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RESEARCH ARTICLE

Effect of Electric Current Severity, Shock Timing for Seedling and Spray of Nano-Fertilizer on Vegetative Growth, Flowering and Induced Genetic Variation (DNA) of Statice Plant (*Limonium sinuatum L.)*

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ABSTRACT

The present study was carried out in the Lath house of Horticulture Department-College of Agricultural Engineering Sciences- University of Duhok- Kurdistan region-Iraq, during the period from 1/9/2022 to 1/6/2023 to examine the influence of electric current severity, shock timing and Nano fertilizer (NPK) concentrations on the seedling growth and flowering of Statice plant (Limonium sinuatum L.). The study included three different levels of electric current severity AC (2, 4 and 8 Ampere) were used for two timings of electric shock (1 and 3 min) plus the control treatment. A specific device were used which manufactured for this purpose. After treatment the seedling were planted in plastic pots with 25 cm diameter filled with medium consisting of 1:1 (loam: peat moss) then the plants spray with Nano-fertilizer (20 N 20 P2O5: 20 K2O) at 3 concentrations (0, 2.5 and 5 mg.L-1) at twice times first spray at month after planting of seedlings and second spray after month from first spray. The experiment was applied using a randomized complete block design (RCBD) with three replications. The mean comparisons were performed using Duncan's Multiple Ranges Test at a 5% significance level. The treated seedlings with (T7) 4 A × 1 min without spray of Nano fertilizer provided significantly highest plant height (99.17 cm), longest root length (36.73 cm) and root dry weight (3.37 g), whereas (T18) 4 A × 3 min. with Nano fertilizer at 5 mg L-1 gave maximum value of leaves number (44.00) but (T11) 4 A × 3 min with Nano fertilizer at 2.5 mg L-1 gives maximum values of mean branches numbers (16.67 branch/plant), leaf area (53.88 cm2), vegetative dry weight (51.17 g), total chlorophyll content (37.27 SPAD), inflorescences number (11.14), number of flowers (120.33).AFLP marker had been used in this research to detect the genetic stability of the treated plants which 10 primers combination have been used, the polymorphism rate was ranged between (0 %) and (13.7 %) of the primer (M82+P18) and (M43+P101).

INTRODUCTION

Statice (*Limonium sinuatum* L.) Synonyms (*Statice sinuata* L.), is a Mediterranean plant species belonging to family Plumbaginaceae is gaining importance as a cut flower as well as dried flower crop due to relative ease of cultivation and short growing period. The quality cut flower fetches a premium in the market because of attractive appearance and good vase life (Deshpande *et al*. 2001). It is a short-lived perennial plant, and is often treated as an annual. The leaves are pinnate, lobed, and lance-shaped – up to 10 cm (3.9 in) long. All parts are downy. The winged flower stems appear in summer, and are about 70 cm (28 in)

tall. The flowers present in short, papery clusters in colours ranging from white to pink, purple, and yellow. It has been known to become invasive (David, 2013). It is cultivated worldwide for its brightly colored, flat flower clusters that are used in dried and fresh flower arrangements. It's found in Southern of Spain, North of Africa, Canary Islands and even in Palestine. It usually grows up in sandy grounds (Ibrahim *et al.*, 2016) among the many species of the genus Limonium, (*Limonium sinuatum* L.) P. Mill. Statice (sea lavender, notch leaf marsh rosemary, sea pink, wavy-leaf sea lavender) is cultivated and recognized as cut flowers crop. These colorful plants are an excellent source of dried flowers. The flowers are borne in clusters and colors include purple, apricot, yellow, pink, and blue. It naturally inhabits mainly coastal areas. Statice is a good choice for seashore use since it is salt tolerant (Steven, 2008). Intensive cut flower production demands high levels of fertilization. Improper fertilization may contribute soil, water and environmental pollution. With the rapid increase in population and limited area of cultivation, there is need to improve crop productivity with less effect on the environment. This is only possible with the integration of conventional and non-conventional approaches (Zafar, 2007). Among the many species of the genus *Limonium*, *Limonium sinuatum* is the most commonly cultivated and highly recognized cut flowers crop. The common name "Statice" is actually used in most references for this genus although "sea lavender" is alternatively used because of its lilac-colored flowers and the fact that it naturally inhabits mainly coastal areas (Steven, 2008). Among the cut flower crops grown in the country, Statice is currently in demand by new investors for a large scale production owing to its easy plant care requirement and good selling price in the auction market. Based on these facts, four well-known firms were involved in growing and exporting of this crop. However, among the operating farms, some have been forced to stop production because of the major quality and productivity issues related to fresh weight of the flowers.

Exposing plant tissues to electric shock is an effective technique in terms of its efficiency compared to other physical parameters such as ultrasound, magnetic and thermal treatment **(Vorobiev *et al*, 2009)**. where the process of electric shock is one of the means used in stimulating plants to increase growth and protect plants also from the mother of the earth and the filler art, by treating the seeds with the electric field, as studies indicate that the treatment of seeds with electric current leads to genetic or physiological changes that lead to a change in the effectiveness of some compounds such as oxygen, cytokines and gabardines present in the plant, which in turn reflects on increasing the percentage of germination and stimulating growth in general or stimulating the vital processes of the plant Such as increased breathing, energy saving, increased activity of enzymes decomposed in seeds and seedlings **(Al-Samarrai *et al*, 2011; Piras *et al*, 2013)**. The effect of electric current on seed germination and various growth evidences depends on the intensity of the current used and the duration of exposure of the seeds to it **(Gätjens *et al*, 2017)**. **Abdulrahman (2019)** carried out a study on two cultivar of *Gladiolus grandiflorus* (Bimbo and Sapporo) using electric current severity at three level (AC 4, 6 and 8 amps.) and three timings of electric shock (1, 3 and 5 min.) and found from the results of Bimbo cultivar specially comparison with control that maximum plant height when 6 amps of electric used for 3 minute and maximum number of lateral branches, leaves number, leaf area, vegetative dry weight, Total chlorophyll in leaves, Number of florets per spike, Longest flower spike from 4 amps for 1 minute. **Abdulrahman *et al.* (2023)** indicated in their study on response of scarlet sage (*Salvia splendens*) seedling growth and flowering to different electric current severity, shocking time and GA_3 concentrations that the treatment of salvia seedlings with 4 Ampere of electric intensity for 3 minute with spraying 200 $mg.L^{-1}$ of GA_3 significantly increased number of main branches, leaf area, number of flowers spike, florets number in spike flower and length of flower spike. Whereas, 4 Ampere of electric intensity for 3 minute without GA_3 significantly increased number of leaves, total chlorophyll content, shoot dry weight, root length and root dry weight. In contrast, plant height significantly increased when seedlings were subjected to 8 Ampere of electric intensity for 3 minute and sprayed with 400 $mg.L^{-1}$ of GA_3.

Nanotechnology is a new multidisciplinary solution, especially in the agricultural and food sciences, which has led to new methods of solving many agricultural problems. Nanoparticles have other potential applications in agricultural systems, especially in foliar or ground fertilization operations **(Ghorbani *et al.*, 2011)**. Furthermore, foliar fertilization should be supported with an organic fertilizer system to provide

the needs of nutritional elements. (**Al-Juthery *et al.* (2020)** noted that foliar application of Nano-NPK 20-20-20 fertilizer optimized the growth, yield and concentrations of nutrients in grains of wheat.

Both electrical and electromagnetic energy are essential components of plant life. Electrostatic fields of varying intensities have applied on plants under both laboratory and field conditions for more than 250 years but optimum conditions could not be confirmed for commercial benefits due to various types of outcomes**. (Barman and Bhattacharya, 2016)**.This paper is an attempt to highlight the results of experiments on the growth of plants using electromagnetic field, in addition to detect the genetic mutation of the process by evaluation and analyzing the DNA profiles using molecular markers. Several techniques have been reported for the screening of genetic variation on tissue culture derived material; however, a highly informative and good relation among the time-cost-information is obtained using Amplified Fragment Length Polymorphism (AFLP). This technique involves a double-digestion of DNA with restriction enzymes, ligation of adapters at both extremities of the restriction fragments, and finally, selective polymerase chain reaction (PCR) amplification of the fragments. A semiautomatic process for the analysis could be used, but several considerations must be taken into account before such a use. **(Tamayo-Ordoñez *et al*., 2012)**..(

These experiments aimed to stimulating vegetative growth, improving the quality and quantity of flowers by spray different concentrations of Nano-fertilize, exposing seedling of Statice plant to electric shock with different current severity for different periods of time, also to detect the genetic stability of treated plants.

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MATERIALS AND METHODS

Plant material:

An experiment on "influence of different concentrations of nano-fertilize, electric current severity and shock timing of Statice plant (*Limonium sinuatum*) on vegetative growth, flowering was conducted at the lath house, Department of Horticulture, College of Agriculture, Duhok University, Duhok, Iraq from period 1/9/2022 to 1/6/2023. The seedlings will divide in to 19 groups. Each group of cultivars contained 3 seedlings which will placed in perforated cellophane sacs and soaked in sodium chloride solution (1%) for 3 h to allow the solution to penetrate into the corm tissue to increase the electrical conduction that was later imposed. Thereafter, the seedling will transferred to a 10- liter glass basin through a device manufactured for this purpose consisting of two poles of carbon connected to two wires connected to the electrical current into the basin to increase the contact area between the solution and carbon poles **(Al-Sahuki, 1992)**. A clamber meter was used to measure voltages and amperes passing through the saline solution and to maintain the temperature of the saline solution by adding the ice cubes continuously during the shocking process (Fig. 1). Three levels of electric current severity AC (2, 4 and 8 Ampere) were used for tow timings of electric shock (1 and 3 min) plus the control treatment (where all previous operations were performed except for the use of electricity) as in Table 1. After ending process has been completed for each treatment, the seedlings are placed in a container containing fresh water for three hours to wash the salt from seedlings tissues to avoid damage. Then the seedling was planted in plastic pots with 25 cm diameter filled with medium consisting of 1:1 (loam: peat moss) which was treated with fungicides, insecticides and nematodes before planting as recommended then the plants spray with nano- fertilizer (20 N 20 P2O5: 20 K2O) at 3 concentrations (0, 2.5 and 5 $mg.L^{-1}$) at twice times first spray at month after planting of seedlings and second spray after month from first spray. The studied measurements included: (1) Plant height (cm); (2) Leaves number; (3) Leaf area (cm^2); (4) Shoots dry weight; (5 Number of inflorescence/ plant; (6) Inflorescence diameter (cm); (7) Number of florets/inflorescence; (8) Length of longest root (cm); (9) Root dry weight (g); (10) Total chlorophyll in leaves (SPAD).

Figure (1). Electric shocking approaches (original)

Table (1). Show treatments symbols used in the experiment.

Treatment	Electric current intensity (Amps)	Shock timing (minute)	Nano-fertilizer (20 N 20 P2O5: 20 K2O) mg L^{-1}
T 0	0	0	0
T 1	2	1	0
T 2	2	1	2.5
T 3	2	1	5
T 4	2	3	0
T 5	2	3	2.5
T 6	2	3	5
T 7	4	1	0
T 8	4	1	2.5
T 9	4	1	5
T 10	4	3	0
T 11	4	3	2.5
T 12	4	3	5
T 13	8	1	0
T 14	8	1	2.5
T 15	8	1	5
T 16	8	3	0
T 17	8	3	2.5
T 18	8	3	5

DNA extraction and amplification:

The procedure of DNA isolation was done according to (weigand *et al*., 1993) using a CTAB extraction method. Ten AFLP primer pairs of selective compensation were used in this research. According to (Vos *et al.,* 1995), Genomic DNA was digested using both Msel and Pstil restriction enzymes. Amplification performed using a selective program of 35 cycles with the following profile: A 30sec. DNA denaturation step at 94ºC, 30sec. annealing step at 65ºC, and a 1 min extension step at 72ºC.the samples of PCR were mixed with 2 µl of load dye, and were denatured at 94°C for 3 min, chilled on ice, and run on a denaturing 8% polyacrylamide gel.

RESULTS AND DISCUSSIONS

Vegetative growth parameters

It is obvious from the results in Table (2) that the electric current severity, shocking time and spray of Nano-fertilize concentrations significantly effect on vegetative parameters, which is found that the maximum plant height was showed from effect of T7 (4 amps × 1 min × 0 mg L^{-1} Nano-fertilize) which was (99.167 cm) and significantly superior with all other used treatments especially T0 (control) which showed the

minimum plant height (55.767 cm). The best treatment for increase the number of leaves was T18 (8 amps × 3 min × 5 mg L^{-1} Nano-fertilize) was (44.00) and T11 (4 amps × 3 min × 0 mg L^{-1} Nano-fertilize) which recorded the highest number of leaves, main branch number, leaf area and vegetative dry weight were (41.333), (16.667), (53.887 cm^2) and (51.179) respectively as compere with T1 (2 amps × 1 min × 0 mg L^{-1} Nano-fertilize) which gave lowest number of leaves (12.333). The maximum number of main branch in contract to the plants treated with T2 (2 amps × 1 min × 2.5 mg L^{-1} Nano-fertilize) which recorded the minimum value of main branch number (4.000). The effect of T0 and T1 significantly decrease with the area of leaf to (17.737cm^2) and (20.277 cm^2) when plants were treated with both T0 (control) and T1 (2 amps × 1 min × 0 mg L^{-1} Nano-fertilize) respectively. And about the dry weight of vegetative of T15, when the plants were exposed to the (8 amps × 1 min × 5 mg L^{-1} Nano-fertilize) gave the lowest value (9.613 g).

Table (3): Effect of electric current severity, shock timing and spray of nano-fertilizer on vegetative growth of Statice plant seedlings (*Limonium sinuatum* L.).

Treatments	Plant height (cm)	Leaves number	Main number of branches	Leaf area (cm^2)	Vegetative dry weight (g)	Total chlorophyll SPAD
T0	55.767 i	20.67 h	7.00 e-g	17.74 i	10.90 h	22.83 e
T1	59.50 i	12.33 i	5.67 gh	20.38 hi	9.71 h	31.63 bc
T2	72.50 gh	15.33 i	4.00 h	45.04 b	12.22 gh	32.43 a-c
T3	72.77 gh	20.33 h	5.67 gh	40.47 bc	17.17 f	30.07 bc
T4	69.40 h	38.33 bc	8.33 e-f	25.15 gh	37.69 b	30.63 bc
T5	76.60 fg	30.33 ef	9.33 cd	43.82	25.00 d	32.37 a-c
T6	76.50 g	36.67 cd	9.33 cd	31.98 d-f	23.86 de	30.17 bc
T7	99.17 a	35.67 cd	10.67 bc	40.33 bc	20.36 d-f	33.03 ab
T8	85.27 b-d	39.67 bc	12.33 b	32.38 d-f	34.61 bc	32.97 ab
T9	89.17 bc	20.67 h	7.33 e-g	33.43 de	19.21 f	33.10 ab
T10	77.00 e-g	26.00 g	11.67 b	50.78 a	31.58 c	34.07 ab
T11	83.50 d	41.33 ab	16.67 a	53.88 a	51.17 a	37.27 a
T12	82.83 de	27.67 fg	9.00 c-e	32.94 d-f	24.71 de	29.23 b-d
T13	90.77 b	32.67 de	8.33 d-f	35.63 cd	31.67 c	31.10 bc
T14	81.67 d-f	15.67 i	6.33 fg	29.70 e-g	15.96 fg	31.77 bc
T15	71.83 gh	13.33 i	5.67 gh	20.87 hi	9.61 h	24.83 de
T16	70.13 h	20.67 h	6.00 gh	27.82 fg	16.15 fg	14.40 f
T17	77.40 e-g	38.00 bc	9.33 cd	21.397 hi	20.11 ef	27.43 c-e
T18	89.30 bc	44.00 a	8.67 c-e	31.91 d-f	37.11 b	30.17 bc

From the effect of used factors it can be noticed significant difference in increasing plant height comparison with control this may be due to the fact that the effect of the electric current is within the functional activities of the cells without the genetic material, such effect may change the activity of auxins and gibberellins hormone (Frensom, 1965), which is reflected in the decrease or increase of this parameter or the destruction of some growth-inhibiting enzymes (Francis et al., 1990). These results are in agreement with those obtained by Al-Sahuki and Al-Sbahi (2001) showed decrease and increase in plant height when treated sunflower plant with electric shocks, The reason for the obtained result, which is the significant increase in the rate of plant height, may be due to the importance of the Nano fertilizer used and the physiological role of nitrogen in the representation of prophyrin, which is involved in the composition of the chlorophyll molecule or the chlorophyll pigment necessary for photosynthesis and respiration, and the enzyme cofactors catalyzed by phosphorus, which activate the necessary enzymes involved in the production of amino acids involved in the construction of proteins, in addition to the role of potassium,

which is responsible for the effectiveness of enzymes and maintains the stability of proteins. These nutritional elements work together to control the work of enzymes and the formation of proteins **(Jones et al., 1996)**. And it is found an increase in the number of main branch from the effect of used treatment comparison with control the reason may be due to that the electricity affected in the increase the permeability of plasma membrane which result an increase and easy transport and metabolism of ions and electrons (Rezaei-Zarchi *et al.*, 2012). And this affect many physiological and biochemical process of plant including mobility of food, proteins and enzyme synthesis which ultimately cause positive effect on number of main branch and most plant parameters (Costanzo, 2008). Also it play a role in promoting metabolic activities of cells, such as carbon fixation and alteration of pH inside and outside the cell which allows transport through cellular membranes resulting in osmotic equilibrium by induction or electric tension, therefor the cells react by accumulating secondary metabolites which play a role in biological synthesis (Zhang *et al.*, 2004). Also plant leaf area is an important determinant of light interception and consequently of transpiration, photosynthesis process which lead to plant productivity (Hawash and Al-Shamma, 2016). And in this study is increased when different treatment were applied to plant comparison with control this may be return to osmotic potential mechanics in transferring water and increase in absorption of mineral nutrients, so it contribute in increasing vegetative growth and its size which reflect on increase carbon representation and manufactured materials (Francis et al., 1990). And also due to the cells plasticity of the new growth, this plasticity is important in the elongation and expansion of cells (Abdul Majid et al., 1991). There is also an increase of shoot dry weight from the effect of used treatments of electricity, these findings are agreement with results of Jassim (2007) in a study on Ranunculus flowers which used electric current factor to know its effect on the vegetative growth and found an increase of number of lateral growth, leaf area, leaf chlorophyll content and dry weight of shoots. An increase of chlorophyll content from the effect of used factors may be due to the positive influence of electricity which cause increase in absorption of mineral nutrients (Black et al., 1971) through activation of carbon metabolism process. Or its effect on changing the size and numbers of chloroplast, because good root and vegetative growth of seedlings is correlated to content and activity of that leaves from chlorophyll (Hussien, 2007). These results are in agreement with finding of (Abdulrahman, 2019). As for Nano fertilizer, the plant response varied according to the concentrations used of Nano fertilizer. This may be due to the role of physiological fertilizer in influencing the vital processes within the plant, which was positively reflected in improving the plant's vegetative characteristics, and the characteristics of Nano fertilizers such as their small size and large surface area, which lead to an increase in the absorption surface, raising the efficiency of the photosynthesis process, and increasing plant growth (Chippa, 2017).

2. **Flowering Parameters**

The results in Table (3) showed that the maximum number of flower number, inflorescence number and total chlorophyll were which the plant treated with T11 (4 amps × 3 min × 2.5 mg L^{-1} Nano-fertilize) give (120.333), (11.137) and (37.267) respectively, in contract to the plants flower number treated with T1 (2 amps × 1 min × 0 mg L^{-1} Nano-fertilize) which recorded the minimum value of flower number(20.667),significant decrease of inflorescences number when plants were treated with both T7 (4 amps × 1 min × 0 mg L^{-1} Nano-fertilize) and T9 (4 amps × 1 min × 5 mg L^{-1} Nano-fertilize) and T17 (8 amps × 3 min × 2.5 mg L^{-1} Nano-fertilize) which gave (4.727), (4.710) and (4.613) respectively and finally plants total chlorophyll of T16 (8 amps × 3 min × 0 mg L^{-1} Nano-fertilize) gave the lowest value (14.400 SPAD).

Table (4): Effect of electric current severity, shock timing and spray of nano-fertilizer on the flowering of Statice plant seedlings (*Limonium sinuatum* L.).

Treatments	Flowers number	Inflorescences number
T0	34.67 i	6.60 d-f
T1	20.67 k	6.00 e-g
T2	19.33 k	5.70 e-g
T3	44.00 h	6.30 d-g

T4	36.67 i	7.65 b-e
T5	62.67 f	8.05 b-d
T6	64.00 f	6.95 c-e
T7	71.00 e	4.73 fg
T8	100.00 c	7.280 c-e
T9	60.33 f	4.71 fg
T10	114.67 b	8.59 bc
T11	120.33 a	11.14 a
T12	118.00 ab	9.23 b
T13	63.67 f	8.627 bc
T14	42.67 h	8.180 b-d
T15	25.67 j	7.050 c-e
T16	49.33 g	7.470 b-e
T17	94.33 d	4.613 g
T18	59.67 f	6.597 d-f

The reason of an increase in number of inflorescences and flowers number may be due to the increase of number of main branches from the effect of same treatment, these results are in consistent with finding of Jassim (2007) which used different electric shocks and timings to found there influence on vegetative and flowering growth characters of ranunculus plants. This may be related to the formation of more number of branches from the effect of electricity which caused decrease in plant height and activation in formation and increase in the number of branches and ultimately increase in number of formed inflorescences and flowers number, as the plant shortened mostly led to increase in production because the manufactured materials will turn from building vegetative growth to sexual which reflect to increase number of inflorescences and flowers number. These results are in accordance with those of Amin *et al.* (2010) on *Iris hollandica* and Hussein *et al*. (2020) on Calendula plant. Or the reason may be from the effect of Nano fertilizer in improving inflorescences and flower number, as the low concentration of the Nano-compound fertilizer increased their rate, and this is due to the effective physiological role of Nano-fertilizer in improving the vegetative growth characteristics of the plant, which was positively reflected in flowering. This was confirmed by Amirnia *et al.* (2014) that spraying Nano-fertilizer affected all flower characteristics of Crocus plant compared to the control treatment.

Roots parameters

The results in Table (4) demonstrate that the flowering parameters can be affected by different treatments related to the severity of electric current, duration of exposure, and varying concentrations of Nano-fertilize concentrations and it is noticeable that the significantly superior data of longest root was showed from effect of T7 (4 amps × 1 min × 0 mg L^{-1} Nano-fertilize) which was (36.733 cm) and significantly superior with all other used treatments especially T15 (8 amps × 1 min × 5 mg L^{-1} Nano-fertilize) and T9 (4 amps × 1 min × 5 mg L^{-1} Nano-fertilize)) which showed the minimum roots long (21.067 cm) and (21.700 cm) respectively. The best treatment for root dry weight was significantly with T7 (4 amps × 1 min × 0 mg L^{-1} Nano-fertilize) and T6 (2 amps × 3 min × 5 mg L^{-1} Nano-fertilize) and T11 (4 amps × 3 min × 2.5 mg L^{-1} Nano-fertilize) which recorded (3.370 g), (3.327 g) and (3.247 g) respectively, as compared with T15 (8 amps × 1 min × 5 mg L^{-1} Nano-fertilize) which gave lowest root dry weight (0.903 g).

Table (5): Effect of electric current severity, shock timing and spray of nano-fertilizer on the roots growth of Statice plant seedlings (*Limonium sinuatum* L.).

Treatments	Length of Longest roots (cm)	Root dry weight (g)
T0	25.43 gi	1.51 f

T1	22.40 i-k	1.61 ef
T2	28.07 d-g	1.37 f
T3	28.90 d-g	1.98 de
T4	34.33 ab	2.31 cd
T5	32.90 bc	2.75 b
T6	28.17 d-g	3.33 a
T7	36.73 a	3.37 a
T8	29.83 c-f	2.01 de
T9	21.70 jk	1.61 ef
T10	30.30 c-e	2.60 bc
T11	34.40 ab	3.25 a
T12	27.50 e-g	1.50 f
T13	31.50 b-d	1.60 ef
T14	19.83 k	1.36 f
T15	21.07 k	0.90 f
T16	24.83 ij	2.09 d
T17	33.23 a-c	2.53 bc
T18	26.33 fg	1.67 ef

The reason of significantly longest root length and high dry weight of roots that were obtained from the effect of electric currents as it obvious in Table (4), may be related to their influence on plant metabolism such as hormonal and enzyme activities and on movements of endogenous solutes, particularly carbohydrates, enzymes, plant growth regulators and which stimulate from region of synthesis and/or store in a region of growth (Kose, 2007).

Molecular assessment for genetic variation:

To assess the genetic stability among the treated plants AFLP marker had been used, ten primer combination tested. The figure. (2) showed the result obtained from primer (M17 and P37).M is marker molecular weight (100 bp), T1 is treated plant with current intensity and duration of (2 amps × 1 min), T2 is treated plant with current intensity and duration of (2 mps × 3 min), T3 is treated plant with current intensity and duration of (4 amps × 1 min), T4 is treated plant with current intensity and duration of (4 amps × 3 min), T5 is treated plant with current intensity and duration of (8 amps × 1 min), T6 is treated plant with current intensity and duration of (8 amps × 3 min) and T7 is control.

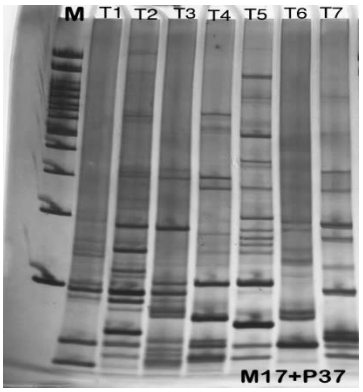

Fig.2 AFLP profile of 7 treatments of statice plant using PstI and MseI (M17+P37) primer combination. M marker molecular weight (100 bp).

The polymorphism percentage had been evaluated by applying ten AFLP primers and the results are shown in table (6), in the table the polymorphism of each treatment are shown the highest one was primer of (M43 + P101) with treatment (1).

Table (6). Oligonucleotide primer combination names and polymorphism rates for AFLP analysis.

Primer combination	Total no. of badns	Polymorphism % T1	Polymorphism % T2	Polymorphism % T3	Polymorphism % T4	Polymorphism % T5	Polymorphism% T6
M289+P71	**77**	**7.7 %**	**3.8 %**	**3.8 %**	**6.4 %**	**6.4 %**	**7.7 %**
M62+ P109	**46**	**8.6 %**	**2.1 %**	**4.3 %**	**4.3 %**	**2.1 %**	**2.1 %**
M291+P293	**60**	**13.3 %**	**11.6 %**	**3.3 %**	**8.3 %**	**11.6 %**	**6.6 %**
M43+P101	**51**	**13.7 %**	**7.8 %**	**5.8 %**	**3.9 %**	**1.9 %**	**3.9 %**
M82+P107	**-----**	**--------**	**------**	**-------**	**---------**	**----------**	**-------**
M3+P50	**---------**	**----------**	**-----------**	**--------**	**-----------**	**----------**	**--------**
M95+P14	**43**	**11.6 %**	**11.6 %**	**9.3 %**	**11.6 %**	**9.3 %**	**9.3 %**
M17+P37	**89**	**8.9 %**	**4.4 %**	**4.4 %**	**4.4 %**	**3.3 %**	**4.4 %**
M95+P237	**63**	**3.1 %**	**4.7 %**	**4.7 %**	**4.7 %**	**1.5 %**	**4.7 %**
M82+P18	**30**	**6.6 %**	**0 %**	**3.3 %**	**0 %**	**3.3 %**	**3.3 %**

***T** means treatment of each sample.

CONCLUSIONS

It has been concluded from the results of this study that the treatment of Statice seedlings with 4 Ampere of electric intensity for 3 minutes with spraying 2.5 mg.L^{-1} of Nano fertilizer (NPK) significantly increased number of main branches, leaf area, vegetative dry weight, total chlorophyll content, inflorescences number and number of flowers. Whereas, 4 Ampere of electric intensity for 1 minute without Nano fertilizer significantly increased plant height, root length and root dry weight. In contrast, 4 Ampere for 3 with Nano fertilizer at 5 mg L^{-1} gave maximum value of leaves number. shows the polymorphism percentage of each treatment with the highest percentage of (13.7 %) and the lowest polymorphism percentage of (0 %) which indicate that the treatment of various electricity current applied on statice plant had not a significant effect on DNA mutation, of course several plants with more electricity current should be studied with more DNA markers to identify the effect on this plant as general.

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