

5 - 47 Effects of Carbon Ion Beam Irradiation on Seed Germination of *Bupleurum chinense**

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Bupleurum radix from the dried root of *Bupleurum chinense* (*B. chinense*) is one kind of commonly used Chinese medicinal materials. It has the effect of reconciling superficialities and interiors, soothing the liver and promoting spleen Yang, treating cold and fever, cold and heat exchange, malaria, swelling pain in the chest and ribs, *etc.* In recent years, the wild resources of *B. chinense* have been depleted, and artificial cultivation is being promoted. However, the planting is not standard, resulting in mixed bupleurum germplasm, so many products do not meet the medicinal requirements. Germplasm innovation of *B. chinense* is imminent^[1]. The high-energy heavy ion beam is an effective mutagen with a high mutation rate, broad mutation spectrum and short stability period. This technique can improve the germplasm diversity and breeding for medicinal plants, but the research of heavy ion beam radiation on *B. chinense* has not been reported.

In this study, carbon ion beams (CIBs) with different doses produced by Heavy Ion Research Facility in Lanzhou (HIRFL) were used to irradiate dried *B. chinense* seeds. The radiosensitivity of dry seed to CIBs was investigated. The irradiated seeds were planted in the turfy soil, and the germinated seedlings were recorded from 20 to 35 d. The germination potential was calculated from the 7th day, and the germination rate was calculated from the 35th day. The germination index was the sum of the daily number of germinations in the final stage of germination process (Table 1). The germination rate of the control was 15.92%. The germination rate decreased significantly with the increase of carbon ion beam dose. When the dose was 300 and 400 Gy, the germination rate decreased to only 0.33% and 0.42% (Table 1). In addition, the germination potential and germination index also showed the same trends. With the increase of radiation dose, the germination potential and germination index decreased significantly (Table 1). The results indicated that CIBs could reduce the germination rate and seed vigor of *Bupleurum chinense* seeds. The half-lethal dose (LD₅₀) of the CIBs was between 50 and 100 Gy. These results provided a dose selection reference for applying heavy ion beam radiation in *B. chinense* mutation breeding.

Table 1 Effects of the carbon ion beam on germination of *B. chinense* seeds. The different letters indicated the significant difference among the treated groups by ANOVA (Tukey) test ($P_{i0.05}$).

Dose / Gy	Germination rate/%	Germination potential/%	Germination index
0	15.92±5.30 a	8.92±3.84 a	2.41±1.01 a
50	10.67±3.91 ab	6.17±1.46 ab	1.99±0.59 ab
100	7.33±3.02 bc	4.00±2.88 bc	1.39±0.28 b
200	1.75±0.43 c	0.67±0.52 c	0.35±0.09 c
300	0.33±0.38 c	0.25±0.43 c	0.05±0.05 c
400	0.42±0.52 c	0.08±0.14 c	0.10±0.14 c

Reference

[1] Y. C. Li, Bulletin of Agricultural Science and Technology, (2021)287.

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