3 - 30 Mutation Breeding of Wheat Irradiated by Carbon Ions Beams

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Heavy ion beams are generally recognized as one of powerful mutagens in plant breeding to generate new mutants with ideal or useful agronomic characters[1]. $^{12}C^{6+}$ ion beams (80 MeV/u) accelerated by Heavy Ion Research Facility in Lanzhou (HIRFL) were used to irradiate wheat samples, one of the major wheat varieties in Qinghai province, named Gaoyuan448. The radiation doses ranged from 10 to 200 Gy. The irradiated samples, controls, and another major wheat variety named Abo were planted in farm locating in Ledu county of Qinghai province in 2014.

Several mutants in M3 generation with high yield and quality characters were screened out and analyzed. The results were compared with Abo and the control (Table 1). It can be concluded that, compared with the control, the yields of mutant Mut1 and Mut3 increased 8.49% and 7.02%, respectively. Meanwhile, the comparison between the mutants and Abo indicates that the yields of mutants are much higher than Abo. For qualities analysis, Mut27 has the highest water content. In addition, the wet gluten content of Mut34 is highest. Meanwhile, Mut34 has the second highest crude protein content in all the samples (6.62% higher than control), flour sedimentation value (9.77% higher than control), lysine content (3.44% higher than control) and crush ash content (2.72% higher than control).

Table 1 Analysis of agronomic charactersand seed quality of wheat mutants induced by carbon ion irradiations.

Mutants	Percentage of yield increment		Water content/%	Crude protein content/%	Wet gluten content/%	Flour sedimentation value/%	Lysine content/%	Crude ash content/%
	Compared to Abo/%	Compared to control/%						
Abo	0.00	-44.59	0.01	6.87	7.57	12.78	8.03	2.17
Control	30.84	0.0	0.00	0.00	0.00	0.00	0.00	0.00
Mut1	36.71	8.49	-0.04	-2.94	-2.56	-12.78	0.46	-4.89
Mut3	35.7	7.02	-0.01	-1.07	5.4	-5.26	0.46	-13.59
Mut26	10.35	-29.62	0.02	-4.57	0.18	0.75	0.23	-7.61
Mut27	3.33	-39.78	0.03	-3.54	-5.25	5.26	-7.34	3.8
Mut28	17.39	-19.46	-0.03	-1.66	-8.2	-0.75	-3.44	-10.87
Mut34	21.58	-13.4	-0.03	6.62	10.68	9.77	3.44	2.72

All the above results suggested that Mut1 and Mut3 have highest yield but with poor quality while Mut34 has high quality but its yield is 13.4% lower than control. Therefore, in the future work, more attention will be paid to these screened mutants in order to obtain ideal wheat varieties with better properties.

Reference

[1] K. Yusuke, H. Saito, Y. Yoshiharu, et al., Plant Biotechnology, 25(2008)113.