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Determination of critical period of crop-weed competition in aerobic rice

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Abstract
A field experiment was carried out at the College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during *kharif* season of 2014. Experiment had ten treatments *viz.*, T_1 - weed free up to 15 DAS, T_2 - weed free up to 30 DAS, T_3 - weed free up to 45 DAS, T_4 - weed free up to 60 DAS, T_5 - weed free up to harvest, T_6 - weedy up to 15 DAS, T_7 - weedy up to 30 DAS, T_8 - weedy up to 45 DAS, T_9 - weedy up to 60 DAS and T_{10} - weedy up to harvest. The experimental design was Randomized Block Design and replicated three times. The least number of weed and dry weight of weed were recorded under the treatment T_5 (weed free up to harvest) closely followed by the treatment T_4 (weed free up to 60 DAS) and T_6 (weedy up to 15 DAS). The highest grain yield was under treatment T_5 *i.e.* weed free up to harvest being statistically at par with the treatment T_4 and T_6. The various weed management practices didn't cause their significant influence on nutrient content in grain, straw and weed. The nutrient uptake by aerobic rice grain and straw was found higher under the treatment T_5 (weed free up to harvest) followed by T_4, T_6 and T_3. Significantly lower nutrient uptake by weeds was observed under the treatment of T_5 (weed free up to harvest).

Keywords: Critical period, crop-weed, aerobic rice

Introduction
Rice is the most important staple food for a large part of the world's Because of its significance on the political, economic, and social levels. In case of aerobic rice cultivation, eliminating puddling and maintaining aerobic condition. Direct seeded rice is frequently said to have reduced productivity, mainly as a result of challenges with weed management. Weeds were reported to reduce rice yields by 12 to 98 per cent, depending on different type of rice establishment. Yield loss of aerobic rice can reduced by determined critical weed-free period. Main aim of this investigation was to define and estimate the critical period of weed control for aerobic rice towards no chemicals weed management strategy.

Material and Methods
The present study was executed at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat during *kharif* season of 2014. The experimental field was prepared by tractor drawn cultivator, disc harrow, land leveler and prepared fine seedbed. The seeds of rice *cv.* NAUR-1 were used for this experiment. For hand weeding *khurpi* and hand hoe was used as per treatment except in the unweeded control plot. Different periodical observation was taken from net plot area by using 1.0 m ×1.0 m size quadrate. Ring line was removed for improving precision and then carried out harvesting, and threshing from net plot area of investigation.

Result and Discussion
Total weed population counted at 15, 30, 45, 60 and at harvest revealed that various treatments considerably reduced the weed population at all the stages of crop growth. All the treatments significantly reduced the weed population of weeds as compared to treatment T_{10} (weedy up to harvest). Treatment T_5 (weed free up to harvest) registered the lowest total weeds population at all stages of crop growth (at 15, 30, 45, 60 DAS and at harvest). Treatment T_5 was remained at par with treatments T_2, T_3, T_4 and T_6 during 30 DAS and T_4 during 45 DAS of aerobic rice. Significantly lowest number of total weeds was registered under treatment T_5 (weed free up to harvest) but it was remained at par with treatments T_3, T_4 and T_6 at 60 DAS. The weed population was found in order of $T_{10}>T_1>T_2>T_9>T_3>T_8>T_7>T_4>T_6>T_5$ among different treatments of crop-weed competition at harvest stage.

The findings are in conformity with those reported by Dewangan (2011) [4]. All the treatments of crop-weed competition considerably influenced dry weight of total weeds and weed competition index. The dry weight of total weeds recorded at 15, 30, 45, 60 DAS and at harvest was reduced significantly by all the treatments as compared to weedy up to harvest (T_{10}). Looking to the periodical data on total dry weight of weeds *i.e.* 15, 30, 45, 60 DAS and at harvest treatment T_5 (weed free up to harvest) recorded lowest dry weight of weeds, closely followed by treatment T_4 (weed free up to 60 DAS) and T_3 (weed free up to 45 DAS). Treatments T_6, T_7, T_8 and T_9 also recorded the lowest dry weight of total weeds only due to removal of weeds in these treatments started from the respective stage. The lower dry weight of total weeds with treatments of T_4, T_3, T_2 and T_1 might be due to better weed management hence, it resulted into the lowest weed counts and finally, reduced the dry weight of weeds at harvest due to the rapid growth of rice crop as indicated by better growth attributes which did not allow weeds to grow vigorously due to smothering effect. Similar results was also reported by Prakash *et al.* (2013). Looking to weed competition index, which is the indicator of losses in grain yield due to presence of weeds. Treatments T_5 (weed free up to harvest) was considered as base for calculating weed competition index. Therefore, treatment T_5 recorded the lowest weed competition index (0.00%) followed by T_4 (8.88%), T_6 (11.10%) and T_3 (15.13%). This might be due to effective weed control achieved under these treatments in terms of reduced biomass resulting in to higher grain yield under these treatments.

Grain and straw yields were produced significantly higher under treatment T_5 (weed free up to harvest) and it was found at par with treatment T_4 *i.e.* weed free up to 60 DAS and T_6 *i.e.* weedy up to 15 DAS. The higher yields under these treatments could be ascribed to better control of weeds which might have favoured higher uptake of nutrients and water, helping the plant to put optimum growth characters. Further, it might have enhanced photosynthetic activity and partitioning of assimilates, resulting in improved yield attributes by virtue of less weed count and dry weight of weeds. Significantly the lower grain and straw yields were recorded under treatment T_{10} (weedy up to harvest). Deprived growth and development of crop under the weedy up to harvest treatment might have been responsible for poor yield. These findings are in agreement with those of Banerjee *et al.* (2008) [2] and Singh *et al.* (2012) [10].

The nutrient uptake by rice grain and straw was recorded higher under the treatment T_5 (weed free up to harvest) followed by T_4, T_6 and T_3. However, the lowest nutrient uptake was found under the treatment T_{10} (weedy up to harvest). Nutrient uptake by weeds was observed significantly lower under the treatment of T_5 (weed free up to harvest), the maximum nutrient uptake by weed was recorded under the treatment T_{10} (weedy up to harvest).

Table 1: Predominant weed flora observed in experimental field

Sr. No	Family	Botanical name	English name	Local name
(A) Monocot weeds				
1.	Poaceae	*Echinochloa crusgalli*	Sama grass	Samo
2.		*Echinochloa colonum*	Jungle rice	Bunt
3.		*Cynodon dactylon*	Bermuda grass	Dharo
4.		*Dactyloctenium aegyptium*	Crow foot grass	Makra
5.		*Brachiaria spp.*	Single grass	Bharbhi
6.		*Cenchrus biflorus*	Indian sandbur	Bharut
7.	Pontederiaceae	*Eichhornia crassipes*	Water hyacinth	Jalkumbi
(B) Dicot weeds				
1.	Solanaceae	*Physalis minima*	Ground cherry	Popti
2.	Amaranthaceae	*Alternanthera sessilis*	Alligator weed	Khanhi
3.	Euphorbiaceae	*Euphorbia hirta*	Milk weed	Dudheli
4.	Amaranthaceae	*Digera arvensis*	Digera	Kanjaro
5.	Sapindaceae	*Cardiospermum halicacabum*	Balloon vine	Kandodio
(C) Sedges weeds				
1.	Cyperaceae	*Cyperus rotundus*	Nut Sedge	Chidho

Table 2: Weed population of aerobic rice as influenced by various treatments

Treatments	Total Weed population/m^2				
	At 15 DAS	At 30 DAS	At 45 DAS	At 60 DAS	At harvest
T1 : Weed free up to 15 DAS	11.13 (123.00)	12.31 (150.67)	12.92 (166.67)	12.84 (164.00)	13.59 (184.00)
T2 : Weed free up to 30 DAS	10.95 (119.00)	11.24 (125.33)	11.75 (137.33)	12.39 (152.67)	12.95 (167.00)
T3 : Weed free up to 45 DAS	9.39 (88.00)	10.98 (119.67)	11.70 (136.00)	11.94 (141.67)	12.07 (144.67)
T4 : Weed free up to 60 DAS	9.58 (91.00)	11.19 (124.33)	11.31 (127.00)	10.77 (115.00)	11.62 (134.00)
T5 : Weed free up to harvest	9.54 (90.00)	10.70 (113.67)	10.82 (116.33)	10.53 (110.00)	9.78 (95.33)
T6 : Weedy up to 15 DAS	9.84 (96.00)	12.02 (143.67)	12.10 (145.33)	11.04 (121.00)	11.46 (130.33)
T7 : Weedy up to 30 DAS	10.32 (106.00)	12.31 (150.67)	12.54 (156.33)	11.99 (143.33)	11.73 (136.67)
T8 : Weedy up to 45 DAS	10.28 (106.00)	12.54 (156.33)	13.11 (171.00)	12.19 (148.33)	11.74 (137.00)
T9 : Weedy up to 60 DAS	11.31 (127.00)	12.89 (165.33)	13.48 (181.00)	14.04 (196.33)	12.53 (156.33)
T10 : Weedy up to harvest (Control)	11.43 (130.00)	13.28 (175.67)	13.97 (194.33)	14.38 (206.00)	15.25 (231.67)
S. Em. ±	0.44	0.28	0.26	0.31	0.33
C.D. at 5%	1.30	0.83	0.77	0.93	0.97
C.V. %	7.32	4.05	3.65	4.45	4.63

Data in parenthesis are original value. Data subject to transformed value

Table 3: Dry weight of weeds and weed competition index (%) in aerobic rice as influenced by various treatments

Treatments	Dry weight of weeds					WCI (%)
	15 DAS (g/m2)	30 DAS (g/m2)	45 DAS (g/m2)	60 DAS (g/m2)	At harvest (kg/ha)	
T1 : Weed free up to 15 DAS	3.40	6.43	8.80	15.17	726.33	35
T2 : Weed free up to 30 DAS	3.30	6.63	5.93	7.57	639.33	23
T3 : Weed free up to 45 DAS	2.87	5.53	5.00	6.47	621.00	15
T4 : Weed free up to 60 DAS	3.13	5.47	4.83	5.30	286.00	9
T5 : Weed free up to harvest	3.10	5.33	4.60	4.33	78.00	0.0
T6 : Weedy up to 15 DAS	4.03	7.60	5.10	7.43	102.33	11
T7 : Weedy up to 30 DAS	3.23	11.00	6.63	12.87	117.33	20
T8 : Weedy up to 45 DAS	3.43	10.80	14.73	16.30	123.00	23
T9 : Weedy up to 60 DAS	3.80	11.73	15.40	24.70	130.33	44
T10 : Weedy up to harvest (Control)	4.60	11.87	17.27	26.10	850.67	53
S.Em. ±	0.24	0.74	0.87	1.08	26.90	-
C.D. at 5%	0.7	2.19	2.58	3.22	79.91	-
C.V. %	11.77	15.53	17.04	14.85	12.68	-

Table 4: Yield and N, P and K content (%) by aerobic rice as influenced by various treatments

Treatments	Yield (q/ha)		Nutrient content (%)					
	Grain	Straw	N		P		K	
			Grain	Straw	Grain	Straw	Grain	Straw
T_1	26.40	40.24	1.188	0.676	0.162	0.070	0.336	1.597
T_2	31.10	46.84	0.982	0.656	0.153	0.067	0.295	1.574
T_3	34.43	46.71	0.980	0.660	0.144	0.053	0.291	1.570
T_4	36.97	50.69	0.985	0.647	0.138	0.051	0.287	1.545
T_5	40.57	54.71	0.975	0.593	0.137	0.051	0.274	1.539
T_6	36.07	49.81	1.076	0.657	0.141	0.056	0.276	1.535
T_7	32.33	45.95	1.198	0.667	0.143	0.060	0.278	1.522
T_8	31.37	45.15	1.180	0.676	0.152	0.061	0.292	1.592
T_9	22.73	37.12	1.171	0.727	0.153	0.070	0.330	1.603
T_{10}	18.93	30.02	1.391	0.755	0.171	0.081	0.340	1.620
S.Em. ±	1.62	4.17	0.101	0.030	0.010	0.006	0.016	0.021
C.D. at 5%	4.82	12.38	NS	NS	NS	NS	NS	NS
C.V. %	9.04	16.13	15.787	7.250	8.170	17.793	9.397	2.356

Table 5: N, P and K uptake (kg/ha) by aerobic rice as influenced by various treatments

Treatments	Nutrient uptake (kg/ha)					
	N		P		K	
	Grain	Straw	Grain	Straw	Grain	Straw
T1 : Weed free up to 15 DAS	31.30	28.08	4.30	2.90	8.85	65.98
T2 : Weed free up to 30 DAS	30.55	30.97	4.74	3.15	9.17	73.99
T3 : Weed free up to 45 DAS	33.77	31.32	4.95	2.49	10.05	74.39
T4 : Weed free up to 60 DAS	36.43	34.14	5.10	2.67	10.60	81.05
T5 : Weed free up to harvest	39.54	35.09	5.55	3.05	11.14	91.16
T6 : Weedy up to 15 DAS	38.67	33.80	5.10	2.86	9.93	78.40
T7 : Weedy up to 30 DAS	38.79	30.79	4.64	2.77	9.00	70.06
T8 : Weedy up to 45 DAS	36.98	29.99	4.79	2.72	9.15	71.13
T9 : Weedy up to 60 DAS	26.61	26.03	3.47	2.49	7.48	57.13
T10 : Weedy up to harvest (Control)	26.11	21.44	3.21	2.28	6.38	45.93
S.Em. ±	2.48	2.87	0.28	0.32	0.54	4.91
C.D. at 5%	7.37	NS	0.83	NS	1.60	14.58
C.V. %	12.69	16.45	10.51	20.04	10.16	11.99

Table 6: N, P and K content (%) and uptake (kg/ha) by weed in aerobic rice as influenced by various treatments

Treatments	Nutrient content (%)			Nutrient uptake (kg/ha)		
	N	P	K	N	P	K
T1 : Weed free up to 15 DAS	0.941	0.249	1.222	6.833	1.801	8.853
T2 : Weed free up to 30 DAS	0.936	0.243	1.142	5.989	1.564	7.323
T3 : Weed free up to 45 DAS	0.930	0.234	1.063	5.770	1.446	6.577
T4 : Weed free up to 60 DAS	0.921	0.213	0.965	2.627	0.592	2.741
T5 : Weed free up to harvest	0.903	0.187	0.946	0.706	0.145	0.745
T6 : Weedy up to 15 DAS	0.928	0.211	0.953	0.950	0.217	0.978
T7 : Weedy up to 30 DAS	0.936	0.225	0.964	1.099	0.264	1.135
T8 : Weedy up to 45 DAS	0.941	0.229	1.043	1.159	0.282	1.288

T9 : Weedy up to 60 DAS	0.958	0.252	1.131	1.250	0.329	1.481
T10 : Weedy up to harvest (Control)	0.965	0.250	1.211	8.201	2.128	10.273
S.Em. ±	0.01	0.02	0.07	0.24	0.15	0.28
C.D. at 5%	NS	NS	NS	0.73	0.44	0.82
C.V. %	2.18	13.76	11.29	12.25	29.19	11.52

Conclusion

Based on one year of experiment, it can be concluded that aerobic rice should be keep weed free up to 60 DAS from that 45 to 60 DAS is more crucial for critical crop – weed competition for getting higher yield, better weed management and nutrient uptake.

References:

1. Babar SR, Velayutham A. Weed management practices on nutrient uptake, yield attributes and yield of rice under system of rice intensification. Madras Agricultural Journal, 2012;99(1-3):51-54
2. Banerjee P, Dutta D, Bandyopadhyay P, Maity D. Production potential, water use efficiency and economics of hybrid rice under different levels of irrigation and weed management practices. Oryza. 2008;45(1):30-35.
3. Brar HS, Bhullar MS. Weed dynamics and dry seeded rice productivity in relation to sowing time, variety and weed control in sub-tropical and semi-arid region of Punjab. International Journal of Agriculture, Environment & Biotechnology. 2014;7(2):219-224.
4. Dewangan D, Singh AP, Nirala H, Verma M. Effect of different weed management practices on weed density and weed dry matter production in system of rice intensification (SRI). Indian Journal of Weed Science. 2011;43(3&4):217-221.
5. Gill GS, Kumar V. Weed index a new method for reporting weed control trials. Indian journal of Agronomy. 1969;16(2):96-98.
6. Mann RA, Shahbaz A, Hassan G, Mohammad SB. Weed management in direct seeded rice. Pakistan journal of Weed Science Research. 2007;13(3-4):219-226.
7. Prakash C, Shivran RK, Koli NR. Bioefficacy of penoxsulam against broad-spectrum weed control in transplanted rice. Indian Journal of Weed Science, 2013;45(4):228-230
8. Sangeetha SP, Balakrishan A, Priya RS, Maheswari J. Nutrients depletion by weeds, yield and economics of drum seeded rice influenced by weed management. Indian Journal of Weed Science. 2011;43(3&4):233-235.
9. Singh K, Tripathi HP. Effect of nitrogen and weed - control practices on performances of irrigated direct-seeded rice. Indian Journal of Agronomy, 2007;52(3):231 -234.
10. Singh M, Sairam CV, Hanji MB, Prabhukumar S, Kishore N. Crop-weed competition and weed management studies in direct seeded rice (*Oryza sativa*). Indian Journal of Agronomy. 2012;57(1): 38-42.
11. Tagour RMH, Ei-Hamed GMA, Ei-Metwally IM. The critical period of crop weed competition of direct seeded rice in salinity land. Arabian University Journal of Agricultural Science. 2010;18(1):89-96.