J. Plant Production, Mansoura Univ., Vol. 2 (2): 179 - 212, 2011

EFFECT OF SEED-ENVIRONMENTAL FACTORS ON GENETIC UNIFORMITY PERFORMANCE OF EGGPLANT (*Solanum melongena*) AND SWEET PEPPER (*Capsicum annum*) LOCAL CULTIVARS.

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ABSTRACT

This study discussed two aspects, an economic and academic aspect. The economic aspect aimed to developing agricultural technologies is simple, low cost and low risk intervention, where poor farmers could make improvements without incurring additional costs. The academic aspect aimed to (I) studying the seed–environmental factors effect (hydro–priming as a model) on genetic variance, residual error variance, precisions of statistical testing procedures and biases the estimates of heritability which effect on selection efficiency; (II) Improving the homogeneity of eggplant and sweet pepper local cultivars by seed hydro-priming treatments; (III) Occurring of difference between protein bands caused by seed hydro-priming treatments could cause conflict of variety identifying through protein electrophoresis; (IV) Evaluate of hydro-priming effect on seed storage and viability and (V) Determine relationship between descriptive, Quantitative characteristics and rogueing (weeding out no typical individuals from a crop plants or field). To achieve these goals, eggplant and sweet pepper local cultivars were used in this study (separated experiments). Seeds were divided into five sub-samples, one of which was kept as untreated control and four other samples were incubated in distilled water at 25ºC for 12, 24, 36 and 48 hours (hydro-priming treatments). To determine the genetic parameters, the plants (for each crop) were divided into two populations, mother population and treated population. The SDS page gel was used in the separation of proteins. Results showed that (I) The seed-environmental factors (seed hydro-priming as a model) revealed changes in population homogeneity at field conditions, the best minimum values of homogeneity index (more homogenous) to most characteristics were obtained by 48h seed-priming treatment in eggplant local cultivar. While in the pepper, the best minimum values of homogeneity index to characteristics of seedling stage were obtained by 48h seed hydro-priming treatment; besides, the best values in case of vegetative, flower and yield stages were obtained by 24 seed hydro-priming treatment; (II) The hydro-Priming treatments (as seed-environmental factor) had effected the results of trait performance and led to changes in residual error variance, which reduces the power of statistical tests and biases the estimates of heritability. These results could lead to reducing selection efficiency; (III) Rogueing practice is reliable only in the case of descriptive traits; (IV) seed-environmental factors (seed hydro-priming as a model) led to specific differences related to induce proteins. This suggests that the use of the electrophoretic pattern was able to distinguish within the close together population as affected by seed–environmental factors and (V) These results indicated that the seed storage period was not critical for eggplant local cultivar seeds affected by hydro-priming treatments up to 18 months, while in case of sweet pepper local cultivar was up to 12 months.

The results had revealed that there a very tight relationship between the environmental factors related to seeds and the plant phenotypic and genotypic performance which reflected on the yield and efficiency of genetic parameters that playing a big role in determining the efficiency of line selection.

Keywords: Eggplant, sweet pepper, hydro-priming, homogeneity, selection efficiency, electrophoresis, rogueing.

INTRODUCTION

Populations of Local varieties are adapted to local climatic conditions, cultural practices, and disease and pests. But the landraces have genetically diverse. As well as, in equilibrium with both environment and pathogens and genetically dynamic. Heterogeneity within spatial variation (as environmental factor) affects the ranking of genotypes (Brownie *et al.,* 1993; Stroup *et al.*, 1994) and broadens the experimental error variance (Ball *et al.,* 1993; Brownie *et al.,* 1993; Helms *et al.,* 1995; Vollman *et al.,* 1996). This could cause a decreased response to selection and a reduced precision of statistical testing procedures. Although, seed priming had been studied in many researches, the vast majority of these researches did not discuss the genetic impact of seed priming (osmo or hydro-priming) on the characteristics of plant. Based on the mentioned above, similar researches had been used as a guidance in this study. This trend consistent with Makhmudova *et al.,* 2009, who reported that treatment of seeds and vegetating plants with Triton X - 100 (Aqueous solution) changed the spike morphology in all plants of the first post treatment generation, these changes were inherited by the second generation in wheat. Many of researchers have been exposed to the correlation between environmental factors (soil parameters, water, nitrogen content, element concentration and organic carbon content) and precision of statistical testing procedures and error variance (environmental variation in plant breeding) (Kirda *et al.,* 1988; Mulla *et al.* 1992; Bernottsson and Bahri, 1995; Ball *et al.,* 1993 and Becher 1995). Pamilo (1988) reported that the genetic response of population to the pattern of the environment can be divided into direct and indirect effects. The direct effects refer to adaptive responses due to selective differences between the genotypes. The direct effects results from the fact that environmental variation affects the population demography (size, sub division, etc.) and this affects the stochastic processes which compose genetic variation. The indirect effects of the environment are more important in determining the levels of multilocus geneic variation and differentiation. Hoffmann and Merila (1999) noticed to several-hypotheses have been advanced to explain an increase or decrease of additive genetic variation and heritability under adverse conditions. Helms *et al.* (1995) reported that estimates of heritability and other genetic parameters might be biased by field heterogeneity. Hydro-priming is a very simple, economical and environmental friendly type of seed priming in which seeds are soaked in water for a certain time and dried before sowing (Thornton and Powell, 1992). The general purpose of seed priming is to hydrate partially the seed to a point where germination processes are initiated but not completed. Most priming treatments involve imbibing seed with restricted amounts of water to allow sufficient hydration and advance of metabolic processes but preventing the protrusion of the radical. Treated seeds usually would exhibit rapid germination when absorb water under field conditions (Ashraf and Foolad, 2005). The results of the priming experiment suggest that the critical moisture content that facilitates repair of chromosomal damage (Sivritepe and Dourado, 1995). Lots of information are available which showed hydration of seeds up

to but not exceeding the lag phase with priming increased RNA and protein synthesis (Fu *et al.,* 1988) faster embryo growth (Dahal *et al*., 1990) and reduced leakage of metabolites (Styer and Cantliffe, 1983) compared with control. Seed priming has been found a doable technology to enhance rapid and uniform emergence, high vigour and better yields in vegetable and flower species (Dearman et al., 1987; Parera and cantiliffe, 1994 and Bruggink et al., 1999). The genetic impact of seed priming on the characteristic of plant was poorly documented; therefore, this investigation aimed to (I) studying the seed – environmental factors effect (hydro–priming as a model) on genetic variance, residual error variance, precisions of statistical testing procedures and biases the estimates of heritability which effect on selection efficiency; (II) Improving the homogeneity of eggplant and sweet pepper local cultivars by seed hydro-priming treatments; (III) Occurring of difference between protein bands caused by seed hydro-priming treatments could cause conflict of variety identifying through protein electrophoresis; (IV) Evaluate of hydro-priming effect on seed storage and viability and (V) Determine relationship between descriptive, quantitative characteristics and rogueing (weeding out no typical individuals from a crop plants or field).

MATERIALS AND METHODS

This study carried out at Kaha Horticulture Research Station (Kaluobia governorate, Egypt) during the years of 2005 and 2006. The soil type of the experimental site classified as a clay soil. Eggplant (spherical shape) and sweet pepper cultivars were used in this study. Seeds of eggplant and sweet pepper were obtained from Shama Company for seed trade, Cairo, Egypt. Seeds were divided into five sub-samples, one of which was kept as untreated control and four other samples were incubated in distilled water at 25ºC for 12, 24, 36 and 48 hours (hydro-priming treatments). After incubation, seeds were dried back to about 12% moisture content at room temperature. Treated and untreated seeds of the eggplant and pepper were sown in seedling trays (209 cell per tray, five trays each treatment) on 10th February 2005 and 2006. The raised seedlings (50 days old), from each crop, were transplanted in the field. Each ridge was 90 cm wide and 3.5m long. Seedlings were transplanted on one ridge. The distance between plants was 30 cm apart and then plants were collected alternately to obtain the vegetative measurements such as plant fresh weight.

Data were recorded on the following characters as follows:

1. Seedling characteristics:

a. Cotyledon length (cm); it was measured by caliper, at the base to the terminal cotyledon.
b. Cotyledon width (cm); it was measured by caliper at the widest distance between two points.
c. Seedling length (cm); it was measured by ruler from terminal root to bases of cotyledons.
d. Seedling diameter (cm); it was measured by caliper, at the determined area between 2cm and 5cm above the base of hypocotyls.

e. Seedling fresh weight (gm); it was weighted with a precision electronic balance reading to 0.001g. It was calculated for each seedlings and then the averages were calculated.
f. Seedling dry weight (gm); it was weighted with a precision electronic balance reading to 0.001g. It was calculated for each dry seedling. It was dried at 105ºC for three days in oven at constant weight.

2. Flower and vegetative characteristics:

a. Early flowers number per plant; it was recorded as the number of total flowers was determined by counting all flowers of plants and then the averages were calculated (30 days from occurrence the first flower anthesis).
b. Plant fresh weight (gm); it was recorded for each plant of population at 90 days from seeding and the average were calculated.
c. Plant dry weight (gm); it was recorded for each plant of population at 90 days from seeding and then the averages were calculated. It was exposed to fans in laboratory for several days to obtain primary dry and then it was dried at 105ºC for three days in oven.
d. Plant height (cm); it was measured from the cotyledonary node to the terminal bud after two months from transplanting.

3. Yield characteristics:

a. Early yield number per plant; the first three pickings were considered as early yield number for every plant and average early fruit number was calculated.
b. Total yield number per plant; number of the harvested fruits in each pick was recorded and summed over harvested season for every plant, to get total yield number per plant.
c. Early yield weight per plant; the first three pickings were considered as early yield weight for every plant and average was calculated.
d. Total yield weight per plant; weight of the harvested fruit in each pick was recorded and summed over harvested season for early plant, to get total yield weight per plant and average was calculated.

Note: all notices mentioned above agree with the eggplant and pepper.

4. Seed germination: germination test was conducted by placing 25 seeds from each of the treatments in 90mm diameter Petri dishes on whatman filter paper that was moistened with 5 ml distilled water. Seeds were kept in incubator at 25ºC in dark condition. A completely randomized design with three replications was used. Radical protrusion of 2mm was scored as germination (Keya *et al*. 2006). Germination was counted in 48 hours intervals and continued until no further germination occurred. The seedling was evaluated as described in seedling Evaluation Handbook (AOSA, 1991). Final germination Percentage (%), seedling characters was recorded after 14 days of planting on filter paper. For statistical analysis, the data of germinating percentage was transformed to arc-sine $\sqrt{(100/x)}$. The treated and untreated were stored for 6 months, 12 month and 18 months at room temperature.

Statistical analysis.

Analysis of variance: the collected data were analyzed statistically using fisher's analysis of variance technique by using combined ANOVA over year, and Duncan's multiple range test was employed to compare the difference among the treatment means at 5% level of probability. All computations were performed using the Minitab software (Minitab inc., 2006).

Biometrical analysis:

1. Confidence interval (C.I).

The standard deviation of population gives us an indication of how good independence and homogeneity through its using in the calculation of confidence interval. The formula used for estimating individual 95% confidence interval for mean based on pooled standard deviation given by Ott and Longnecker (2001). The formula used for homogeneity index was:

Homogeneity index (D) = Upper C.I. – Lower C. I.

2. Estimation of genetic parameters:

The field

Mother population (experimental unit)	**Treated population (experimental unit)**	**Mother population (experimental unit)**
Treated population (experimental unit)	**Mother population (experimental unit)**	**Treated population (experimental unit)**

Fig. 1. Distribution of populations in the field

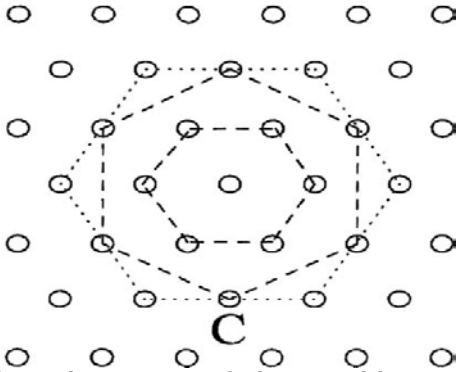

Fig. 2. A regular triangular pattern of plant positions within experimental unit. Each plant in its turn is considered as a candidate and compared to the plants occurring alongside three (grid C) surrounding aureoles.

Three experimental unit per kind of populations, the experimental unit consisting of one grid, one grid consisting of 19 plant (1 central plant + 18) population consisting of 57 plant (3x19) in one year.

This procedure according to Bos and Caligari (1995), mother population: 500 transplant of untreated control seed hydro-priming treatment. Treated population: 500 transplants of all hydro-priming treatments were collected in the mixed population. This population were pooled and randomly assigned to 5 groups with 100 transplants in each group.

Note: mother population and treated population were statistical analyzed separately.

The breeder may divide the selection field into parts such that growing conditions within each of the so–called grids are more uniform than across the whole field. This procedure is called grid selection (Bos and Caligari, 1995). In the statistical analysis, years were considerd as random variable (is assumed to be measured with measurement error). Separate analyses of variance were performed as (Sokal and Rohlf, 1981, p. 280).

ANOVA Table: Formulas

Source of variation		df	Expected MS
$\overline{Y}_A - \overline{Y}$	Among groups (years)	α - 1	$\sigma^2 + n\sigma^2_{BCA} + nb\sigma^2_A$
$\overline{Y}_B - \overline{Y}_A$	Among subgroups within groups (grids within years)	α (b - 1)	$\sigma^2 + n\sigma^2_{BCA}$
$Y - \overline{Y}_B$	within subgroups (error; between measurements on each plant)	αb (n - 1)	σ^2
$Y - \overline{Y}$	Total	αbn - 1	

a. Estimation phenotypic, genotypic and environmental variation.

$$\sigma^2_p = \sigma^2_g + \sigma^2_e$$

where, genotypic variance $\dfrac{MSV - MSE}{r \text{ or } n_o}$ $(\sigma^2_g) =$

Where, MSV and MSE are mean sum of squares due to populations (varieties or treatments) and error, respectively.

Environmental variance (σ^2_e) is equal to mean sum of squares for error (MSE) phenotypic variance (σ^2_p) is comprised of σ^2_g plus σ^2_e; in addition, r = number of replication (in case of equal sample sizes) (Singh and Singh, 1994); while, N_o= average sample size (in case of unequal sizes) (Sokal and Rohlf, 1981). Standard deviation = square root for variance (all kinds of variance, genotypic, environmental and phenotypic) (PSD = Phenotypic standard deviation, GSD = genetic standard deviation and ESD = environmental standard deviation) according to Singh and Chaudhary, 1977

b. Estimation of broad sense heritability.

The formula used for estimating broad–sense heritability was:

$h^2 = (\sigma^2_g / \sigma^2_{ph})*100$ (Allard, 1960)

Where, σ^2_g is the genetic variance and σ^2_{ph} is the phenotypic variance.

3. SDS page electrophoresis technique.

The SDS page gel was used in protein separation was composed of stacking gel that was prepared according to the method of Laemmli (1970) as modified by Studier (1973 C.A. Fahmy and Abou EL-Nasr, 1998). The gel scanning was done on photoscanner and the data were integrated using the scanner software. The similarity indices between the different treatments were calculated according to the equation of Kulczynski (1927 C.A. Khafagi, 1995).

$$\text{Similarity \%} = \frac{1}{2}\,[(s/(s+u)) + (s/(s+v))] * 100$$

Where:

S = bands found in both in both A and B columns

u = bands found in column A not in B;

v = bands found in column B not in A.

RESULTS AND DISCUSSION

Eggplant:

Effect of hydro-priming on homogeneity and independence of eggplant local cultivar at seedling, flower, vegetative and yield stages:

Results in Table (1) showed that minimum values of populations mean to all seed hydro–priming treatments at seedling characters were statistically non significant compared with untreated control. Maximum significant values of populations mean to seedling length and seedling diameter; (14.36 and 0.360, respectively) were recorded in 48h seed hydro-priming treatment; while, maximum significant values of seedling fresh weight and seedling dry weight; (5.699 and 0.177, respectively) were recorded in 24h seed hydro-priming treatment. In respect to maximum values of cotyledon length and cotyledon width to all seed hydro-priming treatments were statistically non significant compared with untreated control.

1

The confidence intervals for the means of seedling length at all seed hydro-priming treatments, seedling fresh weight and seedling dry weight at 24h seed hydro-priming in both treatments did not overlap with untreated control blend, which concludes that the population means for these levels are significant difference at P<0.05. On the other hand, the means of cotyledon length, cotyledon width, seedling diameter (at all seed hydro-priming treatments in all characteristics), seedling fresh weight and seedling dry weight at 12, 36, 48h seed hydro-priming treatments in both characteristics did overlap with untreated control blend, which concludes that the populations mean for these level did not significant differ at P<0.05 (Table 1).

Minimum values of homogeneity index (more homogeneous) to seedling length, seedling diameter, seedling fresh weight and seedling dry weight; (0.0272, 0.077, 0.252 and 0.007, respectively) were recorded in 48h seed hydro-priming treatment. While, minimum values of homogeneity index to cotyledon length and cotyledon width; (3.040 and 0.095, respectively) were recorded in 12h seed hydro-priming treatment. Maximum values of homogeneity index (less homogeneous) to all characters; (3.200, 0.100, 0.680, 0.147, 0.540 and 0.16, respectively) were noted in untreated control seed hydro-priming treatment (Table 1). These results agreed with those of Dearman *et al*., 1987; Perera and Cantliffe, 1994 and Bruggink *et al.,* 1999, those mentioned that seed priming enhanced uniform emergence for seedling. In addition, Rivas *et al.,* 1984; Sundstron and Edward, 1989; Bradford *et al.,* 1990; Chilembwe *et al.,* 1992; Ashraf and Humera, 2001; Ashraf and Iram, 2002; Aziza *et al*., 2004; Jaswinder *et al.,* 2004; Farooq *et al.,* 2005 Geeta, 2005; Uma-singh *et al.,* 2007; Muhmmed *et al*., 2007; Venkatasubramanian and Umarani, 2007; Nascimento and Pereira, 2007; Farooq *et al* ., 2008; Saeid *et al.,* 2008 and Muhammed *et al.,* 2008, those reported to seed priming improved germination and early seedling growth and enhanced shoot and root length, seedling fresh and dry weight, and root and leaf score.

Data in Table (2) reported that minimum significant values to all characters of flower and vegetative stage; (2.065, 226.7, 7.065 and 36.82) and (2.298, 209.2, 6.522 and 35.52) were recorded in 24 and 36h seed hydro-priming treatments, respectively. In respect to maximum significant values to all characters of flower and vegetative stage; (3.095, 325.0, 10.13 and 39.33) and (2.896, 300.2, 9.358 and 38.85) were reported in untreated control and 12h seed hydro-priming treatments, respectively.

The confidence intervals for the means of all characters at 36h seed hydro-priming treatment did not overlap with untreated control blend, which concludes that the population means for these levels are significant difference at P<0.05 (Table 2).

Minimum values of homogeneity index (more homogeneous) to all characters of flower and vegetative stage; (0.540, 45.450, 1.360 and 2.548, respectively) were recorded in 48h seed hydro-priming treatment. While, maximum values of homogeneity index (Less homogeneous) to all characters; (0.675, 54.540, 1.768 and 2.730, respectively) were noted in untreated control seed hydro-priming treatment (Table 2).

2

Effect of seed priming on vegetative and flower stage in plants was reported by Farooq *et al*., 2005; Geeta, 2005; Muhammad and Muhammad, 2006; Nascimento and Pereira, 2007; Mukundam *et al.,* 2007; Saeid *et al.,* 2008; Mukundam *et al.,* 2008 and Muhammad *et al.,* 2008, those reported that the speed of germination and emergence led to better crop stands and made seedlings grow much more vigorous. In addition, it improved growth and yield components.

Results in Table (3) revealed that all values of populations mean to all seed hydro-priming treatments at yield characters were statistically non significant compared with untreated control.

The confidence intervals for the mean of all characters at all seed hydro-priming treatments did overlap with untreated control blend, which concludes that the populations mean for these levels did not significant differ at P <0.05 (Table 3).

Minimum values of homogeneity index (more homogeneous) to all characters of yield stage; (0.720, 1.744, 210.18 and 518.187, respectively) were recorded in 48h seed hydro-priming treatment. Regarding, maximum values of homogeneity index (less homogeneous) to all characters; (0.828, 1.962, 239.998 and 572.733, respectively) were reported in untreated control seed hydro-priming treatment (Table 3). Same results were previously reported by Farooq *et al*., 2005; Geeta, 2005; Muhammed and Muhammed, 2006; Nascimento and Pereira, 2007 and Kukundam *et al.,* 2008, those reported that the seed priming improved growth and yield components.

Effect of seed hydro-priming on some genetic parameters of egg plant local cultivar population at seedling, flower, vegetative and yield stages:

Results in Table (4) showed a remarkable increase in heritability value for treated population of all characters at seedling stage; (1.472, 7.404, 34.456, 2.323, 9.672 and 9.686, respectively) compared to mother population; (-1.586, -0.079, 8.984, 0.015, 0.685 and 0.002, respectively). High value of heritability indicates that the proportion of observed variability due to the additive effects of genes. Phenotypic standard deviation value for treated population of seedling length; (2.543) was increased in comparison to mother population; (2.399). While, phenotypic standard deviation values for treated population of cotyledon length, cotyledon width, seedling diameter, seedling fresh weight and seedling dry weight; (0.940, 0.166, 0.032, 1.356 and 0.042, respectively) were decreased in comparison to mother population; (1.066, 1.005, 1.001, 1.637 and 1.001, respectively). High standard deviation indicates that the data are spread out over a large range of values (expressing the variability of a population). On the other hand, low standard deviation indicates that the data point to be close to the mean (expressing the homogeneity of a population). Genetic standard deviation values for treated population of cotyledon length, cotyledon width, seedling length, seedling fresh weight and seedling dry weight; (7.692, 0.029, 1.493, 0.422 and 0.013, respectively) were increased in comparison to mother population; (0.134, 0.028, 0.719, 0.135 and 0.004, respectively). On the other hand, genetic standard deviation value for treated population of seedling diameter; (0.005) was decreased in comparison to mother population; (0.012).

3

Results in Table (5) revealed increase in heritability value for treated population of early flowers number per plant; (6.236) compared to mother population; (0.023). While, the heritability values for treated populations of plant fresh weight, plant dry weight and plant height; (13.260, 13.411 and 4.973, respectively) were increased in comparison to mother population; (27.606, 26.171 and 17.195, respectively). Phenotypic standard deviation value for treated population of early flowers number per plant; (1.431) was increased in comparison to mother population; (0.023), whereas, phenotypic standard deviation values for treated population of plant fresh weight, plant dry weight and plant height; (121.525, 3.784 and 5.937, respectively) were decreased in comparison to mother population, (133.027, 4.260 and 6.455, respectively). In respect to genetic deviation value for treated population of early flowers number per plant; (0.357) was increased in comparison to mother population; (0.023). On the other hand, genetic standard deviation values for treated population of plant fresh weight, plant dry weight and plant height; (44.253, 1.386 and 1.324, respectively) were decreased in comparison to mother population; (69.894, 2.179 and 2.677, respectively).

Results in Table (6) indicated to decrease in heritability values for treated population of all characters at yield stage; (-0.070, 0.528, -0.071 and 0.530, respectively) compared to mother population; (5.293, 8.307, 6.855 and 8.747, respectively). Phenotypic standard deviation values for treated population of all characters at yield stage; (1.777, 4.347, 512.987 and 1254.231, respectively) were decreased in comparison to mother population; (2.096, 4.647, 531.719 and 1309.486, respectively). In respect to, genetic standard deviation values for treated population of all characters at yield stage; (0.047, 0.316, 13.715 and 91.268, respectively) were decreased in comparison to mother population; (0.482, 1.339, 139.214 and 387.283, respectively).

The previous results related to the genetic parameters for seedling, vegetative and yield stages can be interpreted as following, Hirsch (1997 C.A. Lerner, 2002) reported that heritability does not mean genetically determined and mentioned that the heritability may be used in a confused and confusing manner. In addition, Lehrman (1970 C.A. Lerner, 2002) indicated that, when geneticists speak of a trait as heritable, all they mean in that one is able to predict the trait distribution in the offspring of group on the basis of knowing the trait distribution in the parent group; specially, the descriptive traits. But the geneticist is not saying any thing about the extent to which the expression of the trait may change in response to environmental modification. Lerner and Von (1992 C.A. Lerner, 2002) noted that the heritability value still only describe the extent to which inter-individual differences in a trait distribution measured at one point in time and under one particular set of environmental conditions are associated with inter- individual differences in gene distributions, these statistics do not explain the role of genes in causing the inter-individual differences in the trait distribution.

4-5-6

In addition, Hirsch (1997 C.A. Lerner, 2002) reported that nothing about the role of genes in providing a basis for the development of the trait within the individual. Hence, heritability describes something about group and not any thing about an individual. Moreover, Rustton (1999 C.A. Lerner, 2002) reported that it is possible that heritability (h^2) might equal one for a population reared under set of environmental circumstances and might equal zero for that same population reared under a different set of environmental. Negative heritability can be assumed to be zero (Robinson *et al.* (1955 C.A. Gabriele and wehner, 2007 and Sabu *et al.,* 2009) but should be reported in order to contribute to the accumulation of knowledge, which may be properly interpreted (Dudley and Moll (1969 C.A. Gabriele and Wehner, 2007). Rogueing practice is reliable only in the case of descriptive traits. These results were in accordance with the findings of (Nevo *et al.,* (1984 C.A. Pamilo, 1988) who mentioned that the relation between the environmental and phenotypic variation is theoretically best understood, and experimentally best studied, in the case of specific polymorphism occurring due to variation at single loci. But speculations have widely exceeded this simple case and the overall multilocus-heterozygosity is considered as adaptive strategy associated with the pattern of environmental hetero-geneity.

SDS-Protein electrophoresis and similarity among seed protein of hydro-priming treatments for eggplant local cultivar.

Electrophoretic SDS protein patterns were shown in Table (7). In regard to the total number of protein bands obtained by scanning the gel of the four seed hydro-priming treatments were 22 distinguished bands. The bands varied from treatment to another. Number of these bands ranged from 8 to 14 bands for seed hydro-priming treatments. The highest number of seed protein bands; (14 bands) was found in 24h seed hydro-priming treatment, and the lowest number; (8 bands) was recorded in untreated control. Only three bands namely 4, 17 and 18 were found in all seed proteins of examined treatments. Bands number 2 and 9 were found only in seed proteins related to untreated control, 24h and 48h seed hydro-priming treatments; such as, bands number 11, 12 and 19 were found only in seed proteins related to 24h, 36h and 48h seed hydro-priming treatments. In regard to band number 3, 8 and 15 were found only in seed proteins related to 24h and 48h seed hydro-priming treatments; also, bands number 10, 13 and 20 were found only in seed proteins related to 24h and 36h seed hydro-priming treatments. While, band number 14 was found only in seed proteins related to untreated control and 36h seed hydro-priming treatments. In addition, the band number 16 was found only in seed proteins related to untreated control and 48h seed hydro-priming treatments. Some of the examined seed proteins had specific bands; such as, untreated control; (band number 6) and 36h seed hydro-priming treatments; (band number 6 and 22). That might be used as a biochemical genetic marker for these treatments. The results in Table (8) represent the values of the similarity indices among the 4 seed proteins of hydro-priming treatments. The results indicated that the strongest similarity was between 24h and 48h seed hydro-priming treatments; (85.119%). The lowest similarity was between untreated control and 36h seed hydro-priming treatments; (41.666). This suggests that the use of the electrophoretic pattern was able to

distinguish within the close together population as affected by seed priming treatment; that show the ability of seed hydro-priming treatment to make change in seed proteins. These results agreed with Smith and Cobb (1991), those reported increased protein with priming treatment. Osmopriming of seeds led to increased protein synthesis in wheat seeds (Dell' Aquila and Tritto, 1991; Dell' Aquilla and Spada, 1992). Mazor *et al*. (1984) reported that ATP (Adenosine Triphosphate) concentration increased in Kohlrani, spinach, eggplant and pepper seeds during osmopriming, presumably in relation to increasing protein synthesis. Most evidence suggests that priming allows time for the seed to 'repair' damage from deteriorative events associated with mitochondrial dysfunction, enzyme inactivation, membrane perturbations, and genetic damage incurred during seed storage and ageing. Thus, it may be concluded that priming has two roles in improving seed performance. The first is the advancement of events leading to germination and the second is the repair of seed damage that allows more efficient germination (McDonald, 2000).

Table (7): The presence (+) and absence (-) of bands in SDS protein electrophoresis extracted from seeds of eggplant local cultivar as affected by hydro-priming.

Band number	Hydro-priming duration			
	control	24h	36h	48h
1	-	-	-	-
2	+	+	-	+
3	-	+	-	+
4	+	+	+	+
5	+	-	-	-
6	-	-	+	-
7	-	-	-	-
8	-	+	-	+
9	+	+	-	+
10	-	+	+	-
11	-	+	+	+
12	-	+	+	+
13	-	+	+	-
14	+	-	+	-
15	-	+	-	+
16	+	-	-	+
17	+	+	+	+
18	+	+	+	+
19	-	+	+	+
20	-	+	+	-
21	-	-	-	-
22	-	-	+	-

Table (8): The percentages of similarity between the proteins result for different hydro-priming durations of eggplant local cultivar calculated using Kulczynski index.

hydro-priming duration	control	24h	36h	48h
control	**-**			
24h	49.107 %	-		
36h	41.666 %	69.643 %	-	
48h	62.500 %	85.119 %	52.275 %	-

Seed germination percentage of egg plant local cultivar as affected by hydro-priming duration and storage period.

The results in Table (9) revealed that the seed germination percentage was significantly reduced to interaction between the storage period (12 month) and hydro-priming treatments (36h and 48h) 80% in both treatments compared to untreated control of hydro-priming duration with the storage period (direct after treatment); 98%. On the other hand, the seed germination percentage was not significantly affected by the other interaction between the storage period and hydro-priming duration treatments compared to untreated control of hydro-priming duration treatment with the storage period (direct after treatment); 98%. These results generally indicated that the storage period was not critical period for eggplant local cultivar seeds affected by hydro-priming treatments (up to 18, month). In this respect, Nascimento and West (2000), those reported that seed germination and vigour of primed seeds decreased after 12 months of storage. Both temperature and duration of drying affected seed vigour after storage. In addition, Ashraf and Humera, 2001; Aziza *et al.,* 2004; Farooq *et al.* 2005; Geeta, 2005; Muhammod *et al.,* 2007; Nascimento and Pereira, 2007 and Muhammad *et al.,* 2008, those reported that the seed priming enhanced seed germination. It could be concluded that (I) The seed-environmental factors (seed hydro-priming as a model) revealed changes in population homogeneity at field conditions, the best minimum values of homogeneity index (more homogenous) to most characteristics were obtained by 48h seed-priming treatment in eggplant local cultivar; (II) The hydro-Priming treatments (as seed-environmental factor) had affected the results of trait performance and led to changes in residual error variance, which reduces the power of statistical tests and biases the estimates of heritability. These results could led to reducing selection efficiency; (III) Rogueing practice is reliable only in the case of descriptive traits; (IV) seed-environmental factors (seed hydro-priming as a model) led to specific differences related to induce proteins. This suggests that the use of the electrophoretic pattern was able to distinguish within the close together population as affected by seed–environmental factors and (V) These results indicated that the seed storage period was not critical for eggplant local cultivar seeds affected by hydro-priming treatments up to 18 months.

Table (9): Seed germination (%) of eggplant local cultivar as affected by hydro-priming duration and storage period.

The Storage period	Hydro-priming duration	Seed germination %
Direct after treatment	control	98 ab
	12h	100 a
	24h	86 bc
	36h	94 ab
	48h	100 a
6 month	control	100 a
	12h	100 a
	24h	100 a
	36h	100 a
	48h	100 a
12 month	control	100 a
	12h	92 ab
	24h	92 ab
	36h	80 c
	48h	80 c
18 month	control	100 a
	12h	98 ab
	24h	98 ab
	36h	97 ab
	48h	98 ab

Means within columns followed by the same letter are not statistically different at 5% level (Duncan' s multiple test)

Pepper:

Effect of hydro-priming on homogeneity and independence of sweet pepper local cultivar at seedling, flower, vegetative and yield stages:

Results in Table (10) showed that minimum significant values of populations mean to seedling length, seedling fresh weight and seedling dry weight; (9.024, 1.991 and 0.062, respectively) were recorded in untreated control seed hydro-priming treatment; while, minimum significant value of population mean to leaves number per seedling; (3.397) was recorded in 48h seed hydro-priming treatment. In regard to maximum significant values to all characters of seedling stage; (14.04, 0.035, 4.000, 2.587 and 0.080, respectively) were recorded in 36h seed hydro-priming treatment.

The confidence intervals for the means to all characters of yield stage at all seed hydro-priming treatments did not overlap with untreated control blend, which concludes that the population means for these levels are significant different at $P<0.05$ (Table 10); except, the confidence intervals for the means to leaves number per seedling at 12, 24 and 36h seed hydro-priming treatments did overlap with untreated control seed hydro-priming treatment. Minimum values of homogeneity index (more homogeneous) to all characters of seedling stage; (0.182, 0.004, 0.184, 0.135 and 0.007, respectively) were recorded in 48h seed hydro-priming treatment. Whereas, maximum values of homogeneity index (less homogeneous) to all characters of seedling stage; (0.728, 0.010, 0.414, 0.297 and 0.014, respectively) were recorded in untreated control seed hydro-priming treatment (Table 10). These

results agreed with those of Dearman *et al.,* 1987; Parera and Cantliffe, 1994 and Bruggink *et al*., 1999, those mentioned that seed priming enhanced uniform emergence for seedling. In addition, Rivas *et al.,* 1984; Sundstron and Edward, 1989; Bardford *et al.,* 1990; Chilembwe *et al.,* 1992; Ashraf and Humera, 2001; Ashraf and Iram, 2002; Aziza *et al*., 2004; Jaswinder *et al*., 2004; Farooq *et al.,* 2005; Geeta, 2005; Uma-Singh *et al.,* 2007; Muhammed *et al.,* 2007; VenkataSubramanian and umarani, 2007; Nascimento and Pereira, 2007; Farooq *et al*., 2008; Saeidi *et al.,* 2008 and Muhammed *et al.,* 2008, those reported to seed priming improved germination and early seedling growth and it enhanced shoot and root length, seedling fresh and dry weight and root and leaf score.

Results in Table (11) showed minimum significant values to all characters of flower and vegetative stage (Early flowers number/plant, Plant fresh weight, Plant dry weight and Plant height 3.500, 47.68, 1.486 and 27.65 respectively) were recorded in 24h seed hydro-priming treatment. In addition, maximum significant values to all characters of flower and vegetative stage (Early flowers number/plant, Plant fresh weight, Plant dry weight and Plant height 5.305, 66.88, 2.085 and 29.00, respectively) were noted in 48h seed hydro-priming treatment.

The confidence intervals for the means of plant fresh weight and plant dry weight at 48h seed hydro-priming treatment did not overlap with untreated control blend; while the confidence intervals for the mean of early flowers number per plant at 24h seed hydro-priming treatment did not overlap with untreated control blend, which concludes that the population means for these levels are significant different at $P<0.05$ (Table 11) Minimum values of homogeneity index (more homogeneous) to all characters of flower and vegetative stage; (0.910, 11.817, 0.351 and 1.635, respectively) were recorded in 24h seed hydro-priming treatment. Whereas, maximum values of homogeneity index (less homogeneous) to all characters of flower and vegetative stage; (1.275, 14.544, 0.459 and 2.180, respectively) were noted in untreated control seed hydro-priming treatment (Table 11). Effect of seed priming on vegetative and flower stage in plant were reported by Farooq *et al.,* 2005; Geeta, 2005; Muhammed, 2006; Nascimento and Pereira, 2007; Mukundam *et al*. 2007; Saeidi *et al.,* 2008; Mukundam *et al.,* 2008 and Muhammad *et al.,* 2008, those reported that the speed of germination and emergence, leading to better crop stands, and make seedlings grow much more vigorously. In addition, it improved growth and yield components.

Results in Table (12) showed that minimum significant values to all characters of yield stage; (8.038, 33.58, 205.4 and 858.0) and (7.181, 36.43, 183.5 and 930.9) were recorded in untreated control and 24h seed hydro-priming treatments, respectively. In respect to maximum significant values to all characters of yield stage; (10.50, 43.50, 268.3 and 112.0, respectively) were recorded in 48h seed hydro-priming treatment.

The confidence intervals for the means of total yield number per plant and total yield weight per plant at 48h seed hydro-priming treatment did not overlap with untreated control blend, which concludes that the population means for these levels are different at $P < 0.05$ (Table 12).

Minimum values of homogeneity index (more homogeneous) to all characters of yield stage; (1.820, 4.095, 44.540 and 109.09) and (1.820, 4.095, 44.540 and 109.09) were recorded in 24 and 36h seed hydro-priming treatment, respectively. In respect to maximum values of homogeneity index (less homogeneous) to all characters of yield stage; (2.366, 5.460, 57.902 and 141.81, respectively) were recorded in 48h seed hydro-priming treatment (Table 12). Similar results were previously reported by Farooq *et al.*, 2005; Geeta, 2005; Muhammed and Muhammed, 2006; Nascimento and Pereira, 2007 and Kukundam *et al.*, 2008, those reported that the seed priming improved growth and yield components.

Effect of seed hydro-priming on some genetic parameters of sweet pepper local cultivar population at seedling, flower, vegetative and yield stages: Results in Table (13) showed an increase in heritability value for treated population of seedling diameter; (10.374) compared to mother population; (0.613). While, the heritability values for treated population of seedling length, leaves number per seedling, seedling fresh weight and seedling dry weight; (-4.746, 9.925, 5.813 and 5.817 respectively) were decreased in comparison to mother population; (41.965, 14.064, 17.046 and 17.069, respectively). High value of heritability indicates that the proportion of observe variability due to the additive effects of genes. Phenotypic standard deviation values for treated population of all characters; (2.800, 0.036, 0.928, 0.815 and 0.025, respectively) were increased in comparison to mother population; (1.456, 0.030, 0.916, 0.699 and 0.022, respectively). High standard deviation indicates that the data are spread out over a large range of values (expressing the variability of a population). On the other hand, low standard deviation indicates that the data point to be close to the mean (expressing the homogeneity of population. In respect to, genetic standard deviation value for treated population of seedling length and seedling diameter; (1.814 and 0.011, respectively) were increased in comparison to mother population; (0.317 and 0.002., respectively). Whereas, genetic standard deviation values for treated population of leaves number per seedling, seedling fresh ling fresh weight and seedling dry weight; (0.292, 0.196 and 0.006, respectively) were decreased in comparison to mother population; (0.344, 0.288 and 0.009, respectively).

Results in Table (14) revealed decrease in heritability value for treated population of all characters at flower and vegetative stage; (4.322, 3.917, 3.927 and 2.287, respectively) compared to mother population; (8.379, 30.154, 30.158 and 35.252, respectively). In respect to, phenotypic standard deviation values for treated population of all characters; (2.936, 33.558, 1.045 and 4.767, respectively) were decreased in comparison to mother population; (3.299, 36.802, 1.147 and 5.273, respectively). Regarding, genetic standard deviation values for treated population of all characters; (0.610, 6.641, 0.207 and 0.721, respectively) were decreased in comparison to mother population; (0.955, 20.209, 0.630 and 3.130, respectively).

Results in Table (15) indicated to increase in heritability value for treated population of all characters at yield stage; (7.804, 8.352, 7.798 and 8.370, respectively) were increased in comparison to mother population; (-0.404, 4.038, -0.410 and 4.040, respectively). In respect to, phenotypic

standard deviation values for treated population of all characters at yield stage; (5.228, 12.622, 133.620 and 322.237, respectively) were increased in comparison to mother population; (4.828, 8.662, 123.343 and 221.272, respectively). Regarding, genetic standard deviation values for treated population of all characters at yield stage; (1.460, 3.648, 37.313 and 93.228, respectively) were increased in comparison to mother population; (0.307, 1.741, 7.900 and 44.477, respectively).

The previously mentioned results related to the genetic parameters for seedling, vegetative and yield stages can be interpreted as following, Hirsch (1997 C.A. Lerner, 2002) reported that heritability does not mean genetically determined and mentioned that the heritability may be used in a confused and confusing manner. In addition, Lehrman (1970 C.A. Lerner, 2002) indicated that, when geneticists speak of a trait as heritable, all they mean in that one is able to predict the trait distribution in the off spring of group on the basis of knowing the trait distribution in the parent group; specially, the descriptive traits. But the geneticist is not saying anything about the extent to which the expression of the trait may change in response to environmental modification. Lerner and Von (1992 C. A. Lerner, 2002) noted that the heritability value still only describe the extent to which inter-individual differences in a trait distribution measured at one point in time and under one particular set of environmental conditions are associated with inter-individual differences in gene distribution, these statistics do not explain the role of genes in causing the inter-individual differences in the trait distribution. In addition, Hirsch (1997 C.A. Lerner, 2002) reported that nothing about the role of genes in providing a basis for the development of the trait within the individual. Hence, heritability describes something about group and not anything about an individual. Moreover, Rustton (1999 C.A. Lerner, 2002) reported that it is possible that heritability (h^2) might be equal one for a population reared under set of environmental circumstances and might be equal zero for that same population reared under a different set of environmental. Negative heritability can be assumed to be zero (Robinson *et al*. (1995 C.A. Gabriele and Wehner, 2007 and Sabu *et al.*, 2009) but should be reported in order to contribute to the accumulation of knowledge, which may, in the future, be properly interpreted (Dudley and Moll (1969 C.A. Gabriele and Wehner, 2007). Rogueing practice is reliable only in the case of descriptive traits. These results were in accordance with the findings of (Nevo *et al.,* 1984 C.A. Pamilo, 1988) who, mentioned that the relation between the environmental and phenotypic variation is theoretically best understood, and experimentally best studied, in the case of specific polymorphism occurring due to variation at single loci. But speculations have widely exceeded this simple case and the overall multilocus heterozygosity is considered as adaptive strategy associated with the pattern of environmental heterogeneity.

SDS-Protein electrophoresis and similarity among seed protein of hydro-priming treatments for pepper local cultivar.

Electrophoretic SDS-protein patterns were shown in Table (16). In regard to the total number of protein bands obtained by scanning the gel of the four seed hydro-priming treatments were 22 distinguished bands. The bands varied from treatment to another. Number of these bands ranged from 9 to 16

bands for seed hydro-priming treatments. The highest number of seed proteins bands; (16 bands) was found in 48h seed hydro-priming treatment, and the lowest number; (9 bands) was recorded in 24 seed hydro-priming treatment. Only two bands namely 8 and 17 were found in all seed proteins of treatments examined. Bands number 6, 13, 14 and 18 were found only in seed proteins related to untreated control, 36h and 48h seed hydro-priming treatments; while, bands number 10 and 16 were found only in seed proteins related to 24h, 36h and 48h seed hydro-priming treatments; whereas, band number 5 was found only in seed proteins related to untreated control, 24h and 48h seed hydro-priming treatments. On the other hand, band number 3, 9 and 12 were found only in seed proteins related to 24h and 48h seed hydro-priming treatments. Also, bands number 14 and 11 were found only in seed proteins related to 36h and 48h seed hydro-priming treatments; such as, band number 7 was found only in seed proteins related to untreated control and 48h seed hydro-priming treatments. Moreover, band number 15 was found only in seed proteins related to untreated control and 24h seed hydro-priming treatments. Some of the examined seed proteins had a specific bands; such as, untreated control; (bands number 19, 20 and 21) and 36h seed hydro-priming treatments; (band number 22). That might be used as a biochemical genetic marker for these treatments.

The results in Table (17) represent the similarity indices among 4 seed proteins of hydro-priming treatments. The results indicated that the strongest similarity was between 36h and 48h seed hydro-priming treatments; (80.208%). On the other hand, the lowest similarity was between untreated control and 24h seed hydro-priming treatments; (32.386%). This suggests that the use of the electrophoretic pattern was able to distinguish between the closely population as affected by seed priming treatment; that show the ability of seed hydro-priming treatment to make change in seed proteins.

These results agreed with Smith and Cobb (1991), those reported increased protein with priming treatment. Osmopriming of seeds led to increased protein synthesis in wheat seeds (Dell' A Quila and Tritto, 1991; Dell' A Quilla and Spada, 1992). Mazor *et al*. (1984) reported that ATP (Adenosine Triphosphate) Concentration increased in Kohlrabi, spinach, eggplant and pepper seeds during osmo-priming presumably in relation to increasing protein synthesis. Most evidence suggests that priming allows time for the seed to repair damage from deteriorative events associated with mitochondrial dysfunction, enzyme inactivation, membrane perturbations and genetic damage incurred during seed storage and ageing. Thus, it may be concluded that priming has two roles in improving seed performance. The first is the advancement of events leading to germination. The second is the repair of seed damage that allows more efficient germination (McDonald, 2000).

Seed germination percentage of sweet pepper local cultivar as affected by hydro-priming duration and storage period.

The results in Table (18) revealed that the seed germination percentage was significantly reduced to interaction between the storage period (12 month) and hydro-priming treatments (36h and 48h) 20% and 12%, respectively. Such as, the interaction between the storage period (18 month) and all hydro-priming treatments; (7, 19, 42, 1 and 3, respectively)

compared to untreated control of hydro-priming duration treatment with the storage period (direct after treatment); 56%. On the other hand, the seed germination percentage was not significantly affected by the other interaction between the storage period and hydro-priming duration treatments; (50, 38, 42, 48, 43, 35, 55, 41, 38, 56, 64 and 56, respectively) compared to untreated control of hydro-priming duration treatment with the storage period (direct after treatments); 56%. These results indicated that the storage period (12 month) was a critical limit for sweet pepper local cultivar seeds affected by hydro-priming treatments. In this respect, Nascimento and West (2000), those reported that seed germination and vigour of primed seeds decreased after 12 months of storage. Both temperature and duration of drying affected seed vigour after storage. In addition, Ashraf and Humera, 2001; Aziza *et al.,* 2004; Farooq *et al.,* 2005; Geeta, 2005; Muhammed *et al.,* 2007; Nascimento and Pereira, 2007 and Muhammed *et al.,* 2008, those reported that the seed priming enhanced seed germination.

It could be concluded that (I) The seed-environmental factors (seed hydro-priming as a model) revealed changes in population homogeneity at field conditions, the best minimum values of homogeneity index (more homogenous) the best minimum values of homogeneity index to characteristics of seedling stage were obtained by 48h seed hydro-priming treatment; besides, the best values in case of vegetative, flower and yield stages were obtained by 24 seed hydro-priming treatment; (II) The hydro-Priming treatments (as seed-environmental factor) had effected the results of trait performance and led to changes in residual error variance, which reduces the power of statistical tests and biases the estimates of heritability. These results could lead to reducing selection efficiency; (III) Rogueing practice is reliable only in the case of descriptive traits; (IV) seed-environmental factors (seed hydro-priming as a model) led to specific differences related to the induced proteins. This suggests that the use of the electrophoretic pattern was able to distinguish within the close together population as affected by seed–environmental factors and (V) These results indicated that the seed storage period was not critical for pepper local cultivar seeds affected by hydro-priming treatments up to 12 months.

11

13-14-15

Table (16): The presence (+) and absence (-) of bands in SDS protein electrophoresis extracted from seeds of sweet pepper local cultivar as affected by hydro-priming.

Band number	Hydro-priming duration			
	control	24h	36h	48h
1	-	-	+	+
2	-	-	-	-
3	-	+	-	+
4	-	-	+	+
5	+	+	-	+
6	+	-	+	+
7	+	-	-	+
8	+	+	+	+
9	-	+	-	+
10	-	+	+	+
11	-	-	+	+
12	-	+	-	+
13	+	-	+	+
14	+	-	+	+
15	+	+	-	-
16	-	+	+	+
17	+	+	+	+
18	+	-	+	+
19	+	-	-	-
20	+	-	-	-
21	+	-	-	-
22	-	-	+	-

Table(17): The percentages of similarity between the proteins result for different hydro-priming durations of sweet pepper local cultivar calculated using Kulczynski index.

Hydro-priming duration	control	24h	36h	48h
control	-			
24h	32.386 %	-		
36h	50.000 %	38.888 %	-	
48h	56.862 %	67.973 %	80.208 %	-

Table (18): Seed germination (%) of sweet pepper local cultivar as affected by hydro-priming duration and storage period.

The Storage period	Hydro-priming duration	Seed germination %
Direct after treatment	control	56 ab
	12h	50 ab
	24h	38 bc
	36h	42 b
	48h	48 b
6 month	control	43 b
	12h	35 bc
	24h	55 ab
	36h	41 b
	48h	38 bc
12 month	control	56ab
	12h	64a
	24h	56 ab
	36h	20 cd
	48h	12 de
18 month	control	17 d
	12h	19 d
	24h	42 b
	36h	1 f
	48h	3 ef

Means within columns followed by the same letter are not statistically different at 5% level (Duncan' s multiple test)

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تأثير العوامل البيئية المتعلقة بالبذور علىالتجانس الوراثى للأصناف البلدية من الباذنجان والفلفل

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أجريت تجربتان حقليتان بمحطة بحوث البساتين بقها خلال الموسم الصيفى لعامى 2005، 2006 لدراسة تأثير العوامل البيئية المتعلقة بالبذور – أستخدمت تقنية "تهيئة البذور" كنموذج لتلك العوامل البيئية فى هذه الدراسة – على التجانس المظهرى والوراثى للأصناف البلدية من الفلفل والباذنجان التى لها قبول كبير بين المزارعين والمستهلكين على حد سواء لما لها من صفات بستانية مرغوبة، لذلك قد عمدت هذه الدراسة إلى مناقشة إتجاهيين – إتجاه إقتصادى وإتجاه أكاديمى – فمن حيث الجانب الإقتصادى تهدف الدراسة إلى تنمية تقنيات بسيطة منخفضة التكاليف والمخاطر دون تكبد رؤوس أموال إضافية وخاصة من المزارعين ذوى الدخل المحدود بالإضافة إلى كسب منفعه مالية فورية دون أى تغير فى الإدارة الزراعية للمزرعة. أما الإتجاه الأخر للدراسة وهو الجانب الأكاديمى – وهو مما لا شك فيه لا ينفصل عن الجانب الإقتصادى بل الجانب الإقتصادى مردود له – فقد ناقشت الدراسة عده موضوعات وهى: (1) دراسة تأثير العوامل البيئية المتعلقة بالبذور على التغيرات الحادثة فى المقاييس الوراثية للنباتات بالحقل وأهمها تقدير المكافئ الوراثى heritability والذى له دور كبير فى تحديد كفاءة عملية الإنتخاب للنباتات ذات الصفات المرغوبة وتحسين العشائر والمحافظة على الأصناف من التدهور. (2) تحسين التجانس داخل الأصناف ذات الإختلافات البينية بين أفرادها (ذات قاعدة وراثية عريضة) مثل الأصناف البلدية وهذا يؤدى إلى إرتفاع متوسط العشيره وسهوله أداء العمليات الزراعية مثل الجمع والوقاية. (3) مناقشة ما إذا كانت العوامل البيئية المتعلقة بالبذور قادرة على إحداث إختلافات بين بروتينات البذور لنفس الصنف بتقنية الفصل الكهربى للبروتينات وبالتالى هل هذه الوسيلة فعاله فى تحديد الأصناف أم لا؟ (4) دراسة تأثير تهيئة البذور (كعامل بيئى) على حيوية ومدة تخزين البذور (5) تحديد العلاقة بين المتغيرات الحادثة فى المقاييس الوراثية (نتيجة التغير فى العوامل البيئية المتعلقة بالبذور) وإجراء عملية نقاوه الغريبة Rogueing داخل الصنف.

وقد أجريت أربعة معاملات فى هذا البحث و هى تهيئة البذور للإنبات لمدة 12 و 24 و 36 و 48 ساعة بحضانات إنبات البذور على درجة حرارة 25 درجة مئوية وقد أستخدم الماء المقطر لإجراء عملية التهيئة ثم جففت تلك البذور على درجة حرارة الغرفة وقد استخدم بالتجربة الأصناف البلدية لكل من محصولى الباذنجان الكروى و الفلفل الرومى.

وكانت أهم النتائج المتحصل عليها:

1- أظهرت النتائج وجود فروقات معنوية بين المعاملات قى قيم الصفات المدروسة للمراحل الثلاثة للنبات: مرحلة الشتلة، مرحلة النمو الخضرى والزهرى ثم مرحلة المحصول ومكوناته لكلا المحصولين.
2- أدت معاملات تهئية البذور إلى حدوث تغير على مستوى التجانس المظهرى للعشيره تحت ظروف الحقل وكانت أقل قيمة لدليل التجانس (أى أكثر تجانساً) قد تحققت عند معاملة تهيئة البذور لمدة 48 ساعة فى صنف الباذنجان البلدى فى جمع مراحل نمو النبات بينما فى الفلفل فقد كانت أقل قيمة لدليل التجانس قد تحققت عند معاملة تهيئة البذور لمدة48 ساعة عند مرحلة الشتلة ومعاملة تهيئة البذور لمدة 24 ساعة عند مرحلتى النمو الخضرى والمحصول.
3- أظهرت النتائج تأثير قيمة المكافئ الوراثى عند المعاملة بمعاملات تهيئة البذور وبالتالى نقص كفاءة عملية الإنتخاب المعُتمد على تلك المقاييس الوراثية فى كلا المحصولين.
4- عملية نقاوة الغريبة لا تجدى نفعاً مع الصفات الكمية بينما تكون ذات كفاءة عالية مع الصفات الوصفية فى كلا المحصولين.
5- أدت معاملات تهيئة البذور للإنبات إلى ظهور إختلافات بين البروتينات المستخلصة من البذور بواسطة الفصل الكهربائى للبروتينات مما يشير إلى تأثير العوامل البيئيه على تخليق البروتينات بالبذور و هو ما يشكل عاملا محددا فى كفاءة عملية تحديد الأصناف البلديه على أساس الإختلافات البروتينية فقط لكلا المحصولين.
6- أظهرت النتائج أن هناك فترة حرجة لتخزين البذور المعاملة بمعاملات تهيئة البذور بعد هذه الفترة تبدأ البذور فى إنخفاض نسبة إنباتها ففى حالة الباذنجان كانت الفترة الحرجة لتخزين البذور المعاملة هى 18 شهر بينما كانت فى حالة الفلفل 12 شهر.

و قد أظهرت النتائج أن هناك علاقة وثيقة بين العوامل البيئية المتعلقة بالبذور و بين السلوك المظهرى والوراثى للنباتات مما ينعكس على المردود المحصولى وكفاءة تقدير المقاييس الوراثية التى لها الدور الأكبر فى تحديد كفاءة الإنتخاب للسلالات.

قام بتحكيم البحث

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Table(1): Effect of hydro-priming on homogeneity and independence of eggplant local cultivar at seedling stage.

characters	Hydro-priming duration	Population means	lower C.I.	Upper C.I.	Homogeneity index	Individual 95% C.I. For Mean Based on pooled standard deviation
Cotyledon length	control	3.525 a	1.925	5.125	3.200	(----------*----------)control
	12 h	3.495 a	2.055	5.095	3.040	(---------*----------)12h
	24 h	3.705 a	2.105	5.145	3.040	(----------*---------)24h
	36 h	3.445 a	1.845	5.045	3.200	(----------*----------)36h
	48 h	3.500 a	1.9	5.1	3.200	(----------*----------)48h Pooled standard deviation = 0.3921
Cotyledon width	control	0.8450 ab	0.795	0.895	0.100	(--------*--------)control
	12 h	0.8700 ab	0.825	0.92	0.095	(--------*--------)12h
	24 h	0.9100 a	0.86	0.955	0.095	(--------*--------)24h
	36 h	0.8250 b	0.775	0.875	0.100	(--------*--------)36h
	48 h	0.9050 a	0.855	0.955	0.100	(--------*--------)48h Pooled standard deviation = 0.1024
Seedling length	control	9.620 d	9.348	10.028	0.680	(--*---)control
	12 h	12.54 b	12.265	12.673	0.408	(--*-)12h
	24 h	12.67 b	12.537	12.945	0.408	(-*--)24h
	36 h	11.42 c	11.285	11.557	0.272	(-*-)36h
	48 h	14.36 a	14.228	14.5	0.272	(-*-)48h Pooled standard deviation = 2.059
Seedling diameter	control	0.3479 b	0.2779	0.4249	0.147	(----------*----------)control
	12 h	0.3531 b	0.31114	0.40214	0.091	(------*-------)12h
	24 h	0.3492 b	0.30715	0.39115	0.084	(------*------)24h
	36 h	0.3494 b	0.30736	0.39136	0.084	(------*------)36h
	48 h	0.3609 a	0.31888	0.39588	0.077	(------*-----)48h Pooled standard deviation = 0.03145
Seedling fresh weight	control	4.775 cd	4.523	5.063	0.540	(-------*--------)control
	12 h	5.206 b	5.062	5.35	0.288	(----*----)12h
	24 h	5.699 a	5.591	5.843	0.252	(---*----)24h
	36 h	4.636 d	4.492	4.78	0.288	(----*----)36h
	48 h	4.985 bC	4.841	5.093	0.252	(----*---)48h Pooled standard deviation = 1.288
Seedling dry weight	control	0.1488 cd	0.14084	0.15684	0.016	(--------*--------)control
	12 h	0.1623 b	0.15827	0.16727	0.009	(----*-----)12h
	24 h	0.1777 a	0.17365	0.18165	0.008	(----*----)24h
	36 h	0.1445 d	0.14051	0.14851	0.008	(----*----)36h
	48 h	0.1554 bc	0.15238	0.15938	0.007	(---*----)48h Pooled standard deviation = 0.04016

Means within columns followed by the same letter are not statistically different at 5% level (Duncan' s multiple test)

Table(2): Effect of hydro-priming on homogeneity and independence of eggplant local cultivar at flower and vegetative stage.

characters	Hydro-priming duration	Population means	lower C.I.	Upper C.I.	Homogeneity index	Individual 95% C.I. For Mean Based on pooled standard deviation
Early flowers number/plant	control	3.095 a	2.735	3.41	0.675	(--------*-------)control
	12 h	2.896 a	2.581	3.211	0.630	(-------*-------)12h
	24 h	2.065 b	1.75	2.38	0.630	(-------*-------)24h
	36 h	2.298 b	1.983	2.613	0.630	(-------*-------)36h
	48 h	2.643 ab	2.373	2.913	0.540	(------*------)48h Pooled standard deviation = 1.386
Plant fresh weight	control	325.0 a	297.73	352.27	54.540	(------*------)control
	12 h	300.2 a	277.475	322.925	45.450	(-----*-----)12h
	24 h	226.7 b	203.975	253.97	49.995	(-----*------)24h
	36 h	209.2 b	181.93	231.925	49.995	(------*-----)36h
	48 h	253.8 b	231.075	276.525	45.450	(-----*-----)48h Pooled standard deviation = 113.2
Plant dry weight	control	10.13 a	9.178	10.946	1.768	(-------*------)control
	12 h	9.358 a	8.678	10.174	1.496	(-----*------)12h
	24 h	7.065 b	6.249	7.881	1.632	(------*------)24h
	36 h	6.522 b	5.842	7.338	1.496	(-----*------)36h
	48 h	7.910 b	7.23	8.59	1.360	(-----*-----)48h Pooled standard deviation = 3.528
Plant height	control	39.33 a	37.877	40.607	2.730	(--------*-------)control
	12 h	38.85 a	37.58	40.31	2.730	(-------*--------)12h
	24 h	36.82 ab	35.548	38.278	2.730	(-------*--------)24h
	36 h	35.52 b	34.066	36.796	2.730	(--------*-------)36h
	48 h	38.59 a	37.315	39.863	2.548	(-------*-------)48h Pooled standard deviation = 5.791
Means within columns followed by the same letter are not statistically different at 5% level (Duncan' s multiple test)						

Table(3): Effect of hydro-priming on homogeneity and independence of eggplant local cultivar at yield stage.

characters	Hydro-priming duration	Population means	Lower C.I.	Upper C.I.	Homogeneity index	Individual 95% C.I. For Mean Based on pooled standard deviation
Early yield number/plant	control	6.540 a	6.144	6.972	.828	(----------*----------)control
	12 h	6.635 a	6.239	7.031	.792	(----------*----------)12h
	24 h	6.130 a	5.734	6.526	.792	(----------*----------)24h
	36 h	6.418 a	6.058	7.378	1.320	(----------*----------)36h
	48 h	6.117 a	5.757	6.477	.720	(----------*----------)48h Pooled standard deviation = 1.777
total yield number/plant	control	15.50 a	14.519	16.481	1.962	(---------*---------)control
	12 h	17.14 a	16.154	18.116	1.962	(---------*---------)12h
	24 h	17.22 a	16.241	18.094	1.853	(---------*--------)24h
	36 h	16.76 a	15.783	17.636	1.853	(---------*--------)36h
	48 h	16.72 a	15.845	17.589	1.744	(--------*--------)48h Pooled standard deviation = 4.332
Early yield weight/plant	control	1889. a	1768.501	2008.499	239.998	(----------*----------)control
	12 h	1916. a	1795.801	2016.89	221.089	(----------*----------)12h
	24 h	1770. a	1668.91	1889.999	221.089	(----------*----------)24h
	36 h	1853. a	1752.21	1973.299	221.089	(----------*----------)36h
	48 h	1766. a	1657.11	1867.29	210.18	(----------*----------)48h Pooled standard deviation = 513.2
total yield weight/plant	control	4467. a	4203.27	4776.003	572.733	(----------*----------)control
	12 h	4948. a	4675.27	5220.73	545.43	(----------*----------)12h
	24 h	4973. a	4700.27	5245.73	545.46	(----------*----------)24h
	36 h	4841. a	4568.27	5113.73	545.46	(----------*----------)36h
	48 h	4827. a	4554.27	5072.457	518.187	(----------*---------)48h Pooled standard deviation = 1251
Means within columns followed by the same letter are not statistically different at 5% level (Duncan' s multiple test)						

Table (4): Estimates of some genetic parameters for eggplant local cultivar at seedling stage as affected by hydro-priming.

characters	Populations	Genetic variance	Environmental variance	Phenotypic variance	Heritability %	PSD	GSD	ESD
Cotyledon length	Mother population	-0.018	1.154	1.136	-1.586	1.066	0.134	1.074
	Treated population	0.002	0.154	0.156	1.472	0.940	7.692	0.395
Cotyledon width	Mother population	-0.001	1.011	1.010	-0.079	1.005	0.028	1.005
	Treated population	0.001	0.011	0.011	7.407	0.106	0.029	0.102
Seedling length	Mother population	0.517	5.240	5.757	8.984	2.399	0.719	2.289
	Treated population	2.229	4.240	6.469	34.453	2.543	1.493	2.059
Seedling diameter	Mother population	0.00015	1.001	1.001	0.015	1.001	0.012	1.000
	Treated population	0.00002	0.001	0.001	2.323	0.032	0.005	0.031
Seedling fresh weight	Mother population	0.018	2.660	2.678	0.685	1.637	0.135	1.631
	Treated population	0.178	1.660	1.838	9.672	1.356	0.422	1.288
Seedling dry weight	Mother population	0.00002	1.002	1.002	0.002	1.001	0.004	1.001
	Treated population	0.00017	0.002	0.002	9.686	0.042	0.013	0.040

Table (5): Estimates of some genetic parameters for eggplant local cultivar at flower and vegetative stage as affected by hydro-priming.

characters	Populations	Genetic variance	Environmental variance	Phenotypic variance	heritability	PSD	GSD	ESD
Early flowers number/plant	Mother population	0.001	3.160	3.161	0.023	0.023	0.023	0.023
	Treated population	0.128	1.920	2.048	6.236	1.431	0.357	1.386
Plant fresh weight	Mother population	4885.214	12811.000	17696.214	27.606	133.027	69.894	113.186
	Treated population	1958.356	12810.000	14768.356	13.260	121.525	44.253	113.181
Plant dry weight	Mother population	4.750	13.400	18.150	26.171	4.260	2.179	3.661
	Treated population	1.920	12.400	14.320	13.411	3.784	1.386	3.521
Plant height	Mother population	7.164	34.500	41.664	17.195	6.455	2.677	5.874
	Treated population	1.753	33.500	35.253	4.973	5.937	1.324	5.788

Table (6): Estimates of some genetic parameters for eggplant local cultivar at yield stage as affected by hydro-priming.

characters	Populations	Genetic variance	Environmental variance	Phenotypic variance	heritability	PSD	GSD	ESD
Early yield number/plant	Mother population	0.233	4.160	4.393	5.293	2.096	0.482	2.040
	Treated population	-0.002	3.160	3.158	-0.070	1.777	0.047	1.778
total yield number/plant	Mother population	1.794	19.800	21.594	8.307	4.647	1.339	4.450
	Treated population	0.100	18.800	18.900	0.528	4.347	0.316	4.336
Early yield weight/plant	Mother population	19380.438	263345.000	282725.438	6.855	531.719	139.214	513.172
	Treated population	-188.089	263344.000	263155.911	-0.071	512.987	13.715	513.171
total yield weight/plant	Mother population	149987.750	1564766.000	1714753.750	8.747	1309.486	387.283	1250.906
	Treated population	8329.861	1564765.000	1573094.861	0.530	1254.231	91.268	1250.906

Table(10): Effect of hydro-priming on homogeneity and independence of sweet pepper local cultivar at seedling stage.

Characters	Hydro-priming duration	Population means	lower C.I.	Upper C.I.	Homogeneity index	Individual 95% C.I. For Mean Based on pooled standard deviation
Seedling length	control	9.024 d	8.66	9.388	0.728	(--*--)control
	12 h	12.26 c	12.08	12.626	0.546	(-*--)12h
	24 h	13.02 b	12.841	13.205	0.364	(-*-)24h
	36 h	14.04 a	13.858	14.222	0.364	(-*-)36h
	48 h	14.59 a	14.405	14.587	0.182	(-*)48h
						Pooled standard deviation = 2.133
Seedling diameter	control	0.030 a	0.258	0.268	0.010	(-----*-----)control
	12 h	0.032 a	0.291	0.299	0.008	(----*----)12h
	24 h	0.033 a	0.288	0.295	0.007	(---*----)24h
	36 h	0.035 a	0.298	0.304	0.006	(---*---)36h
	48 h	0.033 a	0.294	0.298	0.004	(--*--)48h
						Pooled standard deviation = 0.03359
Leaves number /seedling	control	3.804 ab	3.596	4.010	0.414	(---------*---------)control
	12 h	4.036 a	3.897	4.196	0.299	(------*-------12h
	24 h	3.725 b	3.587	3.863	0.276	(------*------)24h
	36 h	4.000 a	3.885	4.115	0.230	(-----*-----)36h
	48 h	3.397 c	3.304	3.488	0.184	(----*----)48h
						Pooled standard deviation = 0.8807
Seedling fresh weight	control	1.991 b	1.855	2.152	0.297	(-----*------)control
	12 h	2.622 a	2.513	2.756	0.243	(----*-----)12h
	24 h	2.508 a	2.373	2.616	0.243	(-----*----)24h
	36 h	2.587 a	2.506	2.668	0.162	(---*---)36h
	48 h	2.626 a	2.545	2.680	0.135	(---*--)48h
						Pooled standard deviation = 0.7903
Seedling dry weight	control	0.062 b	0.055	0.069	0.014	(-------*-------)control
	12 h	0.081 a	0.076	0.087	0.011	(-----*------)12h
	24 h	0.078 a	0.072	0.083	0.011	(------*-----)24h
	36 h	0.080 a	0.076	0.084	0.010	(----*----)36h
	48 h	0.081 a	0.078	0.085	0.007	(---*----)48h
						Pooled standard deviation = 0.02463
Means within columns followed by the same letter are not statistically different at 5% level (Duncan' s multiple test)						

characters	Hydro-priming duration	Population means	lower C.I.	Upper C.I.	Homogeneity index	Individual 95% C.I. For Mean Based on pooled standard deviation
Early flowers number/plant	control	4.882 a	4.245	5.519	1.274	(-------*-------)control
	12 h	4.698 a	4.061	5.335	1.274	(-------*-------)12h
	24 h	3.500 b	3.045	3.955	0.910	(-----*-----)24h
	36 h	4.563 a	4.017	5.109	1.092	(------*------)36h
	48 h	5.304 a	4.667	5.941	1.274	(-------*-------)48h
						Pooled standard deviation = 2.872
Plant fresh weight	control	48.73 b	41.458	56.002	14.544	(--------*--------)control
	12 h	57.08 ab	49.808	64.352	14.544	(--------*--------)12h
	24 h	47.68 b	41.317	53.134	11.817	(-------*------)24h
	36 h	50.86 b	44.497	57.223	12.726	(-------*-------)36h
	48 h	66.88 a	59.608	74.152	14.544	(--------*--------)48h
						Pooled standard deviation = 32.90
Plant dry weight	control	1.519 b	1.276	1.735	0.459	(---------*--------)control
	12 h	1.779 ab	1.563	2.022	0.459	(---------*---------)12h
	24 h	1.486 b	1.297	1.648	0.351	(-------*------)24h
	36 h	1.585 b	1.369	1.774	0.405	(--------*-------)36h
	48 h	2.085 a	1.869	2.301	0.432	(--------*--------)48h
						Pooled standard deviation = 1.026
Plant height	control	29.18 a	28.086	30.266	2.180	(----------*----------)control
	12 h	29.13 a	28.042	30.113	2.071	(----------*---------)12h
	24 h	27.65 ab	26.882	28.517	1.635	(-------*--------)24h
	36 h	27.20 b	26.222	28.075	1.853	(---------*--------)36h
	48 h	29.00 a	27.91	29.981	2.071	(----------*---------)48h
						Pooled standard deviation = 4.707
Means within columns followed by the same letter are not statistically different at 5% level (Duncan' s multiple test)						

Table(11): Effect of hydro-priming on homogeneity and independence of sweet pepper local cultivar at flower and

Table(12): Effect of hydro-priming on homogeneity and independence of sweet pepper local cultivar at yield stage.

characters	Hydro-priming duration	Population means	lower C.I.	Upper C.I.	Homogeneity index	Individual 95% C.I. For Mean Based on pooled standard deviation
Early yield number/plant	control	8.038 bc	6.946	9.13	2.184	(------*------)control
	12 h	6.113 c	5.021	7.023	2.002	(------*-----)12h
	24 h	7.181 bc	6.271	8.091	1.820	(-----*-----)
	36 h	9.042 ab	8.132	9.952	1.820	(-----*-----)24h
	48 h	10.50 a	9.408	11.774	2.366	(------*-------)48h
						Pooled standard deviation = 5.021
Total yield number/plant	control	33.58 c	31.305	36.31	5.005	(-----*------)control
	12 h	39.40 ab	36.67	41.675	5.005	(------*-----)12h
	24 h	36.43 bc	34.155	38.25	4.095	(-----*----)24h
	36 h	33.62 c	31.8	35.895	4.095	(----*-----)36h
	48 h	43.50 a	40.77	46.23	5.460	(------*------)48h
						Pooled standard deviation = 12.07
Early yield weight / plant	control	205.4 bc	178.67	232.12	53.448	(------*------)control
	12 h	156.2 c	129.47	182.92	53.448	(------*------)12h
	24 h	183.5 bc	161.23	205.77	44.540	(-----*-----)24h
	36 h	231.1 ab	208.83	253.37	44.540	(-----*-----)36h
	48 h	268.3 a	237.12	295.02	57.902	(-------*------)48h
						Pooled standard deviation = 128.3
Total yield weight per plant	control	858.0 c	792.54	934.36	141.81	(------*-------)control
	12 h	1007. ab	941.24	1072.15	130.90	(------*------)12h
	24 h	930.9 bc	876.35	985.44	109.09	(-----*-----)24h
	36 h	859.1 c	804.55	913.64	109.09	(-----*-----)36h
	48 h	1112. a	1035.23	1177.05	141.81	(-------*------)48h
						Pooled standard deviation = 308.5
Means within columns followed by the same letter are not statistically different at 5% level (Duncan' s multiple test)						

Table (13): Estimates of some genetic parameters for sweet pepper local cultivar at seedling stage as affected by hydro-priming.

characters	Populations	Genetic variance	Environmental variance	Phenotypic variance	Heritability %	PSD	GSD	ESD
Seedling length	Mother population	-0.101	2.220	2.119	41.965	1.456	0.317	1.490
	Treated population	3.290	4.550	7.840	-4.746	2.800	1.814	2.133
Seedling diameter	Mother population	18.000	0.00001	0.00090	0.613	0.030	0.002	0.030
	Treated population	0.00013	0.00113	0.001	10.374	0.036	0.011	0.034
Leaves number /seedling	Mother population	0.118	0.721	0.839	14.064	0.916	0.344	0.849
	Treated population	0.086	0.776	0.862	9.925	0.928	0.292	0.881
Seedling fresh weight	Mother population	0.083	0.405	0.488	17.046	0.699	0.288	0.636
	Treated population	0.039	0.625	0.664	5.813	0.815	0.196	0.791
Seedling dry weight	Mother population	0.00008	0.00039	0.00047	17.069	0.022	0.009	0.020
	Treated population	0.00004	0.00061	0.00064	5.817	0.025	0.006	0.025

Table (14): Estimates of some genetic parameters for sweet pepper local cultivar at flower and vegetative stage as affected by hydro-priming.

characters	Populations	Genetic variance	Environmental variance	Phenotypic variance	heritability	PSD	GSD	ESD
Early flowers number/plant	Mother population	0.912	9.970	10.882	8.379	3.299	0.955	3.158
	Treated population	0.373	8.250	8.623	4.322	2.936	0.610	2.872
Plant fresh weight	Mother population	408.412	946.000	1354.412	30.154	36.802	20.209	30.757
	Treated population	44.107	1082.000	1126.107	3.917	33.558	6.641	32.894
Plant dry weight	Mother population	0.397	0.919	1.316	30.158	1.147	0.630	0.959
	Treated population	0.043	1.050	1.093	3.927	1.045	0.207	1.025
Plant height	Mother population	9.800	18.000	27.800	35.252	5.273	3.130	4.243
	Treated population	0.520	22.200	22.720	2.287	4.767	0.721	4.712

Table (15): Estimates of some genetic parameters for sweet pepper local cultivar at yield stage as affected by hydro-priming.

characters	Populations	Genetic variance	Environmental variance	Phenotypic variance	heritability	PSD	GSD	ESD
Early yield number/plant	Mother population	-0.094	23.400	23.306	-0.404	4.828	0.307	4.837
	Treated population	2.133	25.200	27.333	7.804	5.228	1.460	5.020
Total yield number/plant	Mother population	3.029	72.000	75.029	4.038	8.662	1.741	8.485
	Treated population	13.306	146.000	159.306	8.352	12.622	3.648	12.083
Early yield weight / plant	Mother population	-62.412	15276.000	15213.588	-0.410	123.343	7.900	123.596
	Treated population	1392.233	16462.000	17854.233	7.798	133.620	37.313	128.304
Total yield weight per plant	Mother population	1978.176	46983.000	48961.176	4.040	221.272	44.477	216.756
	Treated population	8691.478	95145.000	103836.478	8.370	322.237	93.228	308.456