Analysis of Genotype × Environment Interaction and Assessment of Stability Parameters for Earliness and Yield of Some Pea (*Pisum sativum* L.) Genotypes under South Valley Environmental Conditions

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ABSTRACT

The present research was conducted to compare 10 local and introduced pea accessions for abiotic stresses (heat and drought) tolerance, using stability analysis. Three field experiments were carried out at the experimental farm of the South Valley University during the three successive winter growing seasons of, 2006/2007, 2007/2008 and 2008/2009. The 10 genotypes (G) of pea were grown, using split plot system design in RCB with four replications, at three different planting dates (early, 10 October =D_1, intermediate, 10 November D_2 and late, 10 December D_3) in every season (Y). Pea plants received two water irrigation treatments water stresses (I). So, eighteen manipulated environments (3 years × 3 planting dates × 2 water stresses = 18 E's) were Formed to analyze G×E interactions and, also, to estimate stability indices of earlineces and yield for the compared 10 pea genotypes.

Pea genotypes showed different responses to environments. Early planting (October 10) hastend flowering and maturity date. Intermediate planting (November 10) gave the tallest plant and caused increase in number and weight of fresh pods/plant and total green pod yield/Fed. Compared with early and late planting date. Irrigation every 12 days (water stress) reduced number of days to flowering and maturity, number of seeds/pod, pod length (cm), number and weight of pods/plant, and total green pod yield by averages of, 6.73%, 6.44%, 20.52%, 5.16%, 0.97%, 29.83%, 15% and 47.23% as compared with irrigation every 6 days (control), respectively in the three seasons.

The Joint regression analysis of variance revealed highly significant differences among genotypes (G), environments (E), and genotype × environment (G×E) interaction for all studied traits. Partitioning the G×E interaction mean squares indicated that the G × E (Linear) mean square was highly significant for all the studied traits, except for days to flowering and maturity date. Suggesting that most of interaction were a linear functions of the environmental values as indicated by the greater magnitudes of G×E (Linear) in comparison with the E + (V + E) mean squares. The E + (V + E) mean squares were also found highly significant for all studied traits, indicating that the non-linear components of G×E interaction were data operating.

The regression coefficients were correlated positively with mean performance over 18 environments, indicating that the low yielding genotypes were generally stables, while the high yielding ones were rather responsive.

The stable genotypes 1 for yielding; 2, 4 and 7 for days to flowering; 2, 3 and 5 for maturity; 2, 3, 6, 7 and 8 for pod length; 1, 3, 5 and 6 for maturity; 2, 3, 6, 7 and 8 for pod length; 1, 3, 5 and 6 for number of seeds/pod and 4 and 8 for number of pods/plant were considered specially adapted to stress environments. Superior stable genotypes with high mean performances as compared with general means overall environments were identified. These includes, 2 and 4 for days to flowering; 2 for maturity; 3, 6 and 8 for pod length and 1, 5, 6 and 8 for number of seeds/pod. Such finding could be useful for improving pea adaption to heat and drought through selection.

Key words: Pisum sativum, environment genotype × environment, stability parameter, regression line

INTRODUCTION

Garden pea (*Pisum sativum* L.) is a viny member and a favorable vegetable crop of Legumes that appears to have originated in western part of Asia and the eastern Mediterranean. Commercial production of pea is primarily for processing, including canning and Freezing. Edible – podded, peas are divided into snow peas and snap peas (Ali *et al.*, (1994); Zayed *et al.*, (1999) (El – Shobakey., 1985), Dera *et al.*, (1993), Nassar *et al.*, (1981) and (Gebril 2004). Garden cultivars have smooth or wrinkled seeds (Kandeel 1990) ; Ali *et al.*, (1994) and Abdou 2005). In Egypt, the area grown with Garden pea was estimated as 54042 Feddan in 2008. Wide ranges of variability among pea cultivars/Lines germplasm in vegetative and yield characters were estimated (Abdou, 1999, El – Shobakey., 1985), Dera *et al.*, (1993), (Nassar *et al* (1981 and Gebril 2004). These, variabilities in pea genotypes allow growing these genotypes in different environmental condition.