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Annotated checklist of Indigenous and Alien Dicotyledonous Agrestal Weeds of Rabi in Uttar Pradesh, India

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ABSTRACT

The present study enumerates the diversity of indigenous and alien agrestal weeds of rabi crops in Uttar Pradesh, India. After a detailed survey of 5 years during 2018–2023, a total of 88 species of weeds belonging to 75 genera and 30 families were documented. In accordance to APG IV classification, the documented weeds are distributed across six major clades; the Malvids and Lamiids with 27 and 19 species respectively, followed by Campanulid (19 species), Fabids (18 species), Eudicots (Four species) and Asterid (one species).

Figures : 03 References : 19 Table : 01
KEY WORDS : Detrimental, Dicotyledonous weed, Identification, Invasive, Uses

Introduction

Weeds are the plants, which grow where they are not wanted[19]. The most important properties of weeds that enable the plants to occur in different habitats are their capability to thrive under adverse conditions as well as those favorable for crops. In some of the cases the seeds of weed species remain dormant for as many as 20–40 years without losing their viability[7]. Weeds that grow along crops are called as agrestrial weeds. Rabi one among three major crops that are grown in India as including Uttar Pradesh sown in winter from October to December and harvested in summer from April to June. The major rabi crops grown in the state are wheat, barley, peas, gram and mustard. As the state holds a responsible position for providing good quality and quantity of yield, it proves to be a very important state to look forward for this study. Recent changes in the cropping pattern and agro-technology of High Yielding Varieties (HYV) have brought about not only changes in weed flora but also the luxuriant growth attained by weeds[12].

About 8000 weed species are found in different crop systems, of which 250 species are considered important for agriculture world[3]. Globally, due to weeds about 34% of agriculture production losses have been assessed. In India weed, might potentially affect crop output by 31.5%[1]. In Uttar Pradesh, Potential yield losses in major crops such as wheat, pigeon pea, groundnut, and soya bean have been calculated 33.5%, 33.6%, 45.5% and 50% respectively[2].

The study of weed flora growing in different crops in different ecosystems and areas is highly needed for

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TABLE-1 : List of Dicotyledonous Agrestal Weeds of Rabi Crops in Uttar Pradesh, India. Growth form: A= Annual; C= Climber; H= Herb; P= Perennial; SS= Sub–shrub. Invasive status/ Mode of Introduction: Fd= Food; In= Invasive; N= Native; O= Occasionally; Ui= Unintentional.

Clade/ Order	Family/ Species Name	Crop Name	Growth form	Phenology	Uses	Invasive status/ Mode of Introduction	Native Range	Voucher Specimen Number
Eudicot								
Ranunculales	**Papaveraceae**							
	Argemone mexicana	All rabi crop	H (A)	Dec.–June	Seeds against snake-bite, cutaneous affection and are laxative	In/Ui	Central Mexico to Honduras	331074 (LWG)
	Argemone ochroleuca	All rabi crop	H (A)	Jan.–July	Roots are used to treat skin diseases[14]	In/Ui	Mexico	323037 (LWG)
	Fumaria indica	Chickpea, Lentil, Mustard, Onion, Pea & Wheat	H (A)	Dec.–March	Plant is aperient, diaphoretic and diuretic	--	W. Asia to N. & Central India	331092 (LWG)
	Ranunculaceae							
	Ranunculus sceleratus	Wheat	H (A)	Jan.–April	Plant is emmenagogue; seeds used as a tonic against cold	--	Temp. Eurasia, N. Africa, to U. S. A.	322989 (LWG)
Fabids								
Oxalidales	**Oxalidaceae**							
	Oxalis corniculata	Chickpea, Vegetable crops & Wheat	H (P)	Dec.–March	Plant against scurvy, leaves are antiscorbutic, coolant and stomachic[16]	In/N	Indian Subcontinent to Japan and Philippines	331067 (LWG)
Malpighiales	**Euphorbiaceae**							
	Chrozophora rottleri	Groundnut & Wheat	H (A)	March–July	Plant is emetic; seeds are cathartic used against cough	In/N	Indian Subcontinent to W. Indo–China	323097 (LWG)
	Euphorbia hirta	Chickpea, Lentil, Mustard & Wheat	H (A)	Most part of the year	Plant used against asthma, bowel complaints, cough, dysentery and intestinal worms	In/Ui	Tropical & Subtropical America	331319 (LWG)
	Euphorbia thymifolia	Vegetable crops & Wheat	H (A)	Aug.–Dec.	Roots against amenorrhea; leaf and seeds in snake bite	In/Ui	Tropical & Subtropical America	219610 (LWG)
	Phyllanthaceae							
	Phyllanthus fraternus	Vegetable crops	H (A)	July–Jan.	Plant diuretic, used against diarrhea, dropsy, gonorrhea, jaundice and malaria.	--	Pakistan to W. India	331406 (LWG)
Fabales	**Fabaceae**							
	Alysicarpus bupleurifolius	Pigeon pea & Vegetable crops	H (A)	Aug.–Dec.	Plant is used to treat fever.	--	China (SW. Guangxi, S. Yunnan) to Queensland	323016 (LWG)
	Cullen corylifolium	Vegetable crops	H (A)	Sep.–April	Seeds anthelmintic, carminative, laxative and to tonify stomach, treat vitiligo[14,16]	--	NE. Tropical Africa, Tropical & Subtropical Asia	323017 (LWG)
	Grona triflora	Mustard	H (P)	Most part of the year	Plant laxative; leaves antiseptic, antidiarrheal, and galactogenic	--	Tropics & Subtropics	323029 (LWG)
	Indigofera linifolia	Chickpea & Wheat	H (A)	Aug.–Feb.	Plant is used against amenorrhea and is also useful in febrile eruption	In/N	Tropical Africa, SW. Arabian Peninsula, Afghanistan to Chin and Tropical Asia, Australia.	331383 (LWG)
	Lathyrus aphaca	Chickpea, Mustard & Wheat	H (A)	Jan.–March	fodder; flowers are resolvent; seeds are narcotic	--	Macaronesia, Medit. to Central Asia and Indian Subcontinent	322946 (LWG)
	Melilotus albus	Chickpea, Barley, Lentil, Mustard, Pea, & Wheat	H (A)	Dec.–March	Plant is carminative and emollient; leaves are anticlotting in nature	--	Europe to China, N. Africa to Myanmar, Ethiopia to S. Africa	331405 (LWG)
	Melilotus indicus	Chickpea, Barley, Lentil, Mustard, Pea & Wheat	H (A)	Dec.–April	Root are emmenagogue, diuretic; leaves are used to treat ulcers; seeds aphrodisiac, astringent and nerve tonic[14,16]	--	Medit. to Central Asia and Indian Subcontinent	322956 (LWG)
	Medicago polymorpha	All rabi crop	H (A)	Jan.–April	Leaves and shoots are edible; also a good soil improver and forage[16]	--	Macaronesia, Europe to Central Asia and W. Nepal, N. & NE. Tropical Africa to Arabian Peninsula	331320 (LWG)

	Vicia hirsuta	Wheat	C	Dec.–march	Leaves, stem and seeds are edible, valuable fodder.	--	Macaronesia, Temp. Eurasia, N. Africa to Tanzania	1028(LWG)
	Vicia sativa	Chickpea, Lentil, Mustard & Wheat	C	Dec.–march	Leaves, shoot and pods are edible also used as fodder	--	Macaronesia, N. Africa to Kenya,Temp. Eurasia to Arabian Peninsula	322937 (LWG)
Rosales	**Rosaceae**							
	Potentilla indica	All rabi crops	H (P)	March–Oct.	Leaves used in diarrhea, digestive upset, gout; flower enhance blood circulation	--	Afghanistan to Russia Far East and Malesia	8365(LWG)
	Cannabaceae							
	Cannabis sativa	Wheat	H (A)	Oct.–April	Plant is analgesic, anodyne, antispasmodic, intoxicant, narcotic, sedative, stomachic and tonic[14,16]	In/Ui	Central Asia to Xinjiangn and Pakistan	331357 (LWG)
Cucurbitales	**Cucurbitaceae**							
	Cucumis maderaspatanus	Vegetable crops	C	Oct.–April	Roots used in tooth–ache; shoots and leaves are used against biliousness and intermittent fever[14,16]	--	India to Nansei-shoto and Australia	331088 (LWG)
Malvid								
Malvales	**Malvaceae**							
	Abutilon indicum	Pigeon pea & Vegetable crops	SS	Sep.–Jan.	Rroots febrifuge; bark astringent, diuretic; leaves demulcent; seed aphrodisiac and laxative[14,16]	--	Mascarenes, Tropical & Subtropical Asia to W. Pacific	331080 (LWG)
	Malva parviflora	Mustard & Wheat	H (A)	Jan.–March	Plant emollient; leaves anti-inflammatory, nervine; seeds in ulcers of bladder[14]	--	Macaronesia, Medit. to Pakistan and Sahara	21601 (LWG)
	Malvastrum coromandelianum	Growing on edges of cultivated field	SS	Aug.–Jan.	Plant treat dysentery; leaf anti–inflammatory; flowers diaphoretic	In/Ui	New World	322976 (LWG)
	Sida acuta	Vegetable crops & Wheat	SS	Aug.–Dec.	Roots astringent and aphrodisiac	In/N	Tropics & Subtropics	1386 (LWG)
	Urena lobata	Growing on edges of cultivated field	SS	Aug.–Jan.	Roots in rheumatism; stem demulcent and emollient; Leaves in swelling	In/N	Tropics & Subtropics	331050 (LWG)
Brassicales	**Cleomaceae**							
	Cleome viscosa	Wheat	H (A)	July–Nov.	Leaves in earache, fever and applied on wound and ulcers; seeds are carminative and vermifuge.	In/N	Tropical & Subtropical Old World.	323021 (LWG)
	Brassicaceae							
	Cardamine hirsuta	Vegetable crops	H (A)	March–Aug.	Leaves and flowers edible; used as flavoring in salads	In/N	Temp. & Subtropical Northern Hemisphere to Old World Tropical Mountains	331093(LWG)
	Lepidium sativum	Wheat	H (A)	Almost throughout the year	Fodder; leaves are consumed as salad, cooked with vegetable curries	--	Europe to Central Asia and Himalaya, Arabian Peninsula	18837(LWG)
Caryophyllales	***Polygonaceae***							
	Polygonum plebeium	Vegetable crops & Wheat	H (A)	Feb.–May	Plant treats diarrhea and pneumonia [14]	--	Tropical & Subtropical Old World	331323 (LWG)
	Caryophyllaceae							
	Silene conoidea	Chickpea, Barley, Lentil, Mustard, Pea & Wheat	H (A)	March–July	Plant is emollient and used to treat ophthalmia.	--	Canary Islands, Medit. to Central Asia and NW. India	331028 (LWG)
	Spergula arvensis	Chickpea, Barley, Mustard, Pea, Lentil & Wheat	H (A)	Throughout the year	Plant is diuretic[14]; Plant, leaves, and seeds are edible; also used as a fodder	--	Europe to Siberia, India, Macaronesia, NW. Africa, Ethiopia to Tropical Africa	331360 (LWG)
	Stellaria media	Chickpea, Barley, Mustard, Pea, Lentil & Wheat	H (A)	July–Jan.	Plant is astringent and diuretic, also applied as a plaster for broken bones and swellings[16]	--	Temp. Eurasia, N. & NE. Tropical Africa	331413 (LWG)
	Amaranthaceae							

	Achyranthes aspera	Pigeon pea & Vegetable crops	SS	Aug.–Feb.	Plant is hypoglycaemic; while leaves are antibiotic; however essential from shoot showed antifungal activity against *Aspergillus carneus* [16]	--	Tropical & Subtropical Old World	323077 (LWG)
	Alternanthera philoxeroides	Wheat	SS	April–Oct.	Phytoremediation of Ar & Pb in their invaded water bodies[18]	In/Ui	Trinidad to N. Argentina	331024 (LWG)
	Alternanthera pungens	Wheat	SS	Most part of the year	Plant is diuretic its decoction useful against gonorrhea; while leaves as a tonic.	In/Ui	Mexico to Tropical America	322987 (LWG)
	Alternanthera sessilis	Pigeon pea, Soya bean, Vegetable crops & Wheat	SS	Most part of year	Plant is antigonorrhoeic, febrifuge and lactagogue.	In/N	Tropical & Subtropical Asia to N. & E. Australia, S. Mexico to Tropical America	323019 (LWG)
	Amaranthus blitum	Vegetable crops	H (A)	March–May	Plant is astringent, cooling and emollient.	--	Peru to Brazil and N. Argentina	331401 (LWG)
	Amaranthus spinosus	Pea, Mustard & Wheat	H (A)	Throughout the year	Plant in snake bite; root in colic, eczema, gonorrhea and menorrhagia; leaves and root boiled together given children as laxative and applied as emollient[16,14]	In/Ui	Mexico to Tropical America	323008 (LWG)
	Amaranthus viridis	Pigeon pea, Mustard, Vegetable crops & Wheat	H (A)	Most part of the year	Plant in snake & scorpion bite; roots as antifertility.	--	SE. Mexico to Tropical America	323049 (LWG)
	Celosia argentea	Pigeon pea & Wheat	H (A)	Sep.–Dec.	Seed treat diarrhea, clearing vision, disease of eye and mouth sore[16,14]	In/Fd	Tropical Africa	331344 (LWG)
	Chenopodiastrum murale	Barley, Chickpea, Lentil, Mustard, Pea & Wheat,	H (A)	Jan.–March	Pesticidal activity; shoots and leaves are eaten as vegetables.	In/N	Macaronesia, Europe, Medit. to NE. Tropical Africa and Sri Lanka	331096 (LWG)
	Chenopodium album	Vegetable crops & Wheat	H (A)	Feb.–April	Plant is anthelmintic, laxative & edible	In/N	Temp. Eurasia to Indian Subcontinent	331391 (LWG)
	Gomphrena celosioides	Vegetable crops & Wheat	H (A)	June–April	Plant is ecdysterone	In/Ui	Ecuador to N. Argentina	323045 (LWG)
	Aizoaceae							
	Trianthema portulacastrum	Mustard, Soya bean, Vegetable crops & Wheat	H (A)	June–Nov.	Plant is alexiteric, analgesic and vermifuge; leaves treat dropsy and oedema; roots abortifacient and anti-asthmatic[14]	--	Tropics & Subtropics	323057 (LWG)
	Petiveriaceae							
	Rivina humilis	Growing on edges of cultivated field	SS	Sep.–Feb.	Cultivated as an ornamental plant	--	Tropical & Subtropical America.	322984 (LWG)
	Nyctaginaceae							
	Boerhavia diffusa	Mustard, Pigeon pea, Vegetable crops & Wheat	H (P)	Most part of year	Root is diuretic used against anemia, jaundice & snake bite	--	Tropics & Subtropics.	323038 (LWG)
	Molluginaceae							
	Glinus lotoides	Wheat	H (A)	Feb.–May	Treat boils, wound and pains in limb & abdominal disorder	--	Tropical & Subtropical Old World.	331302 (LWG)
Asterids								
Ericales	**Primulaceae**							
	Lysimachia arvensis	Chickpea, Barley, Fodder, Mustard, Onion, Vegetable crops & Wheat	H (A)	Dec.–April	Plant treats cerebral affection, dropsy, epilepsy, improves eye sight, leprosy and against to viper bite	In/Ui	Europe to Central Asia and Himalaya, N. Africa to Ethiopia and Arabian Peninsula	331031 (LWG)
Lamiid								
Gentianales	**Rubiaceae**							
	Galium aparine	Barley & Wheat	C	Oct.–March	Plant is diuretic	--	Macaronesia to Temp. Eurasia	331409 (LWG)
	Oldenlandia corymbosa	Wheat	H (A)	July–Dec.	Plant in jaundice and other disease of liver; juice treat burning of palms and	--	Tropical & Subtropical Old World	331341 (LWG)

					soles of feet from fever			
Solanales	**Convolvulaceae**							
	Convolvulus prostratus	Chickpea & wheat	H (A)	Oct.–May	Root diuretic and laxative[16]	--	Cape Verde to NW. India	331340 (LWG)
	Evolvulus nummularius	Wheat	H (P)	Aug.–March	Whole plants used to treat cuts, hysteria, scorpion stings and wound	In/Ui	Tropical & Subtropical America	323026 (LWG)
	Solanaceae							
	Nicotiana plumbaginifolia	Chickpea, Mustard & Wheat fields	H (A)	April–Nov.	Plant is anti-cancerous and antiviral	In/Ui	Mexico to Guatemala	322955 (LWG)
	Physalis angulata	Pigeon pea, Soya bean, Vegetable crops & Wheat	H (A)	July–Dec.	Leaves used to treat earache; While fruit is diuretic & antigonorrhoeic	In/Ui	Tropical & Subtropical America	331051 (LWG)
	Solanum americanum	Growing on edges of cultivated field	H (A)	Sep.–April	Blood purifier, antispasmodic and vermifuge; leaves are chewed in chest pain and to improve kidney function; leaves and young shoots edible	In/Ui	New World	331040 (LWG)
	Solanum nigrum	Chickpea, Mustard, Vegetable crops & Wheat	H (A)	Nov.–June	Fruits used to treat diarrhea, eye disease, fever and hydrophobia	--	Temp. Eurasia, Macaronesia, N. & NE. Tropical Africa	331316 (LWG)
	Solanum virginianum	Vegetable crops	H (P)	Dec.–June	Root treat cough and asthma; leaves pain and rheumatism	--	Arabian Peninsula, S. Iran to S. Central China and Myanmar	331057 (LWG)
Boraginales	**Boraginaceae**							
	Heliotropium indicum	Vegetable crops & wheat	H (A)	Oct.–April	Leaf in snake and scorpion stings; leaves used for washing new borne babies	--	Peru to Brazil and N. Argentina	97724 (LWG)
Lamiales	**Plantaginaceae**							
	Mecardonia procumbens	Barseem & Wheat	H (P)	Sep.–May	–	In/Ui	Tropical & Subtropical America	323027 (LWG)
	Scoparia dulcis	Almost all rabi crops	H (P)	Throughout the year	Plant is emetic, stomachic, and to treat diarrhea and kidney troubles	In/Ui	Tropical & Subtropical America	323034 (LWG)
	Verbenaceae							
	Phyla nodiflora	Vegetable crops	H (P)	Jan.–April	Plant is diuretic and used against fever and boils	--	Tropics & Subtropics	322997 (LWG)
	Acanthaceae							
	Dicliptera paniculata	Pigeon pea	SS	Sep.–Jan.	Plant macerated in an infusion of rice against snake bite	In/N	Africa, Arabian Peninsula, Indian Subcontinent to S. China and Indo–China, Philippines	331371 (LWG)
	Rungia pectinata	Wheat	H (A)	Oct.–March	Leaves treat small pox; while roots are febrifuge	--	S. Arabian Peninsula, Tropical & Subtropical Asia	322935 (LWG);
	Rungia repens	Pigeon pea	H (A)	Most part of the year	Plant in cough, fever and vermifuge; leaves with castor oil applied to the scalp against *Tinea capitis*	--	Indian Subcontinent to Myanmar	331311 (LWG)
	Lamiaceae							
	Mesosphaerum suaveolens	Growing on edges of cultivated field	SS	Oct.–Jan.	Plant treat dysentery, vermifuge; leaves as cigarettes smoke for the treatment of chronic bronchitis and asthma	In/Ui	Mexico to Tropical America	331081 (LWG)
	Salvia plebeia	Wheat	H (A)	Jan.–May	Plant is astringent, anthelmintic, and diuretic; leaf is anti- odontalgic; seed is treating diarrhea gonorrhea, hemorrhoid and menorrhagia	--	Iran to S. Russian Far East and Vietnam, N. Sumatera, Philippines, N. & E. Queensland to E. Victoria	331059 (LWG)
	Mazaceae							
	Mazus pumilu	Chickpea, Barseem crop, lentil & Pea	H (A)	Oct.–March	Plant juice is used to treat typhoid	--	Asia	322986 (LWG)

Campanulid								
Asterales	**Asteraceae**							
	Ageratum conyzoides	Mustard	H (A)	Oct.–March	Juice of root is antilithic; leaves treat cut and sore	In/O	Mexico	331305 (LWG)
	Ageratum houstonianum	Growing on edges of cultivated field	H (A)	Most part of the year	Plant is fungicidal against *Phytophthora infestans*	In/Ui	Mexico to Central America	322916 (LWG)
	Bidens pilosa	Chickpea	H (A)	Aug.–Dec.	Heartache, kidney troubles, toothache and ulcers	In/Ui	Tropical & Subtropical America	12785 (LWG)
	Cirsium arvense	Wheat & Mustard	H (P)	Feb.–May	Roots are edible while stem cooked like Asparagus	--	Temp. Eurasia, NW. Africa	323093 (LWG)
	Cotula anthemoides	Mustard & Pigeon pea	H (A)	Nov.–March	Plant is heated with oil applied externally in rheumatism and also infusion is used as an eye wash	--	Africa, Arabian Peninsula, Himalaya to S. China and Indo–China	323099 (LWG)
	Cyanthillium cinereum	Mustard, Pigeon pea, Vegetable crops & Wheat	H (A)	Most part of the year	Plant is diaphoretic, treat spasm of the bladder, strangury & piles[16]	--	Tropical & Subtropical Old World to NW. Pacific	323005 (LWG)
	Eclipta prostrata	Chick pea, Lentil, Mustard, Pea, Vegetable crops & Wheat	H (A)	Most part of the year	Roots in ulcer and urinary trouble; leaves are effective against catarrh in infants and scorpion sting; leaves promote hair growth[16]	In/Ui	Temp. & Subtropical America.	323056 (LWG)
	Galinsoga parviflora	Chickpea	H (A)	Feb.–March	leaves in insect bite and nettle stings, cuts and wound; good fodder	In/Ui	Mexico to Tropical America	323085 (LWG).
	Gamochaeta purpurea	All rabi crop	H (A)	Dec.–March	Plant is used as a tea to treat cold and flu		E. Canada to Tropical America	331020 (LWG)
	Grangea maderaspatana	Vegetable crops & Wheat	H (A)	Oct.–Feb.	Leaves treat hysteria, antiseptic, amenorrhea, anodyne and antispasmodic[17,16]	In/N	Tropical & Subtropical Old World	323041 (LWG)
	Launaea aspleniifolia	All rabi crop	H (A)	Nov.–March	Roots are galactagogue	--	Indian Subcontinent to Indo–China	323063 (LWG)
	Parthenium hysterophorus	Vegetable crops	H (A)	Most part of the year	Plant treat neuralgia and is analgesic, emmenagogue,and febrifuge	In/Ui	Tropical & Subtropical America	331394 (LWG)
	Pseudognaphalium affine	Wheat	H (A)	Feb.–Oct.	A plant decoction treats cough, influenza, and sore throat	--	Caucasus to Temp. E. Asia and Indo–China	322934 (LWG)
	Pulicaria undulata	Border of crop fields	H (A)	Nov.–Dec.	Swelling and bruises, also effective against headache	--	Canary Islands (Gran Canaria) Sahara & Sahel to India	323058 (LWG)
	Sonchus asper	Mustard, Vegetable crops & Wheat	H (A)	Jan.–April	A poultice of plant is applied on wound or boil	In/Ui	Temp. Eurasia, N. Africa to Sahel and Somalia	331006 (LWG)
	Sonchus oleraceus	Mustard	H (A)	Dec.–March	Roots and leaves are effective against fever and are cathartic, hydragogue and tonic[17]	In/Ui	Macaronesia, Europe to Medit., Sahara to Arabian Peninsula	323067 (LWG)
	Synedrella nodiflora	All rabi crops	H (A)	Nov.–Dec.	Leaves treat sore legs and rheumatism	In/Ui	Tropical & Subtropical America	331414 (LWG).
	Tridax procumbens	Vegetable crops & Wheat	H (A)	Most part of the year	Plant is analgesic, antidiabetic, immunomodulatory, leishmanicidal, and repellent	In/Ui	Mexico to Tropical America	331026 (LWG)
	Xanthium strumarium	Chickpea	SS	Sep.–Jan.	Plant is sedative, emollient, and diaphoretic; roots in cancer, boil and ulcers	In/N	S. Central & S. Europe to China and Indo-China, Taiwan, NW. Africa	331019 (LWG)

their control, management and eradication. The previous information on weeds of some cultivated fields in different regions of Uttar Pradesh have previously been documented but there is still an underlying gap for the proper knowledge and uses of weed species[6,11,13,15]. The present research was undertaken to record the diversity of agrestal weed species in different rabi crop fields of the state of Uttar Pradesh, with the objective to collect, identify, document the uses and to maintain the voucher specimen. Altogether, this will be the first comprehensive work on agrestal weeds found in all major rabi season crops across the state. In contrast, certain plant species have been identified and documented in the area as trouble makers because they are invasive weedy with early dispersal and if not managed properly, these plants will subsequently replace native vegetation in upcoming years.

Study Area

Uttar Pradesh, being the 4th largest State in India covers an area of 2,40,928 sq. km, is an agricultural dominating land where the majority of the total workforce 70% is engaged in agricultural and allied sector ventures[10]. It is located between 30Ú0'0.000'' N latitudes and 80Ú0'0.000'' E longitudes in the Indo-Gangetic Plain of north central India. The temperature of the area varies

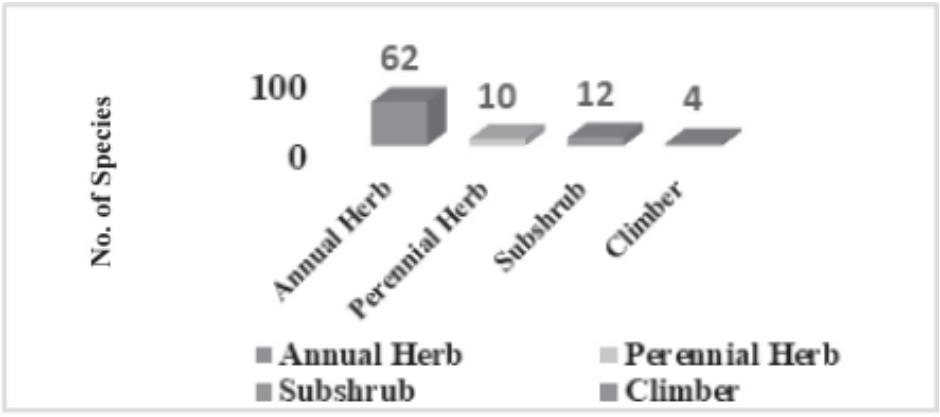

Fig. 1 : Different growth forms of weed plant species

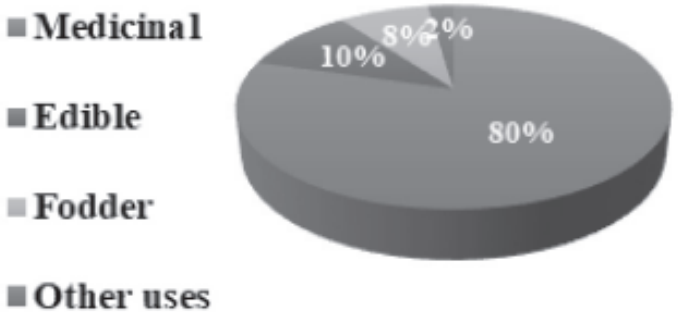

Fig. 2 : Contribution of Weeds in percentage based on its uses

between 32°C–42°C in the summer and 2°C–15°C in the winter and rain fall ranges from 1,000 to 2,000 mm (39–79 in) in the east to 600–1,000 mm (24–39 in) in the west. Of the total geographical area, the state consists of about 24, 1704 sq. km. cultivable areas and only 14, 818 sq. km are under forest cover. Being an agricultural state, it cultivates about 28% of India's wheat. The state is divided into 9 agro-climatic zones. The entire area is covered with alluvial and colluvial soils and rocks, providing the best conditions for extensive crop production. Three distinct annual seasons like winter (November–February), summer (March–June) and rainy (July–October) seasons are prevailing here. The dicot dominant over monocot in the state flora and represented by 2607 species distributed under 1,094 genera belonging to 174 families.

Methods

Multiple field tours, in rabi season were conducted in different areas throughout the state between 2018–2023 to examine and document the weeds growing in different crops, a local survey was also done while documentation to know their uses. The plants were collected in flowering and fruiting stages with detailed taxonomic data such as habit of plant, associated crops, colour of flowers, GPS data *etc.* for their proper identification. The nativity and updated names of each plant species have been provided with the help of Plants of the World online 2024 (POWO)[9] and the invasive status of weeds from different literature[5,18]. The voucher specimens were prepared by standard procedure[4]. The identification of weed species was made with the help of Handbook on Weed Identification, different floras and important taxonomic works[8,14,16,17] and by authentic specimens housed at reorganized Indian herbaria like CAL, DD, BSA, LWG, CDRI, and CIMAP. Voucher specimens have been deposited at LWG for future records. The plant species are enumerated and arranged as per APG IV Classification. The weed species are represented (Table-1) according to their scientific names along with their family, nativity, associated crop(s), phenology, invasion status, mode of introduction, voucher specimen number and uses if any. Uses of the weeds were documented from the previously published work and local survey. Furthermore, photographs of some agrestal of rabi are provided in Fig. 3.

Results and Discussion

In the present study 88 weeds species belonging to 75 genera and 30 flowering plant families were recorded in the study area, representing six clade and 15 orders as per APG IV classification (Table-1, Fig. 1). Among the reported plants, 30% of taxa were recorded from the clade Malvids followed by 23% from Lamiid, 21% Campanulid, 20% Fabids, 5% Eudicot and 1% from Asterids. Out of the total weeds, 42 species are native to India and 46 species are alien in origin, meanwhile maximum alien species are from American continent. The top dominating families with number of species are Asteraceae (19), Amaranthaceae (11), Fabaceae (10), Malvaceae (5), Solanaceae (5), Euphorbiaceae (3), Acanthaceae (3) which contribute approx. 64% of total rabi weeds. 15 families are represented by only one species. Some of the dominant genera are *Amarnthus* (3 sp.), *Alternanthera* (3 sp.), *Solanum* (3 sp.), Sonchus (2 sp.), Vicia (2 sp.). Habit analysis revealed that herbs area dominant (72spp.; 82%), followed by sub-shrubs (12spp.; 14%), climbers (4spp.; 4%) (Fig. 1). Weeds species are primarily annuals (75%) followed by perennials (25%). Out of the total number of weeds from the study area, 42 species belong to 36 genera and 16 families were found to be of invasive nature. About 13 invasive species are native to India.

Although weeds are generally considered as detrimental to the crops, many weeds possess various

Fig. 3 : Agrestal Weeds of Rabi Crops: A. *Achyranthes aspera*; B. *Ageratum houstonianum*; C. *Amaranthus viridis*; D. *Argemone ochroleuca*; E. *Bidens pilosa*; F. *Cannabis sativa*; G. *Euphorbia hirta*; H. *Galinsoga parviflora*; I. *Gamochaeta purpurea*; J. *Heliotropium indicum*; K. *Lathyrus aphaca*; L. *Lysimachia arvensis*; M. *Malva parviflora*; N. *Mazus pumilus*; O. *Parthenium* hysterophorus; P. *Physalis angulata*.

economic values. Several of them are being used by local communities as food, fodder, folk medicines and other purposes. Out of total weed species, about 80% of the species were used to treat various ailments, such as diabetes, gastrointestinal disorders, fever, gynecology, cardiovascular disorders, skin diseases, rheumatism, urinogenital tract infection, diarrhea and kidney disorders. Many weeds (8%) are used by local people as feed to the domestic animals while10% species are edible (Fig. 3). Apart from that some weeds are used as ornamental purposes like *Rivina humulis* while *Alternanthera philoxeroides* used as a Phytoremediation of Arsenic (As) and Lead (Pb) in their invaded water bodies.

Discussion

The current study provides a complete list of the agrestal weed species found in the rabi crops of Uttar Pradesh and their economic values. Many species of plants in the study area have numerous environmental and economic significance, and are useful as natural resource for wildlife and humans. Apart from this, some crops are invasive plants and weeds are considered troublesome because they have the capacity to replace natural vegetation within a short period of time. Therefore, it is particularly important to have proper documentation and knowledge about the useful and invasive properties of weeds.

References

1. Bhan VM, Kumar S, Raghuwanshi MS. Weed Management in India. *Indian Journal of Plant Protection.* 1999; **27**: 171–202.
2. Gharde Y, Singh PK, Dubey RP and Gupta PK. Assessment of yield and economic losses in agriculture due to weeds in India. *Crop Prot.* 2018; **107**: 12–18.
3. Holm L, Pancho JV, Herberger JP, Plucknett DL. A geographical Atlas of world weeds. John Wiley and Sons, New York, United Kingdom. 1979.
4. Jain SK, Rao RR. Handbook of field and herbarium methods. Today and Tomorrow's Printers and Publishers, New Delhi, India. 1977.
5. Khanna KK. Invasive alien angiosperm of Uttar Pradesh. *Biological Forum- An International Journal*. 2009;**1**: 34–39.
6. Kushwaha AK, Tewari M and Chaudhary LB. Survey on weed diversity in two major crop fields, rice and wheat in Sonbhadra district, Uttar Pradesh, India. *J. Crop Weed.* 2018; **14**: 154–161.
7. Muenscher, WC. Weeds. MacMillan, New York, USA. 1955.
8. Naidu VSGR. Hand Book on Weed Identification. Directorate of Weed Science Research Maharajpur, Jabalpur, India. 2012.
9. Plant of World Online (POWO) (2022) https://powo.science.kew.org/. Accessed on: 2022-08-05.
10. Roy R, Ahmad H. State Agricultural Profile of Uttar Pradesh (2014-2015). Agro-Economic Research Centre, University of Allahabad, Allahabad. 2015.
11. Sah D, Panwar GS, Kumar A, Kalhapure AH, Singh N. Phytosociological study of weeds in major rabi season crops of Bundelkhand region. *J. Pharmacogn. Phytochem.* 2020; **9**: 3209–3213.
12. Sharma M. Weed flora of Punjab in Rabi crops. *Indian J. Weed Sci.* 1978;**10**: 15–18.
13. Shazia, Siddiqui MB. Weed diversity of Aligarh, Uttar Pradesh. In: *Proceeding of the 18th Annual Conference of IAAT and International Seminar on Multidisciplinary approaches in Angiosperm systematics,* Kalyani, West Bengal, India. 2012; 149–155.
14. Singh KP, Khanna KK, Sinha GP. Flora of Uttar Pradesh, Volume I. Botanical Survey of India, Kolkata, India. 2016.
15. Singh M, Singh OP, Singh MP. Floristic composition of weeds in mixed winter crop on Gujar lake's margins in Uttar Pradesh. I*ndian J. Weed Sci.* 2012; **44**: 62–64.
16. Singh SC, Khanuja SPS. Lucknow Flora: The Plant Wealth of the Region. Central Institute of Medicinal and Aromatic Plants, Lucknow, India. 2006.
17. Sinha GP, Shukla AN. Flora of Uttar Pradesh, Volume 2. Botanical Survey of India, Kolkata, India. 2020
18. Srivastava S, Dvivedi A, Shukla RP. Invasive Alien Species of Terrestrial Vegetation of North-Eastern Uttar Pradesh. *Int. J. For. Res.* 2014; **2014**: 1–9.
19. Tull J. Horse-hoeing husbandry, or, An essay on the principles of vegetation and tillage. Printed for A. Millar, London, United Kingdom. 1751.