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EFFECT OF LOW TEMPERATURE ANTI – OXIDATION SYSTEM

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Abstract: The role of the plant's enzymatic protective system in reducing and preventing damage at low temperatures, as well as in maintaining normal physiological metabolism, is examined. It is assumed that the activity of SOD can be used as an indicator to determine the resistance of wheat to cold.
Keyword's: active oxygen, low temperatures, enzymes, defense system, free radicals.

Plants produce reactive oxygen species (ROS) during normal growth and development. At this time, the production and elimination of reactive oxygen species in the body is in a balanced state. In the 1950s, foreign scholar Harman. DG proposed the «superoxide theory», and in the 1970s Fridoricch. I proposed the «biological oxygen toxicity theory» . This kind of balance, a large amount of active oxygen free radicals accumulate in the body, the active oxygen scavenging ability is impaired, thereby causing free radical damage at low temperatures. At the same time, the enzymatic defense system in the plant will be activated, such as superoxide dismutase (SOD), peroxidase (POD), catalase (CAT). GSH), reducing ascorbic acid (ASA), etc. With these defense systems, further reduce or prevent damage at low temperatures, thereby maintaining normal physiological metabolism.

SOD, POD, and CAT are three important antioxidant enzymes that are widely present in animal and plant organisms and are called cytoprotective enzyme systems. Among them, SOD is recognized as the first line of defense of the enzymatic defense system, mainly distributed in mitochondria, chloroplasts and cytoplasm. The main function of SOD is to scavenge superoxide free radicals. The role of SOD and POD is to enzymatically decompose H_2O_2, avoiding the accumulation of large amounts of H_2O_2 to poison cells, thereby improving the cold resistance and antioxidant capacity of plants . CAT is mainly located in the organelles where peroxisomes, glyoxylates, and related oxidases are located. It mainly removes H_2O_2 produced by peroxidation and avoids the damage of reactive oxygen species. ASA and GSH are important reducing substances in plants, and play an important role in scavenging oxygen free radicals, maintaining protein stability, biomembrane system integrity, and defense against membrane lipid peroxidation . The above-mentioned several enzymes work in synergy to keep the free radicals in the body at a low level and prevent free radical damage. In short, under low temperature stress, a large amount of O^{2-} produced in the plant is decomposed into H_2O_2 by disproportionation, and then H_2O_2 is further oxidized and decomposed by SOD, POD, and CAT, so that the free radicals can be kept at a low level, and low temperature damage is reduced or avoided. .

Chen Lu believes that the increased CAT activity in the tillering stage of wheat compared with SOD and POD activity is more conducive to improving the cold resistance of wheat after the low-temperature freezing injury in the three-leaf and one-heart stage. The activities of antioxidant enzymes (SOD, POD and CAT) in wheat roots showed an upward trend after low temperature stress treatment, and the activities of three antioxidant enzymes at jointing stage increased more than the tillering stage. At low temperature during jointing stage, SOD, POD, and CAT of Zhoumai 18 and Zhongmai 1 increased and then decreased. The activity of Zhongmai 1 was higher than that of Zhou Mai 18, indicating that Zhongmai 1 had higher resistance under low temperature stress. Oxidase activity effectively removes reactive oxygen species accumulated in wheat under low temperature stress. Research by Li Xiaolin showed that the natural cooling of jointing stage and the low temperature

treatment of medicine interval, Zhengmai 366 and Shaanmai 139 had low SOD activity and poor ability to resist spring cold. It is speculated that SOD activity can be used as an index to identify cold resistance of wheat.

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