Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Mutation breeding for crop improvement


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The Joint Food and Agriculture Organization of the United Nations/International Atomic Energy Agency (FAO/IAEA) Division of Nuclear Techniques in Food and Agriculture assists member countries in the application of radiation-induced mutation breeding technologies for the improvement of existing and local crop varieties. Through the development of resilient varieties with higher yields, improved quality and greater tolerance to environmental stress, such as disease, drought and salinity, these varieties contribute considerably and sustainably towards global food security and the enhancement of biodiversity.

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What FAO does


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- Supports the global use of mutation breeding for crop improvement through applied research and development, specialized laboratory services, technology transfer, capacity building and information management to increase food security and food quality in member countries;
- Performs research and development to improve mutation induction and mutation detection techniques to accelerate mutant line development, including screening of mutant germplasm and molecular discovery of mutations;
- Provides capacity building and transfers technology to member countries, primarily through coordinated research projects as well as more than 40 national and regional technical cooperation projects;
- Provides technical support and laboratory services to member countries, including assistance in crop irradiation and the establishment of crop-specific mutation induction and trait selection procedures;
- Maintains the publically available *Mutant Variety Database* with currently more than 3200 officially released mutant varieties of agricultural and horticultural crops;
- Provides policy advice, particularly crucial to developing countries where mutation breeding is largely viewed as a public good, as well as a variety of information services, including advisory group panels and symposia;
- Trains around 150 trainees annually at the FAO/IAEA Laboratories at Seibersdorf as well as through workshops and training courses on-location in member countries.

Contributes to FAO's Strategic Objectives 2, 4 and 5

Make agriculture, forestry and fisheries more productive and sustainable
Enable inclusive and efficient agricultural and food systems
Increase the resilience of livelihoods to threats and crises

Mutation breeding for crop improvement

Understanding the context

Global challenges, including a rapidly growing human population, a reduction in productive agricultural lands and an increasingly erratic climate, threaten crop productivity and food security. It is anticipated that food production will have to increase by at least 60% to feed a projected population of 9 billion people by 2050. Crop mutation breeding and the development of improved crop varieties adapted to climate change is an important factor in meeting this demand.

The genetic diversity of crop plants is the foundation for the sustainable development of new varieties to meet present and future challenges. Induced mutations offer numerous benefits to crop improvement, especially when conventional breeding techniques fail for the lack of appropriate genetic variation.

Viet Nam officially released 18 mutant rice varieties over the past 10 years, including several mutant rice varieties tolerant to the saline conditions of the Mekong Delta. Within only four years of its release to farmers, the most successful of these saline-tolerant rice varieties were grown by 4.5 million farmers on 30% of the rice production area in the Mekong Delta of Viet Nam, generating an additional income of US $374 million/year. Viet Nam also has a highly successful soybean breeding programme, with mutant soybean varieties occupying about 50% of the dedicated soybean area.


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Mutation breeding techniques have led to the development of improved barley and amaranth mutant varieties in Peru that are adaptable to climatic conditions in high altitudes. The mutant barley variety, Centenario II, today yields 3 000 kg/ha, up from 800 kg/ha, and is widely accepted by Peruvian farmers in the Andes. This variety contributes roughly US $32 million annually to the poor, high-altitude Andean region. Similarly successful is the mutant amaranth variety, Centenario, which covers 47% of the dedicated area for this crop.

In Bangladesh plant breeders developed 76 mutant varieties in 12 different crop species. Cultivation of the Binadhan-7 mutant variety, an early maturing variety with increased cropping intensity, has expanded so far to over 300 000 ha of land as it enables three cropping seasons per year and hence helps combat the seasonal food shortage (Monga).

CONTACT US

Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture
International Atomic Energy Agency, Wagramer Strasse 5,
PO Box 100, 1400 Vienna, Austria

MORE INFORMATION

www-naweb.iaea.org/nafa