

CRITICAL PERIODS OF WEED COMPETITION IN A SHORT DURATION RICE VARIETY 'TRIVENI'.

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The annual loss due to weed infestation is estimated at 15 million tons of rice, equivalent to 28% of the annual production (Gopalakrishna Pillai and Rao, 1974).

Crops and weeds compete for water, nutrients, sunlight and space. In almost all crops, there is a critical period of weed competition when the competition adversely affects crop growth and yield. In rice, this critical period is 4-6 weeks after transplanting (Shetty and Gill, 1974) and in uplands it ranges from 0-45 days after drilling (Bhan *et al.* 1974).

Knowledge of the critical periods of weed competition will facilitate scientific planning of weed control. There is not much information available in Kerala on the period of rice crop growth at which the field should be kept free of weeds. Therefore, an investigation was undertaken during the second crop season of 1976-77 to study the critical periods of crop-weed competition in a short duration rice variety, 'Triveni'.

Materials and Methods

The present investigation was carried out at the College of Agriculture Vellayani, Kerala Agricultural University, with 17 treatments consisting of weed free periods of 10, 20 and 30 days, up to 60th day and an unweeded check (Table 1). The experiment was laid out in Randomised Block Design, with three replications. All the plots were given uniform operations as per the package of practices recommendations of the Kerala Agricultural University (1976). For uniformity of weed growth, weed seeds of *Echinochloa crus-galli* at the rate of 5g/plot (6 x 4 m) were applied just before transplanting.

Weed counts were taken prior to weeding, 10 days after weeding and at harvest. Weed dry matter accumulation was recorded prior to weeding and at harvest and total accumulation was also worked out.

Results and Discussion

Weed species

The most serious weed species found in the experimental area were *Echinochloa crus-galli*, *Echinochloa colonum*, *Brachiaria ramosa*, *Ischaemum rugosum*, *Cyperus* spp. *Fimbristylis miliacea*, *Monochoria vaginalis*, *Ludwigia parviflora* and *Salvinia molesta*.

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Weed population

The weeds did not emerge till the 10th day after transplanting in all the plots. In undisturbed plots, weed population increased significantly up to the 40th day of transplanting. In unweeded check (T_{10}) 86 per cent of total weeds emerged by the 40th day of transplanting (Table 2)

The weed reemergence observed 10 days after weeding was maximum in plots weeded 1-30 days for monocots, early weeded plots (1-10 days) for dicots and in 11-20 day weeded plots for all types of weeds (Table I). The 10 day weed free periods which helped to suppress the monocots, dicots and total weeds were 31-40 days, 11-20 days and 21-30 days respectively. Of all the treatments, weeding 11-40 days produced the least number of weeds. Among the 20 day weed-free periods tried 11-30 days and among the 10 day weed free periods 21-30 days, produced minimum weed population.

The pattern of weed emergence suggest that dicots occur more during the early stages and the monocots towards the later stages of the crop. Weed population in unweeded control also support the above pattern of weed growth (Table 2). This shows the competitive nature of the monocots with rice crop (Muzik, 1970).

Dry matter production of weeds

The weeds accumulated very little dry matter by the 20th day in unweeded plots. The dry matter accumulation was maximum during 31-40 days after transplanting. Shetty and Gill, 1974 reported that the increase in dry matter accumulation got reduced after the 40th day.

Among the 10, 20 and 30 day weed free intervals tried, plots weeded 21-30, 21-40 and 21-50 days produced minimum weed dry matter from the respective groups, indicating that weeding need be started after 21st day of transplanting. The convenient period for weeding may be 21-30 days after transplanting, since this was the shortest. (10 day) period which reduced weed population as well as weed dry matter. The weeds emerging after the 40th day were not serious competitors for the rice crop.

Yield characters

A ten day weed free condition during 11-40 days produced more number of productive tillers, the range being 278.0-331.5/m² as compared to those weeded before the 10th and after the 40th day of transplanting (207.5-251.0/m²). This is in agreement with the findings of Mohammed AM and Sankaran (1975) and Ravindran (1976). The percentage of productive tillers also showed the same trend

The increase in panicle weight was due to the increase in the number of filled grains. A weed free period of 10 days during 21-40 days was most favourable for more number of filled grains per panicle. This is in agreement with Narayanswamy (1976) and Ravindran (1976),

Grain Yield

The maximum grain yield of 3466 kg/ha was obtained in plots having minimum weed free condition of ten days during 21-40 days. Weeding up to 20th day alone and weeding after the 40th day alone did not increase the yield, which indicated that weed competition during 31-40 days was critical. The above finding is in agreement with those of Shetty and Gill (1974) and Nair *et al* (1975).

Among the 10, 20 and 30 day weed free intervals tried, plots weeded 21-30, 21-40 and 21-50 days after transplanting recorded the highest yields for the respective groups (Table 3). This points to the fact that weeding need be started by 21 st day of transplanting. It may also be noted that weeding 21-30 days after planting is the shortest period, the yield (3248 kg/ha) of which was on par with the maximum yield. This indicates the necessity of keeping rice fields free of weeds for a short period of 10 days between 21-30 days after transplanting for a short duration variety for good yields.

Straw yield

As in the case of grain, weeding for a short period of 10 days between 21-30 days after transplanting produced the straw yield of 3499 kg/ha which was on par with the maximum yield of 3698 kg/ha (Table 3).

Weed index

Weed index is a measure of the weed competition in terms of the reduction in yield in comparison with the plot having minimum weeds. (Gill and Vijayakumar, 1969).

Unweeded check (T_{1c}) recorded the maximum index of 25.5 followed by very early weeded plot (1-10 days) and very late weeded plot (51-60 days). The least index (0.8) was in plot weeded 1-40 days. The total dry matter production by crop plus weed in unweeded control was 6831 kg/ha which was less than the dry matter production by crop alone in plot weeded 1-60 days. (7067 kg/ha). Due to the severity of the competition between crop and weed, both were not able to accumulate dry matter equal to their potentials when grown alone.

Summary

In studies on the critical periods of crop-weed competition a in short duration rice variety 'Triveni,' carried out at the College of Agriculture, Vellayani, during the second crop season of 1976-77, it was found that the critical period of crop-weed

Table 1

Effect of different periods of weed removal on weed growth

Treatments (Weed free days after transplanting,	Before weeding (number/m ²)			10 days after weeding (number/m ²)			At harvest (number/m ₂)			Dry matter of weeds (g/m ₂)		
	Mono- cot	Di- cot	Total	Mono- cot	Di- cot	Total	Mono- cot	Di- cot	Total	Before weeding	At harvest	Total
T ₁ 1-10	—	—	—	6.6 [43.0]	9.4 [86.8]	11.4 [129.0]	18.6 [344.0]	14.6 [213.0]	23.7 [558.0]	—	137.1	137.1
T ₂ 11—20	1.0 [0.0]	1.0 [0.0]*	1.0 [0.0]	6.9 [46.0]	9.3 [84.6]	11.5 [131.0]	15.9 [253.0]	11.1 [122.0]	19.4 [374.0]	0	72.7	72.7
T ₃ 21—30	6.3 [38.6]	10.3 [105.0]	12.1 [144.0]	6.4 [40.2]	5.5 [29.2]	8.4 [69.6]	9.9 [96.8]	7.1 [48.7]	12.1 145.0	3.9	24.1	28.0
T ₄ 31—40	9.6 [91.6]	14.2 [200.0]	17.1 [290.0]	4.4 [18.4]	3.2 [9.0]	5.4 [27.8]	5.9 [33.7]	4.7 [21.0]	7.5 [55.6]	26.3	15.2	41.5
T ₅ 41—50	16.4 [269.0]	17.8 [317.0]	24.2 [586.0]	4.2 [17.0]	3.2 [9.0]	5.2 [26.0]	5.1 [25.2]	4.2 [16.1]	6.4 [40.4]	85.9	7.4	93.3
T ₆ 51—60	16.9 [285.0]	19.1 [365.0]	25.5 [651.0]	—	—	—	4.0 [15.0]	3.0 [8.0]	4.9 [23.0]	105.2	5.7	110.9
T ₇ 1—20	—	—	—	6.3 [39.0]	9.2 [83.4]	11.1 [123.0]	15.3 [232.0]	12.4 [153.0]	19.6 [385.0]	—	81.3	81.3
T ₈ 11—30	1.0 [0.0]	1.0 [0.0]	1.0 [0.0]	6.3 [39.0]	5.7 [31.5]	8.5 [70.4]	10.0 [98.0]	6.1 [36.0]	11.7 [134.0]	0	22.2	22.3
T ₉ 21—40	7.5 [55.1]	9.7 [93.8]	12.0 [143.0]	4.4 [18.1]	3.7 [13.0]	5.7 [31.3]	6.7 [43.5]	5.1 E 25,2]	8.4 [69.4]	4.1	15.8	19.9

T ₁₀	31-50	11.5 [131.0]	16.3 [265.0]	20.0 [398.0]	3.8 [13.6]	3.2 [9.0]	4.9 [23.1]	4.7 [21.5]	4.1 [16.0]	6.2 [37.0]	33.8	5.5	39.3
T ₁₁	41-60	161 [259.0]	18.2 [328.0]	24.3 [588.0]	— —	— —	— [9.0]	3.2 [19.0]	3.2 [17.9]	4.4 [17.9]	85.9	3.6	89.5
T ₁₂	1-30	— —	— —	— —	7.1 [49.0]	4.9 [23.0]	8.6 [72.1]	9.6 [90.0]	6.2 [37.9]	11.4 [128.0]	—	21.2	21.2
T ₁₃	11-40	1.0 [0.03]	1.0 [0.0]	1.0 [0.0]	3.5 [10.9]	3.6 [11.8]	4.9 [23.3]	6.2 [37.0]	5.6 [30.5]	8.3 [68.0]	0	16.7	16.7
T ₁₄	21-50	7.0 [48.4]	11.2 [125.0]	13.0 [169.0]	3.7 [12.9]	2.9 [7.5]	4.6 [20.3]	5.0 [24.0]	4.1 [15.9]	6.4 [39.8]	6.2	6.6	12.8
T ₁₅	31-60	12.9 [164.0]	14.9 [220.0]	19.7 [386.0]	— —	— —	— —	13.0 [170.0]	3.0 [8.0]	4.1 [16.0]	32.6	4.2	36.8
T ₁₆	Weedy check	— —	— —	— —	— —	— —	— —	20.1 [405.0]	17.7 [313.0]	26.8 [719.0]	—	154.2	154.2
T ₁₇	1-60	— —	— —	— —	— —	— —	— —	3.0 [8.0]	2.83 [7.0]	4.0 [15.0]	—	2.0	2.0
CD	[0.05]	1.75	1.62	1.67	1.49	0.95	1.59	1.72	0.74	1.83	20.10	13.19	22.20

* Original weed counts indicated in parenthesis

Table 2
Pattern of weed growth in the check plot

No of days after transplanting	Weed population/m ²					Dryweight of weeds (g/m ²)
	Monocots		Dicots		Total	
	No./m ²	% of total	No./m ²	% of total	No./m ²	
10 th	0	0	0	0	00	0
20 th	65	37.7	111	62.3	178	7.2
30 th	102	27.3	272	72.7	374	31.0
40 th	250	40.0	372	60.0	622	88.4
50 th	296	44.6	365	55.4	661	108.8
60 th	387	53.8	333	46.2	720	129.3
80 th	406	56.5	313	43.5	719	154.2

Table 3
Effect of different periods of weed removal on yield characters
and weed Index.

Treatments (weed free days after transplanting)	Productive tillers/m ²	weight of Panicle (g)	Grain yield (kg/ha)	Straw- yield (kg/ha)	Weed index
T ₁ 1—10	207.5	1.17	2636	2761	24.0
T ₂ 11—20	331.5	1.27	2920	3153	14.4
T ₃ 21-30	281.5	1.53	3248	3499	4.9
T ₄ 31—40	301.5	1.55	3175	3611	4.4
T ₅ 41-50	244.5	1.24	2818	2993	18.1
T ₆ 51-60	238.0	1.20	2599	2828	23.5
T ₇ 1—20	311.5	1.17	3066	3228	11.3
T ₈ 11-30	298.5	1.60	3208	3423	6.6
T ₉ 21-40	311.5	1.63	3307	3618	2.4
T ₁₀ 31-50	284.5	1.71	3224	3658	3.0
T ₁₁ 41—60	251.0	1.28	2966	3240	14.0
T ₁₂ 1-30	278.0	1.55	3314	3542	3.4
T ₁₃ 11—40	295.0	1.68	3383	3658	0.8
T ₁₄ 21-50	261.5	1.68	3406	3472	3.1
T ₁₅ 31—60	248.0	1.65	3175	3535	5.5
T ₁₆ Weedy check	221.0	1.10	2533	2756	25.5
T ₁₇ 1-60	296.0	1.65	3466	3631	0.0
CD (0.05)	53.64	0.383	326.7	215.9	

competition lies between 21 and 40 days after transplanting. During this period, the weed emergence and dry matter accumulation were maximum. At least a weed free condition of 21 -30 days in the critical period of 21-40 days, is essential to obtain good yields.

സംഗ്രഹം

ത്രിവേണി എന്ന മൂപ്പ് കുറഞ്ഞ നെല്ല് നട്ട് 21 മുതൽ 40 ദിവസം വരെയുള്ള കാലയളവിൽ കളകൾ വളരാനിടയായാൽ വിളവ് സാരമായി കുറയുന്നതായും, എന്നാൽ നട്ടു് 21 മുതൽ 30 ദിവസം വരെയെങ്കിലും കളയും, വിളയും തമ്മിൽ ത്തിയുള്ള മൽസരം ഒഴിവാക്കിയാൽ നല്ല വിളവ് കിട്ടുന്നതായും, വെള്ളായണി കാർഷിക കോളേജിൽ നടത്തിയ പരീക്ഷണങ്ങൾ തെളിയിച്ചു.

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