Effect of saline-alkali stress on physiological characteristics of grain amaranth seedling

Zhang Yuxia ,Zhang Yuqin Tan Weiwei
Inner Mongolia University for Nationalities , Tongliao , 028042 , China . E-mail : yuxiaZhang@163 .com

Key words : grain amaranth , variety ,seedling ,saline-alkali stress ,physiological characteristics

Introduction The stage of seed germination is a sensitive period to salt . According to the actual situation of drought and saline-alkali areas in north , the research treated amaranth seed with mixing salt solutions to discuss that injury and mechanism of adaptation in relation to saline-alkali stress for grain amaranth , and provide theoretical basises to cultivation and selection of seed resisting saline-alkali stress in drought and saline-alkali areas of north .

Material and methods Seedling of red amaranth K112 ,red amaranth R104 and wild amaranth was cultured in outside on June of 2007 ; seedlings were watered with Hoagland solution every three days , other time was used water to spread . When seedlings had five-leaves year old , they was respectively treated with four different concentrations by combining NaCl , Na_2SO_4 , $NaHCO_3$ and Na_2CO_3 with 1 :9 :9 :1 of substance ratio , Per treatment concentration repeated 3 times ; They was randomly arranged . After 15 days treating ,we started to determine physiological indexes .

Results With increase of treatment concentration , the relative conductivity in red amaranth K112 and R104 a little increased , but that of wild amaranth significantly increased under moderate and high concentration of treatment ; From the table1 we also can see clearly that chlorophyll content delined with increasing concentration of treatment , and that in red amaranth R104 and wild amaranth which had high content of chlorophyll itself extremely decreased , it illustrated that saline-alkali stress destroyed chlorophyll in wild amaranth and red amaranth R104 .

Table 1 *Effect of saline-alkali stress on physiological characteristics of amaranth seedling .*

variety	Treatment (mol/L)	Relative Conductivity(%)	Chlorophyll (mg/g)	Proline (ug/ g)	Soluble Sugar(mg/g)
	CK	18 .81bA	1 .40aA	342 .50bB	215 .07bcAB
Red amaranth	0 .1	22 .05abA	1 .35abA	372 .91bB	187 .84cB
K112	0 .2	23 .94aA	1 .34abA	562 .50aA	284 .06abAB
	0 .3	22 .55abA	1 .25bA	322 .91bB	319 .15aA
	CK	22 .04aA	2 .08aA	363 .33bB	120 .71dC
Red amaranth	0 .1	24 .35aA	1 .62bB	383 .33bB	170 .38cBC
R104	0 .2	21 .17aA	1 .39cB	541 .66aA	213 .31bB
	0 .3	21 .65aA	1 .12dC	352 .08bB	304 .94aA
	CK	20 .09bB	2 .59aA	337 .50bA	85 .38bB
	0 .1	19 .39bB	1 .92bB	350 .00abA	136 .03bAB
Wild amaranth	0 .2	29 .64aA	1 .84bB	410 .41aA	139 .25bAB
	0 .3	25 .23aAB	1 .36cC	295 .83abA	268 .45aA

According to the figures in Table 1 ,we can see clearly that proline content of three varieties of grain amaranth first increased and then decreased with increasing treatment concentration and significantly increased on condition of moderate concentration ; Meanwhile this table also shown that soluble sugar content of three grain amaranth increased with increase of treatment concentration ,and significantly increased under high content of treatment . Moreover their content in red amaranth K112 and R104 were more than in wild amaranth .

Conclusions The ability of red amaranth R104 and K112 in relation to resist saline-alkali stress were stronger than that of wild amaranth , so seedling of red amaranth R104 and K112 could normally grow in saline-alkali areas where wild amaranth was distributed . Overall , proline and soluble sugar were osmotic substance of grain amaranth to adjust saline-alkali stress .

Reference

Erdei L . ,Taleisnik E . ,Changes in water relation parameters under osmotic and salt stress in maize and sorghum .[J] *Plant Physiol* ,1993 ,89 :381-387 .