

Varietal Tolerance of Rice to Herbicides

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ABSTRACT

Twenty nine rice varieties were tested for their tolerance to herbicides. At normal doses (3.5 kg a. i./ha) propanil did not cause mortality of plant but inflicted a mild chlorosis in Karuna, Co. 36, Krishna, Vaigai, IR. 8, Kannaki, TKM. 6, Cauvery, ADT. 27 and GEB. 24 and severe chlorosis in PTB. 10, ASD. 5, BAM. 3, Bhavani, IR. 5, Jaganath, Pennai, Bala, IR. 22 and IR. 20. However all these varieties recovered from chlorosis within 10 days after application. Benthocarb was highly selective on IR. 20, SR. 26, B. BAM. 3, GEB. 24, Kannaki and Vaigai whereas the varieties Bhavani, IR. 22, PTB. 10, TKM. 6, Co. 32 and ADT. 27 were found to be less tolerant. Varieties IR. 22, GEB. 24, IR. 8, Bala, Kanchi and Bhavani were highly susceptible to the herbicide butachlor whereas varieties Karuna, ADT. 27, Karikalan and Annapoorna were tolerant even to high dose (8 kg a.i./ha). These tolerant *japonica* derivatives were susceptible to benthocarb while the susceptible variety Ponni was tolerant to benthocarb.

INTRODUCTION

Rice varieties significantly differ in their tolerance to herbicides (Badea *et al.*, 1970; Bueno and Cabanilla, 1971). Chang (1971a) reported that *japonica* variety Chianung 242 is more tolerant to a herbicide Roundup (2-Chloro N-isopropyl acetanilide + 2, 4-D) than other varieties tested. For 2, 4-D application *indica* varieties are more susceptible than *japonica* varieties (Anon. 1973). The susceptibility of a particular variety to a herbicide would not preclude the use of this chemical in other varieties of the same crop. The determination on the effect of a new herbicide on all popular varieties in a particular agroclimatic condition is of special importance in any weed control programme. With this in view, trials were conduct-

ed to test the tolerance of 29 rice varieties to three herbicides butachlor, benthocarb and propanil.

MATERIALS AND METHODS

The varieties used included tall and dwarf *indica*, dwarf mutant and *japonica* derivatives (Table). One square metre plots were formed with channel all round the plots. Seeds were sown in lines with a spacing of 20x5cm under low land condition. Germination counts were taken on the sixth day after sowing. In the first trial taken in October, 1973, herbicide benthocarb (G) 10% was applied on the eight day in two concentrations namely 3 and 12 kg a.i./ha. Propanil was applied as post-emergence spray on 21st day after sowing at two levels namely 3 and 5.

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14 l a. i./ha. In the second trial seeds were sown in the last week of March 1974 and herbicide butachlor (G) 5 per cent was applied on the sixth day after sowing in three concentrations namely 2, 4 and 8 kg a. i./ha. The mortality of seedlings, if any, was recorded on the 40th day after sowing.

RESULTS AND DISCUSSION

Butachlor : The varieties greatly vary in their tolerance to herbicide. The mean mortality percentage caused by butachlor ranged from 15 to 72 for 2kg, 22 to 97 for 4 kg and 60 to 100 for 8 kg a.i./ha. Both tolerant and susceptible varieties were found in tall and dwarf *indica* and *japonica* derivatives. In lower dose of butachlor at 2kg a.i./ha lesser mortality was noticed in ADT.27, Karuna, Pennai, Karikalan, PTB. 10, Kanchi, BAM. 3, SR. 26 B, Co. 29, Annapoorna, IR. 20 and TN. 1. High mortality (55-72) was noticed in IR. 22, GEB. 24, IR. 8, Ponni, Bala, Kannaki, Krishna, DGW, Bhavani. At 4 kg a. i./ha varieties IR. 22, Ponni, GEB. 24, ASD. 5 and Bhavani were highly susceptible (97-85) whereas varieties Karuna, ADT. 27, Karikalan, TN. 1, PTB. 10, Pennai, Annapoorna were moderately tolerant (22-53). At very high dose of 8 kg a. i./ha the mortality ranged from 91 to 100 in most of the varieties except in Karuna (60), ADT. 27 (80) and Karikalan (83) which are all of *japonica* derivatives. The other *japonica* derivative Ponni is highly susceptible probably due to the different parentage. In varieties Karikalan and Karuna, ADT. 27 is found as one of the parents and so varieties ADT. 27, Karikalan and Karuna

are tolerant to butachlor. It is interesting to note that these tolerant *japonica* derivatives are susceptible to herbicide benthocarb while the susceptible variety Ponni is tolerant to herbicide benthocarb (Sankaran and Mohamed Ali, 1974).

Benthocarb : Application of benthocarb at 3 kg a. i./ha under wet conditions recorded mortality percentage from 12 to 59 Whereas at high dose of 12kg a. i./ha, it varied from 35 to 100 (Table). Response of varieties was the same in both the doses of herbicide. Both tolerant and susceptible varieties were found in tall and dwarf *indica* whereas the dwarf mutant and *japonica* derivatives were less tolerant. The highly tolerant varieties namely IR. 20, SR. 26-B, BAM.3, GEB.24 and Kannaki are either tall or dwarf *indica* types. They are hardy in nature and the variety SR.26. B and BAM. 3 are noted for their saline resistance. The dwarf *indicas* are hybrid derivatives which seem to possess medium tolerance. The varieties Bhavani, IR. 22, PTB. 10, TKM. 6, Co. 36 and Co. 32 and ADT. 27 were found to be least tolerant. It can be stated that the popular tall *indica* variety of Tamil Nadu, TKM. 6 which is noted for its quality grain and multiple resistance to pests and diseases is less tolerant to this herbicide. The variety GEB. 24 has independently behaved as highly tolerant but on crossing with TN. 1 the resultant progeny IR. 22 was less tolerant. Thus, in hybrid varieties, the tolerance seems to depend on their parents. Chang (1971 b) observed that the application of benthocarb at 3 kg a. i./ha on 4th day after transplanting

TABLE. Effect of herbicides butachlor, benthocarb and propanil on the mortality of rice seedling

Variety	Parents or selection	% Mortality and tolerance rating					
		Butachlor			Benthocarb		Propanil*
		2 kg a.i./ha	4 kg a.i./ha	8 kg a.i./ha	3 kg a.i./ha	12 kg a.i./ha	14 kg a.i./ha
1	2	3	4	5	6	7	8
Indica Tall							
PTB. 10	Thakka	25 B	52 C	94 E	51 C	99 E	24 B
ASD. 5	Kerthigai samba	52 C	89 E	99 E	39 B	88 E	6 A
BAM. 3	Bayagunda	34 B	74 D	97 E	16 A	49 C	13 A
SR. 26. B	Kalar Samba	34 B	64 D	91 E	15 A	49 C	12 A
PVR. 1	SR. 26. B x MTU. 1	—	—	—	25 B	61 D	— A
Co. 32	Tiruchengode samba	46 C	68 D	97 E	48 C	89 E	— A
Co. 29	Co. 4 x Co. 13	33 B	70 D	95 E	36 B	73 D	13 A
GEB. 24	Kitchili Samba	71 D	90 E	100 E	12 A	54 C	7 A
TKM. 6	Co. 18 x GEB 24	55 C	75 D	93 E	47 C	96 E	1 A
Bhavani	Peta x BP. 176	55 C	85 E	93 E	45 C	100 A	10 A
Indica Dwarf							
Krishna	TN. 1 x GEB. 24	58 C	80 D	99 E	38 B	75 D	1 A
Pennai	TN. 1. x ASD. 1	20 A	53 C	94 E	34 B	88 E	15 A
Annapoorna	TN. 1. x PTB. 10	38 B	48 C	90 D	32 B	87 E	19 A
Bala	TN. 1 x N. 22	61 D	79 D	95 E	55 C	80 E	42 C
Kanchi	TN. 1 x Co. 29	52 C	63 D	98 E	43 C	73 D	42 C
Cauvery	TN. 1 x TKM. 6	42 C	71 D	100 E	40 B	84 E	10 A
Jaya	TN. 1 x T. 141	—	—	—	30 B	82 E	8 A
Co. 37 (IET. 849)	TN. 1 x CO. 29	45 C	62 D	97 E	12 A	81 E	4 A
IR. 8	Peta x Deege woogen	67 D	79 D	99 E	42 C	88 E	— A
IR. 20	Peta x TN. 1 IR. 262 x TKM. 6	35 B	69 D	100 E	18 A	35 C	15 A
Kannaki	IR. 8 x TKM. 6	60 C	67 D	98 E	13 A	60 D	22 B

TABLE. Contd.

1	2	3	4	5	6	7	8
IR. 22	IR. 8 x Tadukam	72 D	97 E	100 E	59 C	100 E	23 B
Co. 36	IR. 8 x Co. 32	59 C	97 E	100 E	28 B	96 E	5 A
TN. 1	Taichung Native	35 B	38 B	91 E	—	—	—
Dee Goe woogen	Natural mutant	57 C	78 D	98 E	—	—	—
Dwarf Mutant Jaganath	Dwarf mutant from T. 141	50 C	78 D	87 E	49 C	95 E	5 A
Japonica ADT. 27	Norin. 8 x GEB. 24	15 A	31 B	80 D	56 C	93 E	16 A
Karikalan	TN. 1 x ADT. 27	22 B	37 B	83 E	44 C	88 E	8 A
Karuna	IR. 8 x ADT. 27	17 A	22 B	60 C	44 C	86 E	8 A
Ponni	Taichung 65 x Malayan indica	63 C	92 E	97 E	24 B	92 E	20 A

Rating for mortality: A=0-20; B=21-40; C=41-60; D=61-80; E=81-100%

* Propanil 3.5 kg a.i./ha caused no mortality and grade A to all varieties

caused little or no toxicity to bushy *indica* TN. 1 and tall growing *japonica* variety Chainung. 242.

Propanil: At normal dose of propanil (3.5 l a.i./ha) no mortality of plants was noticed but different degrees of yellowing of leaves were observed in all the varieties. Mild chlorosis was seen in Karuna, Co. 36, Krishna, IET 849 (Vaigai), IR.8, Kannaki, TKM. 6, Cauvery ADT. 27 and GEB. 24. Marked chlorosis was noted in PTB.10, ASD.5, BAM. 3, Bhavani, IR. 5, Jaganath, Pennai, Bala, IR. 22 and IR. 20. However all these varieties recovered from chlorosis within 10 days after application. It was observed that plants with erect, green thick leaves exhibited mild chlorosis than wide, thin, light green leaves. At toxic dose, the mortality range varied

from 0 to 42 per cent (Table). The varieties PVR.1, Co. 32, IR.8 and TKM.6 seemed to be highly tolerant whereas Bala, PTB. 10, IR. 22 and Kannaki are less tolerant. Smith (1961) reported that propanil up to 13.5 kg a.i./ha did not cause injury to rice,

From the above data, it can be inferred that rice varieties showed differential response to the herbicides. Varieties IR. 22, GEB. 24, IR. 8, Bala, Kanchi, DGW. Bhavani are highly susceptible for butachlor at 2 kg a. i./ha. The varieties Karuna, ADT. 27, Karikalan are tolerant to high doses of butachlor of 8 kg a.i./ha. Propanil did well on ADT. 27 whereas the varieties IR. 20, SR. 26. B, BAM. 3 and GEB. 24, Kannaki and IET. 849 (Vaigai) were highly selective to benthocarb. These

tolerant varieties can be utilised for breeding tolerant varieties of rice for the above herbicides. The highly susceptible varieties of butachlor, IR, 22, Bhavani, Bala, Kanchi were also less tolerant to benthocarb and propanil. Hence lower dose of herbicides or suitable mechanical weed control practices have to be followed for the above susceptible varieties. These results further stressed the need for selecting a suitable herbicide for each variety of rice.

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