

BRIEF COMMUNICATION

M₁ Chlorophyll Chimeras Induced by Different Mutagens and their M₂ Chlorophyll Mutation Yields in Rice

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Abstract. Studies with gamma rays, fast neutrons, and EMS treatments in rice showed higher frequency of M₁ chlorophyll chimeras in the EMS treatments, a correlation between the frequencies of M₁ chlorophyll chimeras and M₂ chlorophyll mutants, and a higher M₂ mutation frequency in the progeny of chimerical M₁ plants compared to those of normal-looking plants.

In the course of studies with different mutagenic treatments (16, 18, 20, and 22 kr of gamma rays; 1.6, 1.8, 2.0, and 2.2 krad of fast neutrons; and "wet" and "dry-back" variants of 2.0% ethyl methanesulphonate, EMS) on the Hungarian rice variety Dughan Shali (*Oryza sativa* subsp. *japonica*), plants showing chlorophyll chimeras were noted in the M₁. M₂ crops were raised from the chimerical and normal-looking plants separately. Data on frequency of M₁ chimerical plants and the M₂ chlorophyll mutation are presented in Table 1. Though the M₂ s were grown and analysed treatment-

TABLE 1

FREQUENCIES OF M₁ CHLOROPHYLL CHIMERAS AND M₂ CHLOROPHYLL MUTANTS after treatments with gamma rays, fast neutrons, and EMS

Mutagens	M ₁ plants			M ₂ seedlings from					
	N	n _{ch}	ch _c	normal-looking plants			chimerical plants		
				N	n _m	m _c	N	n _m	m _c
Gamma rays	1 845	46	2.49	80 244	740	9.22	808	45	55.69
Fast neutrons	2 495	22	0.88	69 970	749	10.70	1 425	76	53.33
EMS	764	61	7.98	31 799	1 127	35.44	3 217	143	44.45

N = total

n_{ch} = chimerasn_m = mutantsch_c = % chimerasm_c = mutants per 1000 seedlings

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wise and plant-progeny-wise, for purposes of comparison only pooled data for the three mutagens are presented here.

Compared to gamma rays and fast neutrons, the EMS treatment was found to induce higher frequency of chlorophyll chimeras in M_1 . Similar observations have been recorded in *Arabidopsis thaliana* by GICHNER and VELEMÍNSKÝ (1965) and in hexaploid wheat by VARUGHESE and SWAMINATHAN (1968).

Another observation which can be made from the data is that there is a correlation between the frequencies of chlorophyll chimeras in the M_1 and chlorophyll mutation in the M_2 as observed by GICHNER (1966) in *Arabidopsis thaliana* and VARUGHESE and SWAMINATHAN (1968) in wheat.

Comparison of normal-looking and chimerical M_1 plants for their M_2 mutation yields has not been reported so far in rice. Data presented here allow such a comparison and show that the chimerical M_1 plants yielded higher M_2 chlorophyll mutation frequencies under all the three mutagens. This indicates that selecting the chimerical plants in the M_1 , whenever available, will be advantageous for obtaining high mutation frequency in M_2 .

None of the chimerical plants in the M_1 bred true in the M_2 , and there was not a single plant showing chlorophyll streaks in the progenies of the chimerical plants. These facts and the preponderance of chlorophyll streaks in the M_1 from EMS treatment may suggest that most of these chimeras were periclinal in nature or were caused by alteration in the DNA of chloroplast. VARUGHESE and SWAMINATHAN (1968) have explained such a possibility as a consequence of the two facts that EMS is more specific to guanine and cytosine (*cf.* FREESE 1963), and that the chloroplast DNA is known to be rich in G-C content (CHUN *et al.* 1963). The other fact that, irrespective of the mutagens, the chimerical M_1 plants yielded higher M_2 chlorophyll mutation frequencies than the normal-looking ones suggests the possibility of gene mutations also as suggested by GICHNER and VELEMÍNSKÝ (1965).

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Pokusy s účinky gama záření, rychlých neutronů a působení EMS u rýže ukazovaly na vyšší frekvenci chlorofylových chimér v M_1 v případě působení EMS. Byla zjištěna korelace mezi frekvencemi chlorofylových chimér v M_1 a chlorofylových mutantů v M_2 a vyšší frekvence mutací v M_2 v potomstvech chimerických rostlin v M_1 ve srovnání s frekvencemi rostlin normálního vzhledu.