

# Diversity of weed flora associated with rice crop in Kasaragod district, Kerala, South India

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Received : July, 2010; Accepted : August, 2010

## SUMMARY

The Kasaragod district is one of the major rice producing area, where crop yield is affected badly by weed flora. The present investigation provides an account of weeds of rice crops in Kasaragod district and also threw light on their economic importance. During present study, 142 plants belonging to 37 families were collected, identified and reported.

Subrahmanya Prasad, K. and Raveendran, K. (2011). Diversity of weed flora associated with rice crop in Kasaragod district, Kerala, South India. *Internat. J. Plant Sci.*, **6** (1): 49-54.

**Key words :** Rice, Weeds, Yield, Weed control

India is the second largest rice producing country in the world (Nag and Nag, 2004). Rice (*Oryza sativa* L.) production is an important part of the national economy as it can grow in a wide range of soil types, including saline, alkaline and acidic (Takahashi, 1984). Major problem in paddy fields is the weed management, which is the most critical factor affecting the crop yield. Weeds are those plants whose virtues have not yet been discovered or a plant considered undesirable, unattractive or troublesome, especially one growing where it is not wanted. Weeds become detrimental to crops by changing the pH of soil, decreasing soil nitrogen and phosphorus content, which in turn reduces straw yield by 13-38% and grain yield by 25-47% (Manandhar *et al.*, 2007). It is estimated that in Asia yield loss due to uncontrolled weed growth in direct seeded paddy fields was 45-75% and for transplanted low land paddy fields approximately 50% (Johnson, 1996). 12% of the total loss of crop yields has been attributed to the weeds alone (Ananya, 1999).

Weeds exert a direct effect on crop as they compete with them for nutrients, moisture and light. Due to high seed viability, easy dispersal of seeds, wide adaptability to extremes of climatic conditions and biotic stress, weeds show vigorous growth and high persistence (Singh *et al.*,

1999).

Kasaragod district, the northernmost district of Kerala, lies between 11<sup>0</sup>18' and 12<sup>0</sup>48' N latitudes and 74<sup>0</sup>52' and 75<sup>0</sup>26' E longitudes. Like all other areas of the country, here also weeds are one of the major threats for rice production. In this paper an attempt was made to explore the diversity and species composition of the weeds of rice crop in Kasaragod district of Kerala.

## MATERIALS AND METHODS

Extensive field trips were carried out to paddy fields which are spreaded all over the Kasaragod district, from January 2007 to December 2009. Fortnightly field observations were undertaken during the period June to February. During these field trips the weeds were collected from paddy fields and were identified using regional floras (Hooker, 1872 - 1897; Gamble and Fischer, 1915-1936; Manilal and Sivarajan, 1982; Mathew, 1984; Ramachandran and Nair, 1988; Gopalakrishna Bhat, 2003; Anilkumar *et al.*, 2005). The voucher specimens were deposited at the SSC herbaria. The village people and farmers were personally interviewed using data sheets and questionnaires. Data regarding the different weeds of rice, their properties, effects on rice yield, control measures and uses were collected. Authentic publications (Kirtikar and Basu, 1935; Anonymous, 1948-1976; Nadkarni, 1954; Chopra *et al.*, 1956; Ambasta, 1986; Jain, 1991; Sivarajan and Indira Balachandran, 1994; Warriar *et al.*, 1994) were referred to know the economic importance of these weeds.

## RESULTS AND DISCUSSION

Present study reveals that Kasaragod district was

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rich in weed flora. During present investigation a total of 142 weeds belonging to 92 genera and 37 families were documented. Poaceae, cyperaceae and scrophulariaceae were the dominant contributors with 23, 16 and 14 members, respectively. The botanical identity of these

plants, their family, local name, habit and use are given in Table 1. Critical study revealed that the dicots comprised of 26 families, 57 genera and 84 species, while monocots 11 families, 35 genera and 58 species. The relative proportion of dicot with monocot, families with genera

**Table 1 : Weed flora associated with rice crop in Kasaragod district**

Sr. No.	Botanical name	Family	Local name	Habit	Use
1.	<i>Acrocephalus hispidus</i> (L.) Nicols. & Sivadasan	Lamiaceae	-	Erect herb	-
2.	<i>Aeschynomene indica</i> L.	Papilionaceae	-	Erect herb	F
3.	<i>Ageratum conyzoides</i> L.	Asteraceae	<i>Kadutulasi</i>	Erect herb	M
4.	<i>Alternanthera sessilis</i> (L.) R. Br. ex DC.	Amaranthaceae	<i>Honagane</i>	Diffuse herb	M, V
5.	<i>Amischophacelus axillaris</i> (L.) R. Rao & Kamm.	Commelinaceae	-	Diffuse herb	-
6.	<i>Axonopus compressus</i> (Swartz.) P. Beauv.	Poaceae	-	Perennial grass	-
7.	<i>Bergia aestivosa</i> W. & A.	Elatinaceae	-	Succulent herb	-
8.	<i>Bergia capensis</i> L.	Elatinaceae	-	Succulent herb	-
9.	<i>Biophytum reinwardtii</i> (Zuct.) Klotz.	Oxalidaceae	<i>Mukkutti</i>	Erect herb	M, V
10.	<i>Blumea mollis</i> (D. Don.) Merr.	Asteraceae	-	Erect herb	-
11.	<i>Blumea oxydonta</i> DC.	Asteraceae	-	Prostrate herb	-
12.	<i>Blumea virens</i> Wall. ex DC.	Asteraceae	-	Erect herb	-
13.	<i>Blyxa aubertii</i> Rich. var. <i>echinosperma</i> (Clarke.) Cook. & Luond.	Hydrocharitaceae	-	Submerged herb	-
14.	<i>Blyxa octandra</i> (Roxb.) Planch. ex Thw.	Hydrocharitaceae	-	Submerged herb	-
15.	<i>Brachiaria miliiformis</i> (Presl.) A. Chase	Poaceae	-	Perennial grass	-
16.	<i>Centella asiatica</i> (L.) Urban	Apiaceae	<i>Ondelaga</i>	Prostrate herb	M, V
17.	<i>Coldenia procumbens</i> L.	Boraginaceae	<i>Tripadi</i>	Spreading herb	M
18.	<i>Commelina benghalensis</i> L.	Commelinaceae	<i>Neerukaddi</i>	Diffuse herb	M, V
19.	<i>Commelina diffusa</i> Burm. f.	Commelinaceae	-	Diffuse herb	M
20.	<i>Cressa cretica</i> L.	Convolvulaceae	-	Small shrub	-
21.	<i>Curculigo orchioides</i> Gaertn.	Hypoxidaceae	<i>Nelappane</i>	Herb	M
22.	<i>Curcuma oligantha</i> Trimen.	Zingiberaceae	<i>Kadukuve</i>	Small herb	M
23.	<i>Cyanotis cristata</i> (L.) D. Don.	Commelinaceae	-	Diffuse herb	-
24.	<i>Cyathula prostrata</i> (L.) Blume.	Amaranthaceae	<i>Kempu uttarane</i>	Prostrate herb	M
25.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	<i>Garika</i>	Creeping grass	M
26.	<i>Cyperus compressus</i> L.	Cyperaceae	-	Tufted grass	-
27.	<i>Cyperus difformis</i> L.	Cyperaceae	-	Tufted grass	-
28.	<i>Cyperus halpan</i> ssp. <i>halpan</i> L.	Cyperaceae	-	Perennial grass	-
29.	<i>Cyperus iria</i> L.	Cyperaceae	-	Tufted grass	-
30.	<i>Cyperus tenuispica</i> Steud.	Cyperaceae	-	Tufted grass	-
31.	<i>Demodium heterophyllum</i> (Willd.) DC.	Papilionaceae	-	Trailing herb	-
32.	<i>Desmodium triflorum</i> (L.) DC.	Papilionaceae	<i>Nelapparande</i>	Trailing herb	M
33.	<i>Digitaria bicornis</i> (Lamk.) Roem. & Schult.) Veldkamp.	Poaceae	-	Annual grass	-
34.	<i>Digitaria longiflora</i> (Retz.) Pers.	Poaceae	-	Annual grass	-
35.	<i>Dipteracanthus prostratus</i> (Poir.) Nees.	Acanthaceae	-	Diffuse herb	-
36.	<i>Dopatrium junceum</i> (Roxb.) Buch. Ham. ex Benth.	Scrophulariaceae	-	Erect herb	-
37.	<i>Dopatrium junceum</i> var. <i>lobelioides</i> Benth.	Scrophulariaceae	-	Erect herb	-
38.	<i>Echinochloa colona</i> (L.) Link.	Poaceae	-	Annual grass	-
39.	<i>Echinochloa crusgalli</i> (L.) P. Beauv.	Poaceae	-	Annual grass	-
40.	<i>Eclipta prostrata</i> (L.) L.	Asteraceae	<i>Garga</i>	Erect herb	M

Contd.... Table 1

Table 2 contd.....

41.	<i>Elatine ambigua</i> W.	Elatinaceae	-	Submerged herb	-
42.	<i>Elatine triandra</i> W. & A.	Elatinaceae	-	Submerged herb	-
43.	<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	<i>Ilikivi</i>	Slender herb	M
44.	<i>Epaltes divaricata</i> (L.) Cass.	Asteraceae	-	Annual Herb	-
45.	<i>Eragrostis uniloides</i> (Retz.) Nees ex Steud	Poaceae	-	Annual grass	-
46.	<i>Eriocaulon cinereum</i> R. Br.	Eriocaulaceae	-	Acaulescent herb	-
47.	<i>Eriocaulon cuspidatum</i> Dalz.	Eriocaulaceae	-	Acaulescent herb	-
48.	<i>Eriocaulon sexangulare</i> L.	Eriocaulaceae	-	Acaulescent herb	-
49.	<i>Eriocaulon truncatum</i> Buch. Ham. ex Mart.	Eriocaulaceae	-	Acaulescent herb	-
50.	<i>Eriochloa procera</i> (Retz.) C.E. Hubb.	Poaceae	-	Perennial grass	-
51.	<i>Euphorbia hirta</i> L.	Euphorbiaceae	<i>Halukodi</i>	Procumbent herb	M
52.	<i>Euphorbia thymifolia</i> L.	Euphorbiaceae	<i>Kempukodi</i>	Prostrate herb	M
53.	<i>Eusteralis deccanensis</i> Panigrahi	Lamiaceae	-	Procumbent herb	-
54.	<i>Fimbristylis aestivalis</i> (Retz.) Vahl.	Cyperaceae	-	Tufted annual	-
55.	<i>Fimbristylis littoralis</i> Gaudich.	Cyperaceae	-	Tufted annual	-
56.	<i>Fuirena ciliaris</i> (L.) Roxb.	Cyperaceae	-	Erect annual	-
57.	<i>Geissaspis cristata</i> Wight & Arn.	Papilionaceae	<i>Kuduhullu</i>	Diffuse herb	F
58.	<i>Grangea maderaspatana</i> (L.) Poir.	Asteraceae	-	Prostrate herb	-
59.	<i>Hedyotis auricularia</i> L.	Rubiaceae	<i>Nela nekkare</i>	Trailing herb	M
60.	<i>Hedyotis brachypoda</i> (DC.) Sivar. & Biju	Rubiaceae	-	Diffuse herb	-
61.	<i>Hedyotis corymbosa</i> (L.) Lam.	Rubiaceae	<i>Parpataka</i>	Annual herb	M
62.	<i>Heliotropium indicum</i> L.	Boraginaceae	<i>Chelkondi</i>	Erect herb	M
63.	<i>Heliotropium scabrum</i> Retz.	Boraginaceae	-	Procumbent herb	-
64.	<i>Impatiens minor</i> (DC.) Bennet	Balsaminaceae	<i>Sone hoo</i>	Flaccid herb	M
65.	<i>Indigofera prostrata</i> Willd.	Papilionaceae	-	Diffuse herb	-
66.	<i>Isachne globosa</i> (Thunb.) O. Ktze	Poaceae	<i>Nore hullu</i>	Slender herb	-
67.	<i>Isachne miliacea</i> Roth.	Poaceae	-	Slender grass	-
68.	<i>Ischaemum indicum</i> (Houtt.) Merrill	Poaceae	-	Perennial grass	-
69.	<i>Ischaemum mangaluricum</i> (Hack.) Stapf ex Fischer	Poaceae	-	Perennial grass	-
70.	<i>Ischaemum rugosum</i> Salisb.xx	Poaceae	-	Annual grass	-
71.	<i>Justicia procumbens</i> L.	Acanthaceae	<i>Poddolu poo</i>	Diffuse herb	M
72.	<i>Justicia serpyllifolia</i> (Clarke) Gamble	Acanthaceae	-	Diffuse herb	-
73.	<i>Justicia trinervia</i> Vahl.	Acanthaceae	-	Procumbent herb	-
74.	<i>Kyllinga brevifolia</i> Rottb.	Cyperaceae	-	Perennial herb	-
75.	<i>Kyllinga nemoralis</i> (Forster) Dandey ex Hutchinson	Cyperaceae	<i>Mustha</i>	Perennial herb	M
76.	<i>Leersia hexandra</i> Sw.	Poaceae	-	Perennial grass	-
77.	<i>Lemna perpusilla</i> Torrey	Lemnaceae	<i>Neeratada gida</i>	Free floating herb	M
78.	<i>Lepidagathis fasciculata</i> (Retz.) Nees	Acanthaceae	-	Diffuse herb	-
79.	<i>Leucas biflora</i> (Vahl.) R. Br.	Lamiaceae	<i>Kiranidai</i>	Procumbent herb	M
80.	<i>Leucas indica</i> (L.) R. Br. ex Vatke.	Lamiaceae	<i>Thumbe</i>	Erect herb	M
81.	<i>Linnophila indica</i> (L.) Druce.	Scrophulariaceae	<i>Mangannari</i>	Small herb	M
82.	<i>Linnophila repens</i> (Benth.) Benth.	Scrophulariaceae	<i>Mangannari</i>	Diffuse herb	M
83.	<i>Lindernia anagallis</i> (Burm. f.) Pennell	Scrophulariaceae	-	Decumbent herb	-
84.	<i>Lindernia antipoda</i> (L.) Alston.	Scrophulariaceae	-	Decumbent herb	-
85.	<i>Lindernia ciliata</i> (Colsm.) Pennell	Scrophulariaceae	-	Erect herb	-
86.	<i>Lindernia crustacea</i> (L.) f. Muell.	Scrophulariaceae	-	Diffuse herb	-
87.	<i>Lindernia hyssopioides</i> (L.) Haines	Scrophulariaceae	<i>Krishna poo</i>	Erect herb	-
88.	<i>Lindernia pusilla</i> (Willd.) Boldingh.	Scrophulariaceae	-	Diffuse herb	-
89.	<i>Lindernia rotundifolia</i> (L.) Alston	Scrophulariaceae	-	Diffuse herb	-
90.	<i>Lipocarpha chinensis</i> (Osbeck.) Kern.	Cyperaceae	-	Tufted herb	-

Contd.... Table 2

Table 2 contd.....

91.	<i>Lobelia alsinoides</i> Lam.	Companulaceae	-	Annual sub erect herb	-
92.	<i>Ludwigia adscendens</i> (L.) Hara	Onagraceae	-	Erect herb	M
93.	<i>Ludwigia hyssopifolia</i> (G. Don.) Exell.	Onagraceae	-	Erect herb	-
94.	<i>Ludwigia perennis</i> L.	Onagraceae	-	Erect herb	-
95.	<i>Mecardonia procumbens</i> (Miller) Small	Scrophulariaceae	-	Prostrate herb	-
96.	<i>Microcarpaea minima</i> (Koenig ex Retz.) Merr.	Scrophulariaceae	-	Prostrate herb	-
97.	<i>Mimosa pudica</i> L.	Mimosaceae	<i>Muttidare muni</i>	Diffuse herb	M, F
98.	<i>Monochoria vaginalis</i> (Burm. f.) K.B. Presl.	Pontederiaceae	-	Marsh herb	-
99.	<i>Murdannia nudiflora</i> (L.) Brenan	Commelinaceae	-	Procumbent herb	-
100.	<i>Murdannia simplex</i> (Vahl.) Brenan	Commelinaceae	-	Sub erect herb	-
101.	<i>Najas graminea</i> Del.	Najadaceae	-	Submerged herb	-
102.	<i>Naregamia alata</i> Wight & Arn.	Meliaceae	<i>Nelakkanchi</i>	Erect under shrub	M
103.	<i>Nelsonia canescens</i> (Lam.) Spreng.	Acanthaceae	-	Trailing herb	-
104.	<i>Neanotis rheedii</i> (Wall ex Wight & Arn.) W.H. Lewis	Rubiaceae	-	Slender herb	-
105.	<i>Oryza rufipogon</i> Griff.	Poaceae	<i>Kaadu batha</i>	Aquatic grass	F
106.	<i>Osbeckia muralis</i> Naudin	Melastomataceae	<i>Kirunekkare</i>	Erect herb	M
107.	<i>Panicum repens</i> L.	Poaceae	-	Perennial grass	-
108.	<i>Paspalidium punctatum</i> (Burm. f.) A. Camus	Poaceae	-	Perennial grass	-
109.	<i>Paspalum conjugatum</i> Berg.	Poaceae	-	Perennial grass	-
110.	<i>Paspalum scrobiculatum</i> L.	Poaceae	-	Tufted grass	-
111.	<i>Peperomia pellucida</i> (L.) H.B. & K.	Piperaceae	<i>Neerkaddi</i>	Succulent herb	M
112.	<i>Phyllanthus amarus</i> Schum. & Thonn.	Euphorbiaceae	<i>Nelanelli</i>	Erect herb	M
113.	<i>Phyllanthus debilis</i> Klein. ex Willd.	Euphorbiaceae	<i>Nelanelli</i>	Erect herb	M
114.	<i>Phyllanthus urinaria</i> L.	Euphorbiaceae	<i>Kempu nelanelli</i>	Erect herb	M
115.	<i>Pilea microphylla</i> (L.) Liebm.	Urticaceae	-	Slender herb	-
116.	<i>Polycarpon prostratum</i> (Forsk.) Ascher. & Schweinf.	Caryophyllaceae	-	Diffuse herb	-
117.	<i>Polygonum plebeium</i> R. Br.	Polygonaceae	-	Prostrate herb	-
118.	<i>Pouzolzia zeylanica</i> (L.) Benn.	Urticaceae	-	Erect herb	-
119.	<i>Pycneus macrostachyos</i> (Lam.) J Raynal	Cyperaceae	-	Perennial herb	-
120.	<i>Pycneus polystachyos</i> (Rottb.) P. Beauv.	Cyperaceae	-	Perennial herb	-
121.	<i>Pycneus pumilus</i> (L.) Nees.	Cyperaceae	-	Tufted herb	-
122.	<i>Rotala indica</i> (Willd.) Koehne	Lythraceae	-	Much branched herb	-
123.	<i>Rotala rosea</i> (Poir.) Cooke	Lythraceae	-	Slender herb	-
124.	<i>Rotala rotundifolia</i> (Roxb.) Koehne	Lythraceae	-	Slender herb	-
125.	<i>Rottboellia cochinchinensis</i> (Lour.) Clayton	Poaceae	-	Annual grass	-
126.	<i>Rungia pectinata</i> (L.) Nees	Acanthaceae	-	Diffuse herb	-
127.	<i>Sacciolepis indica</i> (L.) A. Chase	Poaceae	-	Slender grass	-
128.	<i>Sacciolepis interrupta</i> (Willd.) Stapf.	Poaceae	<i>Ote hullu</i>	Perennial grass	F
129.	<i>Schoenoplectus juncooides</i> (Roxb.) Palla	Cyperaceae	-	Tufted annual	-
130.	<i>Schoenoplectus lateriflorus</i> (Gmel.) Lye.	Cyperaceae	-	Tufted annual	-
131.	<i>Scoparia dulcis</i> L.	Scrophulariaceae	<i>Kallurukki</i>	Erect herb	M
132.	<i>Smithia conferta</i> Smith.	Papilionaceae	-	Diffuse herb	F
133.	<i>Spermacoce mauritiana</i> O. Gideon	Rubiaceae	-	Diffuse herb	F
134.	<i>Spermacoce pusilla</i> Wall.	Rubiaceae	-	Erect herb	-
135.	<i>Sphaeranthus indicus</i> L.	Asteraceae	<i>Gadde karande</i>	Erect herb	M
136.	<i>Sphenoclea zeylanica</i> Gaertn.	Sphenocleaceae	-	Erect herb	-
137.	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	<i>Kaadu tulasi</i>	Erect herb	M, F
138.	<i>Utricularia reticulata</i> Smith.	Lentibulariaceae	-	Erect herb	-
139.	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	<i>Sahadevi</i>	Erect herb	M
140.	<i>Xyris indica</i> L.	Xyridaceae	-	Annual herb	-
141.	<i>Xyris pauciflora</i> Willd.	Xyridaceae	-	Slender herb	-
142.	<i>Zornia gibbosa</i> Span.	Papilionaceae	<i>Murikootti</i>	Diffuse herb	M

Where 'M' – medicinal, 'F' – fodder and 'V' – vegetable.

**Table 2 : The relative proportion of dicot with monocot, families with genera and species**

Division	Family	%	Genera	%	Species	%
Dicot	26	70.27	57	61.96	84	39.15
Monocots	11	29.73	35	38.04	58	40.85
Total	37		92		142	
Ratio	2.35:1		1.63:1		1.44:1	

and species, respectively are shown in Table 2. The ratio of dicot to monocot was 2.35:1 (family) 1.63:1 (genera) and 1.44:1 (species). Critical review of literature made it clear that out of 142 plants, 40 were medicinally important, while 8 were used as fodder resources and four as leafy vegetables.

In earlier studies by McIntyne *et al.* (1991) they reported *Echinochloa crusgalli* (L.) P. Beauv. and *Cyperus difformis* L. as main weeds of rice crops. *Echinochloa crusgalli* (L.) P. Beauv. is such a devastating weed that it has been listed among the worlds ten worst weeds (Kendig *et al.*, 2003). Cyperaceae members are regarded as worst weed for the rice crops because of their moisture loving and alkalinity tolerant nature (Kumar *et al.*, 2008). Studies by Singh *et al.* (1999) on weeds of rice crops of Doon valley revealed *Lindernia anagallis* (Burm. f.) Pennell, *Lindernia crustacea* (L.) f. Muell., *Cyperus iria* L., *Echinochloa colona* (L.) Link., *Echinochloa crusgalli* (L.) P. Beauv. and *Fimbristylis miliacea* Vahl. as dominant weeds.

### Conclusion:

Present study aimed at the elucidation of diversity of weed species of rice fields of Kasaragod district, documented a total of 142 weeds. Most of the weeds belonged to the families poaceae, cyperaceae and scrophulariaceae. During the study it was recognized that in addition to universal weeds *Cyperus iria* L. and *Echinochloa colona* (L.) Link., *Cyperus halpan* ssp.

*halpan* L., *Isachne globosa* (Thunb.) O. Kuntze, *Sacciolepis interrupta* (Willd.) Stapf., *Ludwigia hyssopifolia* (G. Don.) Exell were the other serious weeds of this region. This much diversity of weed species, makes it necessary to have a thought on the control measures. Hand weeding is the most common and effective method but at present very hard to execute due to shortage of labourers and similarity of some weeds to paddy in young stages. Mechanical and chemical weed control methods are easy to perform and popular having identified problems of environmental resistance, pest resurgence and detrimental effect on non-target organisms. Weed control can be achieved through the usage of clean and pure seeds for sowing, proper ploughing and field preparation, keeping the field surroundings clean and neat, controlled and calculated water, fertilizer application.

Most of these species are economically important, as many of them are used medicinally, as food and as fodder resources. This makes it necessary to manage these weeds properly, so that they can be utilized elsewhere through proper conservation.

### Acknowledgement:

The authors are grateful to the paddy farmers and village people of Kasaragod district for their full co-operation during the field visit. They are also indebted to the Principal and Management, Sir Syed College, Taliparamba for providing facilities. The first author is thankful to the KSCSTE for financial assistance.

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