ISSN: 0975-833X

Available online at http://www.journalcra.com

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

International Journal of Current Research
Vol. 7, pp.001-004, August, 2010

RESEARCH ARTICLE

PHYTOSOCIOLOGICAL ATTRIBUTES OF WEEDS IN RICE FIELDS OF NORTH COSTAL ANDHRA PRADESH, INDIA

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ARTICLE INFO

Article History:
Received 17th May, 2010
Received in revised form
25th May, 2010
Accepted 24th June, 2010
Published online 4th August, 2010

Key words:
Phytosociological, weeds,
Rice field, North Coastal

ABSTRACT

Weed-crop competition is critical in obtaining crop yields because of greater competition ability of weeds than the crops. Weeds deplete large quantities of mineral nutrients and moisture more efficiently than the crop plants and thrive better over the crops in drought conditions. They shade the crop seedlings and occupy space where crop plants should grow their roots. Weeds have higher contents of nutrients than crop plants; they grow faster and absorb nutrients more efficiently and thus limiting the availability of the same to crop plants. Besides, the weeds inflict allelopathic effects on crop plants which are large through their depressive root exudates. The Important Value Index calculated for the individual weed species encountered in the rice crop fields revealed interesting results. The analysis on the frequency classes of weed species encountered in rice crop field revealed interesting results. A total of 65 weed species (29 dicots, 36 monocots) were recorded from 60 quadrates combining three field sites. Out of 65 species: A class is represented by 40 species followed by 20 under B, 2 under C and 3 under D, no single species under E this results showing the heterogeneity of weed vegetation.

INTRODUCTION

A weed is an unwanted plant growth in a place where some other plants are also growing or no other plant has to grown at all. The plants growing in a wrong place i.e. in agriculture fields are often referred to as weeds. The unwanted plants which are growing in crop fields and competing along with the crop plants and has a short vegetation phase with high reproductive potential. Weed is a plant which we do not want it (Salisbury, 1961). According to(Muzik 1970), weed is a plant out of place or an undesirable plant or a plant with negative value or plant which compete with main crop for soil. (Barboer *et al* 1999) defined weed as a non native invasive plant. There are many weeds in India, some of which grow widely in crop fields and were not known until recent years. Some of the Indian weeds have managed to reach distant countries, where they were unknown; similarly exotic weeds have crept into Indian soils. Weeds are genetically labile and phenotypically plastic; such characters enable them to pass through successfully in adverse habitats they easily invade crop fields which are favourite grounds for their quick growth.

An ecological survey of weed flora is a must for a comprehensive idea of weed problem. Understanding the sociological structure of weeds in crop fields is a prerequisite for its effective management. Identification and quantification of weed species present in different crop cultures and cropping systems is possible to provide strategies for weed control methods in important crops that can be adapted by marginal farmers. Since not all the weed species are important to determine the nature of weed communities, it will be desirable to know the quantitative characters like density, frequency and Important Value Index of all individual species.

The North Coastal Andhra Pradesh is situated between $17^0\ 10^1$ to $19^0\ 10^1$ N latitudes and 81^053^1 to $84^0\ 50^1$ E longitudes. It is bounded on the north by Orissa state, on the South by East Godavari district, on the eastern part bordering with Bay of Bengal and on the West by East Godavari district and part of Orissa. North Coastal Andhra Pradesh comprising three districts of Srikakulam, Vizianagaram and Visakhapatnam. The irrigated and rain fed areas of North Coastal Andhra Pradesh is a total area of about 85,2700 hectares is under cultivation from the total geographical area of 23,48,612 hectares of the three districts.

The major river systems are Vamsadhara, Nagavalli, Janjavathi, Champavathi,Vegavathi, Vattigadda, Gosthani, Sarada, Varaha and Thandava. Except a few reports on crop weeds, their distribution pattern and ecological status were published in the district floras and no authentic or comprehensive study on the weed species of North Coastal Andhra Pradesh has been taken up so far. Further no detailed floristic and phytosociological studies on the weeds in crop fields of these region have been worked out.

MATERIAL AND METHODS

Rice (*Oryza sativa*) is significant, irrigated crop in North Coastal Andhra Pradesh both in terms of acreage as well as productivity. Hence phytosociological studies were

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conducted in rice crop field. Rice is the most dominant crop of this area, the variety 'Srikakulam sannalu' (RGL 2537) crop duration of 150-165 days (Srikakulam district), was selected for the phytosociological investigations. The studies were conducted before weeding during Kharif season (June-October).

Three crop dominant mandals were selected for the phytosociological studies. The location of field sites and period of study of rice crop is as follows:

Crop/Period of study	Field site-1	Field site-2	Field site -3
Rice crop (2007)	Palakonda (Mandal)	Narasannapeta (Mandal)	Nandigam (Mandal)

All the weeds encountered in the field sites of the above crop field was carefully collected and identified. Random quadrate method was adopted for studying phytosociological attributes of weeds. In field site, 20 quadrates of 100 cm^2 were laid down and hence a sum of 60 quadrates. All the weeds from each quadrate were collected separately in polythene bags. All the plant species encountered in 60 quadrates were listed.

The phytosociological attributes: abundance, density and frequency and their relative values and Importance Value Index (IVI) were calculated the following principles of (Curtis and Mclntosh,1950, Misra, 1968, and Mueller-Dombois and Ellenberg, 1974).

$$\text{Frequency (\%)} = \frac{\text{Total number of quadrates in which the species occur}}{\text{Total number of quadrates studied}} \text{X } 100$$

$$\text{Density} = \frac{\text{Total number of individuals of a species in all quadrates}}{\text{Total number of quadrates studied}}$$

$$\text{Abundance} = \frac{\text{Total number of individuals of a species in all quadrates}}{\text{Total number of quadrates in which the species occurred}}$$

$$\text{Relative frequency} = \frac{\text{Frequency of individuals of a species}}{\text{Total frequency of all species}} \text{X } 100$$

$$\text{Relative density} = \frac{\text{Density of individuals of a species}}{\text{Total density of all species}} \text{X } 100$$

$$\text{Relative abundance} = \frac{\text{Abundance of individuals of a species}}{\text{Total abundance of all species}} \text{X } 100$$

Importance Value Index = Relative density + Relative frequency + Relative abundance

Based on (Raunkiaer, 1934), the frequency classes of weed species were determined. Accordingly there are 5 frequency classes, i.e. 'A' class with the species of frequency ranging from 1-20%; 'B' class 21-40%; 'C' class 41-60%; 'D' class 61-80% and 'E' class 81-100%. Further the weed community frequency patterns were compared with the normal frequency pattern of Raunkiaer (A>B>C>=D<E). Based on the frequency pattern of the community, the homogeneity and heterogeneity of the vegetation. If the values are high with respect to B, C and D, then the community is said to be heterogeneous where as higher values of E indicates the homogeneous nature.

RESULTS

Abundance, Density, Frequency and their relative values for determining the distribution pattern and Importance Value Index (IVI) of the weeds encountered in rice crop fields are provided in Table- 1**.** A total of 65 weed species (29 dicots, 36 monocots) were recorded from 60 quadrates combining three field sites. *Wolffia globosa* is most abundant weed in rice field followed by *Polygonum glabrum*, *chloris montana , Fimbristylis miliace , Aeschynomene indica* and C*oix lacrymajobi*

The Important Value Index calculated for the individual weed species encountered in the rice crop fields revealed interesting results. *Wolffia globosa* is the most important species followed by the *Echinochloa crussgalli, Cyperus rotundus, Cynodon dactylon and Dactyloctenium aegyptium.*

Frequency of weed species

The frequency classes of the weed species encountered in the study sites were analyzed. Further the frequency formula for each class also determined. The results obtained are presented in Table -2.

The analysis on the frequency classes of weed species encountered in rice crop field revealed interesting results. Out of 65 species: A class is represented by 40 species followed by 20 under B, 2 under C and 3 under D, no single species under E this results showing the heterogeneity of weed vegetation.

Table 2. Frequency Classes of Weed Species

S. No	Frequency classes	Rice crop
1	A: 01-20	40
2	B:21-40	20
3	C:41-60	2
4	D:61-80	3
5	E:81-100	-
6	Total	65

Frequency formulae

Rice crop	A>B>C<D

From the results obtained it is clearly established that most of the weed species encountered in the three crop fields fall under A, B,C and D frequency classes and hence the weed vegetation is relatively heterogeneous.

DISCUSSION

In the rice crop the IVI calculated for the individual weed species shows that *Wolffia globosa* (22.15) is with high IVI followed by *Echinochloa crus galli* (14.2), *Cyperus rotundus* (11.61)*, Cynodon dactylon*(10.84*), Dactyloctenium aegyptium* (9.93). With the quantitative analysis it shows that *Wolffia globosa* is important dominate weed in rice field, similar results were found in Rayalaseema, (Lakshmaiah, 2006) Andhra Pradesh. *Echinochloa crusgalli* is the second dominant weed this is also a equal results of Rayalaseema, (Rajeswaramma,2001). *Cyperus rotundus*, commonly called as the 'purplenut sedge', is one of the prominent weed of the present study. This weed is the native of India but has become cosmopolitan, spread over most of the tropic countries, and is treated as the world's worst weed. (Holm *et al.* 1977) It attains dominance most conspicuously on irrigated lands and become serious problem in large number of irrigated crops. It is one of the weeds that appear immediately after sowing and may compete heavily with the crop plants for nutrients and water.

Table 1: Phytosociological attributes of Rice weeds

S.No	Name of the species	TOI	TNI	A	D	F	RA	RD	RF	IVI
1	*Polygala arvensis*	15	20	1.33	0.33	25	1.45	2.31	2.1	5.86
2	*Portulaca quadrifida*	13	13	1	0.21	21.67	1.09	1.47	1.83	4.39
3	*Aeschynomene indica*	4	6	1.5	0.1	6.67	1.64	0.7	0.56	2.9
4	*Ammannia baccifera*	17	18	1.05	0.3	28.33	1.15	2.1	2.39	5.64
5	*Rotala densiflora*	16	17	1.06	0.28	26.67	1.16	1.96	2.25	5.37
6	*Ludwigia octovalvis*	8	10	1.25	0.17	13.33	1.36	1.19	1.12	3.67
7	*Ludwigia perennis*	14	16	1.14	0.27	23.33	1.24	1.89	1.97	5.1
8	*Dentella repens*	22	22	1	0.37	36.67	1.09	2.59	3.09	6.77
9	*Hedyotis corymbosa*	14	19	1.35	0.32	23.33	1.47	2.24	1.97	5.68
10	*Ageratum conyzoides*	16	18	1.12	0.3	26.67	1.22	2.1	2.25	5.57
11	*Eclipta prostrata*	24	28	1.16	0.47	40	1.27	3.29	3.37	7.93
12	*Gynura lycopersifolia*	6	8	1.33	0.13	10	1.45	0.91	0.84	3.2
13	*Xanthium strumarium*	5	6	1.2	0.1	8.33	1.31	0.7	0.7	2.71
14	*Nymphoides hydrophylla*	6	6	1	0.1	10	1.09	0.7	0.84	2.63
15	*Hydrolea zeylanica*	2	2	1	0.03	3.33	1.09	0.21	0.28	1.58
16	*Ipomoea aquatica*	5	5	1	0.08	8.33	1.09	0.56	0.7	2.35
17	*Bacopa monnieri*	28	32	1.14	0.53	46.67	1.24	3.71	3.94	8.89
18	*Limnophila indica*	3	3	1	0.05	5	1.09	0.35	0.42	1.86
19	*Limnophila rugosa*	16	18	1.12	0.3	26.67	1.22	2.1	2.25	5.57
20	*Lindernia antipoda*	15	16	1.06	0.26	25	1.16	1.82	2.1	5.08
21	*Lindernia ciliata*	8	8	1	0.13	13.33	1.09	0.91	1.12	3.12
22	*Lindernia crustacea*	11	14	1.27	0.23	18.33	1.39	1.61	1.55	4.55
23	*Hygrophila auriculata*	16	18	1.12	0.3	26.66	1.22	2.1	2.25	5.57
24	*Phyla nodiflora*	24	24	1	0.4	40	1.09	2.8	3.37	7.26
25	*Basilicum polystachyon*	8	10	1.25	0.17	13.33	1.36	1.19	1.12	3.67
26	*Polygonum barbatum*	18	24	1.33	0.4	30	1.45	2.8	2.53	6.78
27	*Polygonum glabrum*	4	9	2.25	0.15	6.67	2.46	1.05	0.56	4.07
28	*Polygonum hydropiper*	5	5	1	0.08	8.33	1.09	0.56	0.7	2.35
29	*Polygonum plebeium*	4	5	1.25	0.08	6.67	1.36	0.56	0.56	2.48
30	*Ottelia alismoides*	5	6	1.2	0.1	8.33	1.31	0.7	0.7	2.7
31	*Eichhornia crassipes*	13	13	1	0.22	21.67	1.09	1.54	1.83	4.46
32	*Monochoria hastata*	6	6	1	0.1	10	1.09	0.7	0.84	2.63
33	*Monochoria vaginalis*	4	4	1	0.07	6.67	1.09	0.49	0.56	2.14
34	*Commelina erecta*	5	6	1.2	0.1	8.33	1.31	0.7	0.7	2.7
35	*Commelina longifolia*	16	18	1.13	0.3	26.65	1.23	2.1	2.19	5.52
36	*Pistia stratiotes*	2	2	1	0.03	3.33	1.09	0.21	0.28	1.58
37	*Lemna gibba*	6	8	1.33	0.13	10	1.45	0.91	0.84	3.2
38	*Wolffia globosa*	2	33	16.5	0.55	3.33	18.02	3.85	0.28	22.15
39	*Aponogeton echinatus*	5	6	1.2	0.1	8.33	1.31	0.7	0.7	2.71
40	*Aponogeton natans*	4	4	1	0.07	6.67	1.09	0.49	0.56	2.14
41	*Cyperus difformis*	13	13	1	0.22	21.67	1.09	1.54	1.83	4.46
42	*Cyperus diffusus*	16	18	1.13	0.3	26.67	1.23	2.1	2.25	5.58
43	*Cyperus iria*	17	19	1.12	0.32	28.33	1.22	2.24	2.39	5.85
44	*Cyperus rotundus*	37	44	1.19	0.73	61.67	1.3	5.11	5.2	11.61
45	*Fimbristylis bisumbellata*	2	2	1	0.03	3.33	1.09	0.21	0.28	1.58
46	*Fimbristylis dichotoma*	6	7	1.17	0.12	10	1.28	0.84	0.84	2.96
47	*Fimbristylis miliacea*	8	12	1.5	0.2	13.33	1.64	1.4	1.12	4.16
48	*Pycreus polystachyos*	13	16	1.23	0.27	21.67	1.34	1.9	1.82	5.06
49	*Cynodon dactylon*	38	38	1	0.63	63.33	1.09	4.41	5.34	10.84
50	*Dactyloctenium aegyptium*	32	36	1.13	0.6	53.33	1.23	4.2	4.5	9.93
51	*Chloris barbata*	7	10	1.43	0.17	11.67	1.56	1.19	0.98	3.73
52	*Chloris montana*	6	11	1.83	0.18	10	2	1.26	0.84	4.1
53	*Coix lacrymajobi*	4	6	1.5	0.1	6.67	1.64	0.7	0.56	2.9
54	*Echinochloa colona*	2	2	1	0.03	3.33	1.09	0.21	0.28	1.58
55	*Echinochloa crusgalli*	42	58	1.38	0.97	70	1.51	6.79	5.9	14.2
56	*Eleusine indica*	7	8	1.14	0.13	11.67	1.24	0.91	0.98	3.13
57	*Eragrostis atrovirens*	1	1	1	0.02	1.67	1.09	0.14	0.14	1.37
58	*Eragrostis diarrhena*	4	4	1	0.07	6.67	1.09	0.49	0.56	2.14
59	*Ischaemum indicum*	5	6	1.2	0.1	8.33	1.31	0.7	0.7	2.71
60	*Ischaemum rugosum*	4	5	1.25	0.08	6.67	1.36	0.56	0.56	2.48
61	*Panicum repens*	6	7	1.17	0.12	10	1.28	0.84	0.84	2.96
62	*Paspalidium flavidum*	10	11	1.1	0.18	16.67	1.2	1.26	1.4	3.86
63	*Paspalidium punctatum*	8	10	1.25	0.17	13.33	1.36	1.19	1.14	3.67
64	*Pennisetum polystachyon*	2	2	1	0.03	3.33	1.09	0.21	0.28	1.58
65	*Marsilia quadrifolia*	6	6	1	0.1	10	1.09	0.7	0.84	2.63

TOI : Total Occurrence of Individuals; **RA** = Relative Abundance; **TNI :** Total Number of Individuals ;**RD** = Relative Density; **A** = Abundance; **D** = Density; **RF** = Relative Frequency; **IVI** = Important Value Index; **F**=Frequency

CONCLUSION

It is well known that weed competition in the food crops is one of the major causes of low productivity and therefore it become essential to protect the crop from the weed infestation. Most of the crops infested with heavy weeds during the irrigation period and due to the adequate supply of nutrients. These factors like irrigation and supply of nutrients causes enormous growth of weeds. During this period their uptake of water and nutrients will be high and competition with the crop will be expected to be high. Based on the data of the number of species in vegetative phase, it is suggested to remove all the weed flora in 30 to 60 days intervals after sowing.

Acknowledgements: Authors are thankful to the officials of agricultural department and farmers of North Coastal Andhra Pradesh.

REFERENCES

Barboer, M.J., Burks, J.H., Pitts, W.D., Gilliam ,F.S. and Schwartz, M.W. 1999.Terrestrial Plant Ecology. Benjamin Cummings, California.

Curtis, J. T., Mclntosh, R. P. 1950. The interrelationships of certain analytic and synthetic Phytosocioogical characters. Ecology 31: 434-455.

Holm, L.G., Plucknett, D.L., Pancho, J.V. and Herberger, J.P. 1977.The World's Worst Weeds. University Press of Hawai, Hawai.

Lakshmaiah, K. 2006. Agrestals of of Rayalaseema region Andhra Pradesh. Ph.D. Thisis, S.K. University, Anatapur, A.P.

Misra, R.1968. Ecology workbook. Oxford and IBH publishing company Ltd., New Delhi.

Muller- Dombois, Ellenberg, H.1974. Aims and Methods of Vegetation Ecology. John Wiley and Sons, New York.

Muzik, T.J., 1970. Weed Biology and Control. Mc Graw-Hill book Co.,New York.

Rajeswaramma, P.M. 2001. Agrestals of Nellore district, Andhra Pradesh. Ph.D. Thesis submitted to S.K. University, Anantapur

Raunkiaer, C. 1934. The Life forms of Plants and Statistical Plant Geography. Clarendon Press, Oxford

Salisbury, E. J. 1961. Weeds and Aliens. Collins New Naturalist. London.

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