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FLORISTIC AND PHYTOSOCIOLOGICAL SURVEY OF WEEDS IN DIRECT SEEDED RICE CULTIVATION OF VILLAGE KURELI, TAKHATPUR, BILASPUR DISTRICT, CHHATTISGARH

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***Abstract*:** Information and knowledge about the weeds are necessary components for the designing of weed management. The objective of the present study was to find out the most important and dominant weeds in direct seeded rice cultivation of village Kureli, block Takhatpur Bilaspur district Chhattisgarh. For the present study floristic and phytosociological survey have been done in the study area at regular interval during 2020-2021. For the phytosociological studies of weeds random quadrate method was used. Floristic diversity of weeds and phytosociological characters such as frequency, density, abundance and importance value index (IVI) were recorded and evaluated most dominant weeds according to higher value of importance value index (IVI). Rice fields were extremely infested with 65 weed species belonging 20 families. Of these 65 weed species, 16 dicot families, 3 monocot families and 01 pteridophytic species in the study area was reported from 50 Quadrates. The weed flora was dominated by species of the Cyperaceae, and Poaceae families. On the basis of Importance Value Index the most dominant weeds were *Echinochloa colona* (L.)Link , *Cyperus iria* L. *Paspalum scrobiculatum* L., *Cyperus difformis* L., *Alternanthera tenella* Colla *Fimbristylis miliacea* (L.) Vahl, *Ischaemum rugosum* Salisb, *Cynodon dactylon* (L.) Pers., *Ammannia baccifera* L.and *Ludwigia perennis* Burm.f. in the study area.

***Index Terms* -** Dominant weeds, Floristic, Important Value Index, Kureli, Rice crop fields.

I. INTRODUCTION

Weeds are unwanted and undesirable plants that grow along with crops and compete with crops and affect negatively their yield. Weeds compete with crop plants for light, water, space and nutrients. They decrease the quality and quantity of crop productivity (Mukherjee, *et al*., 2005, Rao and Nagamani, 2010, 2013). Weeds not only reduce the yield of the crop but also interfere with the normal life cycle of the neighboring plants.

India is the second largest producer of rice after China in the world (Rao and Chauhan, 2015). In Chhattisgarh, about 80% of the population of the state lives in villages and the main occupation of the villagers is agriculture. Farmers have been facing this problem for many years. Actual yield loss due to weeds is 25.6% whereas potential yield loss is as high as 65.9% in the rice crop field of Chhattisgarh. (Gharde and Singh, 2018).

The high growth rate and higher seed production ability of weeds have a detrimental effect on crop productivity. The information and knowledge about the presence, composition, diversity, and distribution of weed species are required to prepare suitable weed management practices to enhance optimum yields of rice (Begum *et al*., 2005). In the study area, detailed information about the composition, diversity, and distribution of weeds is not available. Therefore, the present study has been done.

II. MATERIALS AND METHODS

Study area

Kureli is the village under Takhatpur block in the Bilaspur district of Chhattisgarh which is situated between 22.033216^0 North latitude and 81.984921^0 East longitude. The soil in this area is kanhar or black soil, it is the highest fertilized soil and suited for rice crops. Matasi soil (sandy loam soil) is also found in some other parts of the village, it is also ideal for paddy.

Methodology

For the present study field visits at regular intervals were done in the study area between 2020 to 2021. The random quadrat method was applied for the phytosociological study of weeds. Fifty quadrats of 1m x1m were laid down in the rice crop fields. All the weed species in quadrates were collected and identified with available authentic flora and e-resources. A herbarium of the voucher specimens was also prepared.

For the phytosociological study frequency, density, abundance, relative frequency, relative density, relative dominance, and Importance Value Index (IVI) were calculated the following methods by Curtis and McIntosh (1950) and Misra (1968).The formula are as under-

Frequency (%) = Total number of quadrates in which the species occurred / Total number of quadrates studied X 100

Density = Total number of individuals of a species in all quadrates / Total number of quadrates studied

Abundance = Total number of individuals of a species in all quadrates / Total number of quadrates in which the species occurred

Relative Frequency = Frequency of individuals of a species / Total frequency of all species X 100

Relative Density = Density of individuals of a species / Total density of all species X 100

Relative Dominance = Basal area of a species / Total Basal area of all species X 100

Importance Value Index = Relative Frequency + Relative Density + Relative Dominance

III. RESULTS AND DISCUSSION

It was found that rice fields were infested with 65 weeds belonging to 20 families (Acanthaceae, Amaranthaceae, Asteraceae, Commelinaceae Convolvulaceae, Cyperaceae Euphorbiaceae, Fabaceae, Linderniaceae, Lythraceae, Malvaceae, Marsileaceae, Onagraceae, Oxalidaceae, Plantaginaceae, Poaceae, Potulacaceae, Solanaceae, Tiliaceae, and Verbinaceae). 16 families, 33 genera, and 36 weeds belonged to dicot and 03 families, 19 genera and 28 weeds to monocot families, and 01 pteridophytic species was also reported. In the study dicot and monocot ratio was recorded as 5.33 and genera wise and species wise ratio was respectively 1.68 and 1.28. Most of the weed species belonged to Cyperaceae and Poaceae families. Thus Cyperaceae and Poaceae families were found to be the most dominant families. A perusal of Table- 1.shows the observations on floristic diversity.

Table-1. Floristic diversity of weeds in Rice crop fields of study site.

S.No.	Family	Scientific name of weed plant	Genera	Species
Dicots				
1.	**Acanthaceae**	***Asteracantha longifolia*** L.	01	01
2.	**Amranthaceae**	***Achyranthes aspera*** L. ***Alternanthera tenella*** Colla ***Amaranthus viridis*** All.	03	03
3.	**Asteraceae**	***Ageratum conyzoides*** L. ***Eclipta alba*** (L.) Hassk. ***Parthenium hysterophorus*** L. ***Sphaeranthus indicus*** Kurz ***Xanthium strumarium*** L.	05	05
4.	**Convolvulaceae**	***Evolvulus nummularius*** (L.)L. ***Merremia emarginata*** (Burm.f.) Hallier	02	02
5.	**Euphorbiaceae**	***Croton bonplandianus*** Baill. ***Euphorbia hirta*** L. ***Euphorbia indica*** Lam. ***Phyllanthus niruri*** L. ***Phyllanthus polygonoides*** Nutt. ex Spreng	03	05
6.	**Fabaceae**	***Aeschynomene indica*** Wall ***Cullen corylifolium*** (L.) Medik. ***Desmodium triflorum*** (L.)DC ***Rhynchosia minima*** (L.)DC ***Vigna trilobata*** (L.) Verdc	05	05
7.	**Linderniaceae**	***Torenia crustacean*** (L.) Cham.&Schltdl.	01	01
8.	**Lytheraceae**	***Ammannia auriculata*** Willd. ***Ammannia baccifera*** L.	01	02
9.	**Malvaceae**	***Abutilon indicum*** (L.)Sweet ***Malachra capitata*** (L.)L. ***Sida acuta*** Burm.f. ***Sida cordata*** (Burm.f.) Borss.Waalk ***Urena lobata*** (L.)	04	05

10.	**Onagraceae**	***Ludwigia perennis*** Burm.f.	01	01
11.	**Oxaladaceae**	***Biophytum sensitivum*** (L.)	01	01
12.	**Plantaginaceae**	***Mecardonia procumbens*** (Mill) Small	01	01
13.	**Portulacaceae**	***Portulaca oleracea*** L.	01	01
14.	**Solanaceae**	***Physalis minima*** L.	01	01
15.	**Tiliaceae**	***Corchorus aestuans*** L.	01	01
16.	**Verbinaceae**	***Phyla nodiflora*** (L.) Greene	01	01
Total	**16**		**32**	**36**
Monocot				
17.	**Commelinaceae**	***Commelina benghalensis*** L. ***Cynotis axillaris*** (L.) D.Don ex Sweet ***Murdannia nudiflora*** (L.)Brenan	03	03
18.	**Cyperaceae**	***Cyperus compressus*** L. ***Cyperus difformis*** L. ***Cyperus esculentus*** L. ***Cyperus haspan*** L. ***Cyperus iria*** L. ***Cyperus rotundus*** L. ***Eleocharis geniculata*** (L.) Roem&Schult ***Fimbristylis dichotoma*** (L.) Vahl ***Fimbristylis miliacea*** (L.) Vahl ***Fimbristylis schoenoides*** (Retz.) Vahl ***Schoenoplectiella articulata*** (L.) Lye	04	11
19.	**Poaceae**	***Brachiaria villosa*** (Lam.) A.Camus ***Cynodon dactylon*** (L.) Pers. ***Dactyloctenium aegyptium*** (L.)Willd ***Dichanthium annulatum*** **(**Forssk.) Stapf ***Digitaria sanguinalis*** (L.) Scop. ***Dinebra retroflexa*** **(**Vahl) Panz ***Echinochloa glabrescens*** Kossenko ***Echinochloa colona*** (L.)Link ***Eleusine indica*** (L.) Gaertn. ***Ischaemum rugosum*** Salisb ***Oplismenus burmanni*** (Retz.) P.Beauv. ***Paspalidium flavidum*** (Retz.)A.Camus ***Paspalum distichum*** L. ***Paspalum scrobiculatum*** L.	12	14
Total	**03**		**19**	**28**
Pteridophyte				
20.	**Marsileaceae**	***Marsilea quadrifolia*** L.	01	01

Total	**01**		**01**	**01**

Total Dicot /Monocot ratio was **16:3** i.e.**5.33**
Genera wise ratio was **32:19** i.e. **1.68**
Species wise ratio was **36:28** i.e. **1.28**

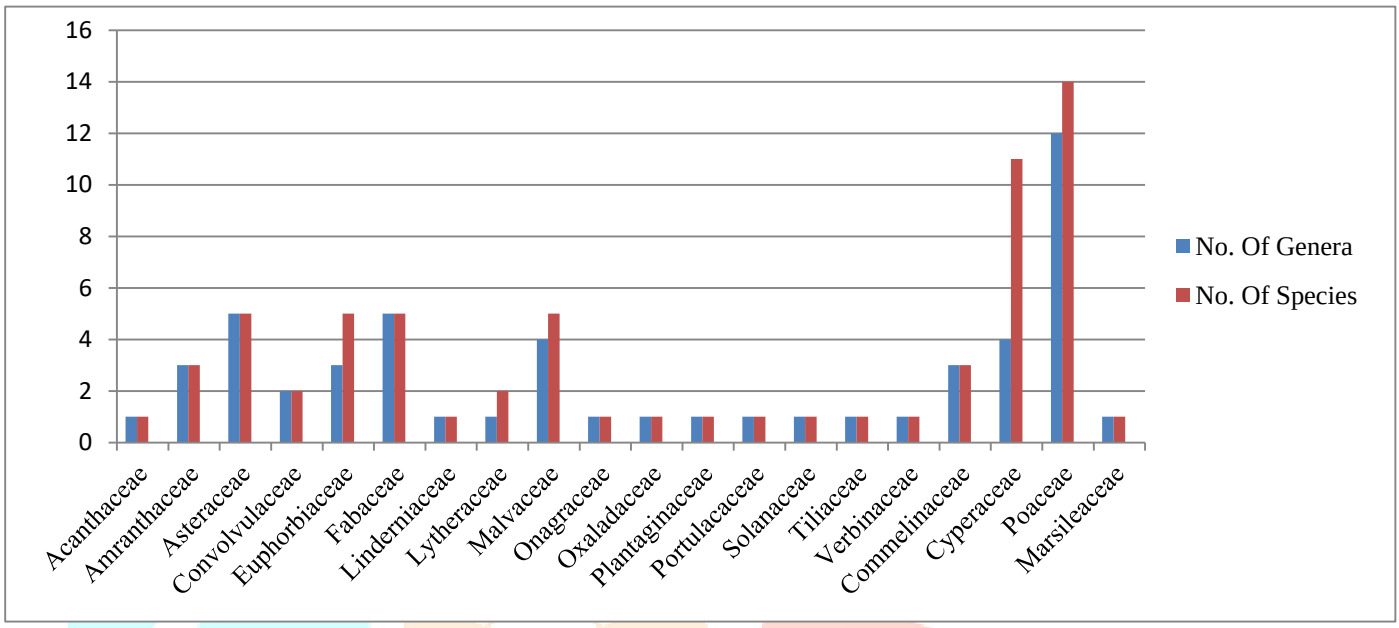

Figure-1.Distribution of Genera and species into different families of Rice crop fields of study site.

The investigation gives important and useful information about the floristic diversity, composition, and distributation of the crop-weed community in the village Kureli of Takhatpur block in the Bilaspur district of Chhattisgarh. Cyperaceae and Poaceae families were found to be the most dominant families. Table 2. shows the data on phytosociological analysis. Based on the importance value index (IVI), the result revealed that the ten most dominant weeds were *Echinochloa colona* (L.)Link with the highest IVI value of 28.71, *Cyperus iria* L. (IVI value of 24.84), *Paspalum scrobiculatum* L.(IVI value of 23.85), *Cyperus difformis* L.(IVI value of 21.13, *Alternanthera tenella* Colla (IVI value of 15.02), *Fimbristylis miliacea* (L.) Vahl (IVI value of 13.02), *Ischaemum rugosum* Salisb (IVI value of 10.39),, *Cynodon dactylon* (L.) Pers. (IVI value of 09.95), *Ammannia baccifera* L. (IVI value of 08.41) and *Ludwigia perennis* Burm.f. recorded with IVI value of 07.66.in the study area(Table-3). These are known to cause heavy yield losses due to competition with crop plants. *Echinochloa colona* (L.)Link was reported as one of the most dominant weed species. Their ecological status in terms of their phytosociological characters like frequency, density, abundance, relative frequency, relative density, relative dominance, and Importance Value Index (IVI) show a clear-cut trend of dominance on the basis of Importance Value Index (IVI) (Fig.-2).

Table - 2. Floristic diversity of weed species in Rice crop fields of study site.

S.No.	Scientific name of weed plant	Family	%F	D	A	R F	RD	RDom	IVI
1.	***Abutilon indicum*** (L.)Sweet	Malvaceae	**14**	**0.18**	**1.28**	**1.36**	**1.33**	**0.22**	**2.91**
2.	***Achyranthes aspera*** L.	Amranthaceae	**08**	**0.08**	**1.00**	**0.77**	**0.59**	**0.06**	**1.42**
3.	***Aeschynomene indica*** Wall	Fabaceae	**12**	**0.14**	**1.16**	**1.16**	**1.03**	**0.11**	**2.30**
4.	***Ageratum conyzoides*** L.	Asteraceae	**06**	**0.06**	**1.00**	**0.58**	**0.44**	**0.02**	**1.04**
5.	***Alternanthera tenella*** Colla	Amranthaceae	**46**	**0.56**	**1.21**	**4.42**	**4.12**	**6.48**	**15.02**
6.	***Amaranthus viridis*** All.	Amranthaceae	**02**	**0.02**	**1.00**	**0.19**	**0.14**	**0.005**	**0.33**
7.	***Ammannia auriculata*** Willd.	Lytheraceae	**18**	**0.18**	**1.00**	**1.75**	**1.33**	**0.02**	**3.10**
8.	***Ammannia baccifera*** L.	Lythraceae	**40**	**0.46**	**1.15**	**3.89**	**3.40**	**1.12**	**8.41**
9.	***Asteracantha longifolia*** L.	Acanthaceae	**08**	**0.08**	**1.00**	**0.77**	**0.59**	**0.06**	**1.43**
10.	***Biophytum sensitivum*** (L.)	Oxaladaceae	**10**	**0.16**	**1.60**	**0.97**	**1.18**	**0.15**	**2.30**
11.	***Brachiaria villosa*** (Lam.) A.Camus	Poaceae	**10**	**0.10**	**1.00**	**0.97**	**0.74**	**0.01**	**1.73**
12.	***Commelina benghalensis*** L.	Commelinaceae	**26**	**0.26**	**1.00**	**2.53**	**1.92**	**1.006**	**5.45**
13.	***Corchorus aestuans*** L.	Tiliaceae	**06**	**0.06**	**1.00**	**0.58**	**0.44**	**0.01**	**1.03**
14.	***Cullen corylifolium*** (L.) Medik.	Fabaceae	**04**	**0.04**	**1.00**	**0.38**	**0.29**	**0.03**	**0.70**
15.	***Croton bonplandianus*** Baill.	Euphorbiaceae	**02**	**0.02**	**1.00**	**0.19**	**0.14**	**0.005**	**0.33**
16.	***Cynodon dactylon*** (L.) Pers.	Poaceae	**36**	**0.4**	**1.11**	**3.51**	**2.96**	**3.48**	**9.95**
17.	***Cynotis axillaris*** (L.) D.Don ex Sweet	Commelinaceae	**08**	**0.08**	**1.00**	**0.77**	**0.59**	**0.12**	**1.49**
18.	***Cyperus compressus*** L.	Cyperaceae	**12**	**0.12**	**1.00**	**1.16**	**0.88**	**0.40**	**2.44**
19.	***Cyperus difformis*** L.	Cyperaceae	**44**	**0.62**	**1.40**	**4.23**	**4.49**	**12.41**	**21.13**
20.	***Cyperus esculentus*** L.	Cyperaceae	**10**	**0.10**	**1.00**	**0.97**	**0.74**	**0.13**	**3.04**
21.	***Cyperus haspan*** L.	Cyperaceae	**10**	**0.14**	**1.40**	**0.97**	**1.03**	**0.35**	**2.36**
22.	***Cyperus iria*** L.	Cyperaceae	**50**	**0.70**	**1.40**	**4.83**	**5.16**	**14.85**	**24.84**
23.	***Cyperus rotundus*** L.	Cyperaceae	**08**	**0.08**	**1.00**	**0.77**	**0.59**	**0.11**	**1.47**
24.	***Dactyloctenium aegyptium*** (L.)Willd	Poaceae	**16**	**0.16**	**1.00**	**1.55**	**1.18**	**0.38**	**3.11**
25.	***Desmodium triflorum*** (L.)DC	Fabaceae	**16**	**0.30**	**1.87**	**1.55**	**2.22**	**0.23**	**4.00**

26.	***Dichanthium annulatum*** **(**Forssk.) Stapf	Poaceae	**10**	**0.10**	**1.00**	**0.97**	**0.74**	**0.08**	**1.79**
27.	***Digitaria sanguinalis*** (L.) Scop.	Poaceae	**12**	**0.12**	**1.00**	**1.16**	**0.88**	**0.11**	**2.15**
28.	***Dinebra retroflexa*** **(**Vahl) Panz	Poaceae	**12**	**0.12**	**1.00**	**1.16**	**0.88**	**0.15**	**2.19**
29.	***Echinochloa glabrescence*** Kossenko	Poaceae	**06**	**0.01**	**1.66**	**0.58**	**0.74**	**0.39**	**1.71**
30.	***Echinochloa colona*** (L.)Link	Poaceae	**46**	**0.64**	**1.39**	**4.46**	**4.73**	**19.52**	**28.71**
31.	***Eclipta alba*** (L.) Hassk**.**	Asteraceae	**26**	**0.26**	**1.00**	**2.53**	**1.92**	**0.47**	**4.92**
32.	***Eleocharis geniculata*** (L.) Roem&Schult	Cyperaceae	**04**	**0.04**	**1.00**	**0.38**	**0.29**	**0.06**	**0.73**
33.	***Eleusine indica*** (L.) Gaertn.	Poaceae	**18**	**0.18**	**1.00**	**1.75**	**1.33**	**1.36**	**4.44**
34.	***Euphorbia hirta*** L.	Euphorbiaceae	**22**	**0.26**	**1.30**	**2.14**	**1.92**	**0.33**	**4.39**
35.	***Euphorbia indica*** Lam.	Euphorbiaceae	**08**	**0.08**	**1.00**	**0.77**	**0.59**	**0.004**	**1.37**
36.	***Evolvulus nummularius*** (L.)L.	Poaceae	**12**	**0.32**	**2.66**	**1.16**	**2.37**	**0.01**	**3.54**
37.	***Fimbristylis dichotoma*** (L.) Vahl	Cyperaceae	**16**	**0.24**	**1.50**	**1.55**	**1.77**	**1.36**	**4.68**
38.	***Fimbristylis miliacea*** (L.) Vahl	Cyperaceae	**36**	**0.50**	**1.38**	**3.50**	**3.68**	**5.84**	**13.02**
39.	***Fimbristylis schoenoides*** (Retz.) Vahl	Cyperaceae	**08**	**0.08**	**1.00**	**0.77**	**0.59**	**0.25**	**1.62**
40.	***Ischaemum rugosum*** Salisb	Poaceae	**40**	**0.50**	**1.30**	**3.80**	**3.75**	**2.84**	**10.39**
41.	***Ludwigia perennis*** Burm.f.	Onagraceae	**32**	**0.42**	**1.00**	**3.11**	**3.10**	**1.45**	**7.66**
42.	***Malachra capitata*** (L.)L.	Malvaceae	**06**	**0.08**	**1.33**	**0.58**	**0.59**	**0.05**	**1.22**
43.	***Marsilea quadrifolia*** L.	Marsiliaceae	**06**	**0.06**	**1.00**	**0.58**	**0.44**	**0.06**	**1.08**
44.	***Mecardonia procumbens*** (Mill) Small	Plantaginaceae	**24**	**0.26**	**1.08**	**2.33**	**1.92**	**0.17**	**4.42**
45.	***Merremia emarginata*** (Burm.f.) Hallier	Convolvulaceae	**30**	**0.4**	**1.33**	**2.92**	**2.96**	**0.42**	**6.30**
46.	***Murdannia nudiflora*** (L.)Brenan	Commelinaceae	**14**	**0.40**	**2.85**	**1.36**	**2.96**	**0.42**	**4.74**
47.	***Oplismenus burmanni*** (Retz.) P.Beauv.	Poaceae	**14**	**0.16**	**1.14**	**1.36**	**1.18**	**0.15**	**2.69**
48.	***Parthenium hysterophorus*** L**.**	Asteraceae	**06**	**0.06**	**1.00**	**0.58**	**0.44**	**0.02**	**1.04**
49.	***Paspalidium flavidum*** (Retz.)A.Camus	Poaceae	**16**	**0.28**	**1.75**	**1.55**	**2.07**	**1.56**	**5.18**
50.	***Paspalum distichum*** L.	Poaceae	**12**	**0.26**	**2.16**	**1.16**	**1.92**	**1.60**	**4.68**
51.	***Paspalum scrobiculatum*** L.	Poaceae	**40**	**0.52**	**1.30**	**3.89**	**3.85**	**16.11**	**23.85**

52.	***Phyla nodiflora*** (L.) Greene	Verbinaceae	**16**	**0.28**	**1.75**	**1.55**	**2.07**	**0.39**	**4.01**
53.	***Phyllanthus niruri*** L.	Euphorbiaceae	**16**	**0.32**	**2.00**	**1.55**	**2.37**	**0.10**	**4.02**
54.	***Phyllanthus polygonoides*** **Nutt. ex Spreng**	Euphorbiaceae	**08**	**0.08**	**1.00**	**0.77**	**0.59**	**0.01**	**1.38**
55.	***Physalis minima*** L.	Solanaceae	**02**	**0.02**	**1.00**	**0.19**	**0.14**	**0.007**	**0.33**
56.	***Portulaca oleracea*** L.	Portulacaceae	**02**	**0.02**	**1.00**	**0.19**	**0.14**	**0.003**	**0.33**
57.	***Rhynchosia minima*** (L.)DC	Fabaceae	**12**	**0.12**	**1.33**	**1.16**	**1.18**	**0.12**	**2.46**
58.	***Schoenoplectiella articulata*** (L.) Lye	Cyperaceae	**02**	**0.02**	**1.00**	**0.19**	**0.14**	**0.01**	**0.34**
59.	***Sida acuta*** Burm.f.	Malvaceae	**06**	**0.08**	**0.75**	**0.58**	**0.59**	**0.05**	**1.22**
60.	***Sida cordata*** (Burm.f.) Borss.Waalk	Malvaceae	**06**	**0.10**	**1.66**	**0.58**	**0.74**	**0.04**	**1.36**
61.	***Sphaeranthus indicus*** Kurz	Asteraceae	**06**	**0.12**	**2.00**	**0.58**	**0.88**	**0.19**	**1.65**
62.	***Torenia crustacean*** (L.)Cham.&Schltdl.	Linderniaceae	**12**	**0.26**	**2.16**	**1.16**	**1.92**	**0.04**	**3.12**
63.	***Urena lobata*** (L.)	Malvaceae	**08**	**0.08**	**1.00**	**0.38**	**0.59**	**0.08**	**1.05**
64.	***Vigna trilobata*** (L.) Verdc	Fabaceae	**24**	**0.32**	**1.33**	**2.33**	**2.37**	**0.60**	**5.30**
65.	***Xanthium strumarium*** L.	Asteraceae	**04**	**0.04**	**1.00**	**0.38**	**0.29**	**0.01**	**0.68**

Where F= Frequency, D = Density, A = Abundance, RF = Relative Frequency, RD = Relative Density, RDom = Relative Dominance, IVI = Importance Value Index

Table - 3.Top 10 dominant weed species in Rice crop fields of study site.

S.No.	Scientific Name of Weed Plant	Family	Importance Value Index
1.	***Echinochloa colona*** (L.)Link	Poaceae	**28.71**
2.	***Cyperus iria*** L.	Cyperaceae	**24.84**
3.	***Paspalum scrobiculatum*** L.	Poaceae	**23.85**
4.	***Cyperus difformis*** L.	Cyperaceae	**21.13**
5.	***Alternanthera tenella*** Colla	Amranthaceae	**15.02**
6.	***Fimbristylis miliacea*** (L.) Vahl	Cyperaceae	**13.02**
7.	***Ischaemum rugosum*** Salisb	Poaceae	**10.39**
8.	***Cynodon dactylon*** (L.) Pers.	Poaceae	**09.95**
9.	***Ammannia baccifera*** L.	Lythraceae	**08.41**
10.	***Ludwigia perennis*** Burm.f.	Onagraceae	**07.66**

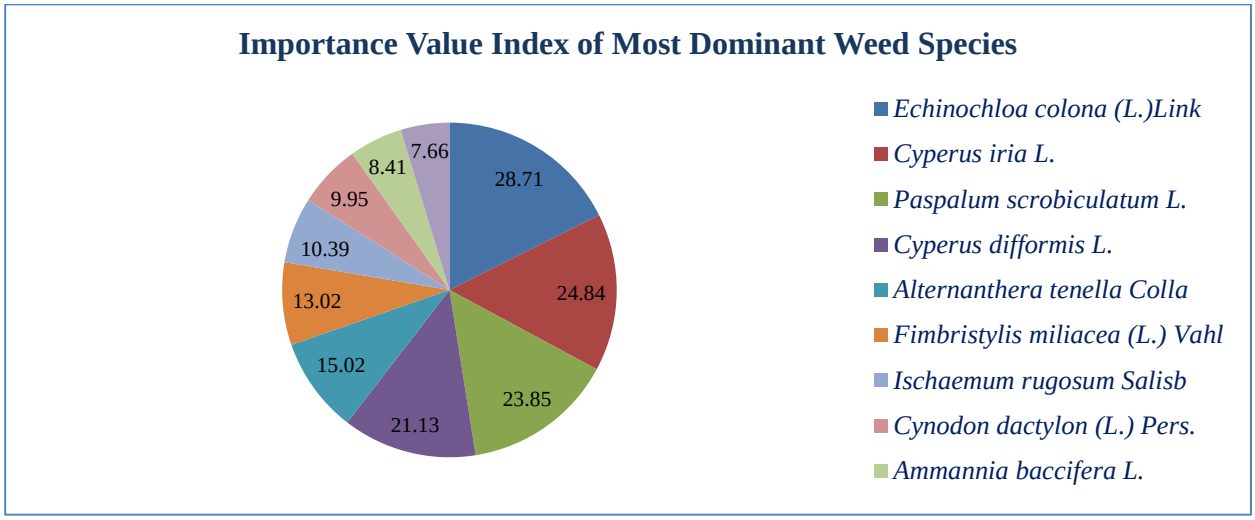

Figure -2. Represents top 10 Dominant weed species on the basis of Importance Value Index

The findings are in agreement with Dubey (1986), Sharma (2009).They have reported *Echinochloa colona* (L.)Link and *Paspalum scrobiculatum* L and *Cyperus iria* L., *Cyperus flavidus* Retz. and *Echinochloa colona* (L.)Link respectively in the Rice field of Bodari and Chichirda in Bilaspur Chhattisgarh and Western Chhattisgarh. Sinha (2017) at Koria district Chhattisgarh also found *Cyperus iria* L.,and *Echinochloa colona* (L.) Link as dominant weeds of rice crop. Pragada and Mulliboyana (2010) recorded *Wolffia globosa* (Roxb.) Hartog & Plas and *Echinochloa crus-galli* (L.)P.Beauv. as most adundant weeds at North Costal Andhra Pradesh. Duary *et al.*, (2015) at the Red and Lateritic belt of West Bengal reported *Ludwigia parviflora* Roxb. and *Eclipta alba* (L.)Hassk. as major weeds in rice crop.

IV. CONCLUSION

According to the result obtained, it is concluded that the weed flora in the study area species of the Cyperaceae and Poaceae families reflect the most dominating situation. The most dominant species are *Echinochloa colona* (L.)Link and, *Cyperus difformis* L. and *Fimbristylis miliacea* (L.) Vahl, *Alternanthera tenella* Colla, *Cyperus iria* L.This knowledge may prove in designing weed management program. Various other aspects may also be explained in the near future.

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