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Different seed dormancy levels imposed by tissues covering the Caryopsis in strains of Zoysiagrass (*Zoysia japonica* Steud .)

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Key words : zoysiagrass ,seed dormancy ,glume and lemma ,water permeability

Introduction Zoysiagrass caryopses are covered with a waxy glume and inner lemma , these structures are the main factors restricting zoysiagrass seed germination (Forbes et al . ,1948 ; Xu , 2005) . The objective of this study was to explore whether the outer structures were significantly different among strains with variation in seed dormancy .

Materials and methods Two domesticated strains including Zoysia green (*Z . japonica* var . *pollida Nakai* ex Honda)" and Zoysia brown (*Z . japonica* Steud .)" , and a control of wild *Z . japonica* population were cultivated at Jiaozhou City , Shandong Province (36°10′ N , 119°46′ E , altitude 50m) . The area of each strains measured 22 .0 m by 70 .0 m , there were tree belts with 3-5 m high and more than 50 m wide as isolation border between each strains , field management methods were same . Two to five kilogram seeds for each strain were collected and a preliminary germination test was conduct in 2005 and 2006 , respectively . Seed viability was measured by tetrazolium testing . Intact seeds of three strains were cut in cross-section to remove only the tip ends (tip cutting) of the glume , lemma and the caryopsis at a point distil to the embryo or only the base ends (basal cutting) of the same tissues being careful to not cut the embryo . Bare caryopses obtained by careful removal of the glume and lemma by hand (Xu , 2005) . The arcsine transformation was applied in the analysis of variance related to the germination percentages .

Table 1 *Final germination percentage and seed viability for two domesticated strains and wild type collected in* 2005 *and* 2006 .

Seed strain	FGP (%)		Seed viability(%)	
	2005	2006	2005	2006
Zoysia green	68[a]*	55[a]	78[ab]	84[a]
Zoysia brown	46[b]	44[b]	80[a]	83[a]
Wild type	32[c]	33[c]	75[bc]	81[a]

* Note : Different letters in the same column means significantly different ($p<0.05$) according to the Duncan's Multiple Range Test .

Table 2 *Final germination percentage (%) of seed for three tested zoysiagrass stains with different treatments after* 28 *d of germination test .*

Seed strain	Intact seed	Tip cutting	Basal cutting	Bare Caryopsis	$LSD_{0.05}$
Zoysia green	67	67	71	75	3 .9
Zoysia brown	46	57	64	69	4 .9
Wild type	42	59	57	60	8 .8
$LSD_{0.05}$	3 .8	3 .2	12 .6	6 .3	

Results There were significant differences ($p<0.05$) in final germination percentage (FGP) among three tested seed strains in both years consistently (Table 1) . It indicated there was a variation in seed dormancy phenotype among these strain . Zoysia green" strain showed the lowest seed dormancy . Both cut-seed treatments and removal of the outer structure significantly increased FGP compared with the intact seeds . Seeds with the base end removed (basal cutting) had a higher FGP than those with the tip end removed (tip cutting) , except wild type seed (Table 2) . The results of experiment suggested that seed dormancy of zoysiagrass is mainly caused by the covering tissues , moreover , the covering structures at the base end play a more important role in preventing germination than tip part , due to its closer proximity to the embryo . Zoysia green" strain showed a lesser physical restricts imposed by its covering structures involving seed dormancy than Zoysia brown" strain and wild type . Apart from the physical restricts , physiological dormancy still occurred in caryopsis . Caryopsis of Zoysia green" had the lowest inhibitors , but the wild type had the highest .

Conclusions Zoysia green" strain is characterized as the lowest seed dormancy , involved with a lesser physical restrict and a low content of physiological inhibitors in seed . The phenotype variation in seed dormancy among zoysiagrass strains is largely classified into a coat-imposed dormancy .

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