Effect of Ion-Beam Implantation on Seed Vigor of *Roegneria Kamoji* Ohwi

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Key Words: Roegneria Kamoji Ohwi, ion-beam, seed vigor, damage effect, saddle curve

Introduction *Roegneria Kamoji* Ohwi is a cross-pollinated, long lived and perennial species in *Roegneria*, Triticeae tribe of Gramineae, has multi-florets and multi-seeds and has resistance against humidity and fusarium head blight. Domestic research was focused mainly on genetic variation in morphology, cytology, isoenzyme, RAPD and SSR(Zhou, 2000). Ion-beam, as a new source of mutation, has been characterized by its higher mutation rate and wider mutational spectrum with lower damage for the implanted organism (Yuan *et al*. 2003). In this study, ion beam is implanted in seeds to provide abundant mutated colonies for the genetic improvement of *Roegneria Kamoji* Ohwi.

Materials and methods Seeds of *Roegneria Kamoji* Ohwi T0503 were provided by professor Xu Zhu of the Grassland Research Institute of Chinese Agricultural Science. The implantation was performed with the Ion Beam Bioengineering Instrument at Inner Mongolia University. The seeds were placed into the target chamber of the implantation machine. When the pressure of vacuum of the target chamber reached around 1.6～2.6×10^{-2} Pa, the seeds were implanted with low energy (25 keV) nitrogen ion beams under the flux of 2.6×10^{13} ions/cm^2 per pulse. The fluence ranged from 500×2.6×10^{13} ions/cm^2 to 5000×2.6×10^{13} ions/cm^2.

Results Both the germination energy and germination rate showed Saddle Curve as the doses increased (Figure 1). The seed germination of *Roegneria Kamoji* Ohwi increased initially at the lower doses of 500×2.6×10^{13} ions/cm^2 and 1,000×2.6×10^{13} ions/cm^2, followed by a declining trend at higher doses. The sub-lethal dose for germination rate was 3,500(2.6(10^{13} ions/cm^2. The highest dose of 5000×2.6×10^{13} ions/cm^2 cause severe damage to the seeds resulting in a germination rate of 11.8%. The seeds treated with low doses germinated faster and grew better, while the seeds treated with high doses had slower germination and weaker growth. The vigor index can be used to represent physiological damages at seedling stage after ion beam implantation. In this study, most doses improved the seed vigor index. Implantation with the dose of 1000×2.6×10^{13} ions/cm^2 resulted in the highest seed vigor index (Figure 2).

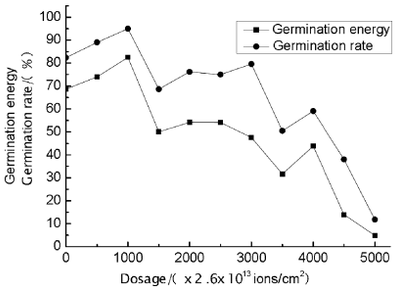

Figure 1 *Germination energy and rate as a function of dose.*

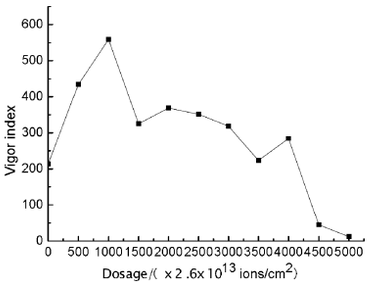

Figure 2 *Vigor index as a function of dose.*

Conclusions The effects of icon beam implantation on the seeds of the *Roegneria Kamoji* hwi depends on doses. Doses differed significantly in their effects on the germination energy, germination rate and vigor index. Ion-beam implantation with a low dose can bring excitation effect and resulted in high germination rate and energy. With suitable energy and dose, the ion-beam implantation can obviously improve performance and quality of the contemporary crop. However, if ion-beam implantation is used to induce genetic mutation or assist genetic improvement, higher doses shall be used(Yang *et al*., 2006). In this research, the vigor index is still high even at the medium and high doses (1,500 to 4,000 × 2.6×10^{13} ions/cm^2), and the author thinks higher doses have mutagenesis effects on *Roegneria Kamoji* Ohwi.

References

Zhou Yonghong, 2000. A biosystematic study on Roegneria dolichathera, R. pendulina and R. kamoji. ACTA PRATACULTURAL *SCIENCE* 2, 45-52.

Yuan Chengling, Yu Zengliang, 2003. The Grand Progress of Low-Energy Ion Beam in Life Sciences. *Progress In Biotechnology* 4, 57-61.

Yang Gen, Bian Po, Zhang Zhenghong, Ren Jie, Wu Lijun, Yu Zengliang, 2006. Bioeffects of Low Energy Ion-Beam Implantation and Vacuum Treatment on M1 Arabidopsis Thaliana. *Plasma Science & Technology* 8, 242-245.