
Biotechnologically Evolved Rice (Orzya Sativa) Crop.

By Mrs. Farzana Panhwar, June 2005

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Abstract

Rice is a staple food for 2.4 billion people in the world. Rice contains essential amino acids lysine and theonine. It also contains iron and calcium but it is not available due to presence of phytic acid. Thiamine content depends upon the polishing of rice.

The scientist throughout the world working genetically to develop rice varieties having pest, fungus, herbicide, disease, stress, viral resistance, male sterility, altered photosynthesis and flowering, increase growth and yield better nutritional qualities like starch content, protein and oil contents, resistant to various diseases and under adverse condition like water-logging and salinity.

- For future rice production we have to:
- Increase the area under high yielding rice varieties.
- To recommend only right kind of rice varieties, according to climate, soil and nutritional value.
- To grow genetically crop under stick recommended management of weeding, hoeing, irrigation, fertilising and harvesting.

Future work on symptomatology, aetiology, morphological, physiological variation of the pathogen, pathogenic variability, types of varietal resistance, techniques of resistance, biochemical and anatomical traits of varieties in relation to resistance, genetics of resistance, methods and strategies in breeding for resistance to various rice varieties under various environmental conditions need to be studied

Introduction

Rice (*Oryza Sativa*) a cereal grain. Is the major food stuff of Asia. About 8% of the total energy provided by rice. It is protein of good quality, with net dietary protein (NPU) value of about 65. Rice contains essential amino acid lysine and theonine. Although rice contain calcium and iron but it is not available due to presence of phytic acid. Thiamine content of rice depend upon the degree of milling like rice only husk removed contain 250 mg of thiamine/100 grams, on polish of rice remove half of the thiamine when rice polish 3 time, like rice available in the market contain 70mg which is 1/3rd of original thiamine.

In Pakistan, the top five varieties occupy 80% of the total area. In the year 1994-95 the area under rice production was 2,124,600 hectares while in Sindh it was 598,300 hectares. The rice production in Pakistan was 3,446,500 tonnes while in Sindh it was 1,406,700 tonnes. For the same year the yield of rice per hectare was 1,622 kgs while in Sindh was 2,351 kgs.

Genetically evolve rice.

There are as under.

- Rice genetically evolved crops are Blast fungus, drought resistant and gall midge.
- Although IRRI policy not be patent either the germplasm collected from farmer's fields or the products of its conventional breeding work, it can not protect and prevent the patent on germplasm. And companies make minor modification like IRRS and patented it.
- Rice Tee company obtained patent on Indian and Pakistani Basmati rice. The company has been awarded a patent on any breeding cross involving 22 farmer bred Basmati rice.

- New hybrid 'Terminator' technology will force farmers to buy rice seed every planting season from transitional corporation.
- Agro Evo , have Bt-rice patent.
- In Japan, Genetic modification rice was:
 - RSV resistant by MAFF company and in the year 1994 approved for commercial planting.
 - Rice resistant to RSV resistant, work done by plant research Institute in the year 1994 it approved for commercial planting.
- Rice Tec, a company in Texas has taken patent on basmati, rice. This is biopiracy against India and Pakistan.
- According to Derwent ,Bio-technology Abstract between 1982 to 1997 there were 160 patents awarded on transgenic rice and technologies employed to transform it.
- In rice the selection for lysine over producers, led to genotype with increased seed lysine and protein, but its yield decreased.
- Genetically evolved rice show:
 - Resistance to diseases and pests like tungro virus resistance.
 - Introduction of pro-vitamin-A.
- The nutritional value in rice is also be reprogrammed , since it have 5-10%. Soluble prolamine, in which human digestive system absorb only 70-80%, insoluble glutton. So by new technology a new rice variety is evolved which not only increase the protein percentage high but also help in digestion, at the same time transgenic rice have more nutritional value, drought and salinity tolerance.
- If polished rice used for long-time it results into beriberi, a disease due to thiamine deficiency.
- Integrated duck-rice production developed in Japan in which ten day old ducklings are released into recently transplanted rice fields at a density of 190/ducks/hectare, these ducks control insects, weeds snail and mice. Ducks are removes form the field before rice ears.
- Duck owner trying to reduce feeding cost and use paddy grains dropped around rice.
- Biotechnology is used to improve the existing cultivars, showing better fixation of atmospheric nitrogen, increase nutritional quality better tolerance to salinity, alkalinity.
- A male sterility gene used to assist in the production of new rice hybrid, in which old rice variety is being used. The new hybrid give 30% more yield than the ordinary variety.
- International rice research Institute (IRRI) developed new high-yielding, high external input varieties.
- Scientist used wild rice varieties with the help of breeders.
- Bt rice was evolved with join research with IRRI and 'Novartis'.
 - The golden rice - A Big illusion?
- Breeding of Bacterial leaf blight.
- Japanese companies are working on increasing yield.
- Chemical companies getting royalties on seeds and licence fee on genetic technologies.

Pro-Vitamin-A gene in rice

Vitamin-A deficiency associated with malnutrition, which is mostly found in Asia, Africa, Latin America. Vitamin-A deficiency cause partial or full blindness (Xerophthalmica) and produce illness like: diarrhoea, or means, in China. Oranges contain Pro-vitamin-A, which absorb easily.

The publication on the pro-vitamin A rice appeared on the Journal Science on 14th January 2000 (p.303), science sent a pre-print of article on 1700 Journalist around the world and Mary Lon Gnerinot who wrote the commentary in science, remarks, one can only hope that this application of plant genetic engineering to ameliorate human misery without regard to short term profit will restore this technology to political acceptability.

- The various project to reduce vitamin-A deficiency was the projects of UN and FAO like:
 - Strategies used to fight vitamin-A deficiency.
 - Food fortification (like margarine containing vitamin A in Philippines sugar fortified with vitamin A in some Latin American countries.
 - Supplementation: Administration of high dose Vitamin-A capsules twice a year is the daily requirement.

The Institute of technology in Zurich (Switzerland) , have evolved transgenic rice containing pro-vitamin A.

Rice Qualities used for patenting are: Pest resistance Fungus resistance.,

Herbicide resistance, Disease resistance., Stress resistance.. Viral resistance., Male sterility. Altered photosynthesis/flowering. Increased growth, Yield increased. Starch content. Protein content , Oil content.

Breeding of rice resistant to fungal diseases like: Brown spot, Sheath blight. Sheath rot., Stem rot., Stem rot, Bakanal., Narrow brown leaf spot, Leaf scald, Udbatta., False shnuit.

Breeding of rice resistance to virus disease. Rice Tungrow virus, Rice Dwarf. Rice yellow Dwarf., Stripe disease.. Grassy stunt disease, Hoja Blanca disease, Ragged stunt, Black streated dwarf diseas., Necvosis Mosaic disease. Orange leaf disease

Varieties of rice resistant or tolerant to major diseases and pest

No.		
(a)	Drought-tolerant.	N22, Bala, Brown gora, Black gora, Jet 1444, Lal Nakanda, CR-143-2-2, Kanchhan, Kiran, Bhavani.
(b)	Blast-resistant.	CO15, K332, K333, Java, Rasi, Vani, BJ1, ARC 6087, ARC 6633.
(c)	Helminthosporise resistant.	Bam 10, T 141, ARC 11253, ARC 11073, ADT 31.
(d)	Resistant to bacterial leaf blight.	Jet 1441, BJ1, TKM-6.
(e)	Resistant to tungro virus.	Kataribhog, PTB2.
(f)	Resistant to grass-stunt virus.	O. nivart, IR362.
(g)	Resistant to green leaf-hopper.	Vani, Ptb2, Ptb7, RP5-12, Pankhari 203, Ptb18.
(h)	Resistant to gall midge.	Eswarakora, Surekha, CR94MR 1523, Ptb 18, Ptb21, RPW 6-17.
(i)	Resistant to brown plant-hopper.	Ptb21, Ptb33, IET-5IV8, IET5119, RP1045-6-10-1, T1425, T1432, Ennapatta, T1421, Sonamukhi, Pandi, ARC6650.
(j)	Resistant to white backed plant hopper.	T1471, Lal basmati, Kodyan Eswaramangalam.
(k)	Tolerant of stem-borer.	TKm6, W1263, LET 2812, IET 2815, IET 2845, Kodyan.

Rice varieties for special situation

- CR-93-4-2; Kakatiya and RP-6-13 for gallmidge area.
- CR-93-MR-1550-Red rice resistant to leaf and brown plant hoppers and tungro virus.

For water logged conditions

- IET-2337; IET-2379 Kalinga-1; Kalinga-2-CR-10-5071; Jhona-351; CR-1014; Panidham-2; Panidhan-1-Mahsuri; Pankaj Jagannath.
- Rice are prove to many diseases like bacteria, fungi, viruses and mycoplasma - like organisms.

Various scientist's opinion, these are as under:

- Potrykus (Technology institute said that we give transgenic rice free of charge and any restrictions to poor farmers in developing countries).
- John R. Lupien, Director of Food and Nutrition Division of FAO in Rome Italy concludes: A sing nutrient approach towards a nutrition, related public health problem is usually, with exception of iodine and selenium deficiencies neither feasible nor desirable.
- In the words, of Ralph Riley, Chairman of the IPRB Scientific Advisory Committee. "We now live in the age of genetic engineering and we should all recognise that a paradigm shift is occurring when no longer do we go from the phenotype to the gene but can now go from the (gene) sequence to the phenotype."
- Parasitic wraps (beneficial killing leaf-eating caterpillars.)

Future work on symptomatology, aetiology, morphological, physiological variation of the pathogen, pathogenic variability, types of varietal resistance, techniques of resistance, biochemical and anatomical traits of varieties , in relation to resistance, genetics of resistance,.

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