International Journal of ChemTech Research
CODEN (USA): IJCRGG ISSN: 0974-4290
Vol.8, No.12 pp 226-237, 2015

Performance Automatic Sprinkler Irrigation Management for Production and Quality of Different Egyptian Wheat Varities

H.A. Mansour*

Water Relations & Field Irrigation Department, Agric. Division,
National Research Centre, Cairo, Egypt.

Abstract: The field experiments of current research work were conducted at the research station of the National Research Center, El-Noubaria, El-Behaira Governorate, during the two successive seasons of 2012/2013 and 2013/2014 to study the effect of automation sprinkler irrigation management, four Egyptian wheat varieties: Sids 12, Giza 168, Gemmeza 7 and Gemmeza 11 varieties and different water amounts 100, 75 and 50 from soil field capacity FC (%) on yield components and some technological properties. The design experiment was factorial in complete randomized blocks with three replications. The results could be summarized as follows: Grain yield, 1000 kernel weight and moisture in grain at harvest under 100, 75 and 50%FC were increased by (6.7, 5.0; 0.8 %), (6.2, 4.3; 4.9 %) and (5.9, 4.8; 4.6 %), respectively in second season relative to the first season. On the other hand, grain yield, 1000 kernel weight and moisture in grain at harvest under Sids 12, Giza 168, Gemmeza 7 and Gemmeiza 11 varieties increased by (7.1, 4.5; 0.3), (6.9, 5.5; 7.1), (6.3, 3.7; 6.5) and (4.2, 5.1; 2.8), respectively in the second season relative to the first season. Quality parameters % net flour, % of grain protein, % fat, and % total sugar in flour), under water amounts (FC%) were increased by (1.8, 11.5, 19.7; 30.8 %), (1.7, 10.4, 20.7; 18.8 %) and (1.4, 10.7, 9.6; 32.7 %), respectively in the second season relative to the first season. It could be concluded that: 50 and 75 % FC treatment gave the highest values and it has significant differences between results values, so that for best grain quality production purpose using water50 or 75 % FC treatments with a variety of Sids 12 and 94. While for better flour quality we can recommend using also50 or 75% FC but with verity of Giza 168 and Gemmeza 7 .

Introduction:

Wheat crop is the most important cereal crop in the world in terms of area and production and it is a stable food for more than one third of the world population in Egypt, wheat is the main winter cereal crop, it is used as a stable food grain for urban and rural societies and as a major source of straw for animal feeding. The wheat area over the last 10 years (2003-2013) has been expanded from (0.43 to 0.59 million Feddan) and the average productivity per Feddan has been increased from 6.4 to 8.8 million ton during that period, however total wheat consumption has increased drastically due to overall population growth of about 2.5 % per year Therefore, Egypt imports about 60 percent of wheat requirements this reflects the size of the problem and the efforts needed to increase wheat production gab, due to extremely limited lands. Therefore, it is essential to improve irrigation water productivity and decrease irrigation demand while maintaining the crop productivity. A greater number of irrigations has resulted in higher yields (18–40%) due to increase in number of productive tillers(15–20%) and in photosynthates accumulation by more than 60.2%compared with two irrigations at CRI stage and late tillering stages[1,2,3] reported a marked increase in leaf area index, crop growth rate and aboveground biomass of wheat with increasing amount of irrigation water applied.

They further reported that in a water scarce area, critical crop growth stage approach for scheduling of irrigation was found to be best. [4] reported that wheat receiving four irrigations at CRI, maximum tillering, boot stage and milkstage resulted in 13.7 and 29.0% higher grain yield over two (at CRI and boot stages) and three irrigations (at CRI, boot and milk stages),respectively. Irrigations are recommended at times corresponding to the specific growth stages (crown root initiation, early tillering, late jointing/boot, heading/flowering) of the wheat[5]. In the growing season of winter wheat, irrigation is a common practice to meet winter wheat's consumption on water. Drops of sprinklers break aggregated and compact thin surface layers and lead to formation of seal or crusts and hard setting[6,7,8]. Under sprinkler irrigation, pores in topsoil varied with intensity,
drop size and amount of water applied. Porosity reduction is mainly due to size decrease of elongated pores and is associated with the increase of runoff rate, especially in bare soil[9,10]. In a crop field, however, the water for sprinkler irrigation is intersected by plant canopy, which gives rise to different distribution[11,12,13]. The effect of sprinkler irrigation on soil structure might be different in winter wheat fields and bare fields.

[14]identifiedfive stages of a structural crust developing in a loamy clay soil using quantitative image analysis. The results indicated that the percolation threshold decreases from 130 μm at the second stage down to 40μm at the fifth stage. [15] modeled the dynamics of the soil pore-size distribution, however, the development and application of the model is hampered by a lack of definitive data on soil structural and hydraulic dynamics. [16]indicated that macro pores were the main contributing pores to the total flow under both conventional tillage and minimum tillage, in spite of the very low macro porosities. [17] carried out a numerical study to investigate how the presence of micro-scale heterogeneities affects the dynamics of dense non-aqueous phase liquid and water flow in porous domain. For sustained irrigation with marginal quality waters, practices like appropriate selection of crops, improved conjunctive use and water management options, frequency and doses of amendments have been recommended[18]. Use of sprinkler irrigation, where smaller amounts of water can be uniformly applied to fields, further helps to achieve higher water use efficiencies[19]. Crops sprinkled with low quality water are exposed to two ways that salts can affect plant growth and yield: direct salt adsorption through leaves as well as increased soil salinity[20].They added that degree of injury with sprinkler irrigation is governed by salt diffusion through the leaf cuticle, weather conditions and the water stress of plants. Since injury is related more to number of sprinklings than to their duration, recommended that infrequent and heavy irrigations should be preferred over frequent and light irrigations when using sprinklers. The use of line source sprinkler method has been advocated for obtaining salinity production functions under such conditions[21].With this method it is possible to determine the separate and interactive effects of the quantity and salinity of applied water on crop yields. Therefore, double-line sprinkle resource was used for two growing seasons to determine the water–yield relations of wheat (*Triticum aestivum L*.) for two different types of marginal quality waters i.e. saline and alkali waters.

The present investigation aim to studying the the effect of automation controller sprinkler irrigation management, four Egyptian wheat varieties: Sids 12, Giza 168,Gemmeza 7 , and Gemmeza 11 varieties and different water amounts 100, 75 and 50 from soil field capacity FC (%) on yield components and some technological properties in the new cultivated land at El-Nubaria, El-Buhaira Governorate (National Research Center, Research Station Farm) .

Materials and Methods:

The present investigation was conducted at National Research Center, El-Noubaria Research Station El-Behaira Governorate, during the two successive seasons of 2012/2013 and 2013/2014 to study study the effect of automation sprinkler irrigation management, four wheat varieties: Sids 12, Giza 168, Gemmeza 7, and Gemmeza 11 varieties and different water amounts 100, 75, 50 %field capacities FC on yield components and some technological properties.

Some soil physical, chemical and water properties of the studied soil are carried out after[22] and moisture retention at Water Amount (FC) and wilting point after[23]. Soils of both investigated sites were sandy loam in texture. Some soil chemical characteristics of the studied two sites were recorded in **Table 1**. Analysis farmyard manure used in the experiments was as follows: 4.85 dSm^{-1} (EC, 1:20), 7.77 (pH, 1:20), 11.2% (OM), 5.4, 0.85 and 1.12% total (N, P and K) and 1:16.5 (C: N ratio).

Table (1) Soil properties of Research Station Farm of NRC, El-Nubaria, Elbuhaira, Egypt.

Soil Depth (cm)	Particle Size distribution, %				Texture Class	Soil θ_S(w/w)%			HC (cmh^{-1})	BD (g/cm³)
	C. Sand	F. Sand	Silt	Clay		F.C.	P.W.P.	A.W		
0-15	8.4	78.6	7.5	5.5	Sand	12.0	4.1	7.9	6.68	1.56
15-30	8.6	78.7	7.3	5.4	Sand	12.0	4.1	7.9	6.84	1.58
30-45	8.5	78.5	7.8	5.2	Sand	12.0	4.1	7.9	6.91	1.63
45-60	8.8	78.7	7.6	5.9	Sand	12.0	4.1	7.9	6.17	1.62

FC= field capacity, P.W= wilting point; AW= available water

pH: (1.25), EC: electrical conductivity in the extracted soil paste, OM organic matter, FC: Water Amount (FC), WP: wilting point, AW available water, vb volume basis.

The experimental design was a factorial including two factors in a completely randomized block design with 3 replicates. The plot area was 16 m^2 (4 x 4). NPK fertilization added according to recommended by Egyptian Agricultural Ministry, while the water amounts of FC field capacities was applied as a different amounts of water as follows: 100% FC, as (control), 75, % FC, and 50 % FC.

Figure (1) show the automation controller of sprinkler irrigation for wheat varities under studying. The automation controller system consists of moisture sensors, temperature sensors, signal conditioning circuit, digital to analog converter, LCD Module, Relay driver, solenoid control valves, etc. The unit is expressed in Figure(1). The important parameters to be measured for automation of sprinkler irrigation system are soil moisture and temperature. The entire field is first divided into small sections such that each section should contain one moisture sensor and a temperature sensor. RTD likePT100 can be used as a temperature sensor while densitometer can be used as the moisture sensor to detect moisture contents of soil showed in Figure (2). These sensors are installed in the ground at required depth. Once the soil has reached desired moisture level the sensors send a signal to the micro controller to turn off the relays, which control the valves of surface drip irrigation systems used.

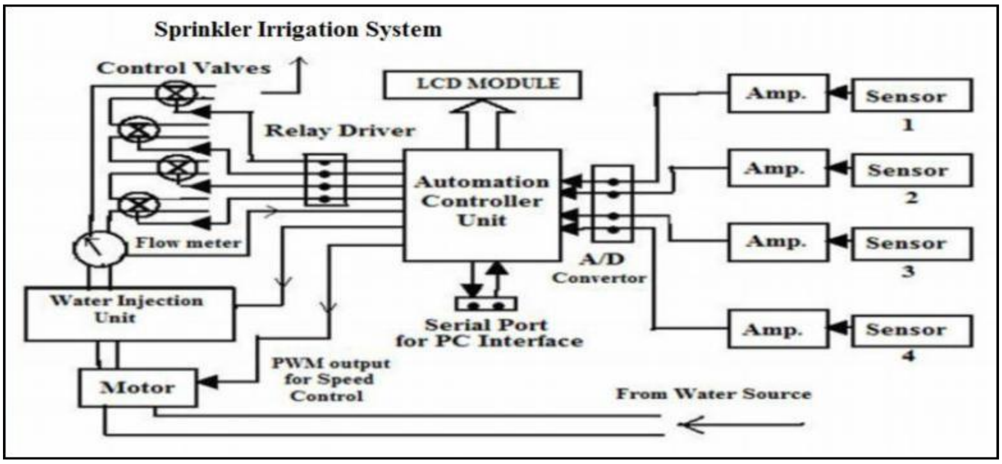

Fig.(1) Layout of Automation sprinkler irrigation system

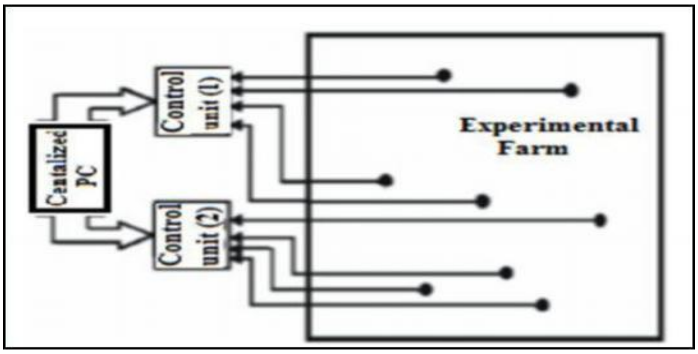

Fig.(2) Application of control unit for automation sprinkler irrigation ystem

Fertilizers was added as urea (46.5 %N) at two equal doses, the first was applied before the first irrigation and the second one was added Three weeks later Phosphorus as(100kg) mono-calcium superphosphate (15.5% P2O5) and potassium as (100kg) potassium sulfate (48% K2O) being added after Seed sowing and before irrigation. Ten spikes were taken at random from each plot at harvest , then the averages of the number of grains / spike and grains weight/spike were determined .This character was measured after heading by using a woody frame of one square meter which put at random on the plants of each plot and the internal fertile spikes were counted and recorded. Samples have been collected at random from grain yield of each plot and then 1000-grain was counted and weighted. Plants in each plot were harvested, and then weigh as a total yield. The harvested plants were threshed and the grains of each plot were collected and weighed. The grain yield was expressed as ardab/fed. (ardab =150 kg) .This was calculated by subtracting the grain yield from the total yield and converted to ton/fed. Data measurements: Grain samples harvested were taken from of each plot, from each of which a subsample was analyzed for protein concentration using a Unity Scientific at (Agricultural Research Center), Unity Scientific, with protein recorded on a dry matter basis. Test weight was measured at harvest in 2012/2013 and 2013/2014 using harvested grain yield.

Test weights in this study have a caveat: readings were taken on a wide range of moisture contents; conversion to standard test weight depends on the physical characteristics of the grain staying the same at higher moistures. Using moisture content to standardize test weights should give a reasonable estimate, however[24]. Comparison of the test weight measurements taken by the grain measurement equipment on the combine against the levels found from manual analysis diverged more for readings taken at higher moisture contents. Test weight and moisture measurements were performed on grain that was not completely clean of chaff; although the test weight given was the average of a number of samples (depends on yield, but usually at least seven), a sample of a variety that contained chaff could have a lower test weight compared to other varieties with similar treatment but threshed and cleaned better.

For quality analysis, grain samples were machined and hand cleaned to ensure complete removal of foreign materials and broken kernels. Cleaned samples were analyzed for moisture and protein content using the ISI scan analysis package (Infra-Soft International, State College, PA) for the Foss near-infrared analyzer (FOSS NIR Systems, Laurel, MD). Protein percentages are reported at 100 g kg–1 moisture content. Nanopure water was added and mixed with grain samples to make final moisture content of 150 g kg–1. After 18 h of tempering (water and grain mixing), either 600 g (2007) or 500 g of tempered samples was milled following[25]. Milled samples were weighed and sieved through a 0.25-mm sieve.

Farinograph analysis was conducted in a 50-g dough bowl, using the constant dough method of[26] Flour moisture and protein were measured using the near-infrared reflectance method of[27,28]. Water absorbance was determined based on the moisture content of the flour and the amount of water added to optimize the dough (discussed below). Water absorbance values are reported on a 14% moisture basis. The temperature of farinograph was maintained at 30°C.For each sample, the arrival time, peak time, water absorption, departure time, stability, mixing tolerance index (MTI), breakdown time, and 20-min drop values were determined (Fig. 1). The arrival time is the period of time (in min) from adding water to the top of the curve touches the 500 Brabender units (BU) line and indicates the flour hydration time. The peak time is the time interval (to the nearest 0.5 min) from the first addition of water until the curve reaches its maximum height[29].Peak time measures the length of time required to reach a maximum consistency[30]. If the height of the curve during peak time was not within the 500 ± 20 BU interval, the sample was mixed with a different flour/water ratio and rerun. A new ratio was determined based on the difference in water absorbance for the previous run. If the peak time occurred when the height of the curve was within the range (500 ± 20 BU), this time and the BU line were used for other calculations. Protein characterization was conducted on milled wheat samples from the 0 and recommended N rate treatments using high pressure liquid chromatography (Waters Corp., Milford, MA). Wet and dry gluten contents were determined with a hand-washing method according to[31]. The relative concentrations of glutenin and gliadin were determined following the techniques of[32], whereas the HMW-GS and LMW-GS contents were determined following the techniques of Fu and[33].Each analysis was done in duplicate.

Fig.(3) Showing Farinograph device for estimating dough quality parameters. 1- A flour, 2-Sample of 50 or 300 grams on a 14 percent moisture basis is weighed and placed into the corresponding farinograph mixing bowl., 3- Water from a buret is added to the flour and mixed to form a dough., 4- As the dough is mixed, the Farinograph records a curve on graph paper., 5- The amount of water added (absorption) affects the position of the curve on the graph paper. Less water increases dough consistency and moves the curve upward., 6- The curve is centered on the 500-Brabender unit (BU) line 20 BU by adding the appropriate amount of water and is run until the curve leaves the 500-BU line.

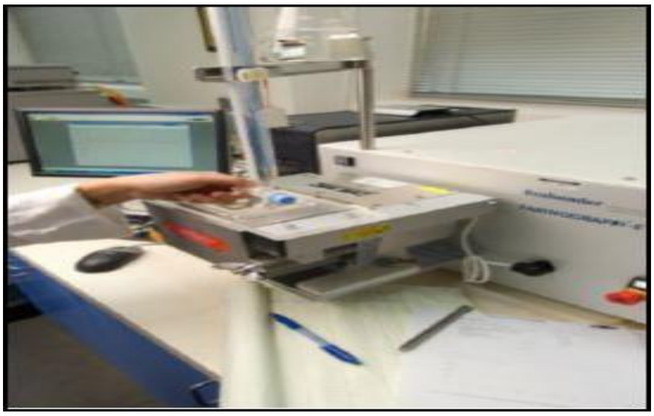

Fig. (3) Farinograph mixer and apparatus (St. Paul, 2000.)

The Farinograph test measures and records the resistance of a dough to mixing with paddles.1- Absorption is the amount of water required to center the Farinograph curve of the 500-Brabender unit (BU) line. This relates to the amount of water needed for a flour to be optimally processed into end products. Absorption is expressed as a percentage.,2- Peak Time indicates dough development time, beginning the moment water is added until the dough reaches maximum consistency. This gives an indication of optimum mixing time under standardized conditions. Peak time is expressed in minutes.,3- Arrival Time is the time when the top of the curve touches the 500-BU line. This indicates the rate of flour hydration (the rate at which the water is taken up by the flour). Arrival time is expressed in minutes.,4- Departure Time is the time when the top of the curve leaves the 500-BU line This indicates the time when the dough is beginning to break down and is an indication of dough consistency during processing. Departure time is expressed in minutes.,5- Stability Time is the difference in time between arrival time and departure time. This indicates the time the dough maintains maximum consistency and is a good indication of dough strength. Stability time is expressed in minutes., and 6- Mixing Tolerance Index (MTI) is the difference in BU value at the top of the curve at peak time and the value at the top of the curve 5 minutes after the peak. This indicates the degree of softening during mixing. The mixing tolerance index is expressed in Brabender units (BU).Weak gluten flour has a lower water absorption and shorter stability time than strong gluten flour.

The data were subjected to the proper statistical analysis of variance according to[34] Significance of difference among means was compared using least Significant Differences (L.S.D) at the 0.05 level of significance.

Results and Discussion

Effect of Water Amount (FC) levels and wheat varieties on growth, yield and yield components:

Data in Table (2) Illustrate that under automation controller sprinkler irrigation system, the effect of different three filed capacities 100, 75 and 50 % FC on a number of spikes/m^2on the first and second seasons 2012/2013 and 2013/2014, respectively. Regarding Water Amount (FC) levels, means values of the number of spikes/m^2, It could be ranked in the following ascending order: 100<75<50.According to a number of spikes/m^2, the effect of Water Amount (FC) levels on all studied characters there are significant differences at the 5 % level between all values of characters. Regarding to the number of spikes/m^2, gradually increases were detected by increasing Water Amount (FC) levels, where application of 50 % FC achieved the maximum number of spikes/m^2 (408, 411 spikes/m^2) in the first and second season, respectively. Table (2) Showing that the high number of spikes/m^2 of variety Sids 12 significantly exceeded at 5 % level. According to wheat varieties, means values of the number of spikes/m^2, It could be ranked in the following ascending order: Gemmeza 11 < Gemmeza 7 < Giza 168 < Sids 12, respectively.

The results of varieties (Giza 168, Gemmeza 7 and Gemmeza 11) where it gave the highest number of spikes/m2 (404, 398, 389; 407, 402, 394 spikes/m^2) in first and second seasons, respectively. The interaction between Water Amount (FC) levels and wheat varieties had a significant effect on the number of spikes/m2 and the maximum number of spikes/m^2 (411, 414 spikes/m^2) were obtained by Sids 12 wheat variety applied by 50% FC. The increasing in the number of spikes/m^2 might be due to the role of Water Amount (FC) in stimulating the merited acting and cell elongation of the plant. These results could be attributed to increasing seed yield per feddan and the important role of Water Amount (FC) on amino acid structure. Data in Table (2) Show the effect of three filed capacities 100, 75 and 50% FC on 1000 kernel weight (g) in the first and second seasons 2012/2013 and 2013/2014, respectively. Regarding to Water Amount (FC) levels, means values of 1000 kernel weight (g), it could arrange in the following ascending order: 100<75<50.According to 1000 kernel weight (g), the effect of Water Amount (FC) levels and wheat varieties on all studied characters, there are significant differences at the 5 % level between all values of characters. Regarding to 1000 kernel weight (g), increases gradually were detected by increasing Water Amount (FC) levels, where application of 50 % achieved the maximum 1000 kernel weight (g) (41.45, 43.70 g) in the first and second season, respectively. Table (1) Showing that the high 1000 kernel weight (g) variety Sids 12 significantly exceeded at 5 % level. Regarding to wheat varieties, means values of 1000 kernel weight (g), it could arrange in the following ascending order: Gemmeza 11 < Gemmeza 7 < Giza 168 < Sids 12.The results of varieties (Giza 168, Gemmeza 7 and Gemmeza 11) it gave the highest 1000 kernel weight (g) (42.72, 44.91 g) in first and second seasons, respectively. The interaction between Water Amount (FC) levels and wheat varieties had significant effect on 1000 kernel weight (g) and the maximum number of 1000 kernel weight (g) (45.90, 48.85 g) were obtained by Sids 12 wheat variety fertilized by 50% FC.

Data in Table (2) Illustrate that the effect of three FC (100, 75 and 50 %) on Total yield (grain + straw) (ton/fed) in the first and second seasons 2012/2013 and 2013/2014, respectively. Regarding to Water Amount (FC) levels, means values of Total yield (ton/fed), It could arrange in the following ascending order: 100 <75<50.According to Total yield (ton/fed), the effect of Water Amount (FC) levels on all studied characters there is significant differences at the 5 % level between all values of characters. Regarding to Total yield (ton/fed), gradually increases were detected by increasing Water Amount (FC) levels, where application of 50% FC achieved the maximum Total yield (ton/fed) (4.44, 4.57 ton/fed) in the first and second season, respectively.

Table (2) Showing that the high Total yield (grain + straw) (ton/fed) variety Sids 12 significantly exceeded at 5 % level. Regarding to wheat varieties, means values of Total yield (ton/fed), It could arrange in the following ascending order: Gemmeza 11 <Gemmeza 7 < Giza 168 < Sids 12.The results of varieties (Giza 168, Gemmeza 7 and Gemmeza 11) where it gave the highest Total yield (ton/fed) (5.01, 5.80 ton/fed) in first and second seasons, respectively. The interaction between Water Amount (FC) levels and wheat varieties had a significant effect on Total yield (ton/fed) and the maximum Total yield (ton/fed) (5.68, 6.17 ton/fed) were obtained from Sids 12 wheat variety applied with 50 % FC.

Data in Table (2) Indicated that the effect of three Water Amount (FC) levels 50, 75, 100 % FC on Moisture in grain at harvest (%) in the first and second seasons 2012/2013 and 2013/2014, respectively. Regarding to Water Amount (FC) levels, means values of Moisture in grain at harvest (%), It could arrange in the following ascending order: 100 <75<50.According to Moisture in grain at harvest (%), the effect of Water Amount (FC) levels and wheat varieties on all studied characters there is significant differences at the 5 % level between all values of characters. Regarding to Moisture in grain at harvest (%), gradually increases were detected by increasing Water Amount (FC) levels, where application of 50% FC achieved the maximum Moisture in grain at harvest (%) (9.50, 10.06 %) in the first and second season, respectively. Table (2) Showing that the high Moisture in grain at harvest (%) variety Sids 12 significantly exceeded at 5 % level. Regarding to wheat varieties, means values of Moisture in grain at harvest (%), It could arrange in the following ascending order: Gemmeza 11 <Gemmeza 7 < Giza 168 < Sids 12.The results of varieties (Giza 168, Gemmeza 7 and Gemmeza 11) where it gave the highest Moisture in grain at harvest (%) (10.20, 10.24 %) in first and second seasons, respectively.

The interaction between Water Amount (FC) levels and wheat varieties had significant effect on Moisture in grain at harvest (%) and the maximum number of Moisture in grain at harvest (%) (12.22, 12.51 %) was obtained by Sids 12 wheat variety fertilized by 100 kg/fed. Table (2) Illustrate that the effect of three Water Amount (FC) levels (60, 90 and 100 kg N/Fed) on Grain yield (Ard/fed) in the first and second seasons 2012/2013 and 2013/2014. Regarding to Water Amount (FC) levels, means values of Grain yield (Ard/fed), It could arrange in the following ascending order: 100 <75<50. According to Grain yield (Ard/fed), the effect of Water Amount (FC) levels on all studied characters there is significant differences at the 5 % level between all values of characters. Regarding to Grain yield (Ard/fed), gradually increases were detected by increasing Water Amount (FC) levels, where application of 50% FC achieved the maximum Grain yield (Ard/fed) (24.81, 26.37 Ard/fed) in the first and second season, respectively. Table (2) Showing that the high Grain yield (Ard/fed) variety Sids 12 significantly exceeded at 5 % level. The results of varieties (Giza 168, Gemmeza 7 and Gemmeza 11) were it gave the highest Grain yield (Ard/fed) (27.02, 29.10Ard. fed) in first and second seasons, respectively. Regarding to wheat varities, means values of Grain yield (Ard/fed). It could arrange in the following ascending order: Gemmeza 11 <Gemmeza 7 < Giza 168 < Sids 12, respectively. The interaction between Water Amount (FC) levels and wheat varieties had a significant effect on Grain yield (Ard/fed) and the maximum number of Grain yield (Ard/fed) (28.92, 30.28 Ard/fed) were obtained from Sids 12 wheat variety irrigated with 50 % FC treatment.

Effect of water applied amounts and wheat varieties on wheat yield quality:

Results in Table (3) illustrate that the effect of three water amounts (50, 75 and 100 % FC) on wheat yield quality parameters as following: % net flour, % of grain protein, % of fat, and % total sugar in flour in the first season 2012/2013. Regarding Water Amount (FC) levels, means values of % net flour, % of grain protein, % of fat, % total sugar and % wet gluten in flour and % dry gluten in flour, It could arrange in the following ascending order: 50<75< 100. Results in Tables (3) illustrate that the effect of wheat varieties (Sids 12, Giza 168, Gemmeza 7 and Gemmeza 11) on wheat yield quality parameters as following: % net flour, % of grain protein, % of fat, and % total sugar in flour in the first season 2012/2013. In respect to wheat varieties, % net flour% of fat and % total sugar could be arrange in the following descending order: Sids 12 > Giza 168 >Gemmeza 7 and > Gemmeza 11 . While % grain protein, % wet gluten in flour and % dry gluten in flour could be arrange in the following ascending order: Sids 12 < Giza 168 <Gemmeza 7 and <Gemmeza 11 .

In the first season 2012/2013, the maximum values in (% net flour, % of grain protein, % of fat, and % total sugar in flour) in the first season 2012/2013 were (75.69, 13.25, 3.24, and 1.35 %) were recorded under interactions of (100 X Sids 12, 100 X Gemmeza 11 , 100 X Sids 12, 100 X Sids 12, 100 X Gemmeza 11 and 100 X Gemmeza 11), respectively. Whereas the minimum values were (68.15, 8.03, 1.52, and 0.51 %) were recorded under interactions of (60 X Gemmeza 11, 60 X Sids 12, 60 X Gemmeza 11, 60 X Gemmeza 11, 60 X Sids 12 and 60 X Sids 12), respectively. Concerning the effect of Water Amount (FC) levels and wheat varieties on % net flour, % of grain protein, % of fat, and % total sugar in flour, there were significant differences at the 5 % level at all interactions. According to LSD 0.05 values of % net flour, % of grain protein, % of fat, and % total sugar in flour in the first season 2012/2013, the effect of Water Amount (FC) levels and wheat varieties on all, there are significant differences at the 5 % level between all values. Data in Table (3) showing that the effect of three Water Amount (FC) levels mentioned above on wheat yield quality parameters as follows: % net flour, % of grain protein, % of fat, and % total sugar in flour in the second season 2013/2014.

Table (2). Effect of water amounts (FC) levels and wheat varities on growth, yield and yield components through two growing seasons (2012/2013) and (2013/2014).

Water amounts (FC %)	Wheat varieties	Number of spikes/m^2		1000 kernel weight (g)		Total yield (Grain+Straw)(ton/fed)		%Moisture in grain at harvest		Grain yield (Ard/Fed.)	
		2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014
100	Sids 12	399	404	39.12	41.47	4.81	6.01	10.81	10.46	23.62	25.95
	Giza 168	394	398	36.81	38.62	4.32	4.49	9.64	9.94	20.81	21.76
	Gemmeza 7	382	388	33.32	35.52	3.72	3.99	9.03	9.47	18.90	20.91
	Gemmeza 11	364	375	28.95	30.60	2.92	3.11	8.81	8.81	16.87	17.77
Mean		385	391	34.55	36.55	3.94	4.40	9.58	9.67	20.05	21.60
75	Sids 12	404	406	43.15	44.40	5.74	6.40	10.78	10.95	25.72	28.26
	Giza 168	398	402	40.12	42.80	4.90	5.32	9.88	10.93	21.61	23.14
	Gemmeza 7	389	393	38.67	39.81	4.61	5.09	9.35	9.82	21.44	22.75
	Gemmeza 11	370	375	31.23	33.60	3.85	4.63	9.01	9.67	19.51	20.30
Mean		390	394	38.29	40.15	4.77	5.36	9.76	10.34	22.07	23.61
50	Sids 12	408	411	45.90	48.85	6.28	6.77	10.82	11.11	27.52	28.88
	Giza 168	402	407	42.72	45.76	5.17	5.77	9.83	11.06	22.89	25.56
	Gemmeza 7	395	401	42.14	43.52	4.37	5.12	9.49	10.85	23.22	24.47
	Gemmeza 11	376	381	35.05	36.61	4.34	3.01	9.42	9.62	20.01	20.96
Mean		395	400	41.45	43.70	5.04	5.17	10.10	10.66	23.41	24.97
Mean	Sids 12	404	407	42.72	44.91	5.61	6.40	10.80	10.84	25.62	27.70
	Giza 168	398	402	39.90	42.39	4.80	5.19	9.78	10.64	21.77	23.49
	Gemmeza 7	389	394	38.04	39.62	4.07	4.74	9.29	10.04	21.19	22.71
	Gemmeza 11	370	377	31.74	33.60	3.70	3.58	9.08	9.38	18.80	19.68
$LSD_{0.05}$ for Water Amount (FC) Means		4.46	2.19	2.13	2.12	0.63	1.36	0.03	0.23	1.21	1.34
$LSD_{0.05}$ for Wheat varieties		3.14	1.1	0.67	0.86	0.2	0.3	0	0.07	0.34	0.46
$LSD_{0.05}$ for Interaction		5.38	3.68	0.99	2.44	0.46	0.52	-0.08	-0.08	0.89	0.52

Table (3). Effect of water amounts (FC%) levels and wheat varities on grain quality through two growing seasons (2012/2013) and (2013/2014).

Water amount FC (%)	Wheat Varieties	% of net flour Season		% of grain protein Season		% of fat Season		% of total sugar Season	
		2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014	2012/2013	2013/2014
100	Sids 12	69.85	70.78	7.36	8.76	1.45	1.89	0.63	0.90
	Giza 168	69.85	70.78	7.36	8.76	1.45	1.89	0.63	0.90
	Gemmeza 7	68.52	69.52	10.22	11.45	1.39	1.61	0.39	0.72
	Gemmeza 11	69.85	70.78	7.36	8.76	1.45	1.89	0.63	0.90
Mean		69.03	70.32	8.81	10.06	1.42	1.83	0.49	0.82
75	Sids 12	72.55	73.89	8.45	9.56	1.88	2.71	0.99	1.18
	Giza 168	71.62	72.78	8.56	9.94	1.80	2.39	0.90	1.01
	Gemmeza 7	70.56	71.44	11.65	12.79	1.57	1.87	0.47	0.84
	Gemmeza 11	72.55	73.89	8.45	9.56	1.88	2.71	0.99	1.18
Mean		71.03	72.27	10.11	11.37	1.66	2.16	0.70	0.92
50	Sids 12	74.89	75.78	9.27	10.45	2.99	3.53	1.10	1.51
	Giza 168	73.26	74.34	9.46	11.07	2.79	3.03	1.02	1.38
	Gemmeza 7	72.44	73.25	12.34	13.56	2.43	2.64	0.93	1.22
	Gemmeza 11	74.89	75.78	9.27	10.45	2.99	3.53	1.10	1.51
Mean		73.03	74.06	10.88	12.28	2.56	2.86	0.91	1.27
Mean	Sids 12	72.62	73.84	8.32	9.45	2.14	2.86	0.92	1.24
	Giza 168	71.58	72.63	8.46	9.92	2.01	2.44	0.85	1.10
	Gemmeza 7	70.51	71.40	11.40	12.60	1.80	2.04	0.60	0.93
	Gemmeza 11	72.62	73.84	8.32	9.45	2.14	2.86	0.92	1.24
LSD0.05 for Water Amount (FC %) Means		1.12	1.13	0.41	0.75	0.13	0.16	0.05	1.12
$LSD_{0.05}$ for Varities Means		0.41	0.64	0.05	0.19	0.04	0.03	0.04	0.41
$LSD_{0.05}$ for Interaction		1.31	0.99	0.91	1.09	0.01	0.07	0.01	1.31

One can notice that the data of wheat quality in second season took the same trend of first season but with increasing values. Regarding main factor Water Amount (FC) levels, means values of % net flour, % of grain protein, % of fat, and % total sugar in flour, It could arrange in the following ascending order: 60 < 90 < 100.

Data in Table (3) showing that the effect of four wheat varieties mentioned above on wheat yield, quality parameters as follows: % net flour, % of grain protein, % of fat, and % total sugar in flour in the second season 2012/2013.In respect to wheat varieties, % net flour% of fat and % total sugar could be arrange in the following descending order: Sids 12 > Giza 168 > Gemmeza 7 > Gemmeza 11. While % grain protein, % wet gluten in flour and % dry gluten in flour could be arrange in the following ascending order: Sids 12 < Giza 168 <Gemmeza 7 <Gemmeza 11 .

In Table (3), Regarding % net flour, gradually increases were indicated by decreasing water amount, where application of 50 % FC achieved the maximum % net flour, (73.83 and 74.86 %) in the first and second seasons, respectively. The high of % net flour, variety Sids 12 significantly exceeded the results of verities (Giza 168, Gemmeza 7 , and Gemmeza 11) were it produced the highest % net flour (73.42 and 74.64 %) in first and second season, respectively. The interaction between Water Amount (FC) levels and wheat varieties had significant effect on % net flour and the maximum values of % net flour (75.69 and 76.58 %) were obtained by Sids 12 wheat variety irrigated by FC. In respect of % of grain protein, increases gradually were noticed by increasing Water Amount (FC) levels, where application of 50% FC achieved the maximum % of grain protein, (11.86 and 13.08 %) in the first and second seasons, respectively. The high of % of grain protein, variety Sids 12 significantly exceeded the results of verities (Giza 168, Gemmeza 7 , and Gemmeza 11) were it produced the highest % of grain protein (9.12 and 10.25 %) in first and second season, respectively.

The interaction between Water Amount (FC) levels and wheat varieties had significant effect on % of grain protein and the maximum values of % of grain protein (10.07 and 11.25 %) were obtained by Sids 12 wheat variety irrigated by 50 %FC. The increasing of proteins percentage with increasing Water Amount (FC) levels may be due to Water Amount (FC) element in formation of amino acid structure. From Table (3) regarding LSD 0.05 of % net flour, % of grain protein, % of fat, and % total sugar in flour in the second season 2012/2013, the effect of Water Amount (FC) levels and wheat varieties on all, there are significant differences at the 5 % level between all values. Concerning the effect of Water Amount (FC) levels and wheat varieties on % net flour, % of grain protein, % of fat, and % total sugar in flour, there were significant differences at the 5 % level at all interactions. The increasing of quality parameters with increasing Water Amount (FC) levels may be due to Water Amount (FC) element in formation of amino acid structure. In the second season 2013/2014, the maximum values in (% net flour, % of grain protein, % of fat, and % total sugar in flour) in the first season 2012/2013 had (76.58, 14.82, 3.78, and 1.76 %) were recorded under interactions of (50% FC X Sids 12, 50% FC X Gemmeza 11 , 50% FC X Sids 12, 50% FC X Sids 12, 50% FC X Gemmeza 11 and 50% FC X Gemmeza 11), respectively. Whereas the minimum values were recorded (69.93, 9.15, 1.75, and 0.86 %) under interactions of (100% FC X Gemmeza 11 , 100% FC X Sids 12, 100% FC X Gemmeza 11 , 100% FC X Gemmeza 11 , 100% FC X Sids 12 and 100% FC X Sids 12), respectively.

In Table (3), it is notice that (% net flour, % of grain protein, % of fat, % total sugar and % wet gluten in flour and % dry gluten in flour), Water Amount (FC) increased by (1.8, 11.5, 19.7;30.8, %), (1.7, 10.4, 20.7; 18.8 %) and (1.4, 10.7, 9.6, 32.7; %), respectively in second season relative to first season. On contrast (% net flour, % of grain protein, % of fat, and % total sugar in flour), under Sids 12, Giza 168, Gemmeza 7 and Gemmeza 11 varieties increased by (1.6, 11.0, 23.2; 21.5%), (1.4, 13.6, 16.0; 18.5 %), (1.2, 8.9, 10.5; 2.8 %) and (2.1, 10.2, 11.7; 38.2 %), respectively in second season relative to first season. The increasing of quality parameters with increasing Water Amount (FC) levels may be due to Water Amount (FC) element in formation of amino acid structure. Results agreed and supported with[35-38].

Conclusion

This research article studied the using of automation controller for sprinkler irrigation system and shown that it's very important for saving water, Yield and yield components as follows: Grain yield, 1000 kernel weight and moisture in grain at harvest under (60 Kg/fed), (90 Kg/fed) and (100 Kg/fed) Water Amount (FC) were increased by (6.7, 5.0; 0.8 %), (6.2, 4.3; 4.9 %) and (5.9, 4.8; 4.6 %), respectively in second season relative to the first season. On the other hand, under Sids 12, Giza 168, Gemmeza 7 and Gemmeza 11 :grain yield, 1000 kernel weight and moisture in grain at harvest varieties increased by (7.1, 4.5; 0.3), (6.9, 5.5; 7.1), (6.3, 3.7; 6.5) and (4.2, 5.1; 2.8), respectively in the second season relative to the first season. Quality parameters % net flour, % of grain protein, % fat, and % total sugar in flour), Water amount (FC) were increased by (1.8, 11.5, 19.7; 30.8 %), (1.7, 10.4, 20.7; 18.8 %) and (1.4, 10.7, 9.6; 32.7 %), respectively in the second season relative to first season. From data and discussions mentioned above, It could be concluded that: Although 50 % water applied treatment gave the highest values but it was less in the significant differences between results values, so that for best grain yield and quality production purpose using applied water 75 and 100 % with variety of Sids 12 and 94. While for better flour quality, we can recommend using 50 or 75 % applied water but with verity of Giza 168 and Gemmeza 7.

References

1. Kumar, A., Sharma, D.K., Sharma, H.C., 1995. Response of wheat (Triticum aestivum) to irrigation and Water Amount (FC) in sodic soils. Indian Journal of Agronomy 40, 38–42.
2. Pal, S.K., Verma, U.N., Thakur, R., Singh, M.K., Upasani, R.R., 2000. Dry matter artitioning of late sown wheat under different irrigation schedules. Indian Journal of Agricultural Sciences 70, 831–834.
3. Pandey, D.S., Kumar, D., Misra, R.D., Prakash, A., Gupta, V.K., 1997. An integrated approach of irrigation and management to reduce lodging in wheat (Triticum aestivum). Indian Journal of Agronomy 42, 86–89.
4. Shivani, Verma, U.N., Kumar, S., Pal, S.K., Thakur, R., 2003. Growth analysis of wheat (Triticum aestivum) varities under different seeding dates and irrigation levels in Jharkhand. Indian Journal of Agronomy 48, 282–286.
5. Mishra, B., Shoran, J., Chatrath, R., Chatrath, A.K., Sharma, R.K., Gupta, R.K., Singh,R., Rane, J., Kumar, A., 2005. Cost Effective and Sustainable Wheat Production Technologies. Directorate of Wheat Research, pp. 36 (Karnal-132001, Technical Bulletin No. 8).
6. Ragab, R. A. 1983. The effect of sprinkler intensity and energy of falling drops on soil surface sealing. Soil Sci. 136(2): 117–123.
7. Tarchitzky, J., Banin, A., Morin, J. and Chen, Y. 1984. Nature, formation and effects of soil crusts formed by water drop impact. Geoderma. 33: 135–155.
8. 8- Adeoye, K. B. 1986. Physical changes induced by rainfall in the surface layer of an Alfisol, northern Nigeria. Geoderma. 39: 59–66.
9. Panini, T., Torri, D., Pellegrini, S., Pagliai, M. and Salvador Sanchis, M. P. 1997. A theoretical approach to soil porosity and sealing development using simulated rainstorms. Catena. 31: 199–218.
10. Sun, Z. Q., Kang, Y. H. and Jiang, S. F. 2008. Effects of water application intensity, drop size and water application amount on the characteristics of topsoil pores under sprinkler irrigation. Agr. Water Manage. 95: 869–876.
11. Li, J. and Rao, M. 2000. Sprinkler water distributions as affected by winter wheat canopy. Irrigation Sci. 20: 29–35.
12. Lamm, F. R. and Manges, H. L. 2000. Partitioning of sprinkler irrigation water by a corn canopy. Trans. Am. Soc. Agr. Eng. 43: 909–918.
13. Kang, Y. H., Wang, Q. G. and Liu, H. J. 2005. Winter wheat canopy interception and its influence factors under sprinkler irrigation. Agr. Water Manage. 74: 189–199.

14. Cousin, I., Issa, O. M. and Bissonnais, Y. L. 2005. Microgeometrical characterisation and percolation threshold evolution of a soil crust under rainfall. Catena. 62: 173–188.
15. Leij, F. J., Ghezzehei, T. A. and Or, D. 2002. Modeling the dynamics of the soil pore-size distribution. Soil Till. Res. 64: 61–78.
16. Cameira, M. R., Fernando, R. M. and Pereira, L. S. 2003. Soil macropore dynamics affected by tillage and irrigation for a silty loam alluvial soil in southern Portugal. Soil Till. Res. 70: 131–140.
17. Mirzaei, M. and Das, D. B. 2007. Dynamic effects in capillary pressure-saturations relationships for tow-phase flow in 3Dporous media: Implications of micro-heterogeneities. Chem. Eng. Sci. 62: 1927– 1947.
18. Sharma, B.R., Minhas, P.S., 2005. Strategies for managing saline/alkali waters for sustainable agricultural production in South Asia. Agric. Water Manage. 78, 136–151.
19. Singh, H.P., Kaushish, S.P., Kumar, A., 2000. Micro-irrigation. In: Proceedings of the International Conference on Micro and Sprikler Irrigation Systems, 2000, Central Board of Irrigation and Power, New Delhi, February 8–10, p. 794.
20. Maas, E.V., Grattan, S.R., 1999. Crop yields as affected by salinity. In: Skaggs, R.W., van Shilfgaarde, J. (Eds.), Agricultural Drainage. Agron. Monog. 38, ASA, CSSA. SSSA, Madison, Wisconsin, pp. 55– 108.
21. Levy, Y., Columbus, D., Sadan, D., 1999. Trickle linear gradient for assessment of the salt tolerance of citrus rootstocks in the orchard. Irrig. Sci. 18, 181–184.
22. Klute, A. 1986. Water retention: Laboratory methods. In A. Klute (ed.), Methods of Soil Analysi, Part1, Physical and mineralogical methods. 635-662, 9 ASA and SSSA, Madison, WI.
23. Rebecca, B. 2004. Soil Survey Laboratory Methods Manual. Soil Syrvey Investigations Report No. 42 Natural Resources Conservation Services.
24. Hellevang, Kenneth J. (1995). AE-905: Grain Moisture Content Effects and Management. http://www.ag.ndsu.edu/pubs/plantsci/crops/ae905w.htm (Accessed 2 September 2011).
25. AACC International. (2011a). Method 26-50.01: Brabender Quadrumat Jr. (Quadruplex) method. In Approved methods of the American Association of Cereal Chemists. 11th ed. Am. Assoc. Cereal Chem., St. Paul, MN.
26. AACC International.(2011b). Method 54-21.01: Farinograph method for flour. In Approved methods of the American Association of Cereal Chemists. 11th ed. Am. Assoc. Cereal Chem., St. Paul, MN.
27. AACC International.(2011c). Method 39-10.01: Near-infrared reflectance method for protein determination in small grains. In Approved methods of the American Association of Cereal Chemists. 11th ed. Am. Assoc. Cereal Chem., St. Paul, MN.
28. AACC International.(2011d). Method 39-11.01: Near-infrared reflectance method for protein determination in wheat flour. In Approved methods of the American Association of Cereal Chemists. 11th ed. Am. Assoc. Cereal Chem., St. Paul, MN.
29. Shuey, W.C. 1997. Interpretation of the farinogram. p. 31–32. In B.L. Appolnia and W.H. Kunerth (ed.) The farinograph handbook. 3rd ed. Am. Assoc. Cereal Chem., St. Paul, MN.
30. Bloksma, A.H., and W. Bushuk. 1988. Rheology and chemistry of dough. p. 131–217. In Y. Pomeranz (ed.) Wheat: Chemistry and technology. Am. Assoc. Cereal Chem., St.
31. Sarker, M.Z.I., H. Yamauchi, S.J. Kim, C. Matsumura-Endo, S. Takigawa, N. Hashimoto, and T. Noda. (2008). A farinograph study on dough characteristics of mixtures of wheat fl our and potato starches from different varities. Food Sci. Technol. Res. 14:211–216. doi:10.3136/fstr.14.211
32. Sissons, M.J., N. Ames, R.A. Hare, and J.M. Clarke. (2005). Relationship between glutenin subunit composition and gluten strength measurements in durum wheat. J. Sci. Food Agric. 85:2445–2452. doi:10.1002/jsfa.2272
33. Sial, M.A., Dahot, M.U., Mangrio, S.M., NisaMangan, B., Arain,M.A., Naqvi, M.H., Shabana, M., (2007). Variety x environmentinteraction for grain yield of wheat varieties tested under waterstress conditions. Sci. Int. 19 (2), 133–137.
34. Snedecor, G.W. and W.G. Cochran (1980). Statistical Methods ‖ 7th Edin. Iowa State Univ. Press, Iowa, U.S.A.

35. Mansour, H. A., E.F. Abdallah, M.S. Gaballah and Cs. Gyuricza (2015). Impact of bubbler discharge and irrigation water quantity on 1- hydraulic performance evaluation and maize biomass yield. Int. J. of GEOMATE, Vol. 9, No. 2 (Sl. No. 18), pp. 1538-1544
36. Mansour, H. A., M. Abdel-Hady and Ebtisam I. El-dardiry, V. F, Bralts (2015). Performance of automatic control different localized irrigation systems and lateral lengths for: 1- emitters clogging and maize (zea mays l.) Growth and yield. Int. J. of GEOMATE, Vol. 9, No. 2 (Sl. No. 18), pp.pp. 1545-1552.
37. Mansour, H. A.1, El-Hagarey, M. E.,Saad A., Ibrahim, Ayman A. A. and Bralts, V. F. 2015. Management of Sprinkler Irrigation System and Different Egyptian Wheat Varieties for Uniformity, Yield and Water Productivity. European Journal of Academic Essays 2(6): 1-6.
38. Mansour, H. A.1,,Saad A., Ibrahim, Ayman A. A.,and El-Hagarey, M. E. 2015. Management of Sprinkler Irrigation System and Different Egyptian Wheat Varieties for Technological Quality Properties. European Journal of Academic Essays 2(6): 7-13.

*
*
*