Nitrogen fertilizer affect starch synthesis to define non-waxy and waxy proso millet quality

[1]Honglu Wang, [1]Dongmei Li, [1]Qian Ma, [1]Enguo Wu, [1]Licheng Gao, [1]Pu Yang, [1]Jinfeng Gao, [1]Baili Feng

([33]Northwest A & F University, Yangling 712000, China)

Abstract:【Objective】 Understanding the effect of nitrogen fertilization on the quality of proso millet is key to expanding the use of this crop to address water scarcity and food security. Therefore, this study determined the impact of nitrogen fertilization on the proso millet quality. **【Method】** The two varieties of proso millet used in the present study were waxy (W139) and non-waxy (N297). Four N treatments were conducted as follows: 0 (N0), 90 (N1), 180 (N2), and 270 (N3) kg/hm^2 N. The amylose, amylopectin biosynthesis activities, nitrogen metabolic enzymes activities, appearance, nutritional and cooking quality of proso millet were analyzed under four nitrogen levels. **【Result】** The results of this study showed that increasing nitrogen fertilization significantly decreased the appearance quality. After applying nitrogen fertilizer, the w139 variety exhibited an increase in the proportion of short amylopectin chains, disordered structure, resulting in an increase in setback viscosity and decrease in pasting temperature. In contrast, the n297 variety exhibited a larger proportion of long amylopectin chains and hydrophobic functional groups, strengthening the inter- and intramolecular forces of the starch colloids. These factors increased peak viscosity and reduced breakdown viscosity, thus improving the cooking quality of the n297 variety. Compared with the n297 variety, the w139 variety had a lower amylose content and number of functional groups, resulting in lower pasting temperature and peak viscosity and higher breakdown viscosity. Nitrogen fertilization has varying impacts on the quality traits of different proso millet. Notably, the amylose content of the w139 variety first increased, reaching a maximum after 20 d, and then decreased, while that of the n297 variety consistently increased. **【Conclusion】** These findings provide new insight into starch synthesis pathways in waxy and non-waxy varieties of proso millet, forming the basis for future studies.

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Honglu Wang, E-mail：2018050099@nwafu.edu.cn