

## 5 - 48 Effects of Carbon Ion Beam Radiation on the Accumulation of Flavonoids in *Astragalus membranaceus*\*

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*Astragali Radix* from the dried root of *Astragalus membranaceus* (*A. membranaceus*), as a medicinal and edible traditional Chinese medicine, has crucial application value in the prevention and treatment of COVID-19 in China. Among them<sup>[1]</sup>, flavonoids are one of the main compounds of astragali radix to exert pharmacological activity and therapeutic effects<sup>[2]</sup>. However, the meager germplasm and uneven quality of *A. membranaceus* restrict its large-scale cultivation and popularization. Therefore, the need to cultivate stable cultivated varieties is extremely urgent. As an efficient mutagenesis technology, carbon ion beam (CIB) provides a potential approach for the innovation of the germplasm resources of medicinal plants by broadening the mutation spectrum, and improving the mutagenesis efficiency. And it has been reported that radiation affects the accumulation of natural compounds in plants<sup>[3]</sup>. However, the effects of carbon ion beam radiation on the accumulation of flavonoids in *A. membranaceus* is still unclear.

In this study, to explore the effects of CIB on the content of flavonoids of *A. membranaceus*, we treated the dried seeds with different doses of CIB (50, 100, 200 and 400 Gy). After one year of cultivation in the field, we determined the contents of calycosin and calycosin-7-O- $\beta$ -D-glucoside in the root of *A. membranaceus* (Fig. 1). It was found that the content of calycosin increased significantly with the radiation dose. The maximum value of 0.61 mg·g<sup>-1</sup> occurred at 400 Gy, which was 4.48 times higher than that in the control group. The glucoside content of calycosin-7-O- $\beta$ -D-glucoside increased gradually at 100 ~ 400 Gy, higher than that of the control group. These results indicated that CIB radiation could promote the accumulation of flavonoids in a dose-dependent manner. In addition, CIB showed a pronounced promoting effects at a low dose of 50 Gy, which was 2.23 times higher than that of the control (Fig. 1(b)). In conclusion, this study will provides reference for the irradiation mutation breeding of *A. membranaceus*.

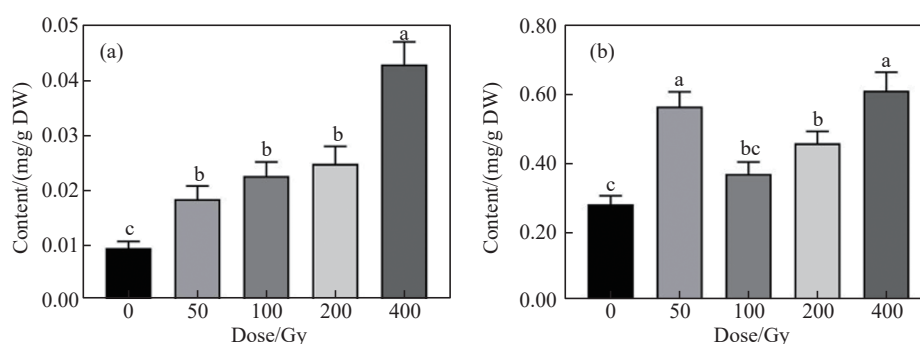


Fig. 1 (color online) Flavonoid contents of *A. membranaceus* irradiated by carbon ion beam with different doses after one year of cultivation in the field. (a) Content of calycosin, (b) Content of calycosin-7-O- $\beta$ -D-glucoside. Differences between groups were analyzed by one-way analysis of variance (ANOVA), Tukey test ( $P < 0.05$ ) for significance test. DW: Dry Weight.

### References

- [1] Y. C. Ye, L. H. Doan, Z. Y. Huang, et al., *Front Pharmacol.*, (2022)12.
- [2] D. Wang, Y. Zhuang, Y. Tian, et al., *Oxid. Med. Cell Longev.*, (2012)282383.
- [3] P. V. Vardhan, L. I. Shukla, *Int. J Radiat. Biol.*, 93, 9(2017)967

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