

# CONTENTS

	TITLE	PAGE
	<b>Introduction.....</b>	1
	<b>Review of Literature .....</b>	3
	<b>Materials and Methods.....</b>	24
	<b>Results and Discussion.....</b>	32
<b>I-</b>	<b>Mean performance.....</b> 1-Days to 50% flowering..... 2-Plant height, cm .....	36
	3-Panicle length, cm .....	
	4-Panicle width, cm .....	
	5- Number of green leaves/plant .....	
	6-1000-grain weight, g.....	
	7-Grain yield / plant, g.....	
<b>II-</b>	<b>Heterosis.....</b> 1-Days to 50% flowering..... 2-Plant height, cm.....	62
	3-Panicle length, cm.....	
	4-Panicle width, cm.....	
	5- Number of green leaves/ plant.....	
	6-1000-grain weight, g.....	
	7-Grain yield / plant, g.....	
<b>III-</b>	<b>Combining ability.....</b>	95
<b>III-</b>	<b>General combining ability(GCA).....</b>	98
<b>A-</b>	1-Days to 50% flowering.....	
	2-Plant height, cm.....	
	3-Panicle length, cm.....	
	4-Panicle width, cm.....	
	5- Number of green leaves/ plant.....	
	6-1000-grain weight, g.....	
	7-Grain yield / plant, g.....	

<b>III-</b>	<b>Specific combining ability(SCA).....</b>	<b>111</b>
<b>B-</b>	1-Days to 50% flowering.....	
	2-Plant height, cm.....	
	3-Panicle length, cm.....	
	4-Panicle width, cm.....	
	5- Number of green leaves/ plant.....	
	6-1000-grain weight, g.....	
	7-Grain yield / plant, g.....	
	<b>Summary.....</b>	<b>131</b>
	<b>References.....</b>	<b>139</b>
	<b>Arabic Summary.....</b>	

## SUMMARY

The main objectives of the present study are to evaluate the performance, heterosis, general and specific combining ability using half diallel analysis. Twenty eight gain sorghum crosses were made among the eight R-lines of grain sorghum, in Shandaweel Agricultural Research Station in 2013 season. The 28 sorghum crosses, eight parental lines and the check hybrid (SH-306) were evaluated in two locations Shandaweel Agri. Res. Station, Sohag Gov. and Arab El-Awammer Agri. Res. Station, Assiut Gov. in season 2014. The parents and their crosses as well as the check hybrid (Sh-306) were evaluated in two experiments for each N level The first experiment with 100 Kg N/Fed and the second experiment with 60 Kg N/Fed. The randomized complete block design was used with three replicates in the two experiments in both locations.

### **Dina were recorded on the following traits:**

- 1- Days to 50% flowering
- 2 - Plant height, cm.
- 3 - Panicle length, cm.
- 4 - Panicle width, cm.
- 5 - No. of green leaves/plant.
- 6 - 1000-grain weight, g.
- 7 - Grain yield/plant, g.

Analysis of variance was done according to **Gomez and Gomez, 1984**. Dina were analyzed for combining ability according to **Griffing's 1956** method II , model I.

Results obtained were summarized as follows:

**Analysis of variance:**

The mean squares for genotypes were highly significant over locations, indicating the presences of variability among crosses and their parents for all studied traits. The interaction between genotypes and nitrogen levels were highly significant over Sohag and Assuit locations. indicating thin genotypes differently response for nitrogen levels for all studied traits. Also, variances of interaction between genotypes x nitrogen x locations were significant or highly significant for all studied traits except plant height, panicle length and panicle width were insignificant.

**I- Mean performance of crosses and their parents:****1- Days to 50% flowering.**

The earliest crosses were (P1 x P5, P3 xP5, P3 x P6, P3 xP8, and P5 xP8)in Sohage location, while in Assuit, most crosses were earlier than their early parent and fifteen crosses were highly significantly earlier than the check Shandaweel-306 over the two levels of nitrogen. The earliest crosses were (P3 x P5, P1 xP5and P3 xP8).

**2-Plant height, cm.**

The cross( P6 x P7) exhibited the highest value under the combined average in Sohag and Assuit locations. The plant height for the crosses, parents and check hybrid were taller in Sohag than Assuit by 2.75, 3.00 and 4.83 cm, respectively.

**2- Panicle length, cm.**

Five and three crosses were highly significantly longer than the check Shandaweel-306 over the two levels of nitrogen in Sohag and Assuit, respectively. It noticed thin, the panicle length increased with increasing nitrogen levels in Sohag and Assiut locations, respectively.

**4- Panicle width, cm.**

The cross (P6xP8) had highly significant under the two levels of nitrogen and combined over the two levels of nitrogen fertilizer in both of Sohag and Assuit locations.

**5-Number of green leaves/plant.**

The crosses (P3x P4 and P5 x P7) had significantly higher number of green leaves / plant compared to the check Sh-306 over 100 and 60 Kg nitrogen levels- in Assuit location.

**6- 1000-grain weight, g.**

Seventeen out of twenty eight crosses in Sohag location had highly significant 1000-grain weight compared to the check hybrid Sh-306 over two levels of nitrogen. Ten crosses out of twenty eight were significantly higher than the check Sh-306 over the two levels of nitrogen. The parent (P8) and cross (P2X P4) had maximum values over the two levels of nitrogen for this trait in Sohag and Assuit locations while the cross (P1 x P4) was the lowest for this trait in both locations.

**7- Grain yield / plant, g.**

The cross (P6 x P7) gave the highest grain yield / plant under the two levels of nitrogen and the combined average, which were (101.70, 85.90 and 93.80 g). Seven crosses had highly significant grain yield / plant than the check Shandaweel-306 over the two levels of nitrogen in Assuit. Also, the cross (P7 x P8) gave the highest grain yield / plant under the two levels of nitrogen and the combined average, which were (94.60, 82.93 and 88.77). 4 out of the 28 crosses (P1x P2, P3x P4, P4x P6 and P7x P8) produced

significantly higher grain yield / plant compared to the check hybrid Sh-306 under two levels of nitrogen(100 and 60 Kg N/ fed.) in each locations.

### **III- Heterosis:**

#### **1- Days to 50% flowering.**

Eleven crosses had negative and highly significant heterobeltiosis and Standard heterosis values under two levels of nitrogen in both location. Moreover, the F1 cross (P3 x P8) showed the highest negative value of Standard heterosis under 100 Kg N level in Sohag and Assuit locations. The first locinion had a better average of heterobeltiosis and Standard heterosis in the desired direction than Assuit location.

#### **2- plant height, cm.**

The crosses (P1 x P4), ( P2 x P7), ( P2 x P8), ( P5 x P7), ( P5 x P8), (P6 x P7) and ( P6 x P8) had positive and highly significant heterobeltiosis and standard heterosis values under the two levels of nitrogen in the both locations.

#### **3-panicle length, cm.**

The crosses (P2 x P4), ( P2 x P6), ( P2 x P7), ( P3 x P8), ( P4 x P6), (P5xP7) and ( P7x P8) showed the highest positive and highly significant heterobeltiosis and standard heterosis values under the two levels of nitrogen in the both locations.

#### **4-panicle width, cm.**

The crosses (P4 x P6), ( P5 x P7), (P6 x P7) (P6 x P8) and ( P7x P8) showed positive and highly significant heterobeltiosis and standard heterosis values under the two levels of nitrogen in the both locations. The cross (P1 x P8) showed least values of heterobeltiosis and standard heterosis under 100% nitrogen level in both location.

**5- Number of green leaves .**

The crosses (P1 x P6), ( P2 x P6), (P5 x P6), (P6 x P7) ), (P6 x P8) and (P7x P8) showed positive and highly significant heterobeltiosis and Standard heterosis values under the two levels of nitrogen in Sohag location. On the other hand, the crosses ( P2 x P6), (P3 x P4) and (P5x P7) showed positive and highly significant heterobeltiosis and Standard heterosis values under the two levels of nitrogen in Assuit location.

**6- 1000-grain weight, g.**

The crosses (P1 x P6), ( P2 x P3), (P2 x P4) and ( P2x P5) showed positive and highly significant heterobeltiosis and standard heterosis values under the two levels of nitrogen in the both locations.

**7-Grain yield / plant, g:**

The crosses (P1 x P2), (P3 x P4), (P4 x P6) and (P7 x P8) had positive and highly significant heterobeltiosis and standard heterosis values under the two levels of nitrogen for grain yield / plant in both locations.

**IV- Combining ability:****IV-A- General combining ability effects (GCA):****1-Days to 50% flowering.**

In Sohag location, the general combining ability effects for Rsh-9, RTX-436 and Rsh-14 were negative and significant or highly significant under 100 and 60 Kg N levels also, in Assuit location, the general combining ability effects for P3 and p5 were negative highly significant under 100 and 60 Kg N levels, These lines may have favorable genes and would be good combiners for earliness.

**2-Plant height, cm.**

The parents Rsh-8, Rsh-14 and Rsh-25 had positive (favorable) and highly significant GCA effects under two levels in both locations, while, P1 had negative (favorable) and highly significant GCA effects under two levels in both locations, these results indicated that those had good combiners for shortness.

**3- Panicle length, cm.**

The two parents Rsh-14 and Rsh-25 were found to be positive significantly superior with respect to GCA effects under 100 and 60 Kg N levels in both of locations and considered as good combiners for panicle width.

**4- Panicle width, cm.**

Rsh-14 was positive and highly significant under the two levels of nitrogen in two locations. These lines may have favorable gene actions for increasing panicle width and will be considered as good combiners for this trait.

**5- Number of green leaves.**

Rsh-14 and Rsh-25 showed positive and significant or highly significant or insignificant GCA effects under 100 and 60 Kg N levels in both locations. These lines may have favorable gene actions for increasing number of green leaves per plant.

**6- 1000-grain weight, g.**

Rsh-8 and Rsh-14 were positive in all cases for GCA effects. These lines may have favorable genes and would be considered a good combiners for heavy 1000-grain weight and may contribute to grain yield.



**7- Grain yield / plant, g.**

The parent Rsh-14 was the best parents for GCA effects in two locations. These lines may have favorable genes and would be considered good combiners for high yielding ability.

**IV-B- Specific combining ability (SCA):****1-Days to 50% flowering:**

The crosses No. 4, 11, 12, 14, 15, 16, 18, 22 and 23 had negative and highly significant SCA effects under two levels of nitrogen in both locations. This means that these crosses could be considered as good combination for earliness and could be used in grain sorghum breeding programs for earliness.

**2- Plant height, cm.**

Four crosses No.11, 17, 20 and 22 exhibited negative and significant SCA effects under two levels in both locations. Indicating that these crosses could be considered as good combination for shortness. While the crosses No. 1, 2, 3, 4, 7, 8, 12, 13, 14, 15, 16, 24, 26, 27, and 28 positive and highly significant SCA effects under 100 and 60 Kg N levels in both locations.

**3- Panicle length, cm.**

The crosses No. 1, 6, 9, 12, 14, 18, 20, 23, 24, and 28 had positive and highly significant SCA effects for panicle length under 100 and 60 Kg N levels in Sohag and Assuit locations.

**4- Panicle width, cm.**

The crosses No. 1, 12, 19, 20, 21, 27, and 28 had positive and highly significant SCA effects for panicle length under 100 and 60 Kg N levels in Sohag and Assuit locations and gave the best performance for panicle width.

**5-Number of green leaves.**

The crosses No. 11, 20, 27, and 28 had positive and highly significant SCA effects for number of green leaves under 100 and 60 Kg N levels in Sohag and Assuit locations and gave the best performance for number of green leaves.

**6-1000-grain weight, g.**

The crosses No. 5, 8, 9 and 10 had positive and highly significant SCA effects for 1000-grain weight under 100 and 60 Kg N levels in Sohag and Assuit locations.

**7-Grain yield / plant, g.**

The crosses No. 1, 2, 6, 14, 20, 26 and 28 had positive and highly significant SCA effects for grain yield per plant under 100 and 60 Kg N levels in Sohag and Assuit locations.