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Phytosociological Studies of Rice Weeds in DS1R and TSR field of Bilaspur District (C.G.)

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Abstract

An overview study of weeds in Dry Seeded Rice (DSR) field and Transplanted Seeded Rice (TSR) field are done in two study sites of Bilaspur district Chhattisgarh such as Ganiyari and Masturi. Their phytosociological characters such as % frequency, density, abundance, IVI, etc. are calculated in the method given by Mishra et.al.1968. General survey was done in the pick period of weed growth on session July to November 2021. Survey indicate more than 42 weed species are associated with rice crop. Those sites soil type and climatic conditions are favorable for weed growth and paddy crop production. Studies of those characters are very much important for weed control and weed free rice production. Observation clearly indicate that *Cyperus iria*, *Echinochloa colona* and *Cyperus flavidus* have been found to be most frequently distributed weeds in those study sites. Density wise also these two species are found the most populated species. The same picture is seen with abundance also. However, on the basis of relative values of frequency, density and abundance in those sites following trends has been observed. *Cyperus iria* > *Echinochola colona* > *Cyperus flavidus.*

Key words : - Rice weeds, DSR and TSR, Phytosociological Studies, Bilaspur district.

Rice (*Oryza sativa* L.) is a member of poaceae and it is important food crop by majority of world's population. It provides 20% of the total calories intake of people in the world.[4] Among the cereal crops, it serves as the principal source of nourishment for over half of the global population[5]. Among the cereals rice is the leading crop worldwide[1] and more than half of the human race depends on rice for their daily substance[3]. Rice is an important crop which is extensively grown in tropical and subtropical regions of the world. In Chhattisgarh rice is the staple food crop of all the population and rice is an important target to provide food security and livelihood for millions people. Paddy is the identity of Chhattisgarh therefore it is called rice bowl of Chhattisgarh.

Weed succession and distribution pattern in rice field are dynamic in nature. The composition of weed flora may differ depending on location[2,19]. Weed is a harmful and aggressive pest for rice causing serious yield reduction in rice production worldwide. Weeds commonly

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absorb added nutrients as much and more rapidly than crops and also competing for nutrients, light, space and moisture throughout the growing season[7,8,15]. The main reduction in rice yield caused by weeds competition is 40-60% which may rich 94 to 96% if weed are not properly controlled[3]. There are two main methods for rice cultivation DSR and TSR. Direct seeding of rice (DSR) refers to the process of establishing a rice crop from seeds sown in the field rather than by transplanting rice (TSR) seedling from the nursery[6]. Dry seeding has been the principal method of rice establishment since the 1950s in developing countries[13]. The (DSR) direct seeded rice fields are more species rich with greater diversity in weed flora then (TSR) transplanted seeded rice[18]. The extent of damage depends upon the nature of weeds, their density, dominance, ecological succession and the association with the crop. Therefore, it is necessary to make a detailed survey of weeds flora in rice fields. An extensive survey of weed flora in (DSR) direct seeded rice and (TSR) transplanted seeded rice of the paddy fields in the study sites Masturi and Ganiyari was done during the peak period of weed growth during cropping season July to October 2021. The survey was aimed to explore phytosociological distribution of weeds in rice cropland fields. Phytosociological studies of direct seeded rice (DSR) and transplanted seeded rice (TSR) field of Masturi and Ganiyari sites are conducted in cropping season 2021.

For general survey of weed flora the paddy crop fields were visited at peak period of weed growth in the month of July to October 2021. For the phytosociological studies of weed flora the standard phytosociological methods were used, given by Mishra *et al.*,[11]. Obtained weed plants were identified with the help of available literature and standard flora[9]. % Frequency, Density, Abundance, Relative frequency (R.F.), Relative density (R.D.), Relative dominance (R. Dom.) and Importance value index (IVI) are calculated by formulae given by Mishra *et. al.*,[11].

The following formulae were used to calculate different Phytosociological parameters:

$$\% \text{ Frequency} = \frac{\text{Total no. of quadrats in which the species occurred}}{\text{Total no. of quadrats studied}} \times 100$$

$$\text{Density} = \frac{\text{Total no.of individuals of a species in all the quadrats}}{\text{Total no.of quadrats studied}}$$

$$\text{Abundance} = \frac{\text{Total no. of individuals of the species in all the quadrats}}{\text{Total no. of quadrats in which the species occurred}}$$

$$\text{Relative Frequency (RF)} = \frac{\text{Total no. of occurrences of a species in all the quadrats}}{\text{Total no. of occurrences of all species in all quadrats}} \times 100$$

$$\text{Relative Density (RD)} = \frac{\text{Total no. of individuals of a species in all the quadrats}}{\text{Total no. of individuals of all species in all quadrats}} \times 100$$

$$\text{Relative Dominance (R.Dom)} = \frac{\text{Total basal cover of a species in all quadrats}}{\text{Total basal cover of all species in all quadrats}} \times 100$$

$$\text{IVI} = \text{Relative frequency} + \text{Relative density} + \text{Relative dominance}$$

Study area and climatic condition :

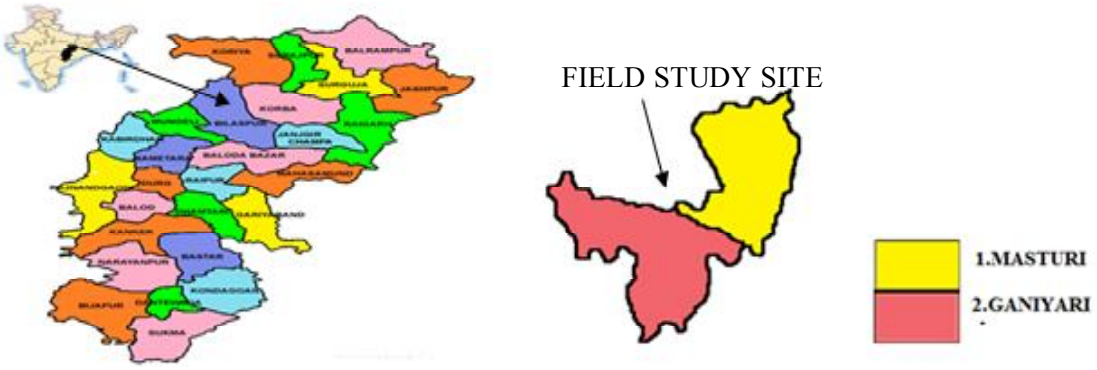
Bilaspur district is located in the northern region of Chhattisgarh state. The geographical distribution of the Bilaspur district is 25°.5'North latitude and 82°.12' East longitude[17] and it is big rice cultivate area. Climatic conditions are generally sub tropical and humid type. Thus it has hot summers, cool winters and small rainy season. The climate is ideal for agriculture particularly for rice. The rainfall of month of July, August, September and October are 16.5, 5.8, 8.0, and 0.9 mm respectively. The minimum and maximum temperature of the district are 23.4°C, 23.4°C, 23.2°C, 20.1°C and 31.9°C, 31.5°C, 31.5°C, 32.4°C in month of July to October 2021. (Source: - Climate department, Barrister Thakur Chhedilal college of Agriculture & Research Station Bilaspur Chhattisgarh. Below map show Chhattisgarh state in India, Bilaspur district in Chhattisgarh map and two study site of Bilaspur Chhattisgarh.

Masturi site :

Table-1 and 2 indicate in Cropping season July to October 2021 Masturi site in direct seeded rice (DSR) and transplanted seeded rice (TSR) field, the highest frequent weed species were *Cyperus iria, Echinochloa colona* and *Cyperus flavidus*. Frequency of this species was 76%, 68% and 38% in DSR and 40%, 35% and 19% in TSR. Other frequent weed species in both sites were *Cynodon dactylon, Marsilia minuta, Cyperus flavidus, Cyperus rotundus, Kyllinga monocephala* and *Succharum spontaneum*. Minimum frequent weed species were *Cyperus difformis Alysicarpus monilifer* and *Fimbristylis feruginea*.

Similar highest dense species were *Cyperus iria* (2.34), *Echinochloa colona* (1.44) and Cyperus flavidus (0.46) in DSR and same species 2.09, 1.35 and 0.25 in TSR. Lowest dense species in both sites were *Alysicarpus monilifer, Astercantha longifolia, Cyperus difformis, Eclipta prostrata, Polygonum plebejum.*

Most abundant weeds were *Cyperus iria* (3.07), *Echinochloa colona* (2.11) and *Cyperus flavidus* (1.64) in DSR and 2.03, 2.05



(Figure 1) Geographical location of Chhattisgarh

and 1.35 in TSR. Minimum abundant species in direct seeded rice (DSR) and transplanted seeded rice (TSR) were *Alysicarpus monilifer, Astercautha longifolia, Achyranthes aspera, Cyperus haspan, Cyperus difformis, Digitaria adscendens, Echinochloa crusgali, Eclipta alba, Ipomoea aquatic, Oplismenus burmannii, Fimbristylis ferruginea, Panicum repens, Rungia pectinata* and *Scripus grossus* (Table-1).

On the basis of observation highest relative frequency, relative density, relative dominance and highest IVI were observed in *Cyperus iria*, *Echinochloa colona* and *Cyperus flavidus* in both (DSR and TSR) sites. In direct seeded rice (DSR) highest relative frequency 12.17, relative density 24.94, relative dominance 18.02 and IVI 55.13 in *Cyperus iria*. In transplanted seeded rice (TSR) highest relative frequency 7.30, relative density15.43, relative dominance 11.05 and IVI 33.78 in *Cyperus iria*. Relative frequency, relative density, relative dominance and IVI of *Echinochloa colona* and *Cyperus flavidus* in both (DSR and TSR) sites are shown in table-2.

Ganiyari site :

Table-1 indicates that the highest frequent weed species in Ganiyari site were *Cyperus iria*, *Echinochloa colona* and *Cyperus flavidus* showing frequency of 96%, 72% and 26% respectively in direct seeded rice (DSR) and 50%, 39% and 16% in transplanted seeded rice (TSR). Less frequent weed species in both (DSR and TSR) sites are having 4% frequency were *Alysicarpus monilifer, Achyranthes aspera, Digitaria sanguinalis, Eragrostis pilosa and Rungia pectinata.*

Most dense species were observed in Cyperus iria (2.20), *Echinochloa colona* (1.36) and *Cyperus flavidus* (1.16) in direct seeded rice (DSR) and same species 2.05, 1.19 and 1.05 in transplanted seeded rice (TSR).

Highest abundance (2.29) was observed in *Cyperus iria,* (1.88), *Echinochloa colona* and 1.81 *Cyperus flavidus* in direct seeded rice (DSR) and same species 2.09, 1.45 and 1.20 in transplanted seeded rice (TSR).

On the basis of observation highest relative frequency, relative density, relative dominance and highest IVI were observed in *Cyperus iria*, *Echinochloa colona and Cyperus flavidus* in both (DSR and TSR) sites. In direct seeded rice (DSR) highest relative frequency 12.17, relative density 24.94, relative dominance 18.02 and IVI 55.13 in *Cyperus iria*. In transplanted seeded rice (TSR) highest relative frequency 7.30, relative density15.43, relative dominance 11.05 and IVI 33.78 in *Cyperus iria*. Relative frequency, relative density, relative dominance and IVI of *Echinochloa colona* in direct seeded rice (DSR) were 12.32, 13.14, 16.46, and 41.92 and in transplanted seeded rice (TSR) relative frequency, relative density, relative dominance and IVI were 6.35, 7.59, 9.93 and 23.87. *Cyperus flavidus* relative frequency, relative density, relative dominance and IVI in direct seeded rice (DSR) were 4.10, 11.20, 8.21 and 23.51and in transplanted seeded rice (TSR) were 3.23, 5.35, 4.59 and 13.17.

Table–1. Phytosociological observation on weed flora of paddy field in direct seeded rice (DSR) and transplanted seeded rice (TSR) in Masturi and Ganiyari site (July to October 2021)

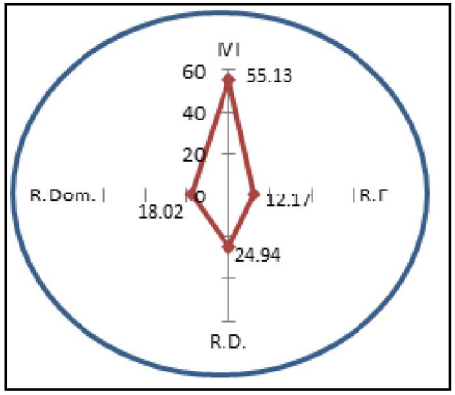
S. No.	Weed Species	Masturi Site (DSR)			Masturi Site (TSR)			Ganiyari Site (DSR)			Ganiyari Site (TSR)		
		% Frequency	Density	Abundance	% Frequency	Density	Abundance	% Frequency	Density	Abundance	Frequency	Density	Abundance
1.	*Alysicarpus monilifer* DC.	04	0.2	1.00	04	0.01	1.02	-	-	-	04	0.02	1.02
2.	*Ammannia baccifera* Linn.	-	-	-	04	0.02	1.00	05	0.1	1.00	-	-	-
3.	*Andropogon pumilus* Roxb.	-	-	-	-	-	-	06	0.02	1.00	04	0.02	1.00
4.	*Aeschynomene indica* Linn.	14	0.16	1.14	-	-	-	14	0.14	1.00	-	-	-
5.	*Ageratum conyzoides* Linn.	10	0.16	1.06	-	-	-	28	0.36	1.28	16	0.20	1.17
6.	*Alternenthera sessilis* Br.	06	0.08	1.33	04	0.05	1.18	14	0.18	1.28	08	0.10	1.16
7.	*Astercantha longifolia* (L.) Nees	08	0.02	1.00	05	0.01	1.03	-	-	-	05	0.01	1.00
8.	*Achyranthes aspera* Linn.	06	0.06	1.00	-	-	-	-	-	-	04	0.04	1.03
9.	*Cassia tora* Linn.	24	0.30	1.25	16	0.15	1.13	20	0.24	1.20	12	0.15	1.10
10.	*Commelina benghalensis* Linn.	16	0.18	1.12	-	-	-	04	0.06	1.50	05	0.03	1.35
11.	*Crotalaria juncea* Linn.	12	0.14	1.16	07	0.08	1.09	18	0.18	1.00	-	-	-
12.	*Cyperus iria* Linn.	76	2.34	3.07	40	2.09	2.05	96	2.20	2.29	50	2.05	2.09
13.	*Cyperus flavidus* Retz.	30	0.46	1.64	19	0.25	1.35	26	1.16	1.81	16	1.05	1.20
14.	*Cyperus rotundus* Linn.	30	0.34	1.13	-	-	-	18	1.07	1.38	10	1.03	1.09
15.	*Cyperus haspan* Linn.	12	0.12	1.00	-	-	-	08	0.06	1.00	-	-	-
16.	*Cyperus difformis* Linn.	02	0.02	1.00	-	-	-	06	0.10	1.22	-	-	-
17.	*Cynodon dactylon* Pers.	36	0.42	1.53	13	0.23	1.33	30	0.36	1.20	14	0.19	1.00
18.	*Digitaria adscendens* Hern.	16	0.16	1.00	-	-	-	-	-	-	09	0.19	1.03
19.	*Digitaria sanguinalis* Linn.	-	-	-	05	0.03	1.00	04	0.04	1.00	-	-	-
20.	*Echinochloa colona* Link.	68	1.44	2.11	35	1.35	2.03	72	1.36	1.88	39	1.19	1.45
21.	*E. crus-galli* Beauv.	12	0.12	1.00	09	0.5	1.03	06	0.20	1.00	04	0.10	1.00
22.	*Eclipta alba* Hassk.	08	0.08	1.00	-	-	-	18	0.24	1.33	-	-	-
23.	*E. prostrata* Roxb.	04	0.02	1.00	-	-	-	07	0.02	1.00	04	0.01	1.00
24.	*Eragrostis pilosa* Beauv.	16	0.18	1.12	09	0.11	1.06	04	0.04	1.00	-	-	-

25.	*Fimbristylis littoralis* Gaud.	14	0.16	1.14	08	0.9	1.09	08	0.08	1.00	05	0.05	1.00
26.	*F. ferruginea* Vahl.	04	0.04	1.00	-	-	-	-	-	-	09	0.04	1.03
27.	*Ipomoea aquatica* Forsk.	06	0.06	1.00	-	-	-	-	-	-	-	-	-
28.	*Justicia simplex* Don.	-	-	-	12	0.05	1.05	04	0.02	1.00	-	-	-
29.	*Kyllinga monocephala* Vahl.	28	0.34	1.21	15	0.03	1.03	16	0.18	1.12	09	0.09	1.09
30.	*Marsilia minuta* Linn.	34	0.42	1.23	-	-	-	18	0.30	1.66	10	0.15	1.33
31.	*Oplismenus burmanni* Beauv.	16	0.16	1.00	-	-	-	16	0.18	1.12	-	-	-
32.	*Oxalis corniculata* Linn.	12	0.14	1.16	09	0.05	1.09	08	0.12	1.50	-	-	-
33.	*Phyllanthus niruri* Linn.	-	-	-	04	0.02	1.00	05	0.02	1.00	-	-	-
34.	*Paspalim paspaloides* Scribn.	16	0.18	1.12	09	0.5	1.03	24	0.36	1.00	13	0.23	1.09
35.	*Panicum repens* Linn.	08	0.08	1.00	-	-	-	06	0.008	1.33	-	-	-
36.	*Polygonum plebejum* Br.	04	0.02	1.00	-	-	-	-	-	-	-	-	-
37.	*Rungia pectinata* Nees.	06	0.06	1.00	04	0.03	1.00	05	0.04	1.00	04	0.02	1.01
38.	*Saccharum spontaneum* Linn.	28	0.34	1.21	15	0.19	1.19	28	0.32	1.14	-	-	-
39.	*Sida acuta* Burm.	18	0.22	1.22	-	-	-	18	0.24	1.33	13	0.19	1.15
40.	*S. cordifolia* Linn.	-	-	-	12	0.09	1.03	06	0.08	1.25	04	0.03	1.03
41.	*Scripus grossus* Linn.	06	0.06	1.00	-	-	-	12	0.16	1.33	09	0.07	1.05
42.	*Setaria glauca* Beauv.	14	0.16	1.14	09	0.10	1.05	10	0.18	1.80	-	-	-

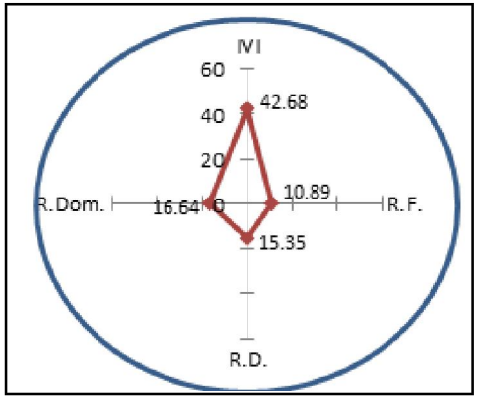
Table-2. Relative frequency, Relative density, Relative dominance and IVI of dominating Weed flora in Direct Seeded Rice (DSR) and Transplanted Seeded Rice (TRS) in Masturi and Ganiyari site (July to October 2021)

S. No.	Weed Species	Masturi Site (DSR)				Masturi Site (TSR)				Ganiyari Site (DSR)				Ganiyari Site (TSR)			
		R.F.	R.D.	R.	IVI Dom.	R.F.	R.D.	R.	IVI Dom.	R.F.	R.D.	R	IVI Dom.	R.F.	R.D.	R. Dom.	IVI
1.	*Cyperus iria* Linn.	12.17	24.94	18.02	55.13	7.30	15.43	11.05	33.78	16.43	21.25	18.62	56.30	9.35	13.93	11.23	34.51
2.	*Echinochloa colona* Link.	10.89	15.35	16.44	42.68	6.23	9.93	8.59	24.75	12.32	13.14	16.46	41.92	6.35	7.59	9.93	23.87
3.	*Cyperus flavidus* Retz.	4.80	4.90	4.40	14.10	3.50	3.93	3.59	11.02	4.10	11.20	8.21	23.51	3.23	5.35	4.59	13.17

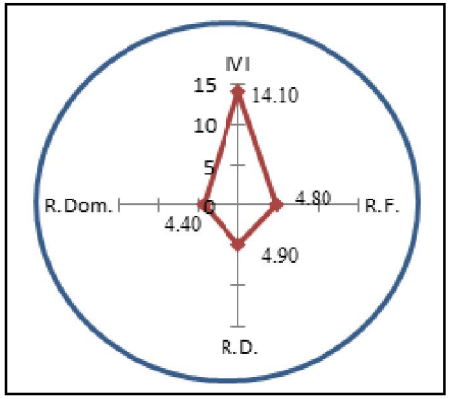
Masturi site- Phytograph



(A) *Cyperus iria* Linn.

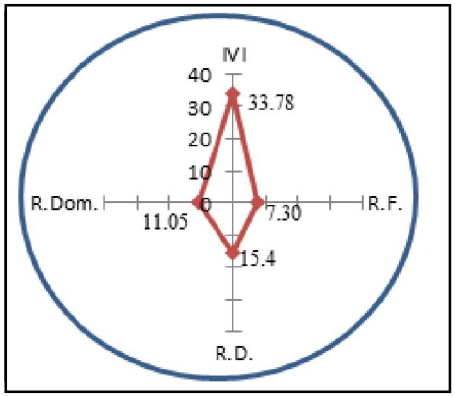


(B) *Echinochloa colona* Link.

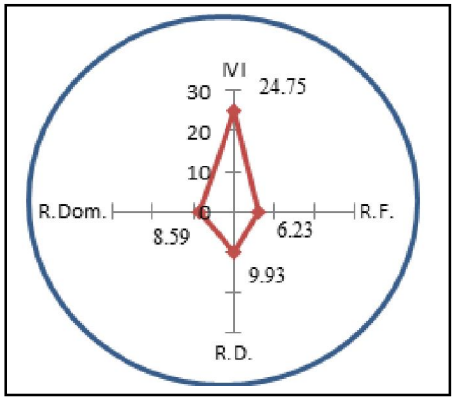


(C) *Cyperus flavidus* Retz.

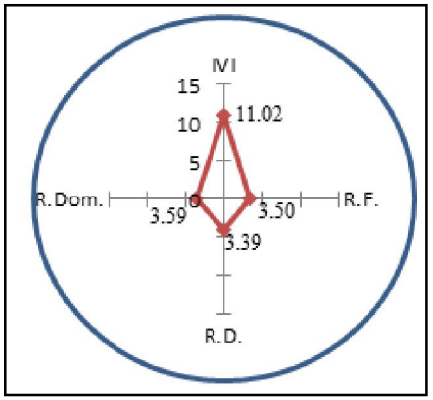
Phytograph of different dominant weed species in DSR (Direct Seeded Rice) of Masturi Site



(A) *Cyperus iria* Linn.



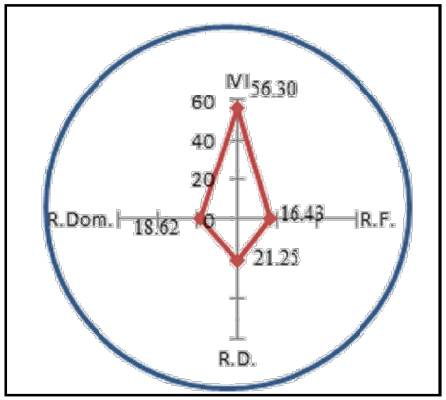
(B) *Echinochloa colona* Link.

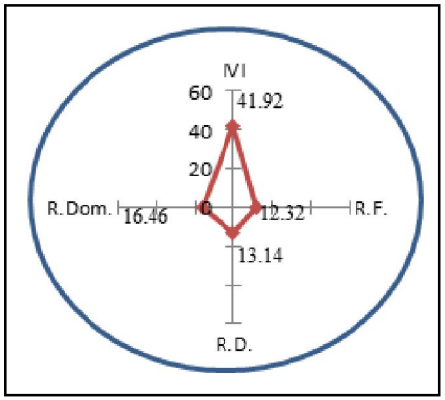


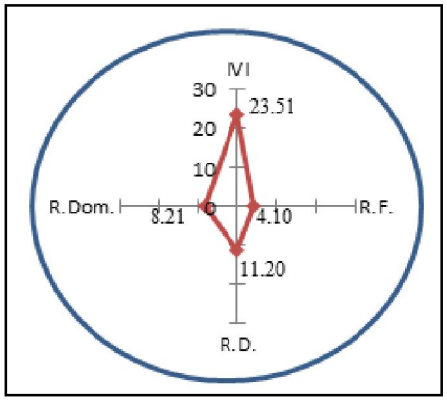
(C) *Cyperus flavidus* Retz.

Phytograph of different dominant weed species in TSR (Transplanted Seeded Rice) of Masturi Site

Ganiyari site- Phytograph

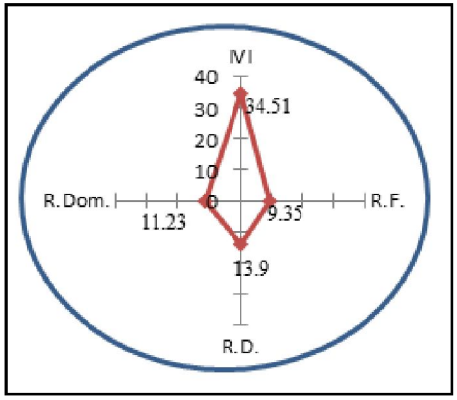


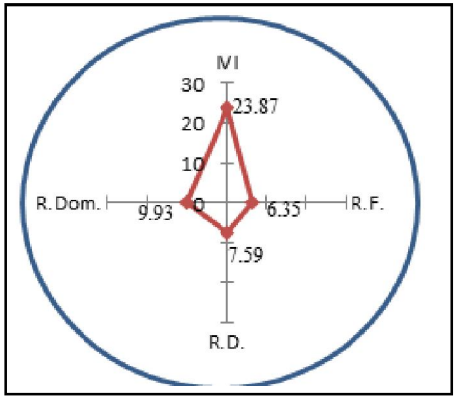


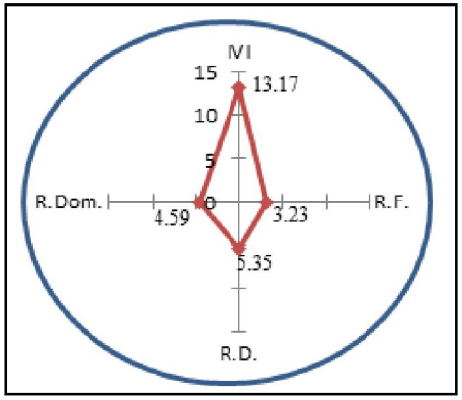


(A) *Cyperus iria* Linn. **(B) *Echinochloa colona* Link.** **(C) *Cyperus flavidus* Retz.**

Phytograph of different dominant weed species in DSR (Direct Seeded Rice) of Ganiyari Site







(A) *Cyperus iria* Linn. **(B) *Echinochloa colona* Link.** **(C) *Cyperus flavidus* Retz.**

Phytograph of different dominant weed species in TSR (Transplanted Seeded Rice) of Ganiyari Site

Some photographs of Weed flora in DSR and TSR fields

***Cyperus rotundus* Linn.**

***Digitaria ciliaris* Retz.**

***Cyperus iria* L.**

***Echinochloa colona* L.**

***Cyperus flavidus* Retz.**

***Phyllanthus niruri* L.**

Perusal of table-1 and 2 observations described above clearly indicate that in DSR *Cyperus iria, Echinochola colona and Cyperus flavidus* have been found to be most frequently distributed weed species in both sites sampled Masturi and Ganiyari. In TSR also *Cyperus iria, Echinochola colona* and *Cyperus flavidus* were found to be most frequently distributed weed species in both sites sampled Masturi and Ganiyari. Density wise also, these three species were found the most populated species. Almost the same picture is seen with abundance also. However, season 2021 July to October seems to be more prone to weed infestation. The reason may be climatic factors and good rain favoring luxuriant weed growth. Similar result are found by many researches such as Junel B. Soriano *et al*., (2018) in Karnataka India[10], Hassan Akhgari (2011) in northern part of Iran[6], Ravindra Kumar (2017) in Hariyana[16], Mantosh Kumar Sinha[16] in Koria district Chhattisgarh[11], Naresh *et al*.,[12] in Western part of Uttar Pradesh[14]. The report of all these researches are discussion on the weed problem in direct seeded rice (DSR) and transplanted seeded rice (TRS) in paddy field.

The present study was conducted to provide knowledge of weeds of paddy field by the phytosociological method. Weeds are major barriers for productivity of all crop plants because they take all nutrients and compete with crop plant. This study will help the farmers and agriculturists to identify the weeds and thus help in the planning a suitable strategy for their control and enhance the productivity of rice.

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