FOREWORD

The present genetic pool of agricultural crops is meager and vulnerable and is still shrinking. We depend on fewer and fewer crops and within each crop on fewer and fewer varieties. This genetic pool cannot satisfy fully the present and future agricultural, environmental, economic, social and industrial needs. The needs of developing countries for new and prolific sources of feed, fuel, and fiber are pressing.

It took rather a long time before it was shown that genetic changes brought about by mutagens could actually be useful for genetic improvement. In fact, it was thirty years after Gregor Mendel proved that the elements of heredity called genes are transmitted intact from generation to generation, that ionizing radiation was discovered. But it took another 30 years to put forth convincing evidence that ionizing radiation can induce mutations, altering genes which were thought to be stable. Since then, mutagenesis has undergone rapid development and opened up a new era of genetic research laying foundations for modern molecular genetics. X-rays, gamma rays, neutrons and other ionizing radiations used as physical mutagens were complemented by chemical mutagens.

Mutagens are the primary source of all variability in organisms. Variability caused by induced mutations is not essentially different from spontaneous mutations during evolution and the methods for the utilization of induced mutations in plant breeding are practically the same as those used for newly arising spontaneous mutants.

The main advantages are that the basic genotypes of the variety is usually only slightly altered while the improved characters added and that the time required to breed the improved variety can be shorter than when hybridization is used to achieve the same result.

Artificially induced mutation does not have any differences in quality with those that have been generated spontaneously during the long years of each organism. The method of utilizing and artificially produced improved variety as mutant is known as mutation breeding. By the use of this method many new varieties have been bred, which contributed to the production of food in the world with the acquisition of high yielding variety with additional pest and disease and environmental stress tolerance.

It was amply demonstrated that the technique has been applied with great success in many annual seed propagated crops such as rice, barley, wheat, cotton, soybean, bean and pea to develop better cultivars, many of which have had a remarkable impact on both the income of the farmers and national economies. Attention has also been focused on vegegetatively propagated perennials such as pears and apples and lately on ornamentals producing uniquely colored petals and leaves.

With many pressing needs in various parts of the world and the demands placed on agriculture to produce more food, feed, fiber, energy, industrial raw materials, etc. under various climatic and input conditions there is also an urgent quest to domesticate new plants and to develop new uses for the existing crops and to improve primitive ones.

Induction of mutation by radiation and chemical mutagens is now well entrenched. At times it is the only way to increase genetic variation in the primary gene pool, as in asexually propagated plants or where the desired market type genotype is very heterozygous and selfing or outcrossing will lead to its breakdown.

The Atomic Energy Commission of Japan with great cooperation from the Japan Atomic Industrial Forum, Inc. held the First International Conference for Nuclear Cooperation in Asia in March 1990 to enhance cooperation in the nuclear field with neighboring Asian countries. As a result, a consensus was reached to implement regional nuclear cooperation from the long term point of view, in the field of utilization of radioisotopes and radiation for agriculture among other areas. Plant mutation breeding was approved as a common field of cooperation in the Fourth International Conference for Nuclear Cooperation in Asia.

The First Plant Mutation Breeding Seminar under the Regional Nuclear Cooperation in Asia, (now Forum for Nuclear Cooperation in Asia, FNCA Workshop on Mutation Breeding) was held in Beijing, China in 1993 with delegates from China, Indonesia, Japan, Korea, Malaysia, the Philippines, Thailand and a representative from the International Atomic Energy Agency, IAEA in Vienna, Austria. The Mutation Breeding Project now includes the Viet Nam (since 1995). Since the inception of plant mutation breeding as an area of cooperation, the Workshop-Seminars have been held almost every year.

Due to the vast information generated by the group it was realized that some aspects of the activities of the group should be institutionalized. In the succeeding roundtable discussions of each workshop, it was held as a consensus that a database of plant mutation breeding – FNCA be established; a mutant stock repository be set up, and that a bench-top mutation breeding manual be published as a guide for the aspiring radiation mutation breeding novice.

To pursue this task, the FNCA Mutation Breeding Project encouraged the Contact Persons (now Project Leaders) to submit contributions to the Manual and an agreement that some techniques published in the proceedings of the seminar – workshop be included to review and standardize the available methods and current technique on plant mutation breeding using both physical (radiation) and chemical mutagens. The contributions of the Project Leader of each participating country and their expert colleagues are sincerely acknowledged.

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