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EFFECT OF SHADING AND SPRAYING WITH SALICYLIC ACID ON THE PROPERTIES OF YIELD FOR TWO VARIETIES OF POTATO

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ABSTRACT: A field experiment was conducted during the agricultural season autumn 2016 in the experimental field of the Department of horticulture and landscaping in the college of Agriculture – University of Diyala, The study included three factors namely: - Two levels of shading (0%, 50%) by using green saran nets used for 42 day and four concentrations of salicylic acid (0, 50,100,150 $mg.L^{-1)}$ and two varieties of potatoes (Burren and Arizona. The experiment included 16 treatments for using the split – split plots Design system was applied according to the design of the complete random section of R.C.B.D and three replicates. The results showed superiority of plants shaded by 50% in the properties of the number of marketable tubers per plant and average wight of tuber marketable and overally yield and the percentage of protein in the tubers and reduce the content tubers of proline as it reached ($9.05tuber.plant^{-1}$and 84.64gm and $55.84ton.h^{1}$ and 10.793% and 2.229 $mg.gm^{-1}$) respectively. It was also outperformed treated plants in all concentrations of salicylic acid in the number of properties characterized by them treated plants concentration of 100 $mg.L^{-1}$ at the best results for properties mentioned above as it reached ($9.05tuber.plant^{-1}$and 89.56gm and $60.05ton.h^{-1}$and 11.084% and 1.869 $mg.gm^{1}$), respectively. It was also outperformed of cultivar plants Arizona in properties mentioned above as it reached ($8.61tuber.plant^{-1}$and 83.03gm and $52.98ton.h^{-1}$and 10.378% and 2.283$mg.gm^{-1}$) respectively.

Keyword: Potato, Shading, Salicylic acid, Varieties, Heat stress, Salinity stress.

INTRODUCTION

The potato is of the strategic crops which belong to the family solanaceae, one of the important tuber crop in the world (Hassan, 1999), Comes as economic crop, ranked fourth at the level of world (Faostat, 2012), The original habitat of South America (Chile and Peru) (Peet, 2001),Lies important food crop through what they contain the tuber of high as elements of metal ,vitamins and carbohydrates(Hassan, 2003), Cultivated potato crop on the vast areas in the most of iraq's provinces, But the increase in the area was accompanied by a decrease in productivity because of the agriculture in our country, Including the extremism in the environmental factors during the growing seasons, That's where the cultivated area with potatoes in Iraq for 2016 for two seasons (spring and autumn) 31.8 thousand acres an increase of estimated increase of 29.8% for last season, who was 24.5 thousand acres and amounted to production for two seasons (spring and autumn) 190.7 tons an increase of estimated increase of 17.1% for last season, which as much as 162.9 tons (Central statistical organization,

2016).World has witnessed in recent rise a growing in the temperatures as a result of environmental pollution and its effect of negative on the agricultural crops including potatoes especially at the beginning of the growth of season autumn, Where the result in high heat and low humidity to low germination, As is the light of the main factors affecting the many of the events vital within the plant , the light is effect depends in the three trends are the length of optical and type of light and light intensity and that the exposure plants to high levels of the light intensity and for a long lead to reduce the rate photosynthesis and to avoid this resort to the use of shading , Which leads to reduce the temperature light intensity and increase efficiency photosynthesis(Raveh, *et.al.,*2003).As found Mariana and Hamdani(2016) through the experience was conducted in the ANDINUSIA to study the effect shading partial three levels of (%0،%30،%50) in the growth and yield four varieties of potatoes, That the shading by level of 50% effecter significantly in the increase plant height as it amounted 69.33 cm and leaf area index amounted 1.1 and overally yield amounted 30.7 ton.h^{-1} in contrast with the treatment of open field which gave the lowest rate (43.16 cm, 0.7 and 19.7 ton.h^{-1}) respectively.

Although of potato cultivation in Iraq in the two seasons, we find that the quantity and quality domestic production without the level of ambition compared with the consumption of the country for this crop, It possible that is due to a number of the reasons the most important stresses environmental exposed to plant, In order to achieve food security to prepare for the growing of the population requires find all solutions that reduce agricultural production. Has been found that the use of salicylic acid is one of the technologies important addressed by the researchers in reducing the negative effects of environmental stresses in the last decade, One of the plant hormones internal play an important role in reducing stress two types of bio and no- bio(Singh and Usha, 2003).Where found Abdul ameer and Abu-Hinna(2015) that the treatment plant potatoes variety Bellini grown on the two seasons (spring and autumn) by salicylic acid by concentrations (0,75,150 mg.L^{-1}) lead to improve the yield characteristics, Where the results show more than concentration 150 mg.L^{-1} to give the highest rate for each of the total plant yield as it amounted (0.669 ,0.483 kg.$plant^{-1}$) and average wight of tuber amounted(87.00,68.00 gm) and overally yield amounted(35.23,28.79 ton.h^{-1}) and the percentage of starch amounted(10.91,10.29%) in contrast with the treatment comparison which gave the lowest rate for characteristics mentioned above amounted (0.510,0.387 kg.$plant^{-1}$),(72.00,64.00 gm),(29.91,22.73 ton.h^{-1}),(9.60,9.11%) for two seasons respectively.

There are many of the evidence that refer to impact variety and environmental conditions and agricultural operations in behavior of development of plant, Where the effected by the production of this crop many factors of which variety appropriate to the region and environmental factors prevailing, These factors affect in the process of competition for outputs of photosynthesis between consumption centers different' including principles of tubers, Which affect the yield quality and quantity(Hassan, et.al,2002).Where found Sadik, et.al (2014) through the study conducted in the region ALRADWANIYAH south Baghdad on the effect foliar of som organic fertilizers on growth and yield of four potato cultivars

(Arizon, Riviera, Ambition, Lusa) has been noticed superiority variety Lusa significantly on the average number of tubers for marketable amounted(7.05 tuber.plant^{-1}) and average wight of tuber for marketable amounted(107.87 gm) and total plant yield amounted(788.16 gm.plant^{-1}) and yield plant marketable amounted(40.69 ton.h^{-1}) in contrast with rest varieties.

*Study aims to the early in agriculture and good production by using shading and salicylic acid to increase plant resistance against different environmental stress and to select the best variety for good production in Dyala province under condition of autumn season.

MATERIALS AND METHOD

A field experiment was conducted during the 2016 growing season of autumn in the **fields of the Department of horticulture and gardening Engineering - Faculty of agriculture - University of Diyala**, to study the effect shading and Spraying with Salicylic Acid on characteristics of yield of two varieties of potato.

A study of factors

1. Levels of shading:- Use in the process of shading green saran nets by system spending low-lying, The treatments was C_0= without shading, C_1= shading 50%, The process of shading has after the agriculture directly on 9/9/2016 and continued for 42 day, So that has been end shading on 21/10/2016, Due to interpolation needing to him.
2. Levels of spraying with salicylic acid:- Use salicylic acid with four concentrations(S_0=only water, S_1=50 mg.L^{-1}, S_2=100 mg.L^{-1}, S_3=150 mg.L^{-1}) spraying on shoot in the early morning and even getting wet full.
3. Varieties are used:- Used two types of seed potatoes V1= Burren and V2= Arizona.

Create the soil field and servicing

Plowed soil field using the plow inverter, In perpendicular to at a depth of 35.30 cm, Enjoyed and adjusted using machine settlement, Worked trerraces perpendicular to the direction of water irrigation, Served manure organic and chemical neutral 20:20:20, Not that plant potatoes can grow well when no more than degree of electrical conductivity extract soil on the 2 Ds.m^{-1} , Where lead height of to 3 Ds.m^{-1} or more to weakness of vegetative growth and root and thus lack of crop by 15%(Boras, et.al,2006).

Tabel (1) some chemical characteristics and physical for soil field

The character	Unity	Value
Ph	------	7.89
Ec (1:1)	$Ds.m^{-1}$	8.98
Organic matter	%	1.71
CaCo3	$gm.kgm^{-1}$	198.28
Components of soil		
%Sand	%	43.60
%Clay	%	35.64
%Silt	%	20.76
Class mixture	Clay loam	

Experimental design

Dish system Split-Split Plots Design according to design, Included experiment 16 treatment resulting from compatibility between the factors study[Two levels shading (0%,50%), Three concentration of salicylic acid (S_1=0 $mg.L^{-1}$, S_1=50 $mg.L^{-1}$, S_1=100 $mg.L^{-1}$, S_1=150 $mg.L^{-1}$), Two varieties from potato(V_1 = Burren ، V_2 =Arizona)], Repeated each transaction three times, Unit area experimental $3m^2$(1m length ×3m width) with taken in to account left distance 1m between sectors and left distance 1m between main plots and distance 0.5m between Sub plots and distance 0.5m between Sub-Sub plots, Was conducted statistical analysis of studied properties according to design in question using the program SAS(2001), Were compared averages by test Duncan polynomial at the level of the possibility 0.05(Al-rawy and kalafullah, 2000).

Agriculture in the field

After preparation of the field set up system drip irrigation and after selecting sound seeds and after breaking the resting phase and hold process of germination, Has process of agriculture on 8/9/2016 order to next to pipeline irrigation by two lines for agriculture in the unit experimental, The distance between line and another 30cm and the distance between plant and another 30cm, at a depth of 8-10cm, Not that range heat appropriate for germination tubers ranging from 15-25 c°, Where germination slow in the temperatures at least of that, While exposed to tuber rot in the temperatures most of that, While needs plants to the temperature ranging from 25-30 c°, While fits potato crops atmosphere is relatively ranging temperature between 15-19 c° during formation tubers(Boras, et.al,2006). As that most moisture for plant potatoes is 85%, While level of light intensity strong necessary for vegetative growth is 5000 $candle.feet^{-1}$(Hassan, 2015).

Table (2) Conditions environmental which grown by the plants

The weeks starting from 9/9/2016	Out shading			In shading		
	The max. temp.(c°)	The max. humidity (%)	The light intensity (cand.ft^{-1})	The max. temp.(c°)	The max. Humidity(%)	The light intensity (cand.ft^{-1})
First	44.30	%63	8620.80	40.30	%65	4254.40
Second	46.48	%64	8175.50	42.62	%66	4074.16
Third	44.72	%52	7989.33	40.37	%48	3990.66
Fourth	45.65	%59	7992.66	41.60	%59	4001.16
Fiveth	46.03	%43	7742.16	40.06	%63	3929.66
Sixth	36.76	%54	7097.33	31.86	%61	3569.16
The process of end the shading has on 21/10/2016						
Seventh	35.53	%56	6413.48	35.53	%56	6413.48
Eightth	36.63	%62	6324.57	36.63	%62	6324.57
Nineth	34.52	%36	5248.97	34.52	%36	5248.97
Tenth	32.22	%57	5042.27	32.22	%57	5042.27
Eleventh	33.80	%49	6456.70	33.80	%49	6456.70
Twelfth	22.95	%67	6565.71	22.95	%67	6565.71
Thirteenth	25.57	%84	3256.22	25.57	%84	3256.22
Fourteenth	24.91	%87	3244.61	24.91	%87	3244.61
Fifteenth	18.17	%99	4208.22	18.17	%99	4208.22
Sixteenth	19.95	%98	4687.84	19.95	%98	4687.84
Seventeenth	19.85	%99	6687.10	19.85	%99	6687.10
Eighteenth	17.08	%97	6087.42	17.08	%97	6087.42

A study of properties

1. Number of marketable tuber per plant (tuber.plant^{-1}):- Was calculated the number of tubers per plant of dividing the number of marketable tubers per ten plants selected randomly from each unit experimental on the number.

2. Average wight of tuber marketable (gm):- Was calculated average wight of tuber by depending on the equation the following:-

Average wight of tuber marketable = Overally yield marketable per ten plants/ Number of marketable tuber per ten plants.

3. Overally yield(ton.h^{-1}):- Was calculated overally yield after calculated total plant yield and overally yield for unit experimental and then to hectare according the quations below:-

1. Yield of unit experimental = Yield per plant × Number of plants in the unit experimental.
2. Overally yield(ton.h^{-1}):- Yield of unit experimental / Unit area experimental × 1000.

4. percentage of protein in the tubers (%):- Was calculated percentage of protein in the tubers on the basis of dry weight according the quation below:-

Percentage of protein on the basis of dry weight = percentage of nitrogen in the tubers × 6.25.

(1970, A.O.A.C)

5. Content tubers of proline (mg.gm^{-1}):- Used method (Bates, et.al,1973).

RESULTS AND DISCUSSIONS

Number of marketable tuber per plant (tuber.plant^{-1})

Show results of the table (3) there is significant impact for shading in the increase the number of marketable tuber per plant potato, As it was characterized by plants shaded at beast a number of tubers amounted (9.05 tuber.plant^{-1}) in contrast with plants non-shading which has given less than a number of tubers amounted (7.57 tuber.plant^{-1}), The effect of salicylic acid significantly in the increase number of tubers marketable, As it was characterized by plants sprayed by concentration 100 mg.L^{-1} significantly at best a number of tubers amounted (9.05 tuber.plant^{-1}) in contrast with plants sprayed by water only, Which has given less than a number of tubers amounted (7.42 tuber.plant^{-1}), As it was for variety significant effect in the increase the number of tubers marketable, As it was characterized by plants variety Arizona at best a number of tubers amounted (8.61 tuber.plant^{-1}) in contrast with plants Bureen, Which has given less than a number of tubers amounted (8.01 tuber.plant^{-1}),

Table (3) Effect shading and salicylic acid and variety and overlap in the number of marketable tuber per plant (tuber.plant^{-1})*

Shading	Varieties	Salicylic acid				Overlap shad. and var.
		0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Without shading	Burren	6.54 j	7.26 i	8.40 Def	7.76 h	7.49 C
	Arizona	6.58 j	7.61 hi	8.47 De	7.99 fgh	7.66 C
Shading 50%	Burren	7.85 gh	8.28 efg	9.23 C	8.76 d	8.53 B
	Arizona	8.74 d	9.56 bc	10.10 A	9.87 ab	9.57 A
Average salicylic acid		7.42 D	8.18 C	9.05 A	8.59 B	

Bilateral overlap between shading and salicylic acid					
Shading	Salicylic acid				Averages Shading
	0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Without shading	6.56 g	7.44 f	8.43 D	7.87 e	7.57 B
Shading 50%	8.29 d	8.92 c	9.67 A	9.31 b	9.05 A
Bilateral overlap between Varieties and salicylic acid					
Varieties	Salicylic acid				Averages Varieties
	0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Burren	7.19 f	7.77 e	8.81 Bc	8.26 d	8.01 B
Arizona	7.66 e	8.59 c	9.29 A	8.93 b	8.61 A

*Notice:- Values followed by the same letter are not significant differences according to Duncan test polynomial

And through results of the same table note there is significant effect for bilateral overlap between shading and salicylic acid in the increase a number of tubers marketable, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 mg.L^{-1} significantly at best a number of tubers amounted(9.67 tuber.plant^{-1}) in contrast with plants non-shading and sprayed by water only Which has given less than a number of tubers amounted (6.56 tuber.plant^{-1}), As it was for bilateral overlap between salicylic acid and variety significant effect in the increase a number of tubers, As it was characterized by plants variety Arizona sprayed with salicylic acid by concentration 100 mg.L^{-1} significantly at best a number of tubers amounted (9.29 tuber.plant^{-1}) in contrast with plants variety burren sprayed by water only, Which has given less than a number of tubers amounted (7.19 tuber.plant^{-1}), As it was triple overlap between shading and salicylic acid and variety significant effect in the increase a number of tubers, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 mg.L^{-1} and belonging to variety Arizona was significantly at best a number of tubers amounted (10.10 tuber.plant^{-1}) in contrast with plants non-shaded and sprayed with water only and belonging to variety burren , Which has given less than a number of tubers amounted (6.54 tuber.plant^{-1}).

Average wight of tuber marketable (gm)

Show results of the table (4) there is significant impact for shading in the increase the average wight of tuber marketable per plant potato, As it was characterized by plants shaded at beast average amounted (84.64 gm) in contrast with plants non-shading which has given less average amounted (78.93 gm),

Table (4) Effect shading and salicylic acid and variety and overlap in the average wight of tuber marketable (gm)*

Shading	Varieties	Salicylic acid				Overlap shad. and var.
		0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Without shading	Burren	67.26 G	75.63 de	84.25 B	79.81 cd	76.75 C
	Arizona	71.45 F	77.65 de	90.43 A	84.92 b	81.11 B
Shading 50%	Burren	73.63 Ef	82.74 bc	91.71 A	89.20 a	84.32 A
	Arizona	76.37 De	82.46 bc	91.86 A	89.16 a	84.96 A
Average salicylic acid		72.12 D	79.62 C	89.56 A	85.79 B	
Bilateral overlap between shading and salicylic acid						
Shading		Salicylic acid				Averages shading
		0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Without shading		69.35 E	76.64 d	87.34 B	82.39 c	78.93 B
Shading 50%		75.00 D	82.60 c	91.78 A	89.14 ab	84.64 A
Bilateral overlap between Varieties and salicylic acid						
Varieties		Salicylic acid				Averages Varieties
		0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Burren		70.45 F	79.18 d	87.98 B	84.53 c	80.53 B
Arizona		73.91 E	80.05 d	91.14 A	87.04 bc	83.03 A

*Notice:- Values followed by the same letter are not significant differences according to Duncan test polynomial

The effect of salicylic acid significantly in the increase average wight of tuber marketable, As it was characterized by plants sprayed by concentration 100 mg.L^{-1} significantly at best average amounted (89.56 gm) in contrast with plants sprayed by water only, Which has given less average amounted (72.12 gm), As it was for variety significant effect in the increase average wight of tuber marketable, As it was characterized by plants variety Arizona at best average amounted (83.03 gm) in contrast with plants Bureen, Which has given less average amounted (80.53 gm), And through results of the same table note

there is significant effect for bilateral overlap between shading and salicylic acid in the increase average wight of tuber marketable, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 mg.L^{-1} significantly at best average amounted(91.78 gm) in contrast with plants non-shading and sprayed by water only Which has given less average amounted (69.35 gm), As it was for bilateral overlap between salicylic acid and variety significant effect in the increase average wight of tuber marketable, As it was characterized by plants variety Arizona sprayed with salicylic acid by concentration 100 mg.L^{-1} significantly at best average amounted (91.14 gm) in contrast with plants variety burren sprayed by water only, Which has given less average amounted (70.45 gm), As it was triple overlap between shading and salicylic acid and variety significant effect in the increase average wight of tuber marketable, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 mg.L^{-1} and belonging to variety Arizona was significantly at best average amounted (91.86 gm) in contrast with plants non-shaded and sprayed with water only and belonging to variety burren , Which has given less average amounted (67.26 gm).

Overally yield (ton.h^{-1})

Show results of the table (5) there is significant impact for shading in the increase the overally yield per plant potato, As it was characterized by plants shaded at beast overally yield amounted (55.84 ton.h^{-1}) in contrast with plants non-shading which has given less overally yield amounted (46.82 ton.h^{-1}), The effect of salicylic acid significantly in the increase the overally yield, As it was characterized by plants sprayed by concentration 100 mg.L^{-1} significantly at best overally yield amounted (60.05 ton.h^{-1}) in contrast with plants sprayed by water only, Which has given less overally yield amounted (42.45 ton.h^{-1}), As it was for variety significant effect in the increase the overally yield, As it was characterized by plants variety Arizona at best overally yield amounted (52.98 ton.h^{-1}) in contrast with plants Bureen, Which has given less overally yield amounted (49.68 ton.h^{-1}), And through results of the same table note there is significant effect for bilateral overlap between shading and salicylic acid in the increase the overally yield, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 mg.L^{-1} significantly at best overally yield amounted(63.45 ton.h^{-1}) in contrast with plants non-shading and sprayed by water only Which has given less overally yield amounted (38.50 ton.h^{-1}), As it was for bilateral overlap between salicylic acid and variety significant effect in the increase the overally yield, As it was characterized by plants variety Arizona sprayed with salicylic acid by concentration 100 mg.L^{-1} significantly at best overally yield amounted (61.65 ton.h^{-1}) in contrast with plants variety burren sprayed by water only, Which has given less overally yield amounted (40.60 ton.h^{-1}), As it was triple overlap between shading and salicylic acid and variety significant effect in the increase the overally yield, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 mg.L^{-1} and belonging to variety Arizona was significantly at best overally yield amounted (64.97 ton.h^{-1}) in contrast with plants

non-shaded and sprayed with water only and belonging to variety burren , Which has given less overally yield amounted (38.15 ton.h^{-1}).

Table (5) Effect shading and salicylic acid and variety and overlap in the overally yield (ton.h^{-1})*

Shading	Varieties	Salicylic acid				Overlap shad. and var.
		0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Without shading	Burren	38.15 j	41.70 i	54.97 De	47.37 h	45.55 c
	Arizona	38.86 j	44.22 i	58.33 C	50.97 fg	48.09 c
Shading 50%	Burren	43.06 i	52.95 ef	61.93 B	57.35 cd	53.82 b
	Arizona	49.73 gh	57.64 c	64.97 A	59.15 c	57.87 a
Average salicylic acid		42.45 D	49.13 C	60.05 A	53.71 B	

Bilateral overlap between shading and salicylic acid

Shading	Salicylic acid				Averages shading
	0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Without shading	38.50 g	42.96 f	56.65 Bc	49.17 d	46.82 B
Shading 50%	46.39 e	55.29 c	63.45 A	58.25 b	55.84 A

Bilateral overlap between Varieties and salicylic acid

Varieties	Salicylic acid				Averages Varieties
	0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Burren	40.60 g	47.33 e	58.45 B	52.36 d	49.68 B
Arizona	44.29 f	50.93 d	61.65 A	55.06 c	52.98 A

*Notice:- Values followed by the same letter are not significant differences according to Duncan test polynomial

Percentage of protein in the tubers (%)

Show results of the table (6) there is non-significant impact for shading in the increase the percentage of protein in the tubers per plant potato, The effect of salicylic acid significantly in the increase

the percentage of protein in the tubers, As it was characterized by plants sprayed by concentration 100 $mg.L^{-1}$ significantly at best percentage amounted (11.084 %) in contrast with plants sprayed by water only, Which has given less percentage amounted (9.272 %), As it was for variety significant effect in the increase the percentage of protein in the tubers, As it was characterized by plants variety Arizona at best percentage amounted (10.378 %) in contrast with plants Bureen, Which has given less percentage amounted (9.806 %), And through results of the same table note there is significant effect for bilateral overlap between shading and salicylic acid in the increase the percentage of protein in the tubers, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 $mg.L^{-1}$ significantly at best percentage amounted(11.975 %) in contrast with plants non-shading and sprayed by water only Which has given less percentage amounted (8.398 %), As it was for bilateral overlap between salicylic acid and variety significant effect in the increase the percentage of protein in the tubers, As it was characterized by plants variety Arizona sprayed with salicylic acid by concentration 100 $mg.L^{-1}$ significantly at best percentage amounted (11.369 %) in contrast with plants variety burren sprayed by water only, Which has given less percentage amounted (9.083 %), As it was triple overlap between shading and salicylic acid and variety significant effect in the increase the percentage of protein in the tubers, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 $mg.L^{-1}$ and belonging to variety Arizona was significantly at best percentage amounted (12.504 %) in contrast with plants non-shaded and sprayed with water only and belonging to variety burren , Which has given less percentage amounted (8.335 %).

Table (6) Effect shading and salicylic acid and variety and overlap in the percentage of protein in the tubers (%)*

Shading	Varieties	Salicylic acid				Overlap shad. and var.
		0 $Mg.L^{-1}$	50 $Mg.L^{-1}$	100 $Mg.L^{-1}$	150 $Mg.L^{-1}$	
Without shading	Burren	8.335 h	9.472 efg	10.149 Cdef	9.174 fgh	9.283 C
	Arizona	8.462 gh	9.547 efg	10.235 Cdef	9.759 def	9.501 Bc
Shading 50%	Burren	9.830 def	10.147 cdef	11.447 B	9.893 def	10.329 b
	Arizona	10.462 bcde	10.916 bcd	12.504 A	11.143 bc	11.256 a
Average salicylic acid		9.272 C	10.021 B	11.084 A	9.992 B	

Bilateral overlap between shading and salicylic acid					
Shading	Salicylic acid				Averages shading
	0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Without shading	8.398 d	9.510 c	10.192 Bc	9.467 c	9.392 A
Shading 50%	10.146 bc	10.531 b	11.975 A	10.518 b	10.793 A
Bilateral overlap between Varieties and salicylic acid					
Varieties	Salicylic acid				Averages Varieties
	0 Mg.L^{-1}	50 Mg.L^{-1}	100 Mg.L^{-1}	150 Mg.L^{-1}	
Burren	9.083 e	9.810 cde	10.798 Ab	9.533 de	9.806 B
Arizona	9.462 de	10.232 bcd	11.369 A	10.451 bc	10.378 A

*Notice:- Values followed by the same letter are not significant differences according to Duncan test polynomial

Content tubers of proline (mg.gm^{-1})

Show results of the table (7) there is non-significant impact for shading in reducing the content tubers of proline per plant potato, The effect of salicylic acid significantly in reducing the content tubers of proline, As it was characterized by plants sprayed by concentration 100 mg.L^{-1} significantly at least content of proline amounted (1.869 mg.gm^{-1}) in contrast with plants sprayed by water only, Which has given highest content of proline amounted (3.021 mg.gm^{-1}), As it was for variety non-significant impact in the reducing the content tubers of proline, , And through results of the same table note there is significant effect for bilateral overlap between shading and salicylic acid in reducing the content tubers of proline, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 mg.L^{-1} significantly at least content of proline amounted(1.766 mg.gm^{-1}) in contrast with plants non-shading and sprayed by water only Which has given highest content of proline amounted (3.227 mg.gm^{-1}), As it was for bilateral overlap between salicylic acid and variety significant effect in reducing the content tubers of proline, As it was characterized by plants variety Arizona sprayed with salicylic acid by concentration 100 mg.L^{-1} significantly at least content of proline amounted (1.853 mg.gm^{-1}) in contrast with plants variety burren sprayed by water only, Which has given highest content of proline amounted (3.055 mg.gm^{-1}), As it was triple overlap between shading and salicylic acid and variety significant effect in reducing the content tubers of proline, As it was characterized by plants shaded and sprayed with salicylic acid by concentration 100 mg.L^{-1} and belonging to variety Arizona was significantly at least content of proline amounted (1.724 mg.gm^{-1}) in contrast with plants non-shaded and sprayed with water only and belonging to variety burren , Which has given highest content of proline amounted (3.245 mg.gm^{-1}).

Table (7) Effect shading and salicylic acid and variety and overlap in the content tubers of proline ($mg.gm^{-1}$)*

Shading	Varieties	Salicylic acid				Overlap shad. and var.
		0 $Mg.L^{-1}$	50 $Mg.L^{-1}$	100 $Mg.L^{-1}$	150 $Mg.L^{-1}$	
Without shading	Burren	3.245 A	2.264 cd	1.961 f	2.150 de	2.405 a
	Arizona	3.210 A	2.266 cd	1.983 F	2.113 def	2.393 a
Shading 50%	Burren	2.866 B	2.364 c	1.809 G	2.103 def	2.285 ab
	Arizona	2.764 B	2.171 de	1.724 G	2.036 ef	2.174 b
Average salicylic acid		3.021 A	2.266 B	1.869 D	2.100 C	
Bilateral overlap between shading and salicylic acid						
Shading		Salicylic acid				Averages shading
		0 $Mg.L^{-1}$	50 $Mg.L^{-1}$	100 $Mg.L^{-1}$	150 $Mg.L^{-1}$	
Without shading		3.227 A	2.265 c	1.972 E	2.131 d	2.399 A
Shading 50%		2.815 B	2.267 c	1.766 F	2.069 de	2.229 A
Bilateral overlap between Varieties and salicylic acid						
Varieties		Salicylic acid				Averages Varieties
		0 $Mg.L^{-1}$	50 $Mg.L^{-1}$	100 $Mg.L^{-1}$	150 $Mg.L^{-1}$	
Burren		3.055 A	2.314 b	1.885 E	2.127 cd	2.345 A
Arizona		2.987 A	2.218 bc	1.853 E	2.074 d	2.283 A

*Notice:- Values followed by the same letter are not significant differences according to Duncan test polynomial

Discussions

Shawn results in tables (3,4,5,6 and 7) that shading is impact of positively to increase the number of marketable tuber, average wight of tuber marketable, overally yield, percentage of protein in the tubers and reducing the content tubers of proline, Attributed reason that to positive role played by shading in the provision of conditions ideal of the temperature and moisture and light intensity(Table .2) which leads to

increase activity enzymes necessary to construction of chloropheyll (Taiz and Zeiger, 2002). That increase construction of chlorophyll with presence of leaf area large and largest number of aerodynamic shins to him impact of effective in the increase rates of the process of photosynthesis and then it travels to tubers during the configuration subsequently that lead to increasing yield characteristics quantitative and improve characteristics quality(Alsidair and Willmitzer, 2001), Either with regard to the role of shading in reducing content tubers of proline is attributable reason for this to the role of shading in reduce exposure plant for stresses environmental, because the proline works on induction of genes to bear plant for stresses environmental(Johari-pireivatlou, et.al,2010). Either with regard to the impact of salicylic acid has results showed that spraying with salicylic acid gave more than a significant in the increase properties mentioned above, Back reason for this to the role of salicylic acid in the revitalization of construction of chlorophyll and prevent loss of hormones(Auxins and Gibberellins)m Which leads to increase cell division and plant growth, Which is reflected positively to construction and accumulation of food in the shoot(Zarghami, et.al,2014) and then it travels be stored in the tubers. Either with regard to the role of salicylic acid in reducing content tubers of proline, attributable reason for this to the role of salicylic acid in reducing azmozmatic potential for cells and increase the water content and inhibition of enzymes construction of proline(Shekoofeh and Shahla, 2012). Either with regard to the impact of variety results shown superiority the variety Arizona on the variety Burren in the properties mentioned above, attributed reason for this to genetic factor of the variety, That's where different varieties in the genes affect in the ability physiological of these varieties in conversion products process photosynthesis in favor growth and elongation cells which is reflected positively to increase of yield properties, or may have come back reason to difference of these varieties in their content of hormones(Auxins and Gibberellins)(Sakar, 2009).

*Based on the above can conclude that shading effect of positively to reduce stress heat and improve the properties of yield, as it was salicylic acid by concentration (100 $mg.L^{-1}$) positive effect to increase the plant resistance for conditions stress environmental.

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الملخص: أُجريت التجربة الحقلية خلال الموسم الزراعي الخريفي 2016 في حقل التجارب التابع لقسم البستنة وهندسة الحدائق في كلية الزراعة- جامعة ديالى، وشملت الدراسة ثلاثة عوامل وهي:- مستويين للتظليل(0% ،50%) بأستخدام شباك الساران الاخضر أستخدمَ لمدة 42 يوم وأربعة تراكيز من حامض السالسليك (0،50،100،150) ملغم.لتر$^{-1}$ وصنفين من البطاطا هما(Burren وArizona) و تضمنت التجربة 16 معاملة بأستخدام نظام القطع المنشقة لأكثر من مرة Split-Split Plots Design على وفق تصميم القطاعات العشوائية الكاملة R.C.B.D وبثلاث مكررات. وقد أظهرت النتائج تفوق النباتات المظللة بنسبة 50% في صفات عدد الدرنات القابلة للتسويق ومتوسط وزن الدرنة القابلة للتسويق والحاصل الكلي والنسبة المئوية للروتين وخفض محتوى الدرنات من البرولين أذ بلغت (9.05 درنة.نبات$^{-1}$ و84.64غم و55.84 طن.هـ$^{-1}$ و10.793 % و2.229ملغم.غرام$^{-1}$) وعلى التوالي .كما تفوقت النباتات المعاملة بجميع التراكيز من حامض السالسليك في عدد من الصفات تميزت منها النباتات المعاملة بتركيز 100ملغم.لتر$^{-1}$ بأفضل النتائج للصفات المذكورة اعلاه أذ بلغو (9.05 درنة.نبات$^{-1}$ و89.56غم و60.05 طن.هـ$^{-1}$ و11.084 % و1.869ملغم.غرام$^{-1}$) وعلى التوالي.كما تفوقت نباتات الصنف Arizona في الصفات المذكورة اعلاه اذ بلغو (8.61 درنة.نبات$^{-1}$ و83.03غم و52.98 طن.هـ$^{-1}$ و10.378 % و2.283ملغم.غرام$^{-1}$) وعلى التوالي.

الكلمات المفتاحية : البطاطا، التظليل، حامض السالسليك، الصنف، الاجهاد الحراري، الاجهاد الملحي.