

## EFFECT OF METAL STRESS CONDITION ON LIFE PERIOD OF DIFFERENT VARIETIES OF RICE

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In the present investigation, experiments have been designed to study the effects of different concentrations of Cd, Pb and Hg on life periods of 14 different varieties of rice (viz., Annapurna, MW 10, Swarna, IR 52, Ratna, IR 36, Mashuri, Kunti, Parijat, Pusa-2-21, IR 42, Samlai, Pankaj, Assam Aus). Three different concentrations of Cd, Pb and Hg, i.e. 1 ppm, 3 ppm and 5 ppm were used for treatment. Treatment with Cd, Pb and Hg salt solutions started after transplantation of the plants and continues for several times at intervals to cover the period of growth from 45 days to boot leaf stage. Then flowering time and maturity were noted for treated and control plants. It was found that life period was affected, i.e. either increased or decreased in some varieties, but others were not effected.

**Key words :** Rice, metal stress, life period

Earlier findings revealed that the plants grown in polluted environment accumulate heavy metals like Cu, Cd, Co, Ni, Pb, Hg, Mn etc. The amount of accumulation in the different parts of the plant body is rather higher for each metal than the amount present in the soil due to accumulation through years, and also from the amount present in the irrigated water. It was also found that there is variation in accumulation in different plant parts for the same metal. Experiments with known concentrations of heavy metals revealed that different varieties of rice showed stimulation or retardation or radicle growth depending on the concentration and the varieties used (Mukherji and Ganguly, 1974; Mukherji and Mitra, 1977; Ray, Barman and Khan, 1989; Ray, 1987, 1990, 1991; Ray and Dasgupta, 1991). A series of investigations were conducted to study the effects of heavy metals like Pb, Cd and Hg of known concentrations on growth and yield parameters of different varieties of rice. The accumulation pattern of different heavy metals in different parts of rice plants have been reported earlier (Ray, Barman and Khan; Ray, 1987). In the present paper, the effects of different concentrations of Cd, Pb and Hg on life period of different rice varieties have been presented.

### MATERIALS AND METHOD

Fourteen different varieties of rice namely Annapurna, MW 10, Swarna, IR 52, Ratna, IR 36, Mashuri, Kunti, Parijat, Pusa 2-12, IR 42, Samlai, Pankaj, Assam Aus were taken for the investigation. Three different concentrations of Cd, Pb and Hg, i.e. 1 ppm, 3 ppm, 5 ppm, prepared following dilution method, were used. Sets were prepared in triplicate for each concentration of each metal and for respective control. Treatment started after transplantation of the plants and continued for several times at intervals to cover the period of growth till boot leaf stage. Then flowering time and maturity were noted for treated and control plants.

### RESULTS AND DISCUSSION

Effect of treatments with different concentrations of Cd, Pb and Hg have been presented in Table 1, 2 & 3.

**Table 1 : Effect of treatment with cadmium salt solution on life period of different varieties of rice (*Oryza sativa* L.)**

Name of test materials (variety)	Concentration of cadmium (in ppm)	No. of days after sowing					Maturity
		Sowing	Transplantation	Establishment	Boot leaf Stage	Range of Flowerin	
Annapurna	Control	0	27	32	50	56-63	89
	1 ppm.	0	27	32	50	59-66	92
	3 ppm.	0	27	32	47	59-66	92
	5 ppm.	0	27	32	50	59-67	93
MW 10	Control	0	27	32	71	72-86	109
	1 ppm.	0	27	32	71	74-86	110
	3 ppm.	0	27	32	70	75-89	112
	5 ppm.	0	27	32	72	78-92	115
Swarno	Control	0	27	32	50	53-68	90
	1 ppm.	0	27	32	47	50-60	85
	2 ppm.	0	27	32	47	56-65	90
	5 ppm.	0	27	32	50	56-65	90
IR 52	Control	0	27	32	95	97-104	130
	1 ppm.	0	27	32	97	99-105	132
	3 ppm.	0	27	32	92	93-99	126
	5 ppm.	0	27	32	93	95-102	128
Ratna	Control	0	27	32	47	56-64	90
	1 ppm.	0	27	32	53	59 -66	92

(Table 1 contd.)

	3 ppm.	0	27	32	50	56-65	90
	5 ppm.	0	27	32	56	61-68	94
IR 36	Control	0	27	32	78	85-92	110
	1 ppm.	0	27	32	82	87-94	120
	3 ppm.	0	27	32	84	86-93	119
	5 ppm.	0	27	32	84	86-93	119
Mashuri	Control	0	27	32	138	140-146	173
	1 ppm.	0	27	32	139	142-150	176
	3 ppm.	0	27	32	141	143-151	177
	5 ppm.	0	27	32	138	140-148	174
Kunti	Control	0	27	32	110	112-120	146
	1 ppm.	0	27	32	112	114-122	148
	3 ppm.	0	27	32	114	116-124	150
	5 ppm.	0	27	32	112	114-122	148
Parijat	Control	0	27	32	112	114-122	148
	1 ppm.	0	27	32	112	114-123	149
	3 ppm.	0	27	32	109	112-120	146
	5 ppm.	0	27	32	110	112-121	147
Pusa 2-21	Control	0	27	32	75	84-92	117
	1 ppm.	0	27	32	70	78-86	112
	3 ppm.	0	27	32	72	81-90	115
	5 ppm.	0	27	32	71	81-90	115
IR 42	Control	0	27	32	78	81-88	114
	1 ppm.	0	27	32	93	95-103	129
	3 ppm.	0	27	32	95	97-105	131
	5 ppm.	0	27	32	97	99-108	133
Samlai	Control	0	27	32	150	156-163	189
	1 ppm.	0	27	32	148	156-164	190
	3 ppm.	0	27	32	149	155-163	189
	5 ppm.	0	27	32	147	152-160	186
Pankaj	Control	0	27	32	125	127-135	161
	1 ppm.	0	27	32	120	122-130	156
	3 ppm.	0	27	32	90	92-100	126
	5 ppm.	0	27	32	122	124-132	158
Assam Aus	Control	0	27	32	119	122-130	156
	1 ppm.	0	27	32	118	120-127	153
	3 ppm.	0	27	32	115	119-126	152
	5 ppm.	0	27	32	118	121-129	155

**Table 2. Effect of treatment with lead salt solution on life period of different varieties of rice (*Oryza sativa* L.)**

Name of test materials (variety)	Concentration of lead (in ppm.)	No. of days after sowing					
		Sowing	Transplantation	Establishment	Boot leaf stage	Range of flowering	Maturity
Pusa 2-21	Control	0	26	31	37	45-61	83
	1 ppm.	-	26	31	37	48-63	85
	3 ppm.	-	26	31	39	48-59	83
	5 ppm.	0	26	31	35	37-59	78
MW 10	Control	0	26	31	35	43-59	81
	1 ppm.	0	26	31	35	43-59	81
	3 ppm.	0	26	31	36	44-59	82
	5 ppm.	0	26	31	36	44-61	82
Sita	Control	0	26	31	59	65-74	99
	1 ppm.	0	26	31	59	64-74	99
	3 ppm.	0	26	31	57	64-75	99
	5 ppm.	0	26	31	59	61-76	98
Parijat	Control	0	26	31	49	59-74	96
	1 ppm.	0	26	31	48	53-74	93
	3 ppm.	0	26	31	49	59-76	97
	5 ppm.	0	26	31	48	53-76	94

It has been found that different varieties of rice respond differently in respect of concentration, as well as the metal concerned. Even the same variety behaved differently for different concentrations of the same metal. For instance, Cd delayed flowering and maturity in 3 ppm or 5 ppm or 1 ppm in case of Annapurna, M.W. 10, Ratna, IR 36, IR42. Whereas in case of early flowering and maturity were obtained in case of IR 52 and Pankaj. The other varieties like Mashuri, Kunti, Parijat were not affected significantly. Treatment with lead-salt-solution produced early flowering and maturity in Pusa 2-21 and other three varieties treated were not significantly affected. Treatment with Mercury salt solution induced early flowering and maturity in Sita and Parijat but delayed flowering and maturity in M.W.10.

**Table 3. Effect of treatment with mercury salt solution on life period of different varieties of rice (*Oryza sativa* L.)**

Name of test materials (variety)	Concentration of mercury (in ppm.)	No. of days after sowing					
		Sowing	Transplantation	Establishment	Boot leaf stage	Range of flowering	Maturity
Pusa 2-21.	Control	0	26	31	36	47-63	85
	1 ppm.	0	26	31	37	48-63	85
	3 ppm.	0	26	31	36	45-61	83
	5 ppm.	0	26	31	36	45-63	84
MW 10	Control	0	26	31	35	36-59	77
	1 ppm.	0	26	31	36	41-63	82
	3 ppm.	0	26	31	36	40-59	79
	5 ppm.	0	26	31	36	42-63	82
Sita	Control	0	26	31	59	65-76	100
	1 ppm.	0	26	31	58	64-76	100
	3 ppm.	0	26	31	57	63-74	98
	5 ppm.	0	26	31	59	64-76	100
Parijat	Control	0	26	31	52	60-74	97
	1 ppm.	0	26	31	49	54-74	94
	3 ppm.	0	26	31	48	55-73	94
	5 ppm.	0	26	31	48	53-71	92

It may be concluded from the results that the response of different varieties of rice with reference to life period differ not only depending on the genotypic difference but also to differences in concentration of metal and also on the kind of heavy metal used. Rice plants are not indifferent to metal stress conditions.

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