinaceae		Annual	Herb	1p	WU-116
Cyperus rotundus L.	Cyperaceae	Murk	Perennial	Herb	1q	WU-117
C. iria L.		Chhatriwaladila	Annual	Herb	1r	WU-118
C. difformis L.		Mothi	Annual	Herb	1s	WU-119
C. compressus. L.		Motha	Annual	Herb	1t	WU-120
Fimbristylis tenera Schult.			Annual	Herb	2a	WU-121
Digitaria sanguinalis (L.) Scop.	Poaceae	TatriGhas	Annual	Herb	2b	WU-122
Echinochloa colona (L.) Link		Swanki	Annual	Herb	2c	WU-123
E. crus-galli (L.) P. Beauv		Swank	Annual	Herb	2d	WU-124
Paspalum conjugatum P.J. Bergius			Annual	Herb	2e	WU-125
Eragrostis japonica (Thunb.) Trin.			Annual	Herb	2f	WU-126
E. tenella (L.) P. Beauv. ex Roem. & Schult.		Chirian da dana	Annual	Herb	2g	WU-127
Ischaemum rugosum Salisb.		Kanki	Annual	Herb	2h	WU-128
Setaria glauca (L) P. Beauv.			Annual	Herb	2i	WU-129
Acrachne sp.			Annual	Herb	2j	WU-130
Dactyloctenium aegyptium (L.) Willld.		Madhana	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 - *Digera 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**

region of peninsular Tanjong Karang in West Malaysia.

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

Image 2. Weed plants of rice crop fields in Fatehgarh Sahib District, Punjab, India: a - *Fimbristylis tenera* | b - *Digitaria sanguinalis* | c - *Echinochloa colona* | d - *E. crus-galli* | e - *Paspalum conjugatum* | f - *Eragrostis japonica* | g - *E. tenella* | h - *Ischaemum rugosum* | i - *Setaria glauca* | j - *Acrachne* sp. | k - *Dactyloctenium aegyptium*. © Mr. Rai Singh.

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 japonica, Dactyloctenium 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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Article

Factors affecting diversity and distribution of threatened birds in Chitwan National Park, Nepal
– Jagan Nath Adhikari, Bishnu Prasad Bhattarai & Tej Bahadur Thapa, Pp, 13511–13522

Communications

Encounter rates and group sizes of diurnal primate species of Mole National Park, Ghana
– Edward Debrah Wiafe, Pp. 13523–13530

Estimating Leopard *Panthera pardus fusca* (Mammalia: Carnivora: Felidae) abundance in Kuno Wildlife Sanctuary, Madhya Pradesh, India
– Devavrat Pawar, Howard P. Nelson, Divya R.L. Pawar & Sarika Khanwilkar, Pp. 13531–13544

Food composition of Indian Eagle Owl *Bubo bengalensis* Franklin (Aves: Strigiformes: Strigidae) from Tiruchirappalli District, Tamil Nadu, India
– Tamilselvan Siva, Periyasamy Neelanarayanan & Vaidyula Vasudeva Rao, Pp. 13545–13551

Short Communications

Sunda Pangolin *Manis javanica* (Mammalia: Pholidota: Manidae) of Gaya Island, Sabah
– Jephte Sompud, Cynthia Boon Sompud, Kurtis Jai-Chyi Pei, Nick Ching-Min Sun, Rimi Repin & Fred Tuh, Pp. 13552–13556

Distribution and morphometric measurements of Blanford's Fox *Vulpes cana* (Mammalia: Carnivora: Canidae) of the Kingdom of Saudi Arabia
– Abdulhadi Aloufi & Ehab Eid, Pp. 13557–13562

Sebaceous gland adenoma in a free-ranging Baird's Tapir *Tapirus bairdii* (Tapiridae: Perissodactyla)
– Randall Arguedas, Maricruz Guevara-Soto & Jorge Rojas-Jiménez, Pp. 13563–13566

Recent records of the Banded Racer *Argyrogena fasciolata* (Shaw, 1802) (Reptilia: Squamata: Colubridae) from southern Coromandel Coast, peninsular India
– Janani Sagadevan, Sumaithangi Rajagopalan Ganesh, Nitesh Anandan & Raveen Rajasingh, Pp. 13567–13572

A new species of *Simulium* (*Simulium*) (Diptera: Simuliidae), with keys to *S. striatum* species-group from India
– Sankarappan Anbalagan, Suryliyandi Vijayan, Chellapandian Balachandran & Sundaram Dinakaran, Pp. 13573–13578

New host records of polyphagous Lepidoptera on Ban Oak *Quercus leucotrichophora* A. Camus (Fabaceae) in the Garhwal Himalaya, India
– Arun Pratap Singh, Kalpana Bahuguna & Gaurav Chand Ramola, Pp. 13579–13591

A preliminary study of the hawkmoth diversity (Lepidoptera: Sphingidae) of Kanyakumari District, Tamil Nadu, India
– Geetha Iyer & Ian James Kitching, Pp. 13592–13604

***Calamus pseudoerectus* (Arecaceae), a new species from the eastern Himalaya, India**
– Sujit Mondal, Shyamal K. Basu & Monoranjan Chowdhury, Pp. 13605–13610

Weed diversity in rice crop fields of Fatehgarh Sahib District, Punjab, India
– Yadvinder Singh & Rai Singh, Pp. 13611–13616

Observations on the female flowers and fruiting of Tape Grass *Enhalus acoroides* from South Andaman Islands, India
– Vardhan Patankar, Tanmay Wagh & ZoyaTyabji, Pp. 13617–13621

Notes

First records of *Agnidra vinacea* (Moore, 1879) (Lepidoptera: Drepanidae: Drepaninae) from the western Himalaya, extending its known range westwards
– Pritha Dey & Sanjay Sondhi, Pp. 13622–13624

Pollinators of Sikkim Mandarin Orange *Citrus reticulata* (Sapindales: Rutaceae)
– Urbashi Pradhan & M. Soubadra Devy, Pp. 13625–13628

Book Review

A holistic look on birds in urban areas
– S. Suresh Ramanan & Lalit Upadhyay, Pp. 13629–13630

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