

Identification of high diverse heterotic groups in sunflower inbred lines for further hybrid production

FARHAT AHMADI AVIN*, ALIREZA NABIPOUR, ABBASALI ZALI, PEDRAM SHAHBAZI, JESU AROCKIARAJ AND SUBHA BHASSU

Mushroom Research Centre and Centre for Research in Biotechnology for Agriculture

University of Malaya, 50603, Kuala Lumpur, Malaysia

**e-mail: farhat.avin@gmail.com*

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ABSTRACT

Sunflower (*Helianthus annuus* L.) as a source of vegetable oil and proteins is grown in many parts of the world. It is the fourth important vegetable oil crop, producing 9 million tonnes per year. The present study was attempted to identify the effective mating partners and assign probable heterotic groups by estimating the genetic variation among the experimental materials. In order to evaluate the genetic diversity of 49 sunflower promising inbred lines, selected morphological features as well as oil percentage were precisely investigated. Sunflower stocks including 18 R-lines and 31 B-lines were planted based on a simple lattice (7 × 7) design with two replications. Relationships among (i) quantitative and quantitative; (ii) qualitative and quantitative; and (iii) qualitative and qualitative traits were estimated by correlation analysis, ANOVA and chi square test, respectively. Results of ANOVA revealed significant differences ($P < 0.01$) between the lines for most of the characters. A considerable outcome appeared when negative correlation between oil percentage and seed weight was achieved. Classification of lines based on cluster analysis separated them into two distinct groups of male and female. These achievements were confirmed by plot analysis based on the first two principal components. Moreover, the results of factor analysis indicated that four factors could explain 73.92% of the total variance. To sum up, the high genetic diversity that was demonstrated among 49 sunflower inbred promising lines suggested that selection of parents for hybridization needed to be based on genetic diversity. According to these findings, the heterotic groups that may lead the crosses to production of vigour hybrids were recommended.

Key words : Cluster analysis, genetic diversity, heterotic groups, lattice design, morphological traits, sunflower

INTRODUCTION

Oilseeds are identified as one of the most important sources of energy and protein and use of them has been increased remarkably in the recent years (Salonen *et al.*, 2008). The sunflower new hybrids have been adapted for the dry areas such as Middle East countries due to their tolerance to drought, saltiness, pH and poor soil condition (Liu *et al.*, 2003). This plant which contains 26-50% high quality oil and 15-21% protein plays an important role on world nutrition.

A high diverse germplasm collection is the basis of the most successful crop breeding programmes (Darvishzadeh *et al.*, 2010). In fact, evaluation of germplasm resources and

information of genetic diversity among species have an important application to accelerate the breeding programmes (Hallauer *et al.*, 1988). Selection of the parents which are genetically enough far from each other is one of the most critical factors of producing the initial breeding groups and hybrids. Heterosis value or the genetic expression of the developmental differences among hybrids and their respective parents (Paterniani, 2001) completely depends on the selection of their parents (Sampath and Mohanty, 1954; Shi, 1985), the availability of a pure local hybrid (Iqbal *et al.*, 2010) and the future breeding programme. Some researchers, for example, Raposo *et al.* (2004), Kaya (2005) and Darvishzadeh *et al.* (2010) believed that the larger genetic distance between two parental

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