I. INTRODUCTION

Sorghum (Sorghum bicolor (L.) Moench) is considered the fourth summer cereal crop in Egypt after maize, wheat and rice.

Approximately 500.000 faddans of sorghum is grown in Egypt each year. Eighty percent of the sorghum belt is located in Upper Egypt and 20% in Middle Egypt, while none is grown in the Delta. Most of this area is planted under irrigation control. The average yield per acre is about 12 Ardabs (Ardab = 140 kg) in Egypt, hence it seems to be the highest productivity all over the world.

Sorghum kernel is used directly in bread making in Upper and Middle Egypt, while the whole plant, fresh leaves and stalks are used for pasture, hay and silage.

Grain sorghum has a perfect flower and it is more frequently self-pollinated crop (95%). The discovery of cytoplasmic male-sterile lines made hybrid sorghum commercially possible.

Webster and Singh (1964) stated that the sterility is due to non dehiscence of the anthers. The fertility in Egyptian varieties which were used in this experiment as male parents acts as restorers giving normal anthers.

The present investigation was carried out by using three male-sterile varieties as female parents and four Egyptian varieties as male parents.

The main objectives of this work intended to:

1. Estimate the combining ability of some sorghum hybrids using the cytoplasmic male-sterile phenomenon.

2. Determine the magnitude of heterosis. Both combining ability and heterosis are necessary to identify the most suitable parents which produce better hybrids.

3. Studying the inheritance of some economic characters in twelve crosses including seven varieties using data obtained in F_1's and F_2's.

The characters studied were: plant height, plant grain yield, ear-length and ear-width. The genetic analysis helped to determine the nature of dominance, the estimation of number of genes, the nature of gene action and the heritability values useful for breeding programmes.

4. Examine the degree of relationship between grain yield per plant and some characters as sources of plant yield variations.