# VARIATION AND COMBINING ABILITY AMONG MAIZE INBRED LINES UNDER DROUGHT STRESS IN RELATION TO BIOCHEMICAL PARAMETERS AS MARKER ASSISTED SELECTION

By

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B.Sc. Agric. Sc. (Agronomy), Al-Azhar University, 2004

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**of**

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# ABSTRACT

**Mahmoud Shawky Abd El-Latif: Variation and Combining Ability among Maize Inbred Lines under Drought Stress in Relation to Biochemical Parameters as Marker Assisted Selection. Unpublished M.Sc. Thesis, Department of Agronomy, Faculty of Agriculture, Ain Shams University, 2011.**

Twenty eight maize hybrids and their parental lines were evaluated under normal and drought at The Experimental Farms at Sakha and Sids Station of the Agriculture Research Center (ARC) in 2009 growing season.

Significant differences were detected between irrigation treatments at Sides location only for earliness traits (days to 50% anthesis, days to 50% silking and anthtsis-silking interval) while, such significant differences were detected at both locations for other studied traits. Significant differences were also observed among genotypes, parents and crosses for all studied traits under both environments at each of the two locations (except anthtsis-silking interval under normal irrigation, ears per plant under each water regimes and stay green under drought at Sakha). The interactions of genotypes, parents and crosses with the two irrigation regimes were generally significant for most studied traits (except anthtsis-silking interval, plant height and ear height at Sakha).

Both general (GCA) and specific combining abilities (SCA) under each and both water regimes at each of the two locations for studied traits (except anthtsis-silking under normal irrigation at Sakha, ears per plant under both regimes at the two locations and stay green under drought at Sakha) were significant. The two types of gene actions interact differently from one location to another in varying manner for studied traits. The relative importance of any of the two types of gene action to the other (GCA/SCA ratio) fluctuates (more or less than unity) from one location to another for the varying traits.

Drought sensitivity index indicated that, the best drought tolerant parents were Gz-628, Sd-34 and Gm-2 and the best drought tolerant hybrids were Sd-7×Sd-63, Sd-63×Gm-18, Sd-34×Sd-63, Gz-602×Gz-628 and Gz-628×Sd-34 which gave the highest yield under drought condition. The best general combiners for grain yield per plant and some of the other studied traits under drought conditions were Gz-628 and Gm-4. The best SCA hybrids under drought conditions for grain yield per plant and some of the other studied traits were Sd-7×Sd-63, Gz-602×Sd-34 and Sd-7×Gm-4. Protein electrophoresis showed that, the electrophoretic patterns of water soluble proteins could be a useful tool for the identification and characterization of the tolerant maize genotypes which differed in number and molecular weight of bands from normal to drought conditions.

**Key Words:** Maize, Combining ability, Drought sensitivity index, Drought tolerance, Protein Electrophoresis.

# التباين والقدرة على الإئتلاف بين سلالات الذرة الشامية تحت ظروف الجفاف وعلاقتها بالشواهد البيوكيماوية كدلائل إنتخابية

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**للحصول على**

**درجة الماجستير في العلوم الزراعية**
**( محاصيل )**

**قسم المحاصيل**
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**صفحة الموافقة على الرسالة**

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# INTRODUCTION

Maize (*Zea mays* L.) is one of the most important cereal crops in the world as well as in Egypt. Worldwide, the total acreage of maize was 160.65 million hectares in 2009; the total production was 791.5 million tons, with an average productivity of 4.93 tons of grain $ha^{-1}$ **(Report of USDA, 2010)**. According to this report, Egypt grew 0.72 million hectares (1.71 million feddans) and produced 6.17 million tons of grains, with an average yield of 8.58 tons $ha^{-1}$ (25.24 ardabs/feddan). According to the same report, Egypt ranks the fourth in the world with respect of average productivity after USA, France and Italy. However, the local production of maize is not sufficient to satisfy the local consumption. So Egypt imports every year about five million tons of maize grains. The problem in the future is that there will be no available maize grain in the producing countries for export, because they will use it in the manufacture of ethanol; a new alternate energy source.

To reach self-sufficiency of maize production in Egypt, efforts are devoted to extend the acreage of maize; in the new reclaimed desert soils and to improve the maize productivity from unit area. Growing maize in the sandy soils of the desert which is characterized by low water holding capacity would expose maize plants to drought stress and cause great losses in grain yield.

Breeding drought tolerant hybrids is discouraged by a perception that drought tolerant hybrids are low yielding in non-drought environments, implying that a yield penalty occurs when irrigation water is adequate. Drought tolerant germplasm might be specifically adapted to low yield environments. **Moreno et al., (2005)** reported that traits that confer drought tolerance lack positive relationship with high yield potential. Hybrids with high yield potential in both drought and non-drought conditions are desired. Possibly, such hybrids could be developed by combining drought tolerant lines with lines that were selected for high general combining ability (GCA) for yield potential under normal