

## EFFECT OF IRRIGATION INTERVALS AND THE POLYTER SOIL CONDITIONER ON THE CHEMICAL INDICATORS AND YIELD OF SEVERAL POTATO CULTIVARS GROWN IN DESERT SOIL

Hassan A. A. Almayeh and Abdulla A. Abdulla

College of Agriculture, Basrah University, Iraq

### Abstract

A factorial experiment was conducted in Al-Basra provainc, Al-Zubair district, within Al-Mashrouf farms in the Al-Raha desert area, for the purpose of studying the effect of the fertilization method and the quality of irrigation water on the vegetative and flowering growth of three cultivars of potatoes in terms of chemical growth and yield. Three factors were used in the experiment, such as the first factor, the use of three irrigation intervals (daily, every 2 days, every 3 days) While the second factor represented three levels of superabsorbent polyester (0, 30, and 60) kg ha<sup>-1</sup>, while the third factor was the cultivation of three potato cultivars (Burien, Arizona, and Riviera). A randomized block design was followed with three replicates for each treatment in split-split-plot arrangement and the least significant difference (L.S.D.) was applied. At the level of 0.05 in analyzing the data statistically. The results showed that there was a significant response caused by the combination (daily irrigation of Riviera plants without the use of polyurethane) the highest results in the content of leaves of chlorophyll, While the combination (daily irrigation of Burien cultivar plants with 60 kg ha<sup>-1</sup> of polyurethane) gave the highest percentage of total soluble solids, and the combination (irrigation every two days for Burien cultivar plants with 60 kg ha<sup>-1</sup> of polyester) gave the highest average of total and marketable yield. The lowest results were achieved when irrigating every three days for cultivar Arizona, without or with polyether treatment.

Keywords: irrigation intervals, super absorbent polyester, chemical indicators and yield, potato cultivars.

### Introduction

Potato *Solanum tuberosum* L. belongs to the Solanaceae family and ranks fourth in the world after wheat, corn and rice in terms of nutritional importance, where it constitutes between 75-90% of the daily food for countries of the world, in addition to its content of some vitamins such as thiamine, riboflavin, niacin and vitamin C, which is an important source of energy and contains High amounts of carbohydrates and minerals (Muthoni) and Nyamongo 2009),. With the increase in the global demand for food, the area of irrigated land has increased in the world, and this increase was accompanied by an increase in the demand for water, which led to a global water crisis, Therefore, the need has become urgent and necessary towards rationalizing and raising the efficiency of water use through the use of modern irrigation methods, which contribute to reducing the percentage of wastage in water. The technical method through the use of different irrigation intervals is considered one of the most important irrigation methods that contribute to achieving this goal (Darusman et al., 1997). This also led us to use polymers to increase the retention of irrigation water at the effective root zone, after the interest of some research centers has recently increased in expanding the use of polymer in many practical applications for the purpose of

development, especially agricultural ones. Due to the abundance of polymers in Iraq and their low prices, as well as the lack of quantity required to be added to the soil, this led us to use highly absorbent polymers. The research problem is manifested in the amount of local production compared to the country's consumption of this crop, which is considered below the level of ambition. In order to improve the reality of potato cultivation in Iraq, a successful plan must be put in place to increase production and encourage farmers to grow this crop by adopting modern technologies, the most important of which is the cultivation of high-productivity and good-quality cultivar (Al-Hisnawy, 2011).

#### Materials And Methods

A field experiment was conducted in Al-Basra province, Al-Zubair district, in the project farms within the Al-Raha desert area, during autumn season 2020/2021. To study the effect of irrigation intervals and different levels of a superabsorbent soil conditioner on the vegetative growth of several potato cultivars during autumn season. Seeds of potato cultivar prepared for cultivation were planted on 10/13/2020, after preparing and plowing the land. The experimental land was divided into nine lines of 27 m in length and 50 cm in width on 9/15/2020, and the distance between one line and the next was 1.5 m. As the single line was divided into 9 experimental units, the length of each unit was 3 m, so that the number of experimental units reached 81 experimental units. Every 27 units were counted in one sector and every 9 adjacent experimental units were distributed as a sub plot, and each unit is treated with one of the three polymer levels as a sub sub plot. Each experimental unit was planted with ten tubers, the distance between them was 30 cm and at a depth of 10 cm, while leaving a separating space of about 1 m between the experimental units within the sector and a distance of 3 m between the different sectors to avoid interaction treatments, taking into consideration leaving a buffer distance at the beginning and end of the experimental sectors, and the area of the experimental unit was 4.5 m<sup>2</sup> to reach The plant density is 19556 plants ha<sup>-1</sup>. The experiment was designed according to the complete random block design, with split-split planks, and with three replications. Each replication included 27 treatments distributed randomly within one replicate. Each experimental unit included three passages. The results were analyzed using GenStat2008 fresh ware using the least significant difference at a probability level of 5% (Al-Asadi, 2019). The research experiment included studying the effect of 3 factors, namely:

1- Irrigation period: It is the main factor and includes 3 irrigation intervals (daily irrigation, every other day, and irrigation every two days).

2- The super absorbent polymer: it is the secondary factor and the soil improver used the agricultural polyester in three levels (0, 30 and 60) kg ha<sup>-1</sup> imported from the Kuwaiti palm company of German origin, manufactured from the natural fibers of the palm and examined in the Polymer Center, University of Basrah

3- cultivars: It is the sub-secondary worker and included the cultivation of 3 different cultivars (Burrin, Arizona and Riviera) taken from Nahar Al-Awrad Company for the trade of potatoes and agricultural supplies.

The following indicators were studied after the plant reached the stage of full flowering and were as follows:

1- Leaves content of chlorophyll (mg/100g fresh weight): It was measured in postgraduate laboratories affiliated to the College of Agriculture / University of Basra according to the Goodwin method (1976), after fresh leaf samples of each experimental unit were digested with acetone (80% concentration) and taken Read the light absorption of each paper sample by spectrophotometer and then calculate the average for each treatment.

2- Proline content of the leaves (mg 100gm fresh material<sup>-1</sup>): The amount of proline was estimated in postgraduate laboratories/College of Agriculture/University of Basra according to the method of Bates et al. (1973).

2- Percentage of soluble solids (%): It was measured using the Hand Refractometer, by taking several drops of tuber juice and placing them on a reflective mirror. By looking at it, the number in the reflector lens that indicates the percentage of dissolved solids is fixed at a rate of five readings. And for five tubers in each experimental unit for each treatment, and then the average was extracted.

3- Yield of one plant (kg): according to the yield of each experimental unit at the end of the season of the three cultivar and each experimental unit within the treatment by collecting the yield of the experimental unit and dividing it by the number of plants in one experimental unit, which is ten.

4- The marketing yield of one plant (kg): according to the number of marketable tubers after excluding small, deformed and infected tubers, and then according to the yield of the marketable experimental unit.

## Results and discussion

### First: Leaves content of chlorophyll (mg/100g fresh weight):

The results in Table (1) indicated that the chlorophyll content of leaves was not significantly affected by irrigation intervals and polyurethane levels. While the cultivars had a significant effect on the aforementioned trait, The plants of the Riviera variety recorded the highest mean of 2.224 (mg/100gm fresh weight) without significantly differing with the plants of the Burien cultivar. The results of the same table also indicated that there were significant differences resulting from the overlap between irrigation intervals and cultivars, where the treatment (daily irrigation of Riviera cultivar plants) recorded the highest mean of 2.361 (mg/100 gm fresh weight), while the overlap treatment (daily irrigation of Arizona cultivar ) recorded less mean of 1.787 (mg/100g fresh weight). It also found significant differences caused by the bi- interaction between the irrigation intervals and the levels of polyurethane, where the treatment (daily irrigation without the use of polyurethane) had the highest average of 2.206 (mg/100g fresh weight), while the lowest average was recorded for the treatment (daily irrigation with the level of 60 kg.ha<sup>-1</sup> polyter) and it reached 1.892 (mg/100g fresh weight). The interaction of cultivars with polyurethane had a significant effect on the same trait, where the interaction (Riviera plants without the use of polyurethane) had a significantly excelled on other treatments by recording the highest mean of 2.328 (mg/100g fresh weight), While the treatment (Arizona variety plants with 60 kg.ha<sup>-1</sup> polyter) recorded the lowest mean of 1.776 (mg/100g fresh weight). The results of the table also indicated that there were significant differences as a result of the triple interaction of the experimental factors, so the treatment (daily irrigation of the Riviera cultivar without the use of polyester) recorded the highest

average of 2.476 (mg / 100g fresh weight), in contrast, the combination recorded (irrigation every 3 days for the Arizona cultivar with 30 kg ha<sup>-1</sup> polyter) the lowest mean was 1.047 (mg/100g fresh weight).

**Table (1) The effect of irrigation intervals and polyester and their interactions on the chlorophyll content of leaves (mg/100g fresh weight) of several potato cultivars grown in desert soil**

irrigation intervals × cultivars	Polymer level Kg.ha-1			cultivars	irrigation intervals
	60.00	30.00	0.00		
2.106	1.964	2.135	2.220	Burien	every day
1.787	1.569	1.872	1.921	Arizona	
2.361	2.144	2.462	2.476	Reviera	
2.201	2.277	1.970	2.357	Burien	every two days
1.876	1.723	2.002	1.904	Arizona	
2.186	2.074	2.118	2.365	Reviera	
2.156	2.204	2.256	2.009	Burien	every three days
1.887	2.037	1.047	1.557	Arizona	
2.127	2.164	2.074	2.143	Reviera	
0.228	0.394			L.S.D. 0.05	
average irrigation intervals	irrigation intervals × Polymer				
2.085	1.892	2.156	2.206	every day	
2.088	2.025	2.030	2.156	every two days	
2.057	2.135	2.125	1.910	every three days	
NS	0.228			L.S.D. 0.05	
average cultivars	cultivars × Polymer				
2.154	2.148	2.120	2.195	Burien	
1.850	1.776	1.973	1.801	Arizona	
2.224	2.127	2.218	2.328	Reviera	
0.131	0.228			L.S.D. 0.05	
	2.017	2.104	2.108	average Polymer	
	NS			L.S.D. 0.05	

**Second: Proline content of the leaves (mg 100gm fresh material<sup>-1</sup>):**

The results of the statistical analysis in Table (2) showed that the irrigation intervals had a significant effect on the leaf content of proline. The daily irrigation caused a significant decrease in the above traits and achieved the lowest average of 0.777 (mg 100 g fresh material<sup>-1</sup>), in contrast to the irrigation treatment every 3 days, which recorded the highest mean of 1.010 (mg 100 gm

fresh material<sup>-1</sup>). This applies to the different cultivars in showing the significant traits in the aforementioned trait, so the plants of the two cultivars Burien and Riviera recorded the lowest average of 0.865 and 0.863 (mg 100 gm fresh material<sup>-1</sup>), respectively, without significantly differing compared to the plants of the Arizona cultivar, which recorded the highest average of 1.047. (mg 100 g fresh material<sup>-1</sup>). This trait was also significantly affected by polyurethane levels, so plants of level 30 and 60 kg ha<sup>-1</sup> recorded the highest leaf content of proline with an average of 0.938 and 0.957 (mg 100 gm fresh material<sup>-1</sup>) without significant differences between them, while the lowest mean was achieved for plants untreated and reached 0.880 (mg 100 gm fresh matter<sup>-1</sup>). The results of the same table showed that there were significant differences resulting from the overlap between irrigation intervals and cultivars. The treatment (daily irrigation of Riviera cultivar plants) recorded a significant decrease for this trait by achieving the lowest average of 0.663 (mg 100 gm fresh material<sup>-1</sup>), in contrast, the interaction treatment (irrigation every two days for the Arizona cultivar) recorded the highest mean of 1.125 (mg 100 gm fresh material<sup>-1</sup>). It also found significant differences caused by the bi-interaction between irrigation intervals and polyurethane levels, where the treatment (daily irrigation without using polyurethane) recorded a significant decrease with an average of 0.696 (mg 100 g fresh material<sup>-1</sup>), While the highest average was recorded when treated (irrigation every 3 days with the level of 30 kg ha<sup>-1</sup> polyurethane) and reached 1.044 (mg 100 gm fresh material<sup>-1</sup>). The interaction of cultivars with polyurethane had a significant effect on the same trait, as the interaction (Burien plants without the use of polyurethane) achieved a significant reduction by recording the least average of 0.786 (mg 100 gm fresh material<sup>-1</sup>), While the treatment (Arizona cultivar plants with 30 kg ha<sup>-1</sup> polyter) recorded the highest mean of 1.097 (mg 100 gm fresh material<sup>-1</sup>). The results of the table also indicated that a significant response occurred as a result of the triple interaction of the experimental factors. The treatment (daily irrigation of the Riviera cultivar with 30 kg ha<sup>-1</sup> polyester) recorded the lowest average of 0.628 (mg 100 g fresh material<sup>-1</sup>) compared to the combination (irrigation every 3 days for the Arizona variety with 30 kg h<sup>-1</sup> polyester) the highest average of 1.047. (mg 100 g fresh material<sup>-1</sup>).

**Table (2) Effect of irrigation intervals and polyester and their interaction on leaf content of proline (mg per 100gm fresh material<sup>-1</sup>) of several cultivars of potatoes grown in desert soil**

irrigation intervals × cultivars	Polymer level Kg.ha-1			cultivars	irrigation intervals
	60.00	30.00	0.00		
0.770	0.880	0.750	0.681	Burien	every day
0.897	0.990	0.978	0.723	Arizona	
0.663	0.679	0.628	0.683	Reviera	
1.027	1.187	1.013	0.882	Burien	every two days
1.125	1.105	1.108	1.163	Arizona	
0.811	0.739	0.829	0.864	Reviera	
0.796	0.721	0.871	0.796	Burien	

1.118	1.116	1.206	1.031	Arizona	every three days
1.116	1.198	1.055	1.096	Reviera	
0.113	0.196			L.S.D. 0.05	
average irrigation intervals	irrigation intervals × Polymer				
0.777	0.849	0.785	0.696	every day	
0.988	1.010	0.983	0.970	every two days	
1.010	1.011	1.044	0.974	every three days	
0.065	0.113			L.S.D. 0.05	
average cultivars	cultivars × Polymer				
0.865	0.929	0.878	0.786	Burien	
1.047	1.070	1.097	0.972	Arizona	
0.863	0.872	0.837	0.881	Reviera	
0.065	0.113			L.S.D. 0.05	
	0.957	0.938	0.880	average Polymer	
	0.065			L.S.D. 0.05	

### Third/ Percentage of soluble solids (%):

The results in Table (3) showed that the irrigation intervals had a significant effect on the percentage of soluble solids T.S.S., where daily irrigation produced a significantly exceeded in the above traits and achieved the highest average of 6.167%. While the irrigation treatment every 3 days recorded the lowest average of 5.774%. While the cultivars did not have a significant effect on the aforementioned traits . As for the polyurethane levels, the untreated plants recorded the highest average of 6.110%. Compared with level 30 and 60 kg ha<sup>-1</sup> treatments, which achieved the lowest average of (5.967 and 5.870)%, respectively, without significant differences between them. The results of the same table showed that there were significant differences caused by the interaction of irrigation intervals with the cultivars, where the treatment (daily Irrigation for Burien cultivar plants) recorded a significant effect of this traits by achieving the highest average of 6.433%, , the interaction treatment (irrigation every 3 days for the Burien cultivar ) recorded the lowest average of 6.433%. 5.600%. It also found significant differences caused by the interaction of irrigation intervals and polyester levels, so the treatment (daily irrigation and every two days without using polyester) recorded a significant superiority with the highest average (6.222 and 6.223)%, respectively, while the lowest average was recorded in the treatment (irrigation every 3 days with the level of 30 kg. ha<sup>-1</sup> Polyter) and amounted to 5.678%. The interaction of cultivars with polyether had a significant effect on the same trait, where the interaction (Burien plants without the use of polyether) achieved a significant increase by recording the highest average of

6.244%, while the treatment (Reviera plants with 60 kg ha<sup>-1</sup> polyter) recorded the lowest average of 6.244%. 5.700%. The results of the table also indicated that a significant response occurred as a result of the triple interaction of the experimental factors. The treatment (daily irrigation of the Burien cultivar with 60 kg.ha<sup>-1</sup> polyester) recorded the highest average of 6.767% compared to the combination (irrigation every 3 days for the Riviera cultivar with 60 kg ha<sup>-1</sup> polyester). The lowest average was 3.367%.

**Table (3) Effect of irrigation and polyether periods and their interaction on leaf content of T.S.S. (%) for several cultivars of potatoes grown in desert soil**

irrigation intervals × cultivars	level Polymer			cultivars	irrigation intervals
	2.00	1.00	0.00		
6.433	6.767	6.167	6.367	Burien	every day
6.122	5.900	6.500	5.967	Arizona	
5.944	5.633	5.867	6.333	Reviera	
6.178	6.233	6.233	6.067	Burien	every two days
5.800	5.833	5.333	6.233	Arizona	
6.011	5.100	6.567	6.367	Reviera	
5.600	5.200	5.300	6.300	Burien	every three days
5.633	5.800	5.767	5.333	Arizona	
6.089	3.367	5.967	5.933	Reviera	
0.383	0.664			L.S.D. 0.05	
average irrigation intervals	irrigation intervals × Polymer				
6.167	6.100	6.178	6.222	every day	
5.996	5.722	6.043	6.223	every two days	
5.774	5.789	5.678	5.856	every three days	
0.221	0.383			L.S.D. 0.05	
average cultivars	cultivars × Polymer				
6.070	6.067	5.900	6.244	Burien	
5.852	5.844	5.867	5.844	Arizona	
6.015	5.700	6.133	6.211	Reviera	
NS	0.383			L.S.D. 0.05	
	5.870	5.967	6.110	average Polymer	
	0.221			L.S.D. 0.05	

**Fourth / Yield per plant (kg):**

The results in table (4) showed that the irrigation intervals had a significant effect on plant yield, where the daily irrigation produced a significantly excelled and achieved the highest average of

2.098 kg, compared with the treatment of irrigation every 3 days, which recorded the lowest average of 1.692 kg. The cultivars also achieved a significant effect on the mentioned trait, so the Burien cultivar plants recorded a significant increase with the highest average of 2.255 kg, compared to the Arizona cultivar plants, which recorded the lowest average of 1.589 kg. As for the polyurethane levels, the treated plants of 60 kg H-1 recorded the highest average of 2.182 kg, compared with the untreated plants that achieved the lowest average of 1.812 kg. The results of the same table showed that there were significant differences caused by the interaction of irrigation intervals with cultivars. The treatment (irrigation every two days for Burien cultivar) had a significant effect on this trait by achieving the highest average of 2.434 kg. It also found significant differences caused by the interaction of irrigation and polyurethane periods, so the treatment (daily irrigation with 60 kg ha<sup>-1</sup> of polyurethane) recorded a significantly exceeded by achieving the highest average of 2.285 kg, while the lowest average was recorded for the treatment (irrigation every 3 days without using polyurethane) and amounted to 1.521 kg. The interaction of cultivars with polyurethane also had a significant effect on the same trait, as the interaction of (Burien cultivar plants with 60 kg ha<sup>-1</sup> of polyurethane) achieved a significant increase by recording the highest average of 2.644 kg, while the treatment (Arizona variety plants using polyurethane) recorded the lowest average. it reached 1,543 kg. The results of the table also indicated that a significant response occurred as a result of the triple interaction of the experimental factors. The treatment (irrigation every two days for the Burien variety with 60 kg ha<sup>-1</sup> polyester) recorded the highest average of 2.859 kg compared to the combination (irrigation every 3 days for the Arizona cultivar without the use of polyester) the lowest average It reached 1,407 kg.

**Table (4) The Effect of Irrigation intervals and Polyether and Their Interaction on the Yield of One Plant (kg) for Several cultivars of Potatoes Cultivated in Desert Soil**

irrigation intervals × cultivars	level Polymer			cultivars	irrigation intervals
	2.00	1.00	0.00		
2.409	2.670	2.261	2.297	Burien	every day
1.709	1.797	1.652	1.678	Arizona	
2.176	2.388	1.983	2.157	Reviera	
2.434	2.859	2.384	2.060	Burien	every two days
1.577	1.638	1.549	1.544	Arizona	
2.148	2.334	2.097	2.012	Reviera	
1.921	2.404	1.728	1.613	Burien	every three days
1.482	1.599	1.440	1.407	Arizona	
1.672	1.950	1.542	1.525	Reviera	
0.444	0.770			L.S.D. 0.05	
average irrigation intervals	irrigation intervals × Polymer				

2.098	2.285	1.965	2.044	every day
2.053	2.277	2.010	1.872	every two days
1.692	1.984	1.570	1.521	every three days
0.257	0.444			L.S.D. 0.05
average cultivars	cultivars × Polymer			
2.255	2.644	2.125	1.996	Burien
1.589	1.678	1.547	1.543	Arizona
1.999	2.224	1.874	1.898	Reviera
0.257	0.444			L.S.D. 0.05
	2.182	1.848	1.812	average Polymer
	0.257			L.S.D. 0.05

#### Fifth: The marketing yield of one plant (kg):

The results in table (5) showed that the irrigation intervals had a significant effect on the marketing yield of one plant, where the daily irrigation produced a significantly excellent and achieved the highest average of 1.866 kg, compared with the treatment of irrigation every 3 days, which recorded the lowest average of 1.440 kg. The cultivars also achieved a significant effect on the mentioned trait, so the Burien cultivar plants recorded a significant increase with the highest average of 1.993 kg, compared to the Arizona cultivar plants, which recorded the lowest average of 1.413 kg. As for the polyurethane levels, the treated plants of 60 kg H-1 recorded the highest average of 1.896 kg, compared with the untreated plants that achieved the lowest average of 1.596 kg. The results of the same table showed that there were significant differences caused by the interaction of the irrigation intervals with the cultivars, where the treatment (irrigation every two days for the Burien cultivar plants) recorded a significant effect of this trait by achieving the highest average of 2.071 kg, in contrast, the interaction treatment (irrigation every 3 days for the Arizona cultivar) recorded the lowest average of 1.262 kg. It also found significant differences caused by the interaction of irrigation and polyurethane periods, so the treatment (daily irrigation with 60 kg ha<sup>-1</sup> of polyurethane) recorded a significantly excellent by achieving the highest average of 2.059 kg, while the lowest average was recorded for the treatment (irrigation every 3 days without using polyurethane) and amounted to 1.273 kg. The interaction of cultivars with polyurethane also had a significant effect on the same trait, where the interaction of (Burien cultivar plants with 60 kg ha<sup>-1</sup> of polyurethane) achieved a significant increase by recording the highest average of 2.303 kg, while the treatment recorded (Arizona cultivar plants with 30 kg H-1). polyurethane) the lowest average was 1.366 kg. The results of the table also indicated that a significant response occurred as a result of the triple interaction of the experimental factors. The treatment (irrigation every two days for the Burien variety with 60 kg ha<sup>-1</sup> polyurethane) recorded the highest average of 2.577 kg compared to the combination (irrigation every 3 days for the Arizona cultivar with 30 kg ha<sup>-1</sup> polyurethane). The lowest average was 1.193 kg.

**Table (5) The Effect of Irrigation intervals and Polyether and Their Interaction on the Market Yield of One Plant (Kg) for Several Cultivars of Potatoes Cultivated in Desert Soil**

irrigation intervals × cultivars	Polymer level Kg.ha-1			cultivars	irrigation intervals
	60.00	30.00	0.00		
2.098	2.356	2.034	1.878	Burien	every day
1.508	1.646	1.449	1.429	Arizona	
1.999	2.174	1.800	2.023	Reviera	
2.271	2.577	2.216	2.020	Burien	every two days
1.470	1.491	1.456	1.462	Arizona	
1.746	1.740	1.762	1.737	Reviera	
1.618	1.977	1.563	1.315	Burien	every three days
1.262	1.372	1.193	1.222	Arizona	
1.438	1.735	1.299	1.280	Reviera	
0.443	0.750			L.S.D. 0.05	
average irrigation intervals	irrigation intervals × Polymer				
1.866	2.059	1.761	1.777	every day	
1.829	1.936	1.811	1.740	every two days	
1.440	1.695	1.352	1.273	every three days	
0.250	0.443			L.S.D. 0.05	
average cultivars	cultivars × Polymer				
1.993	2.303	1.938	1.738	Burien	
1.413	1.503	1.366	1.371	Arizona	
1.728	1.883	1.620	1.680	Reviera	
0.250	0.443			L.S.D. 0.05	
	1.896	1.641	1.596	average Polymer	
	0.250			L.S.D. 0.05	

From the results of the tables included in the research, the significant difference between the two cultivars in the characteristics referred to in Tables (1-5) can be due to the difference in the genetic characteristics of all the cultivars grown in the research experiment and the nature of the cultivar growing in the appropriate weather conditions prevailing in the cultivation area (Al-Sahoki and Daoud, 2020 and AlMyali et al., 2020). The achieved significant effect may also be due to the variation in irrigation intervals, and this may be due to the fact that daily irrigation provides to some extent high and sufficient moisture levels for growth, allowing water to be available to plant

cells continuously, and this is positively reflected in improving and increasing the rate of photosynthesis as it is the reductive force or raw material. In this process, in addition to directly entering the protoplasm of the cells and building the cytoplasm, which gives a higher chance for the largest amount of water to be stored in the tissues of the plant, and thus it plays a major role in the formation of tubers (El-Aubiady, 2005). Adequate humidity also works to improve the functioning of enzymes and the regularity of vital and physiological processes that have a direct effect on growth, while spaced irrigation every 3 days causes an increase in water stress and its direct and negative effect in increasing and widening the leaf area. Thus, reducing its chlorophyll content, as well as its effect on reducing the growth rate of stems and root system as a result of reducing the filling pressure, which is essential in elongating the cells. plants (Anjum et al., 2011 and Habibzadeh and Abedi, 2014). Or the significant effect may be due to the important role caused by treating the soil of the plant with different levels of polyester, which worked to improve the studied chemical parameters and yield characteristics, due to its direct effect in improving the properties of the poor soil physically and chemically through its ability to save water by absorbing it and preserving it from leakage. This in turn reduces the loss of mineral elements necessary for growth. In addition to its role in increasing soil aeration by increasing the number and size of pores and the stability of their assemblies, which helps the roots to penetrate to greater depths (Shock et al., 2013 and Salavati et al., 2018). Polymers are also considered important applications that increase in importance when plants grow under the influence of moisture stress for its role in reducing or stopping the negative effect of low humidity in the soil because it contributes to providing the moisture needed by the plant that helps in its growth and development, which at the same time encourages the growth of beneficial microorganisms ( Chavez et al., 2009 and Maghchiche et al., 2010).

### References

- Al-Sahoki, Medhat and Abdel-Basset Abdel-Razzaq Daoud. 2020. Genome and plant breeding. 1st edition. Ministry of Higher Education and Scientific Research. The Republic of Iraq. 220 pages.
- Al-Hisnawy, E. A. K. 2011.** The effect of spring organic fertilizer (LIQ Humus) on the growth and yield of three cultivars potato plant. Master thesis, College of Agriculture, University of Kufa. IRAQ.
- AlMyali, A. A. H.; A. S. Hassoon and Alammeri, A. A. K. 2020.** Effect of variety and plant date on growth and yield of barley (*Hordeum vulgare* L.). Plant Archives. 20(1): 355–358.
- Anjum, S. A. A.; X. Y. Xie; L. C. Wang; M. F. Saleem; C. Man and Lei, W. 2011.** Morphological ,physiological and bio chemical responses of plant to drought stress. Afric. J. Agric. Res., 6(9): 2026–2032.
- Bates, L.S.; R. Waldren and Teare, I. D. 1973.** Rapid determinate on of free proline for water-stress studies. Plant and Soil, 39: 205–207.

- Chavez, C, E; A. Ventura-Ramos and Fuentes, C. 2009.** Erosion control in furrow irrigation using Polyacrylamide (in Spanish). Hydraulic Engineering in Mexico, 24 (4): 135–144.
- Darusman, J.; A. H. Khan; L. R. Stone and Lamm, F. R. 1997.** Water flux below root zone Vs. drip- line spacing in drip irrigated corn. Soil Soc. Am. J., (61): 1755-1760.
- El-Aubiady, A. S. K. 2005.** Physiological studies to improve growth, Yield, tuber seeds production and decrease the water stress damage in potato (*Solanum tuberosum* L.). Ph. D. thesis, College of Agriculture & Forestry, University of Mosul. IRAQ.
- Habibzadeh, Y. and Abedi, M. 2014.** The effects of arbuscular mycorrhizal fungi on morphological characteristics and grain yield of mung bean (*Vigna radiata* L.) plants under water deficit stress. Peak J. of Agri. Sci., 2 1): 9–14.
- Goodwin, T. W. 1976.** Chemistry & Biochemistry of plant pigment. 2<sup>nd</sup> Academic. Press. London, New York. San.
- Maghchiche, A.; A. Haouam and Immirzi, B. 2010.** Use of polymers and biopolymers for water retaining and soil stabilization in arid and semiarid regions. J. Taibah Uni. for Sci., 4(1): 9–16.
- Muthoni, J. and Nyamongo, D. O. 2009.** A review of constraints to wear Irish potatoes production in Kenya. J. Hort. & Forestry, 1(7): 98–102.
- Salavati, S.; S. A. Valadabadi; K. H. Parvizi; S. Sayfzadeh and Hadidi Masouleh, E. 2018.** The effect of super-absorbent polymer and sowing depth on growth and yield indices of potato (*Solanum tuberosum* L.) in Hamedan Province, Iran. Applied Ecology and Environ. Res.,16(5):7063-7078.
- Shock, C. C.; B. M. Shock and Welch, T. 2013.** Strategies for efficient irrigation water use. Oregon State University. Sustainable Agriculture Techniques EM., 87(83): 1–7.