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Effect of Some Safe Compounds on Growth and Productivity of Peas (*Pisum sativum* L)

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ABSTRACT

Two field experiments were carried out during the two successive season of 2014/2015 and 2015 /2016 at Private Farm at El-Khelala vallage, Belqas Regon, Dakahlia Governorate, Egypt The experiment layout was completely randomized blocks design to investigate the effect of salicylic acid (SA) at 50 -100 -150 ppm and boron at 25 - 50 – 75 ppm each concentrate from salicylic acid and boron replicted twice the first foliar spray at 35 days from sowing and the second foliar spray at 35 and 45 day from sowing compared the control (tap water)on pea (*Pisum sativum* L.) cv Master–B. The results showed that the vegetative growth parameters (plant height, fresh and dry weights/plant, leaves number and leaf area / plant), Leaf chemical parameters (total chlorophyll , caroteinods, N, P, K and boron), pod yield and its components (pod yield, pod weight, number of seeds per pod and weight of 100 fresh seeds) and pod chemical content(total carbohydrates, total sugar and protein)were affected significantly by foliar application treatments .The foliar treatment with salicylic acid 100ppm twice was most effective on vegetative parameters (plant height, fresh and dry weights, leaves number and leaves area) followed by salicylic acid 150 ppm twice respectively. The highest values of pod chemical component were recorded with boron 75 ppm twice (pod yield, pod weight, number of seeds per pod and weight of 100 seeds)in both seasons .The lowest values of the priveous parameters were recorded with the control (non foliar application).

Keywords: peas (*Pisum sativum* L .), carbohydrate, proteins, yield, growth, chlorophyll, sugars , salicylic acid, boron.

INTRODUCTION

Pea(*Pisum sativum* L.)is the second most important grain legume crop in the world which has a wide array of uses for human food and fodder (Akhtar *et al* ., 2003) It has many nutritional values such as high content of protein (21-25 percentage) carbohydrates, iron, phosphorus, calcium, zinc, coppers vitamins A, B12, C ,amino acids, lysine, tryptophan and low contents of fiber (Kent and Endres, 2003)

Increasing the production of peas green pods and dry seeds with high quality is considered an important aim , its affected by many factors such as (temperature, soil type, nutrients,water stress, heat stress , foliar application, variety , etc..) foliar application such as salicylic acid and boron can used to improve yield and quality of peas (Abdel – Aziz *et al*., 2013)

Salicylic acid increase the resistance of the plant disease, insect resistance, un suitable heat, salinity and thirsty.

Salicylic acid naturally occurs in plants in very low quantity, it is a natural product of phenyl propanoid metabolism. Decarboxylation of transcinnamic acid to SA has direct involvement in plant growth, thermogenesis, flower induction and uptake of ions benzoic acid and its subsequent 2- hydroxylation results to Salicylic Acid (Popova *et al* .,2008) .

Low amounts of SA naturally occurs in plants. Endogenous salicylic acid (SA) is said to act like a growth regulator, It functions as an indirect signal stimulating many physiological, biochemical and molecular processes and therefore it affects the plant growth and development (Shafeek *et al* .,2014). However, Salicylic acid is an endogenous growth regulator with phenolic nature, which participates in regulation of several physiological processes in plants, such as stomatal closure, ion uptake, inhibition of ethylene biosynthesis and reduce transpiration (El-Shraiy and Hegazi , 2009)

Boron is unique, not only in its chemical properties, but also in its roles in biology. Since boron discovery as essential plant nutrient, the importance of B element as an agricultural chemical has grown very rapidly and its availability in soil and irrigation water is an important determinant of agricultural production. (Ramesh Kumar *et al*., 2008) **.**

Boron is directly or indirectly involved in several physiological and biochemical processes during plant growth ,Boron deficiency causes reduction in cell enlargement in growing tissues because of its structural role and transport of carbonates through cell membranes, Thus, maximum production of starch and sugars are restricted if crops are suffering from boron deficiency.(Singh *et al* ., 2012).

This investigation aimed to study the effect of foliar application of salicylic acid and boron at different concentration on yield and fruit quality of pea plant .

MATERIALS AND METHODS

Two field experiments were carried out at Private Farm at El-Khelala villages Belqas Regon, Dakahlia, Governorate ,Egypt ,during two seasons of 2014/2015 and2015/2016seasons**.** The experimental design was complete randomized blocks, with three replicates to investigate the effect of salicylic acid (SA) at 50 -100 -150 ppm and boron at 25 - 50 - 75 ppm, plus non treated (foliar with water) on pea cv Master–B.each concentrate from salicylic acid and boron treated once or twice the first foliar spray at 35 days from sowing and the second foliar spray at 35 and 45 day from sowing seeds used in the present study were kindly supplied by Agriculture Research Center, Giza, Egypt. Seeds of peas were sown in the moderately moist soil on 15th and 10th of October in the first and second seasons, respectively in hills, at 10 cm apart in three rows of ridges which were 0.7 m in width and 4 m length. Each plot included four rows and the plot area was11.2 m^2 and each replicate included on 13 treatments

The fertilization N,P and K were added at rate of 60 kg N/fed . as Urea (46% N), 30 kg P_2O_5/fed . as

calcium super phosphate (16.5% P_2O_5) and 50 kg K_2O/fed as potassium sulfate (48% K_2O) . Phosphorus fertilizer added twice, the first one 75% of the level fertilizer during service operations, and the second payment of 25% before the first irrigation, N and K fertilizers were divided in two equal doses, the first one before the first irrigation and the second one before the following irrigation .The normal agronomical practices of peas production were followed as the recommendation of the Ministry of Agriculture .

Soil analysis :

Representative samples of the experimental soil were collected from the surface layer (0 -30 cm) and analyzed for some physical and chemical properties as describe by Black (1965)and Page(1982). The obtained results were shown in Table (1) .

Table 1. physical and chemical properties of the experimental soil during of 2014 / 2015 and 2015 /2016 seasons.

Properties	2014	2015
Chemical analysis A:		
EC (ds.m-1)	1.09	1.85
PH	8.12	8.10
CaCO3 (%)	3.47	3.42
OM (%)	1.59	1.54
SP (%)	58.5	58.4
B: Physical properties %		
C.Sand	1.51	1.52
F.Sand	15.73	16.80
Silt	40.76	39.82
Clay	36.85	36.90
T.class	Loamy	
C: Available nutrient (ppm)		
N	52.60	53.4
P	5.91	6.01
K	183	187
Fe	2.98	2.96
Mn	1.07	1.02
Zn	0.85	0.80
B	0.93	0.91

3.Data recorded were as follows:

Vegetative growth:

Five plants were randomly taken from each plot at 55 days after sowing during both seasons and the following data were recorded Plant height, No. of leaves, plant fresh weight, plant dry weight, and leaf area .

Leaves Chemical Composition:

Total Chlorophyll, caroteinods, N, P, K and boron were determined in the 5 dried leaf according to the methods described by A.O.A.C.(1990).

Pod yield and its components:

Green pods of four rows of each plot were harvested at the proper maturity stage to determine the following parameters average pod yield / fed, average pod weight, average number of seeds per pod and average weight of 100green seeds.

Chemical composition of seeds:

Seeds were taken after 70 days from planting. The Seeds washed with distilled water then dried at 70 till a constant weight and total carbohydrates, Total sugars and protein were determined according to A.O.A.C (1990)

Statistical analysis:

The data of the experiment was tabulated and subjected to statistical analysis according to Snedecor and Cochran (1980) and the mean differences among the treatment means were evaluated by the least significance difference (LSD) at 5% level of probability.

RESULTS AND DISCUSSION

1. **Vegetative growth**

The results in Table 2 showed the highest values of plant height, fresh weight, dry weight, number of leaves/plant and leaves area / plant were obtained from plants sprayed with salicylic acid at concentration of 100 ppm twice in both seasons, followed by salicylic acid 150 ppm twice, on the contrary, the lowest values of (plant height, fresh weight, dry weight, number of leaves/ plant and leaves area per plant) were recorded with the control .These results may be due to the role of salicylic acid in enhancing some physiological and biochemical aspects in this concern. Khan *et al.*, (2010) and Nour *et al.*, (2012)showed that using salicylic acid concentration at(50 and 100 ppm) as foliar application on snap bean gave increased snap bean plant growth and total dry weight of Snap bean, similar results obtained with Agostini *et al.*,(2013)and Fahraji *et al.*,(2014).Also, Boukraa *et al.*,(2015)found that using concentration of salicylic acid at(0.05, 0.5, 1.0 mM) foliar application on plants led to an increase in fresh weight at a concentration of 0.05Mm) and an increase in the number of leaves by using concentration (0.5 Mm) and increased Shoots length (cm) at 1.0 mM on chickpea, similarly,Ismaeil *et al.,* (2016) reported that foliar application of salicylic acid on peas at 50-100 ppm after 60 and 80 days of agriculture significantly increased plant length, number of branches per plant, number of leaves per plant, total leaf area/plant and dry weight of root.

2. Leaves Chemical composition:

In relation to control plants, all treatments resulted in a massive increases in total Chlorophyll, carotenoids, and total pigments contents of pea leaves and N .P. K and B.

Generally,data inTable3showed salicylic acid that foliar treatment at 100ppm twice recorded the highest values. These positive effect of SA increasing in net photosynthesis of plants (Khan *et al.*,2015),also, SA treatment had a positive effect on all the photosynthetic pigments either in stressed or unstressed plants. The increase in photosynthetic rates after application of SA was not always accompanied with increased stomatal conductance levels or transpiration rates however, the intercellular CO_2concentrations of plants sprayed with SA were generally lower than the control plants.

This suggests that the increases in photosynthetic rates followed spraying certain phenolic compounds such as SA could be the result of increased enzyme activity related toCO_2 uptake at the chloroplast level, rather than simple increases in stomatal opening,

Table 2. Effect of foliar application by boron and salicylic acid on vegetative growth of peas plants during 2014 / 2015 and 2015 / 2016seasons .

Treatments	Plant height (cm) seasons		Fresh weight (g/plant) seasons		Dry weight (g/plant) seasons		Leaves (number/plant) seasons		Leaf area (cm^2)/plant seasons	
seasons	14/15	15/16	14/15	15/16	14/15	15/16	14/15	15/16	14/15	15/16
Boron 25 ppm One spray	53.27	60.93	17.57	20.41	3.50	4.16	26.61	29.48	296.72	306.42
Boron 25 ppm Twice spray	53.80	61.06	18.02	20.81	3.50	4.20	27.16	30.16	306.65	307.67
Boron 50 ppm One spray	54.06	61.26	18.11	20.84	3.70	4.26	27.25	30.51	306.82	320.92
Boron 50ppm Twice spray	55.46	62.76	18.96	21.18	3.86	4.30	27.60	31.43	309.60	343.98
Boron 75 ppm One spray	54.66	62.26	18.55	21.02	3.86	4.30	27.56	31.06	307.60	327.48
Boron 75 ppm Twice spray	56.36	63.10	19.65	21.36	4. 09	4.33	27.60	31.60	316.05	344.18
Salicylic acid 50ppm One spray	56.40	63.80	19.79	21.60	4.10	4.33	27.83	31.98	317.63	347.77
Salicylic acid 50 ppm Twice spray	57.36	65.63	20.76	22.49	4.23	4.43	28.15	32.71	332.72	351.77
Salicylic acid 100 ppm One spray	57.33	64.90	20.50	22.35	4.20	4.36	28.13	32.70	325.19	347.90
Salicylic acid 100ppm Twice spray	58.13	66.63	22.04	23.44	4.40	4.50	28.40	33.13	333.59	355.07
Salicylic acid 150 ppm One spray	56.70	64.56	20.18	22.12	4.16	4.33	27.88	32.41	316.27	345.07
Salicylic acid 150ppm Twice spray	57.46	66.10	21.17	22.90	4.33	4.43	28.16	32.95	325.33	350.90
Control	50.73	53.60	14.78	16.53	3.14	3.43	19.83	20.81	280.05	291.77
LSD at 0.05	1.16	0.632	0.776	1.248	0.219	0.201	1.030	0.542	10.006	7.456

One spray at 35 day from sowing **Two spray at 35 day and 45 day from sowing**

While higher concentrations of SA had an inhibitory effect**(**Fahraji *et al.*,2014)These results were in accordance with those reported by Hegazi and El-Shraiy (2007), Zewail *et al.*(2011),Gad El-Hak *et al.*(2012),Shafeek *et al.*(2014) and Chame *et al.*(2016) . They showed that salicylic acid had a significant increase in leaves chlorophyll and percent of seed protein seed of seed beans *Phaseolus vulgaris* plants.

Regarding N,P and K data in Table 3 reveled that the highest percentages of N,P and K were recorded when using Salicylic acid concentration at 100ppm twice on the contrary ,the lowest values of (total Chlorophyll , carotenoids ,N,.P, K and B)were recorded with the control .The positive impact of nutrient uptake seems to be on account of better development of canopy which might have maintained adequate supply of metabolites for better growth. Thus ,better developed root system might have facilitated in more extraction of nutrients from soil and translocation to plant parts, also, salicylic acid increased membrane permeability would facilitate absorption and utilization of mineral nutrients and transport of assimilates (Gad El-Hak *et al.*,(2012).These result agreed with El-Shraiy and Hegazi (2009),Shokr *et al.*, (2009),Khan *et al.*, (2010), Farouk and Osman (2011) and Nour *et al.*, (2012) .

As shown in Table 3 using foliar boron application at 75 ppm twice recorded the high significant increase boron on leaves content comparing with control, Several studies have pointed out the essentiality of B for N_2fixation in the legumes which could be attributable to the possible role of B in Rhizobium legume cell surface interaction, specifically, B is needed for the targeting of nodule-specific plant derived glycoproteins that are crucial as signals for bactericide differentiation into a N_2-fixing form .

These positive effect of boron confirmed with those of Nacer (2011),who reported that Foliar boron (B) was applied at rate of 0.45 $kg \cdot ha^{-1}$ gave significantly increase in the proportion of protein and oil percentage and the concentration of B in leaves and seed were significantly in soybean plant. Many authors are in agreement with the results, EL-Yazied and Abou Mady(2012),Eisa and Ali(2014)and(Moghazy *et al.(*2014**).**

Table 3. Effect of foliar application by boron and salicylic acid on leaf chemical of peas plants during 2014 / 2015 and 2015 / 2016 seasons.

Treatments	Total Chl. (a+b) seasons		Caroteinods seasons		N% seasons		P% seasons		K% seasons		B (ppm) seasons	
Seasons	14/15	15/16	14/15	15/16	14/15	15/16	14/15	15/16	14/15	15/16	14/15	15/16
Boron 25 ppm One spray	0.90	0.94	0.58	0.55	2.60	2.80	0.28	0.29	2.91	3.12	28.93	30.93
Boron 25 ppm Twice spray	0.92	0.96	0.59	0.57	2.69	2.90	0.29	0.29	2.98	3.17	31.23	32.70
Boron 50 ppm One spray	0.94	0.98	0.60	0.59	2.77	2.98	0.29	0.30	3.07	3.24	43.50	47.10
Boron 50ppm Twice spray	0.98	0.99	0.62	0.61	2.97	3.21	0.31	0.32	3.27	3.43	50.66	53.63
Boron 75 ppm One spray	1.03	1.02	0.61	0.63	2.88	3.09	0.30	0.31	3.16	3.37	46.86	51.26
Boron 75 ppm Twice spray	1.09	1.08	0.63	0.65	3.07	3.30	0.32	0.33	3.35	3.56	54.50	58.80
Salicylic acid 50ppm One spray	.98	.97	0.65	0.56	3.14	3.38	0.34	0.34	3.42	3.68	23.46	24.60
Salicylic acid 50 ppm Twice spray	1.01	1.01	0.68	0.58	3.44	3.61	0.37	0.36	3.71	3.84	28.33	29.30
Salicylic acid 100 ppm One spray	1.07	1.06	0.66	0.60	3.34	3.49	0.35	0.36	3.61	3.82	27.20	27.83
Salicylic acid 100ppm Twice spray	1.14	1.13	0.69	0.62	3.59	3.81	0.38	0.38	3.88	4.00	39.73	43.50
Salicylic acid 150 ppm One spray	1.05	1.02	0.64	0.64	3.25	3.38	0.34	0.35	3.52	3.73	25.20	26.20
Salicylic acid 150 ppm Twice spray	1.13	1.11	0.67	0.67	3.50	3.70	0.37	0.37	3.82	3.96	36.23	39.70
Control	0.84	0.88	0.56	0.54	2.52	2.73	0.27	0.29	2.79	3.00	21.53	23.23
LSD at 0.05	0.008	0.040	0.006	0.007	0.063	0.051	0.005	0.078	0.071	0.052	0.942	1.334

One spray at 35 day from sowing **Two spray at 35 day and 45 day from sowing**

4- pod yield and its components

Concerning the effect of foliar application either by salicylic acid or boron on total yield/fed, data recorded in Table4 showed that, there is a markedly increment in yield over control as a result of using salicylic acid or boron

Foliar application of boron at 75ppm sprayed twice increased the yield compared with control treatment followed by boron at 50 ppm sprayed twice compared with control treatment .

it can be concluded that the best foliar treatment application was foliar application with boron at 75ppm followed by boron at 50 ppm sprayed twice, while salicylic acid at 100 ppm spray twice came in third rank, in this connection. Ramesh *et al*.,(2008) showed that when soaking pea seeds for 24 hours in the boron concentration 0.5% led to increasing green pod yield and dry seed yield growth and high yield and seed quality of pea

Regarding, the obtained results in Table 4 indicated that the application of the different foliar treatments significantly increased pod weight ,No. of seeds and weight 100 seed relative to the control treatments in the both growing seasons, the highest values of all parameters were obtained from the plants that received foliar boron 75 ppm twice. These results are agree with that recorded by Nasreen *et al*., (2015) who reported that using boron concentration at(0,1 and 2 kg ha^{-1}) led to increasing number of pods/plant ,pod weight/plant and pod yield ha^{-1} in both seasons of bean plant, Also ,EL-Yazied and Abou Mady (2012) reported that ,foliar applications of boron(Boric acid)at 50 ppm concentration led to increase the final green pod , seed yield , dry seeds yield per plant, number of seeds per pods ,100seed weight and quality of broad bean plants.

Table 4. Effect of foliar application by boron and salicylic acid on yield and its components of peas plants during 2014 / 2015 and 2015 / 2016 seasons .

Treatments	Pod yield (ton /fed)		Pod weight (g/pod)		No of seed pods		Weight of (100 green seeds)	
Seasons	Seasons		seasons		seasons		seasons	
	14/15	15/16	14/15	15/16	14/15	15/16	14/15	15/16
Boron 25 ppm One spray	3.95	4.28	6.40	6.80	8.38	8	49.70	53.60
Boron 25 ppm Twice spray	3.98	4.32	6.40	6.83	8.66	8.33	50.43	54.26
Boron 50 ppm One spray	4.19	4.46	6.46	6.93	8.66	8.66	50.60	54.73
Boron 50ppm Twice spray	4.26	4.56	6.50	6.96	8.66	8.66	50.90	54.93
Boron 75 ppm One spray	4.25	4.45	6.50	6.93	8.66	8.66	50.63	54.93
Boron 75 ppm Twice spray	4.32	4.59	6.50	6.96	9	9	51.16	55.33
Salicylic acid 50ppm One spray	3.93	4.37	6.36	6.76	7.66	7.66	49.40	51.96
Salicylic acid 50 ppm Twice spray	4.08	4.37	6.39	6.76	7.66	7.66	49.66	52.50
Salicylic acid 100 ppm One spray	4.07	4.42	6.40	6.85	8	8.33	49.90	53.20
Salicylic acid 100ppm Twice spray	4.14	4.51	6.46	6.86	8.66	8.65	50.46	54.63
Salicylic acid 150 ppm One spray	4.02	4.41	6,40	6.76	8	8	49.73	54.26
Salicylic acid 150 ppm Twice spray	4.13	4.43	6.43	6.76	8.38	8.33	50.43	54.60
Control	3.52	3.64	6.20	6.76	7.16	7.20	46.90	47.39
LSD at 0.05	0.060	0.066	0.0835	0.180	1.115	1.206	0.599	1.873

One spray at 35 day from sowing Two spray at 35 day and 45 day from sowing

5-Chemical composition of Seeds

Data presented in Table 5 showed the effect of foliar application SA and B on fruit quality(total carbohydrates, total sugars and protein) in both seasons

Results demonstrate clearly that the foliar application had significant increases on total carbohydrates,total sugars and protein.

Rrgarding chemical composition of seeds the highest results recorded by using salicylic acid 100ppm twice (total carbohydrates ,total sugars and protein). on the contrary, the lowest values of (total carbohydrates, total sugars and protein) were recorded with the control. The stimulation effect of SA on the biosynthesis of soluble sugars and proteins was associated to an increase in photosynthetic pigments and consequently the photosynthetic system, El- Shraiy and Hegazi (2009).

Table 5. Effect of foliar application by boron and salicylic acid on chemical composition seeds during 2014 / 2015 and 2015 /2016 seasons.

Treatments	T.carbohydrates %		T. sugar %		C . protein %	
Seasons	Seasons		Seasons		Seasons	
	14/15	15/16	14/15	15/16	14/15	15/16
Boron 25 ppm One spray	46.46	48.62	15.61	15.99	18.63	19.18
Boron 25 ppm Twice spray	46.72	48.86	15.90	16.33	19.03	19.54
Boron 50 ppm One spray	46.86	49.07	16.10	16.57	19.33	19.77
Boron 50ppm Twice spray	47.26	49.56	16.65	17.09	19.94	20.33
Boron 75 ppm One spray	46.94	49.30	16.37	16.87	19.63	20.04
Boron 75 ppm Twice spray	47.55	49.87	16.89	17.40	20.26	20.64
Salicylic acid 50ppm One spray	47.81	50.16	17.22	17.71	20.74	20.94
Salicylic acid 50 ppm Twice spray	48.61	50.97	18.10	18.43	21.52	21.89
Salicylic acid 100 ppm One spray	48.33	50.76	17.80	18.30	21.32	21.61
Salicylic acid 100ppm Twice spray	49.23	51.46	18.63	19.80	21,98	22.50
Salicylic acid 150 ppm One spray	48.07	50.45	17.51	17.99	20.99	21.26
Salicylic acid 150 ppm Twice spray	48.98	51.19	18.41	18.86	21.71	22.22
Control	46.21	48.35	15.40	15.70	18.49	18.86
LSD at 0.05	0.141	0 .111	0.136	0.146	0.117	0.142

One spray at 35 day from sowing Two spray at 35 day and 45 day from sowing .

Salicylic acid treatment caused a significant decrease in the content of soluble sugar and increase the polysaccharide contents. It is seems that salicylic acid application might activate the metabolic consumption of soluble sugars to form new cell constituents as a mechanism to stimulate the growth of plants and also might inhibit polysaccharide-hydrolyzing enzyme system on one hand and/or accelerate the incorporation of soluble sugars in to polysaccharides on the other hand to balance the sugar level (Shokr *and Abdelhamid*2009)

In this connection many authors agreed with those results as El-khawas (2012),Nour *et al*. (2012), Gad El-Hak *et a*l. (2012), (Abdel – Aziz *et al*. (2013), Orabi *et al*.(2013)and Hadi *et al*.(2014).

CONCLUSION

Finally, the best treatment was SA at 100ppm sprayed twice which recorded the most effective parameters. Mean while, Boron at 75 ppm twice recorded the highest values of yield quality and components. Therefor recommended foliar peas plants by Boron at 75 ppm under similar condition.

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تأثير بعض المواد الأمنة على النمو والإنتاجية للبسلة

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[٢]مركز البحوث الزراعية – معهد بحوث البساتين

أجريت هذه الدراسة في تجربتين حقليتين في قرية الخلالة مركز بلقاس – محافظة الدقهلية خلال موسمي الزراعة الشتوي ٢٠١٤ / ٢٠١٥ ؛ ٢٠١٥ / ٢٠١٦ وذلك لدراسة تأثير الرش ببعض مضادات الأكسدة حمض السالسيليك (٥٠ – ١٠٠ – ١٥٠ ملجم / لتر) مرة و مرتين و البورون (٢٥ – ٥٠ – ٧٥ ملجم / لترمرة و مرتين حيث كرر كل تركيز مرتين رشا على الـ باتات. الاولى بعد ٣٥ يوم من الزراعة والثانية بعديوم من الزراعة مقارنة بالكـ ترول على البسلة صـ ف ماستر بى وتم إستخدام تصميم القطاعات الكاملة العشوائية في ثلاث مكرراتوضحت الـ تائج إن أستخدام المواد المذكورة كان له أثر كبير في زيادة الإنتاجية و الجودة ، و قد ظهر ذلك في تفوق قياسات الـ مو الخضريطول الـ بات الوزن الطازج والجاف للـ بات عدد الأوراق للـ بات – المساحة الورقية / نبات) وكذلك المحصول ومكوناته و جودة القرون و وزن ١٠٠ بذرة طازجة في محتواها من الكربوهيدرات والسكريات الكلية والبروتيـ ات وكذلك إزداد محتوى الأوراق من الكلوروفيل والكاروتيـ ينا والـ يتروجين والفوسفور والبوتاسيوم والبورون وذلك بالمقارنة بالكـ ترول .وكانت أفضل المعاملات على التوالي هي حمض السالسيليك ١٠٠ ملجم / لتر مرتين ؛ البورون ٧٥ ملجم / لتر مرتين جودة البذرة في محتواها من الكربوهيدرات والسكريات الكلية والبروتيـ ات ؛ مقارنة بمعاملة الكـ ترولفي ضوء هذة الـ تائج يمكن تحسين جودة ومحصول البسلة وذلك بأستخدام حامض السالسيليك ١٠٠ جزء في المليون وكذلك البورون بتركيز ٧٥ جزء في المليون رشا على الـ باتات مرتين الأولى بعد ٣٠ يوم والثانية بعد ٤٥ يوم من الزراعة للحصول على محصول عالي وجودة مرتفعة من البسلة صـ ف مستربى B