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Determination of damage yield loss relationships and economic injury levels of *Oedaleus asiaticus* (Orthoptera : Acrididae) in steppe of China

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Key words : *oedaleus asiaticus* grass yields ,action thresholds ,economic injury levels (EILs)

Introduction Previous studies reported that *Oedaleus asiaticus* is the common and dominant grasshopper of Xilingol grassland, in Inner Mongolia, China. (Lu et al., 2005). *O. asiaticus* occurs every growing season and results in yield losses through premature dropping of grass. Grain yield losses have also been reported for grasshoppers on grassland from different areas of China (Qiu et al., 2004). Study was to establish the relationship between *Oedaleus asiaticus* populations and yield loss of grass, and determine EILs for *Oedaleus asiaticus* in steppe.

Materials and methods The site was on the Xilingol grassland (43°26'-44°39' N, 116°25'-117°39' E) in Inner Mongolia during the June-September of 2005 and 2006. The vegetation is dominated by *Leymus chinensis* and *Stipa grandis*. The trial was done using cages (1×1×1m³) made from nylon gauze, and *O. asiaticus* was released into the cages at densities of 0, 4, 8, 16, 24 grasshoppers/cage. Typical densities range from 0-30 grasshoppers/m² (Davis et al., 1992). Treatments were assigned at random within each replicate (n=4). Equal numbers of males and females were introduced into each cage. At forage maturity, grain yields of all plants in each plot were recorded. EILs were calculated based on the procedures by Pedigo (1986) as $EIL = C/VIDK$. Where C is cost of management, I is injury units per insect, V is market value per unit produce, D is damage per unit injury, K is proportionate reduction in injury (K=1). D and I were obtained from the slope of the yield function ($Y = a + bx$), where Y= yield; a=a constant (intercept); b=loss per insect insect; and x=number of insects per cage, so $EIL = C/Vbk$.

Results The yield loss and *O. asiaticus* relationship gave a positive linear yield function as presented in Table 1. The yield loss ranged from 0.0039 to 0.0042 kg per insect. The EIL as influenced by different *O. asiaticus* infestation levels during the 2 growing years averaged 9.5 grasshoppers per meter square (Table 1).

Table 1 *O. asiaticus* yield loss function and EILs on grass.

Years	Equation	R ²	Loss (kg) per insect	EIL per insect
2005	$Y = 0.0003x + 0.0073$	0.93**	0.0039	9.2
2006	$Y = 0.0002x + 0.0035$	0.89**	0.0042	9.8

** p<0.01

Conclusions The determination of the EIL of *O. asiaticus* is warranted in this study. A density of *O. asiaticus* 9.5 per meter square causes economic injury damage. The action threshold was set at 9.5 per meter square, a population density at which insecticide application is justified so as to prevent further increasing density from causing economic damage. Further investigations should be done to validate these threshold levels at farmer level. These EILs also should be examined on different varieties of grass to minimize the cost of control to the farmer.

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