CHAPTER 1
INTRODUCTION

Melon (*Cucumis melo*, L.) 2n = 2X = 24 is an economically important cross pollinated vegetable species of the family Cucurbitaceae which includes squash pumpkins, cucumber (Claude, 2001). Individual plant produces both male and female flower and fruit have a great diversity in weight (0.5 to 15 kg), flesh color (orange, pink, green, white and cream or even mixture of those colors), skin color (green yellow, white yellow, canary, red and gray, or blend of these colors), rind texture (smooth, warty, striped, netted, rough, or combination of these textures), shape (round, oval and elongated) and diameter [4 to 20 cm] (Hector *et al*., 2008). Melon was cultivated in Egypt as early of 2400 BC and the Egyptians wrote about melon in later time, the Romans described the cultivation of melon (Shamel, 2013). Gradually their popularity moved west, reaching France in 1490, s, and continued to spread into Central and Northern Europe. Columbus was brought seeds to the new world on his second voyage and reported their cultivation there upon his return (Juan *et al*., 2008).

The area which cultivated with melon in Egypt during 1999 was 53036 fed. This area, gradually, increased up to 60941 fed in 2001. In 2007, the cultivated area reached 100167 fed. Another increasing in cultivated area was taken place in 2012 to become 162200 fed, with total production 1,652,400 tons with average production 12.60 tons/fed according to Ministry of Agriculture. Melon is available all year-round, but main picking season is June through August (Ibrahim, 2012).

Melon grown for its sweet taste or their fruits which have a great benefits for health, it is very low in calories (100 gm fruits has just 34 calories and fats, it an excellent source of vitamin A where 100 gm provide 3382 IU or about 112 % of recommended daily levels) which is a powerful antioxidant and is essential for vision, it is, also, required for maintaining healthy mucus membranes and skin. Melon, also, rich in antioxidant flavonoids such as beta carotene, lutein, zeaxanthin and cryptoxanthin (important to protect eye from UV light and "age-related macular degeneration). 100 gm fresh fruits provide 267 mg of potassium (important component of cell and body fluids and helps control heart rate and blood pressure); 12.69 mg magnesium; 0.03mg manganese; 0.05 mg of copper; 0.1mg zinc; 0.003mg of cobalt and 0.005mg chrome. A fruit, also, contains moderate levels of B-complex vitamin such as niacin, pantothenic acid and vitamin c (Rashidi and Seyfi , 2007).

The strategy for breeding F1 hybrid is to develop parental lines through self-pollination and selection (Robinson and Decker-Walter, 1999). Twenty years ago depression in the important quality traits of sweet melon specially in sweetness traits, therefore, the production of sweet melon decreased followed by cultivated area compared with cantaloupe cultivars, rare researches, also, were done on local cultivars and land races, so by appropriate breeding program as mass selection with selfing pollination will be useful in improvement of important traits (Abd-El-Salam and Marie, 2002). Also El-Shimi *et al*, (2003) also showed that the selection may be useful tool among segregating generation for high quality traits in melon.

In plant and animal breeding the best individuals are selected for the next breeding cycle on the basis of observed phenotypic values for several traits in each candidate individuals. The point is to choose candidate individuals with high genotypic value (g) for traits, selection index (SI) help to select the best individuals which are not directly observed related to observable phenotypic scores (p) for these traits, it is assumed that the genotypes unobserved values and their observed phenotypic scores have a joint probability

distribution such that the expected value of g, given p, E(g/p) = ĝ is the regression of g on p. This regression should be a good predictor of g, so that individuals with the highest values of ĝ can be selected (Jesus *et al*, 2006). A function of the observed phenotypic values p such as E (g/p), which is used to rank and select the candidate individuals, is called a selection index (SI). Ceron and Sahagum (2005) developed an SI based on principal components analysis of the phenotypic variance-covariance matrix of the traits.

However, self-pollination increases plants mean homozygosity, which is not the natural genetic state of a cross pollinated species, and it can cause "inbreeding depression". This is, clearly, observed in hybrid corn production when plant size and vigor of self-pollinated inbred lines are drastically reduced as compared to breeding out cultivars from which they originated (Mohammed and Syed, 2010). Although most cross-pollinated species have higher or lower levels of inbreeding depression as a consequence of inbreeding, there are some in which self-pollination can happen in a continuous way with no vigor loss. Cucurbits, being cross-pollinated, are an example of a group of species in which certain lines seem to lose little vigor by inbreeding (Antonio, 2004).

The utilization of hybrid vigor in the breeding of various crops has a great practical importance. Accordingly, it is very important to increase melon yield per unit area as well as importance the fruit trait (Hatem *et al*., 2009). The most important aspect in melon breeding are fruit characteristics especially average fruit weight, flesh thickness, total soluble solids (TSS) and fruit dray mater. Heterosis is of great importance to be employed in plant breeding to obtain high yielding genotypes. Nowadays, much interested has developed in producing growing F1 hybrids from several normally self-pollinated species, where a considerable amount of F1 yield heterosis had been demonstrated. Accordingly, heterosis on the F1 hybrids were detected on some important character of melon by several researches (Hatem *et al*, 1995, El-Shimi *et al*, 2003, Abd-El-Sayyed and Mahgoub, 2003, Reddy *et al*, 2007, Hatem *et al*, 2009 and Rasoule *et al*, 2014).

The current investigation was aimed to achieve these goals:

- Assessment the magnitude of development in quality traits after two selection generations (selection index method) from two local lines of melon.
- Use of certain genetic parameter to study this development like genetic advance (GA), genetic advance as percentage of mean (GAM), heritability, genotypic and phenotypic coefficient of variance (GCV, PCV), coefficient of correlation and path coefficient analysis.
- Determination the extent of heterosis, dominance gene effect and general combining ability of parents and specific combining ability among crosses.
- Planning breeding programs for the improvement of melon landraces through a specific selection program. Also, improvement the melon through hybridization or by hybridization and selection, in advanced generations