

# FAO/IAEA International Symposium on Plant Mutation Breeding and Biotechnology



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## USING THE IONIZING RADIATION FOR IMPROVING THE DEVELOPMENT AND YIELD OF AGRICULTURAL CROPS

Agricultural production is confronted with multifaceted challenges from global climate change. There is now an overwhelming evidence that “business as usual” for crop development will be insufficient to adapt crops to meet the expanding global agricultural demand. Irradiation of seeds can increase field germination, stimulate growth and development of the plants, as well as increase their resistance to unfavourable environmental conditions. In our experiments it was shown that increased size of seedlings after irradiation with stimulating doses was due to the enhancing pace of development rather than an earlier germination. In a study of the activity of the enzymes involved, most of the enzymes showed increased activity in the range of doses that cause stimulation of seedlings development. It was shown that phytohormones were actively involved in the acceleration of the plant development after irradiation of the seeds within the stimulating dose range. Moreover,  $\gamma$ -irradiation of barley seeds significantly influenced the development of the plants during the growing season. After irradiation with stimulating doses during the 4-years field study we observed a reduction in the duration of the initial stages of ontogeny; the phase of full ripeness started on 5-7 days earlier than in the controls. The manifestation of the effect of irradiation depends on the conditions in which the plants develop. During the dry 2014 season plants originated from the irradiated seeds showed an increase in the number of productive stems, which led to an increase in yield by 34-38%; during optimal 2015 season an increase in the number of grains per spike caused an increase in yield by 8-29%. Therefore, our field study has shown that at least some hormetic effects can occur in the field with sufficient regularity and predictability for a practical use. A more complete understanding of underlying mechanisms of hormesis is needed to exploit its potential benefits in crop production.

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