3 - 47 Effects of Carbon Ion Irradiation on Mitotic Activities of Root Apical Meristematic Cells in Wheat

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Plant growth and development is an open system, and root building is one of the important stages in the process of seed germinating to seedling formation[1]. And a bad or good root growth directly affects subsequent plant growth. Root growth arises from the proliferation of root apical meristematic cells followed by cell expansion that results in root elongation. Plant root apical meristems which are actively proliferating tissues and present high sensitivity to the genotoxic effects of ionization irradiation, are particularly good materials for cytological studies[2].

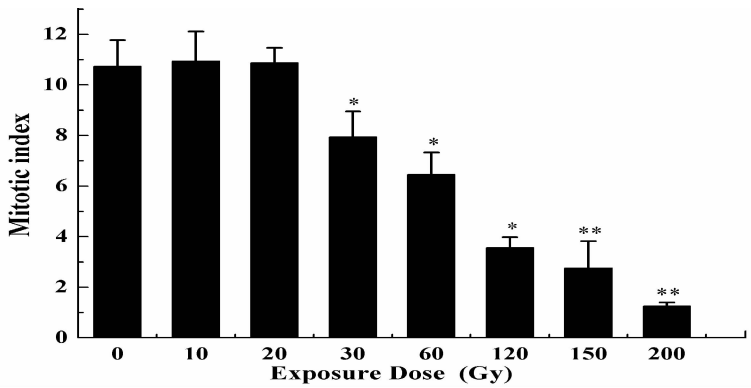

Fig. 1 Mitotic index of root apical meristematic cells of wheat irradiated by $^{12}C^{6+}$ ion beams. Bars represent S. E. The asterisks represent statistical significance: * $p<0.05$, * * $p<0.01$.

In the present study, wheat dry (*Triticum aestivum L*) seeds were irradiated with various doses of $^{12}C^{6+}$ ion beams which energy was 76.4 MeV/u and the biological endpoints including of mitotic index (MI) and mitotic phase index in apical meristematic cells of 1.5 cm long roots were investigated.

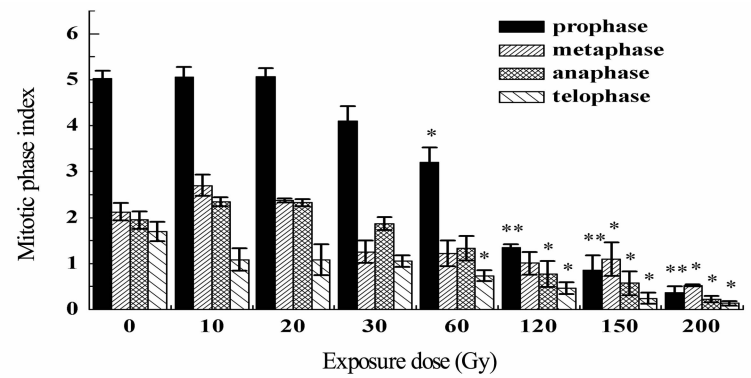

Fig. 2 Mitotic phase index of root apical meristematic cells of wheat irradiated by $^{12}C^{6+}$ ion beams. Bars represent S. E. The asterisks represent statistical significance: * $p< 0.05$, * * $p<0.01$.

As Fig. 1 shown, MI in the root apical meristems had no changes in 10 and 20 Gy and decreased obviously from 30 to 200 Gy. The lowest value in 200 Gy was only 1.26 %. Meanwhile, carbon ion irradiation affected the mitotic phases index (Fig. 2). On the whole, the proportion of prophase cells showed a pattern similar to MI, and the number of telophase cells decreased as the doses increasing. In the mitotic course within 0～120 Gy, the prophase cells occupied the highest proportion, followed were the metaphase and anaphase cells, and the percentages of the telophase cells were the least. While in higher doses such as 150 and 200 Gy, the numbers of prophase and telophase cells decreased significantly, the mitotic cells observed were mostly in metaphase and anaphase. Mitotic index is the measure of the number of cells undergoing mitosis at a given time and reflects the information on the cell cycle progression. These results that

MI decreased in higher doses, and the reduction of prophase cells followed a pattern similar to MI, indicated carbon ion irradiation could cause the cell cycle delay.

References

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[2] R. Zaka, C. Chenal, M. T. Misset, Mutat. Res., 517(2002)87.

3 - 48 Study of M1 Mutagenic Effects of Carbon Ion Irradiation on Lavender Seeds

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Lavender is one species of genus *Lavandula*, which belongs to *Labiatae*. It is a small, aromatic shrub used in the fragrance, specialty food, and alternative medicine industries. The natural geographical environment in Yili of Xinjiang Province the same as France's, so it is suitable for lavender cultivation. However, it is serious for the degeneration of lavender varieties in Xinjiang. Therefore, excellent variety is urgently required to insure sustainable development in lavender industry in China. Recently, heavy ions have been used to create novel germplasm and breed variety in plants. Aimed to determine the optimal irradiation dose, the biological effects were comparatively studied after carbon ion irradiation in Lavender (701 and 702).

In this study, 50 seeds of 701 and 702 were placed in a culture dish containing a piece of filter paper at 25 ℃ under18h-light/8h-dark cycle, respectively. Germination percentage, the length of hypocotyl and embryonic root were recorded at the 14th day. Fresh weight of seedlings was measured at 30th day.

According to table1, the germination percentage of 701 and 702 increased firstly and then decreased when the dose increased using carbon ion irradiation. As shown in Table 2, we found that the length of embryonic root of 701 and 702 was significant shorter than control's. However, the length of hypocotyl of 701 significantly increased after irradiation with 40 and 100 Gy and extremely significant decreased above 160 Gy compared with control in Table 3. Obviously, the length of hypocotyl of 702 decreased with the doses increased. In addition, the fresh weight of seedlings of 701 irradiated by 40, 100, 160 and 240 Gy were heavier than control's, and lighter after irradiation with 300 Gy. Interestingly, the fresh weight of seedlings of 702 was decreased under irradiation doses except 40 Gy.

In conclusion, the carbon ion irradiation had great effects on lavender, and it is helpful to breed novel mutants of Lavender in the future.

Table 1 Effect of carbon ion to germination percentage of 701 and 702($n=3$)

Germination percentage(%)	CK	40 Gy	100 Gy	160 Gy	240 Gy	300 Gy
701	57±7.07	54±11.3	59±1.41	45±1.41	25±7.07*	36±2.83
702	55±7.07	48±8.49	52±2.82	34±2.83	33±7.07	32±8.48

* the difference of germination percentage of 701 and 702 was significant between control and experimental group, $p<0.05$.

Table 2 Effect of $^{12}C^{6+}$ ion to the length of embryonic root of lavender 701 and 702($n=3$)

Length of embryonic root(cm)	CK	40	100	160	240	300
701	2.60±0.36	2.01±0.40**	1.35±0.29**	0.95±0.41**	0.79±0.55**	0.27±0.09**
702	2.54±0.15	2.59±0.11	1.86±0.30**	0.96±0.37**	0.36±0.19**	0.34±0.16**

* the difference of the length of embryonic root of 701 or 702 was significant between CK and experimental group, $p<0.05$; ** expressed the difference of the length of embryonic root of 701 or 702 was extremely significant between CK and experimental group, $p<0.01$.