J Krishi Vigyan 2023, 11 (Supple) : 96-100 DOI : 10.5958/2349-4433.2023.00093.4

Habitat Analysis of Bood Grass (*Isahcne miliacea* Roth ex Roemet Schult) under Major Wet Land Rice Agro Ecological Units of Kerala

Renjan B*, Sansamma George, Bindu B and Anis Joseph R
Farming Systems Research Station, Sadanandapuram
Kerala Agricultural University, Kollam, Kerala PIN 691 531

ABSTRACT

Blood grass (*Isahcne miliacea* Roth ex Roemet Schult) belongs to the family *Poaceae* is most dominant perennial weed species in the rice under cultivated and fallow situations. Habitat analysis of a weed species shows the interrelationship between the growth characters and adaptive mechanism that enable weeds to survive the changes in environment. Blood grass is one of the most dominant weed species in the wet land rice fields of Kerala with a relative density as high as 65 per cent during both first and second crop seasons as well as under both cultivated and fallow situations. Water and soil samples were collected and analyzed and correlated with dry weight of blood grass collected from the same spots to assess the habitat affinity of the weed. The sites selected from four major wet land rice agro ecological units of Kerala. Blood grass co- existed with rice crop, rice fallows, field bunds and irrigation channels but the growth was poor under deep flooded field conditions. The infested sites in general were acidic wherein the pH between from 4.2 to 5.9. Dry weight of blood grass had significant positive correlation with soil organic carbon in all agro ecological units. The dry weight of blood grass samples collected from the agro – ecological units varied between 90.8 g $m^{-2}$to 659.3 g m^{-2}. The available nitrogen, available phosphorus, available potassium in water recorded significant positive correlation while water level recorded significant negative correlation with the weed biomass production. The negative correlation with EC indicated that the blood grass growth was poor in saline soils.

Key Words: Blood grass, *Isahene,* habitat analysis, soil parameters, water parameters.

INTRODUCTION

Habitat analysis of a weed species shows the interrelationship between the growth characters and adaptive mechanism that enable weeds to survive the changes in environment. Kamoshita *et al* (2014) observed that even though more than 1800 plant species have been recorded in paddy fields in the world; most of the research studies are concentrated on about 50 species. This was probably because these species have managed to dominate in diverse environments and regional conditions and special selection pressure have led to local weed differentiations (Kraehmer *et al*, 2016). Blood grass is one of the most dominant weed species in the rice fields of Kerala and as per the reports of Babu *et al* (2014) this wetland weed dominates the weed spectrum with a relative density as high as 65 per cent during both first and second crop seasons as well as under both cultivated and fallow situations.

Patzelt (2015) observed that *Isachne globosa* was a widespread and very variable species and the typical form from Japan, had spikelets with the florets only slightly dissimilar, nearly equal in length and texture and the upper floret rounded on the back without a central groove. Ehrenfeld (2003) has observed that weed species which are of significance are those which utilise the opportunities

Corresponding Author's Email: renjan.b@kau.in

provided by the wetlands to establish themselves. Hence, in the present study an attempt was made to assess the habitat affinity of blood grass so as to find out the field characteristics which made these areas especially vulnerable to its infestation.

MATERIALS AND METHODS

Water and soil samples were collected and analyzed and correlated with dry weight of blood grass collected from the same spots to assess the habitat affinity of the weed. The sites selected from major wet land rice agro ecological units of Kerala which included Agro-Ecological Unit: 10 (North central laterite), Agro-Ecological Unit: 4 (Kuttanad), Agro-Ecological Unit: 9 (South central laterite) and Agro-Ecological Unit: 8 (Southern laterite). 20 samples from each AEU were collected randomly from the blood grass infested wetlands. Weed dry weight of blood grass was recorded by placing a quadrate of size 0.5 m x 0.5 m randomly at two sites in each sampling area. The weeds in the quadrate were uprooted, sundried, then oven dried at 70 +/- 5^0C until constant weight was attained and the weight was recorded in g m^{-2}. The soil samples collected from each of the infested sites were powdered and the required quantity was measured and used for analysis. The soil organic carbon was estimated using chromic acid wet digestion method. Soil samples were analyzed for pH and electrical conductivity (EC) by glass electrode method and conductivity metre respectively and EC values were expressed in dS m^{-1}. Available nitrogen was determined by alkaline potassium permanganate method and available P and K were determined by the Bray colorimetric and ammonium acetate method respectively. The water level in the infested fields was measured using graduated scale and recorded in cm.

RESULTS AND DISCUSSION

Soil Parameters influence habitat of blood grass tables (2a, 2b)

The results indicated that blood grass flourished under a wide range of field conditions. In general the infested wetland soils were acidic wherein the pH values ranged from 4.2 to 5.9. Between the four agro – ecological units, AEU: 4 (Kuttanad) was more acidic (pH 4.2–5) while both AEU 9 (South Central laterite) and AEU 8 (Southern laterite) recorded pH range of 5.2-5.9. The EC of the different AEUs was between 0.11 to 1.80. The highest EC was recorded in AEU: 4 (1.10 to 1.80 dS m^{-1}) and the lowest was in AEU : 10(0.11 to 0.26). The dry weight of blood

Table 1. Correlation between plant dry weight *Vs* soil and water characteristics – Agro ecological unit wise.

Parameters	Correlation coefficient							
	Soil characteristics				water characteristics			
AEU Number	**10**	**4**	**9**	**8**	**10**	**4**	**9**	**8**
pH	0.056	0.077	-0.163	-0.230	-0.085	-0.147	0.262	-0.594*
EC (dS m^{-1})	-0.572*	-0.408	-0.371	-0.036	-0.570*	-0.103	-0.409	-0.594*
Organic carbon (%)	0.591*	0.603*	0.721*	0.669*	0.297	-0.060	0.377	0.708*
Available N (kg ha^{-1})	0.205	0.056	0.543*	0.487*	0.312	0.130	0.523*	0.545*
Available P (kg ha^{-1})	0.129	0.134	0.338	0.585*	0.308	-0.011	0.685*	0.573*
Available K (kg ha^{-1})	-0.218	-0.545*	0.379	0.147	0.458*	-0.231	0.827*	0.459*
Water level (cm)	-	-	-	-	-0.868*	-0.735*	-0.928*	-0.707*

*Significant at the 0.05 level #sample size : 20 from each AEU
AEU 10: North central laterite, AEU 4: Kuttanad,
AEU 9: South central laterite, AEU 8: Southern laterite

Table 2a. Characteristics of blood grass infested soil – Agro ecological unit wise *

Agro Ecological Unit	pH			EC (dS m^{-1})			Organic carbon (%)		
	Range	Average	S Em (+/-)	Range	Average	S Em (+/-)	Range	Average	S Em (+/-)
AEU 10	4.9 - 5.9	5.40	0.07	0.11 - 0.26	0.18	0.01	0.8 - 1.6	1.10	0.05
AEU 4	4.2 – 5.0	4.65	0.07	1.10 – 1.80	1.39	0.04	1.1 – 1.8	1.39	0.04
AEU 9	5.2 – 5.9	5.55	0.06	0.12 – 0.37	0.22	0.01	0.8 – 1.5	1.16	16.73
AEU 8	5.2 – 5.9	5.50	0.06	0.15 – 0.48	0.30	0.12	0.8 – 1.6	0.80	0.05

grass samples collected from the agro – ecological units varied from 90.8 to 659.3. The highest dry weight (g m^{-2}) was recorded from AEU: 10 (410.1), followed by AEU: 8 (387.6), AEU: 9 (331.4) and the lowest was in AEU:4 (108.1).

Water Parameters influence habitat of blood grass tables (3a, 3b)

The range of pH and EC values of the water were 4.1 to 5.9 and 0.10 to 1.6 dS m^{-1} respectively. Between AEUs, the water pH was the lowest and EC was the highest in AEU: 4 (Kuttanad). The organic carbon content of water recorded a range between 0.10 to 0.30 per cent. The highest organic carbon, available nitrogen, phosphorus and potassium content of water were recorded by AEU: 4, AEU: 8, AEU: 4 and AEU: 9 respectively. Water level in the rice fields recorded considerable variation (1.8 to 7.8cm) between AEUs and the highest and the lowest average levels were recorded at AEU: 4 and AEU: 9 respectively.

Correlation Studies of weed dry matter and habitat analysis

During the preliminary survey conducted for selecting the locations for the investigation, it was found that blood grass co- existed with rice crop and was also present in rice fallows, field bunds and irrigation channels but the growth was poor under deep flooded field conditions. Blood grass infested sites in general were acidic wherein the pH ranged from 4.2 to 5.9. AEU: 4 (Kuttanad) was more acidic (pH between 4.2 -5.0), followed by AEU: 10(North central laterite). The EC was between 0.11 to 1.8 dS m^{-2} and here again the highest range was in AEU: 4 (0.11-1.8 dS m-1). The available nitrogen, phosphorus and potassium content of water were 6.3 to 62.7, 4.2 to 37.4, 17.3 to 53.2 kg/ha, respectively. Water level in the field also recorded considerable variation (1.8 to 7.8cm). The variation in the field condition was found reflected in the biomass production wherein dry weight ranged from 90.8 to 659.3 g m^{-2}. The highest dry weight was recorded

Table 2b. Characteristics of blood grass infested soil – Agro ecological unit wise *

Agro Ecological Unit	Available N (kg ha^{-1})			Available P (kg ha^{-1})			Available K (kg ha^{-1})		
	Range	Average	S Em (+/-)	Range	Average	S Em (+/-)	Range	Average	S Em (+/-)
AEU 10	238.3 - 376.3	311.00	8.51	14.2 -17.8	16.30	0.23	94.6 – 124.1	106.60	1.91
AEU 4	288.5 - 388.9	331.37	5.54	22.7 - 29.8	26.71	0.47	160.5 – 188.2	177.73	1.77
AEU 9	276.0 – 368.0	329.20	6.50	11.5- 21.2	15.70	0.56	129.9 – 188.2	154.20	8.11
AEU 8	276.2 – 372.4	324.30	6.41	16.9 - 28.6	22.21	0.77	159.0 – 195.2	181.10	2.10

AEU 10: North central laterite, AEU 4: Kuttanad, AEU 9: South central laterite, AEU 8: Southern laterite
*20 samples from each agro ecological unit

Table 3a.Water characteristics of blood grass infested wetlands – Agro ecological unit wise *

Agro Ecological Unit	pH			EC (dS m^{-1})			Organic carbon (%)		
	Range	Average	S Em (+/-)	Range	Average	S Em (+/-)	Range	Average	S Em (+/-)
AEU 10	4.9 – 5.8	5.27	0.05	0.10 – 0.25	0.16	0.01	0.10 – 0.18	0.13	0.01
AEU 4	4.1 – 5.1	4.55	0.07	0.90 – 1.60	1.13	0.04	0.11 – 0.23	0.16	0.01
AEU 9	4.9 – 5.9	5.50	0.06	0.11 – 0.29	0.17	0.01	0.10 – 0.30	0.13	0.01
AEU 8	4.3 - 5.9	1.60	0.09	0.11 – 0.35	0.20	0.02	0.10 – 0.19	0.14	0.01

by AEU 10 followed by AEU 8, AEU 9 and AEU 4.

The results revealed that dry weight of blood grass had significant positive correlation with soil organic carbon in all AEUs and it was of statistical significance in AEU: 10. Available soil nitrogen had significant positive correlation in AEU:8 and 9. Available phosphorus recorded significant positive correlation at AEU:8 while available potassium was found negatively correlated in AEU: 4.

Among the water characteristics, pH was found negatively correlated with plant dry weight in all except AEU: 9 and the coefficient was statistically significant in AEU: 8. In the case of EC also negative correlation was observed and the value was significant in AEU: 8 and 10. Organic carbon have significant positive correlation at AEU:8. The available nitrogen, available phosphorus, available potassium recorded significant positive correlation at AEU: 8 and 9. In all AEUs, the water level recorded significant negative correlation with the weed biomass production.

There are several reports that plant growth depends on nature of the soil, available nutrients, prevailing environmental conditions and pH (Kirmani, 2011). Correlation studies of plant dry weight with soil and water parameters of the infested sites indicated that the biomass production of blood grass had significant positive correlation with soil and water pH, organic carbon and available nitrogen while EC and available P recorded significant negative correlation. Evidently the growth of blood grass was found more vigorous in soils rich in organic carbon and available nitrogen. According to Salazar *et al* (2011) soil organic carbon is the basis of soil fertility, as it releases nutrients for plant growth, biological and physical health of soil and is a buffer against harmful substances.

CONCLUSION

Habitat analysis of a weed species shows the interrelationship between the growth characters and adaptive mechanism that enable weeds to

Table 3b.Water characteristics of blood grass infested wetlands – Agro ecological unit wise *

Agro Ecological Unit	Available N (kg/ha)			Available P (kg/ ha)			Available K (kg/ ha)		
	Range	Average	S Em (+/-)	Range	Average	S Em (+/-)	Range	Average	S Em (+/-)
AEU 10	11.5 – 62.7	31.15	3.54	9.1 – 12.6	10.30	0.23	17.3 – 30.4	22.05	0.85
AEU 4	6.3 – 62.7	34.62	3.50	23.2 – 37.4	29.10	0.09	33.5 – 42.6	39.13	0.58
AEU 9	12.5 – 45.3	33.60	2.44	4.2 – 26.2	10.40	1.57	32.4 – 53.2	39.70	1.54
AEU 8	6.3 – 49.6	43.30	34.7	10.8 – 29.2	21.60	1.32	25.2 – 47.1	41.20	1.13

AEU 10: North central laterite AEU 4: Kuttanad AEU 9: South central laterite AEU 8: Southern laterite
*20 samples from each agro ecological unit

survive the changes in environment. Blood grass co- existed with rice crop, rice fallows, field bunds and irrigation channels but the growth was poor under deep flooded field conditions. The infested sites in general were acidic wherein the pH ranged from 4.2 to 5.9. The available nitrogen, available phosphorus, available potassium in water recorded significant positive correlation while water level recorded significant negative correlation with the weed biomass production. The negative correlation with EC indicated that the blood grass growth was poor in saline soils. The blood grass dry weight and water level was significantly negative indicating the possibility for suppressing the weed through continuous flooding of the field.

REFERENCES

Babu D S, George S and Nishan M A (2014). Autecology of blood grass in wetland rice ecosystem *Indian J Weed Sci* **46**: 298-299.

Ehrenfeld J G (2003) . Effects of exotic plant invasions on soil nutrient cycling process. *Ecosyst* **6:** 503-523.

Kamoshita A, Araki Y and Nguyen Y T (2014). Weed biodiversity and rice production during the irrigation rehabilitation process in Cambodia. *Agric Ecosyst Environ* **194**: 1-6.

Kraehmer H, Jabran K, Mennan H and Chauhan B S (2016). Global distribution of rice weeds–A review. *Crop Prot* **80**: 73-86.

Patzelt A , Lansdown R V and Knees S G (2015). The status and distribution of wetland-dependent plants in the Arabian Peninsula. *The Status and Distribution of Freshwater Biodiversity in the Arabian Peninsula* p.65.

Salazar S, Sánchez L E , Alvarez J, Valverde A, Galindo P, Igual J M , Peix A and Santa-Regina I (2011). Correlation among soil enzyme activities under different forest system management practices. *Ecol Eng* **37** (8): 1123-1131.

Received on 31/7/2023 *Accepted on 18/10/2023*