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Impact of weather variables on weed infestation in wet season rice in West Bengal

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ABSTRACT

As Indian population has been hiking annually 1.2%, while the average growth rate of total food grain production is nearby 0.8%. So the only option to us is to produce more and more food for people. A number of factors have the responsibility for reducing the yield of crop like insect – pests, diseases and weeds. The average yield reduction from weeds in India ranges 12-78 % : in transplanted rice 30-40 % and in drilled rice it is 70-80%. So, to study the impact of weather variables on population and growth behavior of weeds in rice during rainy season an attempt was made in Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal , India during 2005 and 2006 with nine treatments replicated thrice. All the weed management practices significantly decreased the number of grasses, sedges and broad leaf weed over the treatment of un-weeded control. At 30 DAT hand weeding at 20 DAT + oxadiargyl@.01 kg ha^{-1} treatment recorded the lowest number of all sorts of weeds. At harvest the lowest density of weeds was observed in hand weeding at 20 and 40 DAT. The weed population was monitored during July – September in both the years. The distribution and intensity of rainfall from June to October was highly favourable for weed development and dissemination rather than total rainfall .It was noted that temperature and humidity had also played significant role for maintaining weed population dynamics.

Key words : Distribution , rainfall, rice, weed population

As Indian population has been hiking annually 1.2%, while the average growth rate of total food grain production is nearby 0.8%, so the only option to us is to produce more and more food for people. A number of factors can limit the yield of crop like insect–pests, diseases and weeds. The average yield reduction from weeds in India ranges 12-78 % ; in transplanted rice 30-40 % and in drilled rice it is 70-80%.Populations of short-lived plant species often vary greatly in number between years (Symonides *et al.*, 1986; Firbank, 1993; Hobbs and Mooney, 1995; O'Connor and Roux, 1995; Guo and Brown,1996; Geisselbrecht *et al.*, 1997). Inter annual variability in the occurrence of weed species and in the total biomass of weeds makes predictions about the weed community adversely impacts the ability to make weed management decisions. Although the importance of inter annual weed variability is well known to farmers and scientists, we are not aware of any case in which weed community variability has been quantified. The individual weed species has been studied in detail over longer period of time (Wilson and Brain, 1991). A better understanding of the magnitude of inter annual variation and of the main factors involved in causing it might help to forecast the need for weed control.

MATERIALS AND METHODS

A field experiment was conducted during wet season (*kharif*) of 2005 and 2006 to study the efficacy of different weed management practices and population density of various weed species in rice influenced by weather variables at New Alluvial Zone of West Bengal. It was carried out at 'C' Block farm of BCKV, Kalyani, Nadia, West Bengal. The experimental site was situated at $22^0 5'$ N latitude and 89^0 E longitude with an altiude of 9.75 meters above the mean sea level and topographically the land was medium in slope. The experiment was laid out in Randomized Block Design (RBD) with 9 treatments replicated thrice having plot area of 5 × 4 m^2. The treatment details were T_1 = Un-weeded control, T_2 = Hand weeding at 20 DAT , T_3 = Hand weeding at 20 DAT and 40 DAT,T_4 = Butachlor @ 1.5 kg ha^{-1} at 4 DAT, T_5= Pendimethalin @1.5 kg ha^{-1} at 4 DAT, T_6= Oxadiargyl @0.1kg ha^{-1} at 4DAT, T_7 = Butachlor @ 1.5 kg ha^{-1} at 4 DAT+ Hand weeding at 20 DAT , T_8= Pendimethalin @1.5 kg ha^{-1} at 4 DAT+ Hand weeding at 20 DAT, T_9 = Oxadiargyl @0.1kg ha^{-1} at 4DAT+ Hand weeding at 20 DAT.

Furthermore, we wanted to relate population density of weeds to rainfall, temperature and humidity. Finally, we wanted to determine how weed species composition varied with regional weather. Data on population of weed species were collected from unsprayed control plots .Experiments conducted to evaluate new herbicides along with various management schedules against dicotyledonous weeds also. The specific objectives are to identify how the weed community was related to weather variables and to analyze the efficacy of different weed management practices during *kharif* season.

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Table 1: Meteorological observations during the course of investigation (January, 2005 to October, 2006)

Months	Temperature (^{0}C)				Total Rainfall (mm)		Relative humidity (%)		
	Max.	LTA	Min.	LTA	Rainfall	LTA	Max.	Min.	LTA
2005									
Jan	24.9	25.4	12.0	9.9	20.2	7.6	98.7	55.1	54.5
Feb	30.3	27.4	16.1	13.2	1.20	7.9	95.4	46.1	54.5
March	33.7	32.9	21.2	19.9	122.5	23.4	94.9	50.6	65.7
April	36.0	36.8	24.3	23.9	8.40	62.3	93.2	51.9	63.7
May	37.1	36.4	25.7	25.1	37.6	102.6	92.2	56.8	64.7
June	36.9	36.8	26.8	24.7	239.9	283.8	93.0	62.4	77.8
July	32.3	32.2	25.7	25.1	373.8	293.8	96.8	78.8	79.7
August	33.4	32.5	25.9	25.0	173.5	303.1	97.1	78.4	83.5
Sept	33.7	32.5	25.3	22.8	147.1	282.3	98.9	77.0	83.2
Oct	31.3	29.7	23.4	14.0	353.7	115.4	98.2	77.0	78.7
Nov	30.3	29.2	15.5	14.0	0.0	12.1	98.1	52.1	60.6
Dec	27.6	25.8	11.9	11.3	1.2	4.1	98.3	47.9	56.6
2006									
Jan	27.1	25.4	9.6	9.9	0.0	7.6	98.3	42.2	54.5
Feb	33.5	27.4	15.8	9.9	0.0	7.9	97.0	36.1	54.5
March	35.2	32.9	18.7	13.2	0.0	23.4	90.8	36.9	65.7
April	36.4	36.8	23.4	19.9	37.3	62.3	92.3	49.8	63.7
May	36.6	36.4	24.4	23.9	103.1	102.6	92.6	59.1	64.7
June	35.3	36.8	26.1	24.7	87.1	283.8	95.6	70.5	77.8
July	33.1	32.2	26.2	25.1	409.8	293.8	97.2	81.7	79.7
August	32.4	32.5	25.7	25.0	252.8	303.1	97.6	82.4	83.5
Sept	33.1	32.5	25.3	22.8	421.8	282.3	98.1	77.7	83.2
Oct	33.2	29.7	23.1	14.0	97.9	115.4	98.4	71.8	78.7

Max. = Maximum, Min= Minimum, LTA= Long term average
Source : Department of Agricultural Meteorology and Physics, B.C.K.V., Mohanpur, Nadia

RESULTS AND DISCUSSION

Weed management practices

All the weed management practices significantly decreased the number of grasses, sedges and broad leaf weeds over the un-weeded control (T_1). At 30 DAT T_9 treatment recorded the lowest number of all sorts of weeds. At harvest the lowest density of weeds was observed in T_3 treatment. At 30 DAT the treatment (T_9) recorded the lowest weed biomass.

Weed population dynamics and weather data

Un weeded control plots showed maximum weed density (no.m^{-2}) at harvest being, 29.16 and 26.67 for sedges, 41.22 and 38.20 for broad leaves and 61.05 and 58.85 for grasses during 2005 and 2006, respectively (Table 2). The rainfall received during the crop growing period of both the years had no significant impact on the weed density.

It was also observed that changes of monthly total rainfall and its distribution pattern over the long term average(LTA) of monthly rainfall shifted from normal under changing climatic situation (Table 1).

Most of the management practices for weed control of this experiment showed same trend. So, from the result it is concluded that the highest level of rainfall, which was highly favorable for weed development and dissemination, was observed between 1 July and 15 September where intensity and distribution of rainfall is more important than total rainfall for proper growth and development of weeds during rainy season in West Bengal.

To study the effect of temperature and humidity effect on development pattern of weeds it was noted that temperature ranges 33-37 ^{0}C with above 98% humidity had cumulative impact on weed population dynamics during rainy season.

Still, it is noteworthy that the summer annuals seemed to be least affected by total rainfall. In contrast to summer annuals, whose seed have normally been induced into secondary dormancy by the end of May (Milberg, 1994; Milberg and Andersson, 1997) this suggests that water availability in May and June could promote seedling emergence during this period.

The results from the present study that surprised us most were (i) The growth and development of different weed species specially in rainy season depends on distribution pattern of rain than total rain .Temperature and humidity also plays

pivotal role for maintaining population density of weed during rainy season; (iii) Out of all management practices hand weeding after 40DAT of summer rice showed maximum efficiency over other treatments..

Table 2: Effect of different weed management practices on weed density (no. m^{-2}) at harvest in wet season rice

Treatment	Sedges		Broad leaves		Grasses	
	2005	2006	2005	2006	2005	2006
T_1 - Unweeded control	29.16	26.67	41.22	38.20	61.05	58.85
T_2 - HW at 20 DAT	20.82	16.66	27.15	25.75	34.17	29.00
T_3 - HW at 20 and 40 DAT	6.10	5.33	9.25	7.34	8.12	5.23
T_4 - Butachlor @ 1.5 kg ha^{-1}	17.35	13.41	19.17	16.00	27.32	22.78
T_5 - Pendimethalin @ 1.5 kg ha^{-1}	19.72	16.96	20.20	19.55	32.45	28.11
T_6 - Oxadiargyl @ 0.1 kg ha^{-1}	15.50	12.78	16.15	14.25	24.33	21.23
T_7 - HW at 20 DAT + Butachlor @ 1.5 kg ha^{-1}	10.21	8.04	12.29	11.34	15.15	11.66
T_8 - HW at 20 DAT + Pendimethalin @ 1.5 kg ha^{-1}	14.15	11.67	15.16	13.26	18.22	15.42
T_9 - HW at 20 DAT + Oxadiargyl @ 0.1 kg ha^{-1}	8.27	6.33	11.82	9.45	11.42	9.33
SEm(±)	**0.947**	**0.77**	**1.16**	**1.05**	**1.85**	**1.28**
LSD (0.05)	**2.83**	**2.3**	**3.48**	**3.13**	**5.55**	**3.84**

REFERENCES

Andersson, T. N. and Milberg, P. 1998a. Weed flora and the relative importance of site, crop, crop rotation, and nitrogen. *Weed Science*, **46:** 30-38.

Baskin, J. M. and Baskin, C. C. 1990. The role of light and alternating temperatures on germination of *Polygonum aviculare* seeds exhumed on various dates. *Weed Res.*, **30:** 397-02.

Bhan, V. M. 1994. Weed management-A factor for sustainability in crop production. *In. Proc. XII Nat. Symp. on Resource Management for Sustained Crop Production*, 25-28 February, 1992, Rajasthan Agriculture University, Bikaner, pp. 209-16.

Fogelfors, H. 1977. A. Ê., kerograÈs i Sverige. LantbrukshoÈ gskolans Meddelanden B19, Uppsala, Sweden (in Swedish).

Geisselbrecht, T. L., Geisselbrecht, J. and Mucina, L. 1997. Fine-scale spatial population patterns and mobility of winter-annual herbs in a dry grassland. *J. Veget. Sci.*, **8**: 209-16.

Milberg, P. 1994. Germination ecology of the grassland biennial *Linum catharticum*. *Acta Bot. Neerlandica,* **43:** 261-69.

Paradhkar, V. K., Thakur, S. K. and Tiwari, J. P. 2003. Productivity and economic viability as influenced by herbicides in irrigated wheat in Satpura Plateau. *J. Soils and Crops,* **13**: 22-24.

Sing, G. and Singh, M. 2002. Bio-efficiency of metasulfuronmethyl in combination with isoproturon for control of grassy and non-grassy weeds in wheat. *Indian J. Weed Sci.* **34**: 9-12.

Walia, U. S., Brar, L. S. and Dhaliwal, B. K. 1998. Performance of clodinafop and fenoxaprop – P- ethyl for the control of *Phalaris minor* in wheat. *Indian J. Weed Sci.*, **30**: 48-50.