

MECHANISM OF 'JINMIAO TARGET' IN INHIBITING *OROBANCHE*  
*CUMANA* PARASITISM OF SUNFLOWER

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ABSTRACT

In this study, two different sunflower varieties (LD5009 and JK103) were treated with 'Jinmiao target' by root irrigation. The root samples were collected at 0, 24, 48 and 72 h after irrigation for histochemical analysis. H<sub>2</sub>O<sub>2</sub> content, ROS scavenging enzyme activity and resistance related gene expression in roots were measured. The growth index and tubercle number of sunflower were measured 20 days after irrigation. The aim of this study was to elucidate the mechanism of 'Jinmiao target' in inhibiting *Orobanche cumana* parasitism of sunflower. The results showed that: (1) compared with the control (water application), the number of tubercles in LD5009Jinmiao target decreased by 95.5 and the parasitism rate decreased by 98.20%, the fresh mass and dry mass of tubercles decreased by 94.60% and 81.63%, the height and stem diameter of sunflower increased by 2.09 cm and 0.52 mm respectively, the growth rates were 14.92% and 15.29% respectively. The number of tubercles in the JK103Jinmiao target reduced by 37.5 compared with the control, the parasitism rate decreased by 98.04%, the fresh mass and dry mass of tubercles decreased by 97.06% and 82.69%, the height and stem diameter of sunflower increased by 2.07 cm and 0.39 mm respectively, the growth rates were 12.26% and 9.70% respectively. (2) After irrigating with 'Jinmiao target' inducer, the corpus callosum deposition in the roots of both sunflower cultivars increased. However, the JK103 showed the most significant increase after 48 h. The content of H<sub>2</sub>O<sub>2</sub> after 24 h reached the maximum in JK103 and LD5009 varieties, which were 3.53 and 2.68 μmol·g<sup>-1</sup>, respectively. Compared to the control, the most significant increase of H<sub>2</sub>O<sub>2</sub> content was recorded in LD5009, an increase of 208.05%. (3) The activities of four ROS scavenging enzymes in two varieties showed an initial trend of increasing and then decreasing, all of them reached the maximum value after 48 h of treatment. Compared with the control, the activities of SOD, POD, CAT, PPO in JK103Jinmiao target treatment increased by 69.77 U·g<sup>-1</sup>, 5.44 U·g<sup>-1</sup>·min<sup>-1</sup>, 1.88 U·g<sup>-1</sup>·min<sup>-1</sup> and 527 U·g<sup>-1</sup>·min<sup>-1</sup>, respectively. However, the activities of the above four ROS scavenging enzymes were increased by 25.91 U·g<sup>-1</sup>, 13.16 U·g<sup>-1</sup>·min<sup>-1</sup>, 0.50

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U·g<sup>-1</sup>·min<sup>-1</sup> and 313 U·g<sup>-1</sup>·min<sup>-1</sup> in LD5009Jinmiao target treatment. (4) Transcriptional analysis of related resistance genes indicated that the two varieties were induced in different degrees after treatment. However, induction degree of LD5009Jinmiao target was the most obvious, especially CAT, Mn-SOD and XTH6. The relative expression levels were more than 50 times higher than the control. The results showed that the ‘Jinmiao target’ inducer had significant inhibitory effect on the parasitism of sunflower, the effect was better before parasitizing sunflower (before the formation of tubercles). ‘Jinmiao target’ inducer could promoted callose deposition in sunflower root cells and resisted the infection of sunflower root by *O. cumana* at the structural level, it also induced the increase of ROS scavenging enzyme activity and the expression of CAT, PAL, Mn-SOD and XTH6 genes in sunflower roots, so that sunflower increased resistance to *O. cumana* parasitism. However, the degree of induction varies from cultivar to cultivar.

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**Key words:** Sunflower; *Orobanche cumana*; Jinmiao target; induced resistance