Effect of PP_{333} on starch accumulation and related enzyme activity of storage root in edible sweetpotato-Beijing 553

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Sweetpotato production in China

Sweetpotato is the fourth important staple crop in China, in terms of area and amount of production.

Foci

in sweetpotato science and technology

"3H"

1. Higher yield and quality.

2. Higher efficiency. Fertilizer and water-saving cultivation techniques. Low-Input Agriculture

3. Higher level of ecological safety.

Most Important Questions Need Resolving

1. Higher yield: farm's yield, experimental yield.

   Farmer's yield: 20,000 kg/ha

   Experimental yield: 35,000 kg/ha

2. Higher use efficiency of fertilization and irrigation water

Most Important Questions Need Resolving

Research Objectives:

Harvesting high storage root yield with reduced fertilization and irrigation water.

Main Constraints

to higher yield and Higher use efficiency of fertilization and irrigation water is over growth of vines

Consequence

Significant decreases of fresh weight/lump, storage root number/plant, and fresh yield of sweetpotato resulted from over growth of vines.

Reasons

1.Excess amount of nitrogen fertilizer applied.

2.Too much soil water content.

3.Light deficiency.

4.Inept management in early period of sweetpotato growth.

Our Research

Basic fertility

Sandy loam with 1.02% organic matter and available N, P , K :101.12, 38.79, 65.80 mg/Kg in depth from 0 to 20 centimeter.

The variety

Beijing 553

Experimental treatments

no spraying PP_{333} (M0),

spraying 100 mg/kg PP_{333} (M1)

spraying 200 mg/kg PP_{333} (M2)

Results

Table1. Effects of PP333 on yield and its components of sweetpotato

Year	Treatment	Storage root Lumps per plant	Fresh weight ($g \cdot lump^{-1}$)	Fresh yield ($kg \cdot hm^{-2}$)	Starch yield ($kg \cdot hm^{-2}$)	Dry matter (%)
2009	M0	1.46a	367.88c	26791.6c	2534.42c	21.32a
	M1	1.50a	398.60b	29812.3b	3031.24b	21.46a
	M2	1.62a	460.68a	37256.0a	4440.26a	22.12a
2008	M0	1.55a	347.42b	26914.8b	2510.82c	20.68a
	M1	1.61a	378.36ab	29619.7a	2847.37b	20.83a
	M2	1.58a	434.28a	30768.7a	3197.56a	20.71a

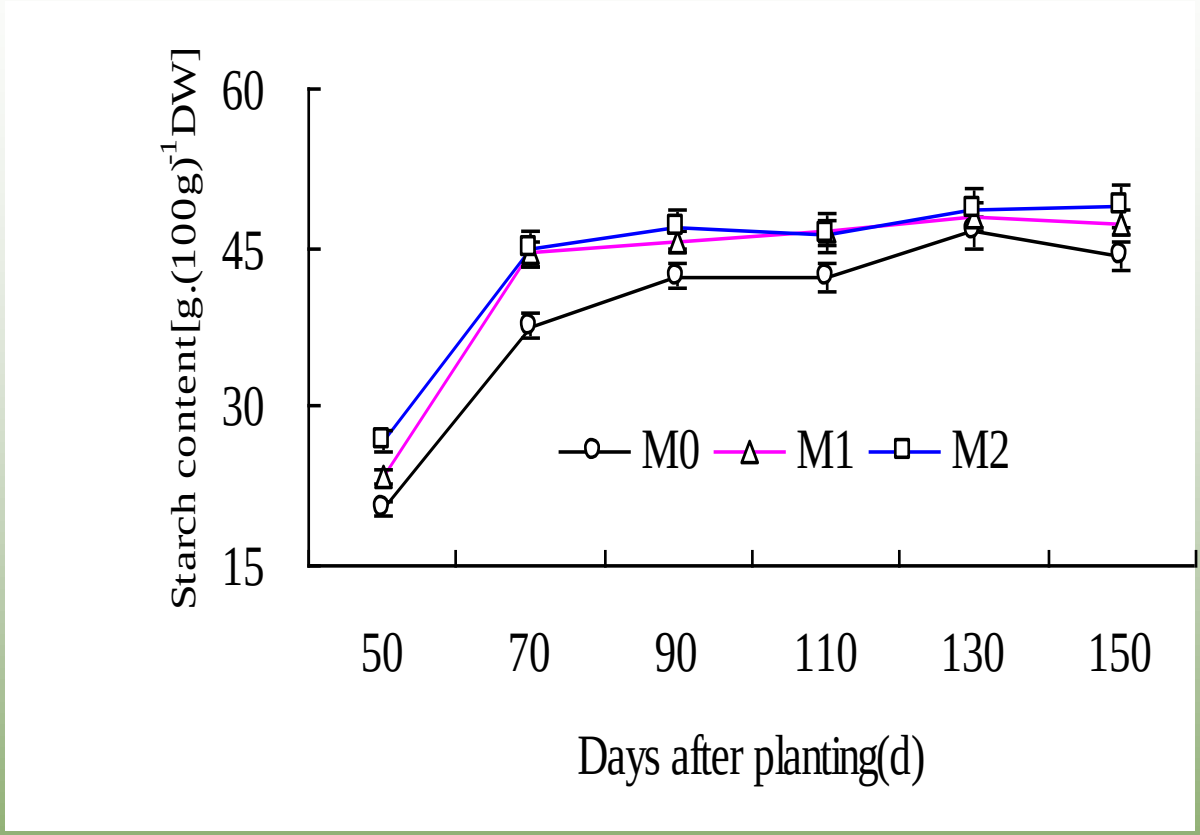

Fig 1. Changes of starch content during storage root development

Table 2. Changes of accumulating quantity of starch (g·plant^{-1})

Treatments	Days after planting(d)					
	50	70	90	110	130	150
M0	0.54b	4.50c	17.74c	37.44c	62.36c	73.68c
M1	1.08a	10.24b	30.04b	49.74b	79.52b	93.64b
M2	1.03a	15.98a	36.02a	55.14a	91.84a	104.87a

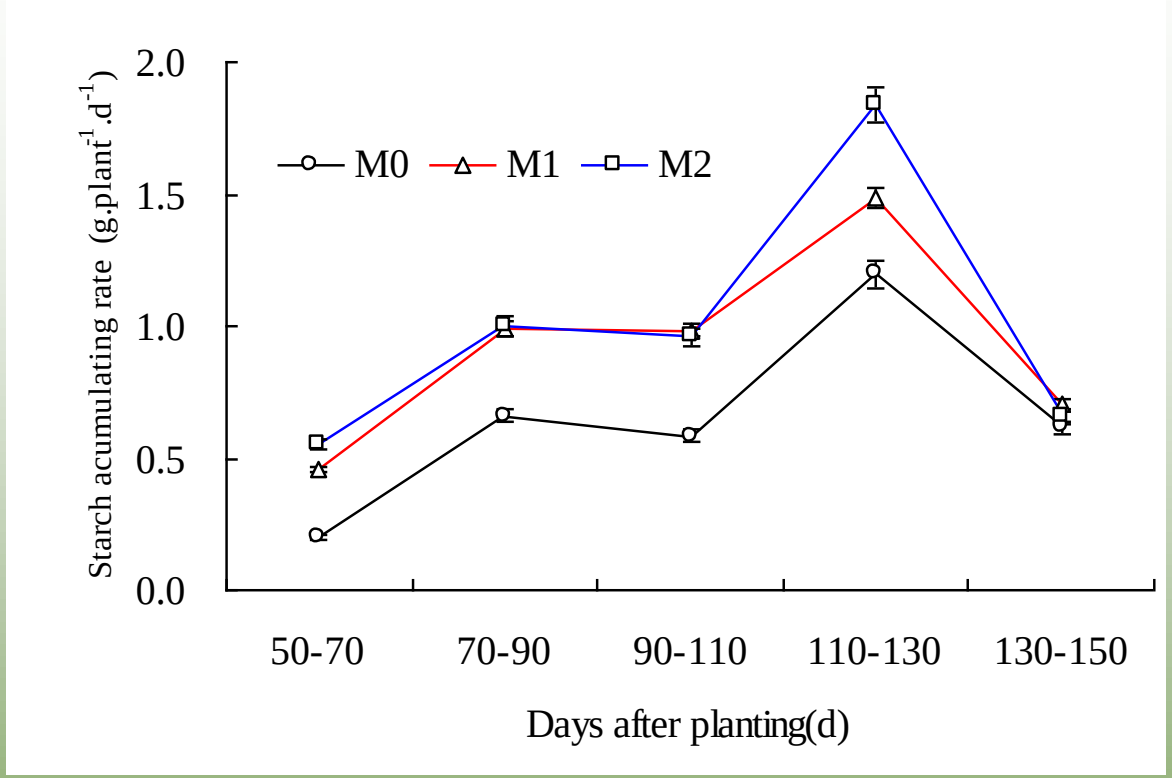

Fig.2 Changes of accumulating rate of starch in storage roots

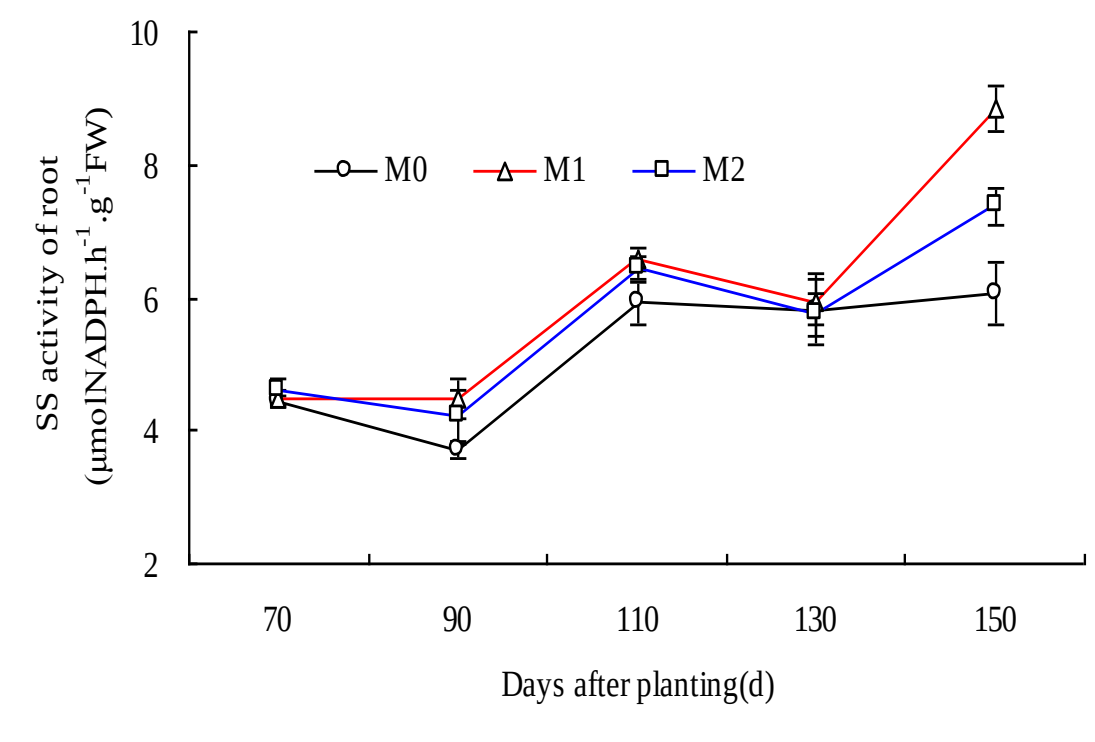

Fig.3 Changes of SS activity in storage root

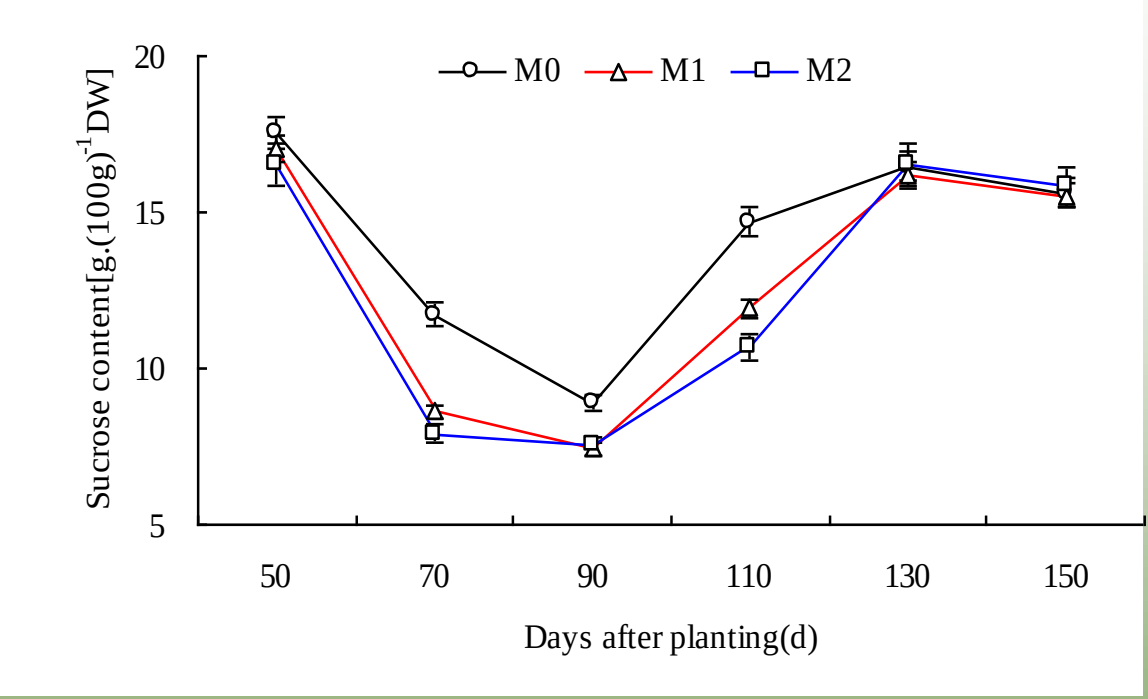

Fig.4 Changes of sucrose content in storage root

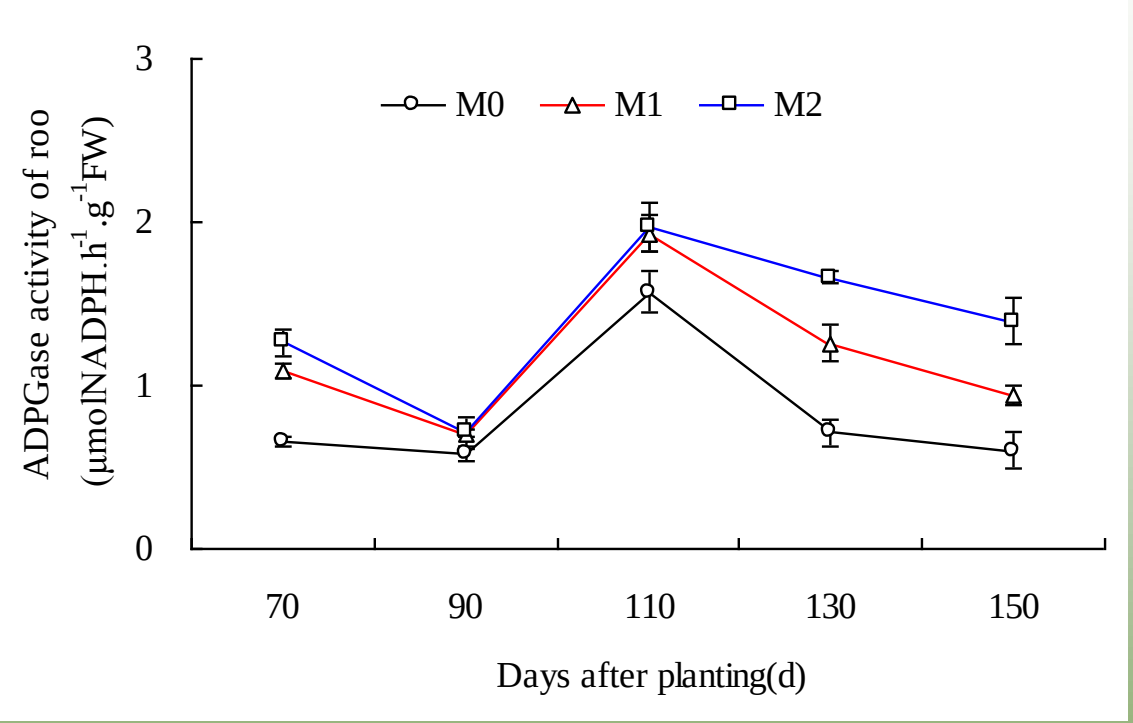

Fig.5 Changes of ADPGase activity in storage root

Table 3 The relationships between starch content, accumulating quantity and rate and the activity of enzymes involved in starch synthesis

	Accumulating rate of starch	Starch content	Accumulating quantity of starch
SS	0.14	0.58*	0.81* *
ADPGase	0.71*	0.69*	0.32

Discussion

Spraying PP_{333} improved storage root development, usually results leads to increased sweetpotato yield (Chen XG, 2008; Zhang F, 2006).

Luo (2003)**indicated that late application of PP_{333} in cassava improved tuber starch synthase and ADPG activity, enhanced tuber starch accumulation capacity, promoted starch accumulation, and improved tuber starch content**.

PP_{333} increased the activity of soluble starch synthase, starch branching enzyme and granular bound starch synthase, which benefited the improvement of rice quality (Tang XR et al., 2002).

Our study indicated that spraying PP_{333} could improve that of SS and ADPGase activities, starch content, starch accumulation rate and starch production in sweetpotato roots.

Correlation analysis showed that SS activity was significantly positively correlated with starch content and starch accumulation. The ADPGase activity was significantly positively related to starch content and starch accumulation rate.

The results suggested that spraying PP_{333} increased yield of storage root, determined by both increased the starch content and improved the starch accumulating rate.

The higher activity of SS and ADPGase was found to result in higher yield of storage root in sweetpotato.

Thank you

for your attention