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Effects of water stress on the PRO and CAT characteristics in forage seedling stage

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Key words : PRO(praline), CAT(catalase), water stress, sainfoin, smooth brome

Foreword Plants with strong drought resistance have formed cell protective enzyme systems and osmotic adjustment metabolites that function uniquely in long term reactions against stresses like drought. A series of metabolites are formed in the plant under soil water stress, of which one most distinct change is the accumulation of dissociative PRO [1] [2] [3], another clear physiological reaction is the variances of cell protective enzyme system including CAT [4] [5].

Material and Treatment Both *sainfoin* and smooth brome, their drought resistance properties already well-known were used in the experiment. Seedlings were grown to a height of 15cm, with Polyethyleneglycol (PEG-4000, 8.7bar) and this was repeated four times. Activity of CAT and PRO content were measured by collecting the lamina of the seedlings once every 8 hours from the beginning of treatment. The content of PRO was measured with the Ninhydrin-Sulfosalicylic acid method, while activity of CAT was measured with the hyposulphite titration method.

Result and Analysis 2.1 The effect of water stress on dissociative PRO content in leaves of the forage are shown in Table 1. The content of PRO in *sainfoin* declined within 0~24 hours under water stress while increases rapidly later up to the maximum at 56 to 64 hours. It declines again after the peak, and seedling almost wither to death 72 hours after the water stress was applied. For smooth brome, the trend of PRO content of differs slightly. It stays stable for the first 0 to 24 hours and increases slowly later but never showing the trend to decline at 72 hours after the onset of water stress.

Table 1 Affection on PRO content and activity of CAT in leaves of the forage under water stress.

Treatment time (h)	smooth brome		<i>sainfoin</i>	
	activity of CAT	PRO content	activity of CAT	PRO content
8	72	3.8	62	52.5
16	99	5.2	58	43.8
24	103	3.8	95	21.2
32	126	18.8	74	45.0
40	94	37.5	72	82.0
48	100	52.5	80	163.8
56	80	127.5	78	237.5
64	66	136.0	77	232.5
72	62	156.0	78	206.0

As shown in Table 1, the changes CAT in smooth brome are larger in scope. It continues to increase for the first 32 hours after the onset of stress, then declines constantly to a lower level than occurred at the beginning of the study. While the activity in *sainfoin* stays at stable with an increasing trend for only 24 hours with a slight decrease later, until entering steady state.

Discussion on results To accumulate PRO and adjust activity of CAT are two effective ways for plants to adapt to the adversity and defend against water stress. As showed in this research, we can see smooth brome with stronger drought resistance shows stronger capability of accumulation of PRO and activity of CAT. As the increase of activity of CAT starts earlier than the accumulation of PRO, activity of CAT can be used as a way to assess and determine the drought resistance capability of forage.