achieved on N_6 and Murashige and Skoog media, respectively.

Germination rate and callus induction efficiency were inversely proportional to the mutagenic activity of the treatments (Table 1). The combined physical and chemical treatment drastically reduced callus induction efficiency. Differentiation was much less in the mutagen treatments than in control (Table 2). In all mutagen treatments, differentiation was similar but the ratio of green plants to the number of calli plated was higher with NaN_3 alone and with NaN_3 + radiation. □

Production of doubled-haploid rice plants through anther culture

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We studied the androgenetic ability of 23 F_1 crosses. Cultivars used were 17 japonica type Brazilian upland cultivars, 3 indica cultivars (Metica 1, Tetep, TOM1-3), 2 cultivars from indica/japonica crosses (IRAT118, Cuiabana), and 1 nonclassified Colombian upland cultivar (Colombia 1).

Cytological studies established a relationship between panicle morphology and optimal microspore stage (late uninucleate). Panicles pretreated for 8 d at 4 °C were dissected and the anthers inoculated for callus-induction [N6 basal medium with 1 mg naphthaleneacetic-acid (NAA)/liter, solidified with 8 g agar/liter]. Calli formed 4 to 8 wk later were transferred to a plant regeneration medium (MS basal medium with 3 mg kinetin/liter + 0.5 mg NAA/liter, solidified with 8 g agar/liter).

Genotypes differed in androgenetic potential (see table). Callus induction rates varied from 0.22 to 29% and plant regeneration rates from 0 to 144%.

The indica/japonica hybrids had good androgenetic yields. On average, 27% of the plants were albinos; 59% of the green plants underwent spontaneous doubling of chromosome number.

The haploid plants were treated with colchicine to achieve diploids. Diploid lines were multiplied and evaluated in the field. Individual lines appeared homogeneous in morphological characteristic, but several lines originating from the same callus demonstrated heterogeneity.

Very promising lines had excellent behavior in upland fields and good grain quality. Those lines have been introduced into the advanced observation tests of the CNPAF breeding program. □

Anther culture ability of 23 simple F_1 crosses.

Cross	Anthers cultured (no.)	Callus induction (%)	Green plant regeneration (no.)	Green plant regeneration[a] (%)
Dourado Precoce/CNA5175	2004	20.1	15	3.7
Dourado Precoce/Araguaia	2124	6.8	0	0.0
Dourado Precoce/IAC81-176	2246	5.6	0	0.0
Dourado Precoce/Colombia 1	2057	8.0	0	0.0
Dourado Precoce/L 13	2064	5.6	0	0.0
Dourado Precoce/Tetep	2040	3.5	19	26.8
Guarani/Dourado Precoce	2010	29.0	0	0.0
Guarani/Araguaia	2020	16.2	0	0.0
Guarani/L 13	2005	23.2	0	0.0
Guarani/Chorinho Aliança	2056	17.3	0	0.0
Guarani/CNAx 539-2-1-3	1854	0.9	3	18.8
Guarani/Jaguari	2166	1.4	0	0.0
Araguaia/IAC81-176	2012	0.7	0	0.0
IREM195/Araguaia	2088	14.8	0	0.0
IREM195/IAC81-176	2058	6.8	0	0.0
IREM257/IAC164	944	4.8	6	13.3
CNA5180/Cuiabana	2780	0.5	3	20.0
CNA5180/IAC81-176	2086	2.9	0	0.0
CNA4157/TOM1-3	1522	2.3	22	62.9
L 8511/Cuiabana	9012	7.9	98	13.8
EEPG 369/Araguaia	4606	8.1	31	8.3
Catetão Precoce/Metica 1	4088	0.2	13	144.4
IRAT118/Cuiabana	2132	2.8	15	25.0

[a] $\frac{\text{Green plants (no.)}}{\text{Callus (no.)}} \times 100$.

Gamma ray-induced genetic male sterile mutation in rice variety Bala

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Upland rice variety Bala was irradiated with gamma rays at 10, 20, 30, 40, and 50 kR and 400 seeds/variety per treatment used to grow the M_1 population. At maturity, 50 M_1 panicles/treatment were selected on the basis of spikelet sterility and used to grow the M_2 (panicle progeny rows).

The panicle progeny rows were screened between flowering and maturity for segregation of male sterile mutations. Sterile mutations were identified by panicle erectness, spikelet chaffiness, and prolonged green plant color. The three first-formed panicles of all sterile mutations were evaluated for grain fertility (Table 1).

At the same time, two sterile plants from each segregating M_2 line (considered true male sterile) were crossed with the parent for segregation