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Cell fusion as a tool for rice improvement

Cell fusion offers a unique opportunity to hybridize sexually incompatible species and to mix cytoplasmic genomes in higher plants. Recent progress in plant regeneration from rice protoplasts facilitates an evaluation of the cell fusion method for rice improvement. By using electrofusion of protoplasts, we obtained hybrid/cybrid plants of the following combinations:

Hybrids of rice x barnyard grass (*E. oryzicola*)

Hybrids of rice x wild *Oryza* species

Cybrids of rice with transferred *cms* cytoplasm

For the latter, protoplasts irradiated with 70 krad x-rays were used.

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Gene manipulation for salt tolerance and blast resistance through in vitro techniques in rice (*Oryza sativa* L.)

Rice calli generally lose regenerating ability in about 90 days. However, plant regeneration (60-70%) from 1500 day old embryo calli of "Thellahamsa" cultivar has been established with 3% sorbitol/mannitol on LS media for efficient genetic manipulation at the cellular level. Matured embryo calli of four susceptible cultivars, "Tellahamsa", "Jaya", "HR-2" and "Zenith" were irradiated (0.1-0.5 kR) and challenged with *Pyricularia oryzae* spore suspensions (10^5 /ml) and with the major toxin d-picolinic acid (125-200 ppm). A total of 514 plants were regenerated from the "resistant" calli. The TC-2 plants exhibited varying degrees of resistance (66-78%). The genetic basis of resistance of regenerated plants and their progeny may help in understanding the mechanism. Rice embryo calli of nine scented and non-scented cultivars were challenged with NaCl (0.5-2%) and 25-50% sea water with or without proline. A total of 222 plants were regenerated. The progeny of TC-2 plants were evaluated with normal and saline soil (EC 13.5 ds/m) for yield parameters. These studies suggested that stable tolerant TC-2 plants under stress exhibited superior yield parameters and the salinity index ranged from 89.4-98.4.

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Effects of gamma-radiation treatment in somatic cell culture of indica rice Basmati 370 selection

Radiation treatment was applied at different doses to germinating embryo, callus, callus with green spots and callus with developing shoots. Results indicate: (1) induction rate of the callus was reduced with increased radiation dose applied to germinating embryos; (2) radiation effect on redifferentiation percentage and/or green plantlets percentage of the callus varied with different treatment dates in the order of callus treatment > treatment of callus with green spots > treatment of callus with developing shoots > treatment of germinating embryo; (3) in vitro irradiation reduced the fertility of regenerated plants, but was able to increase their exerted stigma rate and the frequency of early maturing variation in their progenies; (4) a number of promising mutants including 2 male sterile plants were obtained from the progenies of in vitro irradiation. The radiation treatment with 2.5-5.0kR to callus with green spots or shoots is a method worthy of adoption in rice improvement.

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