

# Effect of Supplemental Irrigation on Vegetative Growth and Yield Properties for Two of Wheat Varieties in Erbil of Iraq

Salem A. Hassen, Ibtisam N. Hazim, Ibraheem M. Aliyas  
*Northern Technical University, Technical Institute of Mosul in Iraq*

**Abstract -** The research was conducted in Erbil region within the Kurdistan territory of Iraq in the agricultural season of 2015/2016 to study the impact of two irrigation levels were rainfall and supplemental irrigation on two wheat (*Triticum aestivum*) varieties were Semeto and Super Marx for studying vegetative growth and yield properties. Used the randomized complete block design (RCBD) with three replications. Results of the variance analysis of the varieties effect and irrigation levels on the characteristics of vegetative growth and yield showed the variety Super Marx significant differs in; plant height cm, spike length cm, at level of 0.05, also in number of spike / m<sup>2</sup>, number of seeds / spike, weight of 1000 grain at 0.01. while not significantly differs in biological and seed yield, but variety Semeto differs with variety Super Marx only in Number of tiller/plant at level 0.01 as in table(3). Showed the variety Super Marx their superior to the variety Semeto in tillers number, spike length, seeds number/spike, biological and seed yield, but not significantly differs with variety Semeto in; plant height, seeds number/spike and weight of 1000 grain. Had the supplemental irrigation significantly effect on the all traits except of tillers number/plant as in table (4). The supplemental irrigation significantly affected on the variety Semeto in all traits except the spike length and tillers number/plant, also significantly affected on the variety Super Marx in all traits except tillers number/plant. Evaluate the variety Super Marx better than variety Semeto for the highest seed yield which reached 7.4 ton / hectare as in table(5), this due to their content of a good genetically traits and the appropriate environmental factors in the region which reflected on vegetative growth and yield.

**Key words;** wheat, Supplemental irrigation, Semeto, super Marx, Erbil.

## I. INTRODUCTION

The wheat (*Triticum aestivum*) consider winter cereal crops belong to (Poaceae or Graminae) family, being planting on a widely in the world and in terms of its importance comes of consumed in first grade and representative essential pillar for food security in the world, including Iraq which suffers from shortage of food, [Kathim and Janabee, 2011], Iraq consumptive more than 3million ton/yearly by import the wheat [Khalid et al, 2006], [Marwan Z.R, 2004] expected the gap between the wheat yield product and the import the wheat will increase on 2020 to reach 3.316.751 ton. This require a Looking for varieties in high yield production of wheat is the major

importance aim for Iraqi agriculture by elicitation a new cultivars also by expanded the agricultural lands. In study on Semeto variety In Erbil ;effect of two system of plowing with and without tillage on two speed of drill equipment under semi-arid region, found Semeto without tillage was Superior to with tillage [Moulod ,2010]. In research about effect of four level of nitrogen and three level of irrigation (50%, 75%, and 100% of field capacity) in use Semeto as anew variety by comparative with Durum wheat, shown the result that increase of nitrogen with water caused increase the yield [Hassen ,2015]. In study, mentioned that the grain yield increased when field capacity increased at 50% for varieties; Sham 6, Bekal and Abaa 99, in following proportions; 68.14, 61.91 and 72.24% respectively by comparative with control (without irrigation) in depending on rainfall [Awais ,2003]. In other study mentioned that the yield of wheat grain increased from 2.61ton/ha as control in depending on rainfall to 4.61ton/ha when added 68mm as supplemental irrigation [Hassen and Thanoon ,2011]. In general form the irrigation system by using 30mm with duration one month caused increase on vegetative and yield characters. The Irrigation in semi-arid region is an important factor for crop productivity. This study focus on effect of two irrigation level on two varieties.

## II. PROBLEM VIEW

Recently increased the challenges in the world, including food security due to environmental and human factors, where countries suffer from lack of food, as in some African countries, this requires the attention of researchers to address this challenge by devising high varieties of productivity and positively adaptation with sustainable of productivity factors in agricultural crop management process as wheat, which is considered a strategic important crop which forms first degree in supply the peoples by food energy. Therefore, came the attention to this research for selection a highly productivity varieties, such as Semeto and Super Marx with the provision of appropriate conditions, such as supplemental irrigation to increase the yield per area unit of fact that the irrigation was first a limiting factor for Wheat production in Iraq

which the type of rain fed agriculture was prevailing in study region.

### III. MATERIALS AND METHODS

This study was conducted in the season of 2015/2016 of Sedan village which distance 25 km from Erbil city center in Kurdistan territory within the province of Erbil in Iraq, where clay soil, To evaluate the impact of two levels of irrigation; rainfall and supplemental irrigation on productivity of 2 Wheat varieties; Semeto, Super Marx. Prepared the experiment land by soil management equipment as; plowing, smothering and leveling. Cultivated two varieties of Wheat in 1/12 by seed rates 160 kg/hectare in rows the distance 15 cm, area of plot 25 m<sup>2</sup>, was fertilized the soil by urea fertilizer 160 kg/hectare in two stages first through planting and the second through first of March, irrigated the plots after planting then each 10 days from the beginning of March to seventh of May-2016. The varieties of Wheat were planted by using the complete randomized block design (CRBD) with three replications. The samples were taken by area 1 m<sup>2</sup> using a wooden square by dimensions 1x1 m from the middle of each plots in 1/6/2013. The data recorded for each experimental units for study following characteristics; plant height cm, spike length cm, number of seeds / spike, number of spikes /m<sup>2</sup>, weight of 1000 grain gm, biological yield Ton/hect. and seed yield Ton/hect. The data were analyzed statistically according to (CRBD) design and compared the mathematical means due to Duncan test at probability levels of 5% and 1% by depending to text book [Alrawi, 1980].

### IV. RESULTS AND DISCUSSION

Irrigation is the main limiting factor for wheat production in Iraq, that the selection of supplemental irrigation with wheat varieties due to the rain precipitation was not Sufficient watery requirements for wheat crop, particularly in stage of caryopsis filling by nutritional content where appear atrophy on the grains which reduces the productivity per area unit, where rain fall reaches in study region 543mm/y. [Meteorological Station of Erbil] that climate factors clear in Figure (1). Explain from Physical and chemical character of soil analysis in study region the texture was clay [Researches Station of Erbil] in Table (2). The aim of research how to activation the relationship between environmental factor that represented by water requirement and genetic factor by the variety and their reflection on vegetative growth & yield characters. Table (3) shows the variance analysis of the varieties and irrigation levels that the variety Super Marx significantly differs in; plant height cm, spike length cm, at level 0.05, also in spikes number /m<sup>2</sup>, seeds number / spike, weight of 1000 grain at level 0.01 and not significantly differs in

biological and seed yield, but variety Semeto significantly differs with variety Super Marx only in Number of tiller/plant at level 0.01 and not significantly differs in biological and seed yield, but variety Semeto significantly differs from variety Super Marx only in tillers Number /plant at level 0.01. Interaction shows significantly superior at 1% for biological and grain yield only, this is consistent with the reached of .Table (4) shows the superior of variety Super Marx to the variety Semeto in spike length 8.816, 6.53 cm ,tillers number 13.0, 4.67,spike number/ m<sup>2</sup> 563.33, 334.5 ,biological harvest 24.57, 12.09 ton / hec.and seeds yield 8.4, 4.74 ton/hect. respectively .But variety Super Marx not significantly differs with variety Semeto in; plant height 71.355, 71.835 cm, seeds number/spike 41.3, 39.665 and weight of 1000 grain 31.82, 30.28 gm respectively ,this is consistent with the reached of (Awais, 2003), (Muhamad 2012, (Hassan 2015) . Table(5) indicate about the interaction between two factors; shows the supplemental irrigation affected significantly on the variety Semeto in plant height 75cm,spike number/m<sup>2</sup> 249.66 ,seeds number/spike 47, seed of 1000 grain 34.62 ,biological yield 9.3 ton/hect.and seeds yield 4.01ton/hect. except the spike length and tillers number/plant, also supplemental irrigation affected significantly on the variety Super Marx in plant height 76.7,spike length 10.46cm,spikes number/m<sup>2</sup> 467.333,seeds number/spike 47.33, weight of 1000 grain 34.62 gm, biological yield 20.26 ton /hect. and seeds yield 7.4 ton/hect except of tillers number/plant, this consistent with the reached of (Hassan and Thanon 2009). Evaluates the variety Super Marx better than variety Semeto due to highest of seed yield. Conclusion that supplemental irrigation with rainfall very necessary to increase the wheat yield in area unit in the study region.

Table (1) Physical and chemical characters of soil analysis in study region

Properties	Value
Organic Matter %	7.8
E.C. ds m <sup>-1</sup>	0.7
Cation Exchange Capacity Meq.100 g.soil <sup>-1</sup>	1.4
available N (ppm)	25
available P ( ppm )	4.65
soluble K (ppm )	164
CaCO <sub>3</sub> g. Kg <sup>-1</sup> .	225
Soil texture	Value
Sand	36.3
Clay	42.3
Silt	21.4
Texture Class	clay

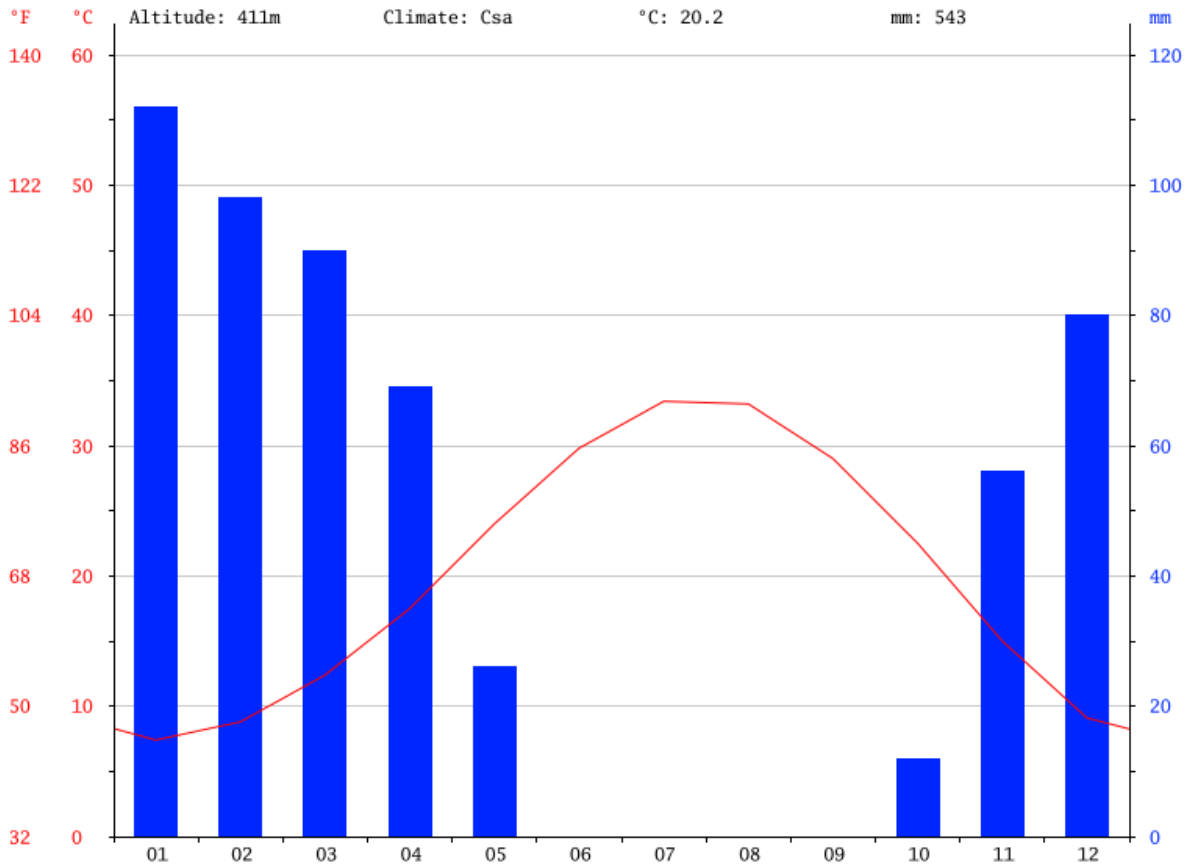


Figure (1) Monthly average of the climate factors in Erbil station in 2015/2016

Table (2) variance analysis for the impact of Wheat varieties and irrigation levels on yield and growth characters

S.O.V	Plant height Cm	Spike length cm	Number Of tillers /plant	Number of spikes/m <sup>2</sup>	Number of seed (grain) / spike	1000 grain weight	Biological harvest	Grain yield
Blocks	2.75	0.1875	1.083	44.08	44.08	7.99	**44.27	0.20
A.	0.69	*15.64	**200.08	33.33	33.33	7.05	**147.2	11.54**
B	*221.27	*16.1	4.083	**675	**675	132.66**	**176.79	47.32**
A*B	15.26	0.38	0.083	27	27	12.20	**46.80	6.12**
Error	22.53	2.645	0.583	7.88	7.88	9.59	1.2	0.34

\*And \*\*Significant at probability level (0, 05 and 0, 01) respectively

Table (3) Effect of varieties and irrigation levels in vegetative growth and yield characters of wheat plant

Verities	Plant height Cm	Spike length cm	N.Of tillers /plant	Number of spike M <sup>2</sup>	N. of grain per spike	1000 grain weight	Biological harvest	Grain yield
Semeto	a71.835	b6.53	b4.67	b 334.5	a39.665	a30.28	b12.09	b4.74
Super marx	a71.355	a8.816	a13	a 563.33	a41.3	a31.82	a24.57	a 8.4
irrig.level								
Irrig.	a75.89	a8.83	a10	a358.49	a47.166	a34.37	a14.78	a5.705
Non irrig.	b67.3	b6.51	a8.835	b180.83	b33.83	b27.72	b7.105	b1.73

Means preceded by similar letters do not differ among them at the level of probability of 0.05

Table (4) Impact of interaction between varieties and irrigation levels on vegetative and yield characters

Verities	Irrigation level	Plant height Cm	Spike length cm	Number Of tillers /plant	Number of spike M <sup>2</sup>	Number of grain per spike	1000 grain weight	Biological harvest	Grain yield
Semeto	Irrigation	ab75	b7.5	b6	b249.66	a47	a34.62	b9.3	b4.01
	Non irrigation	b68.66	b5.56	b4.67	c169.6	b32.33	c25.95	c5.57	c1.46
Super marx	Irrigation	a76.7	a10.46	a14	a467.333	a47.33	a34.62	a20.26	a7.4
	Non irrigation	b65.93	b7.46	a13	c192	b35.33	bc29.5	bc8.63	C 2.0

Means preceded by similar letters do not differ among them at the level of probability of 0.05

REFERENCES

[1] Kathim and Jana bee et al, 2011, Showing appreciation Response wheat crop in Iraq for the period 1991-2002, Journal of Iraqi agricultural sciences ,73 (5):pp., 73-79.

[2] Khalid et al, 2006, Economic and standard analysis of the cost functions on the production resources for the wheat crop in irrigational agriculture of Hawija / Kirkuk province, Journal of Tikrit, University of Agricultural Sciences, Volume (6), No (3) 2006.

[3] Marwan Z .R, 2004, measuring gap size of the self-sufficiency of wheat crop in Iraq for the period (2011-2020), Journal of Baghdad College , Economy Science, Issue No. 2014 pp., 141-152.

[4] Maulood N. ,2005, Evaluation of grain quality properties of some Iraqi and ICARDA selected durum wheat cultivars, Mesopotamia J.of Agtic.Vol.33,No1,pp.1-8.

[5] Hassen S.A, 2015, Effect of supplementary irrigation on production of three wheat crops varieties in Mosul governorate of northern Iraq, Applied irrigation science journal, Vol., 40, NO. 1,pp.,91-114.

[6] Awais et al, 2003, Water harvesting of traditional techniques to develop the drought environment, International center for agricultural researches in arid regions (ICARDA), No. 2, Elope, Syria.

[7] Hassen and Thanoon, 2011, Management of supplementary irrigation of wheat crop in Mosul region, the second conferences of Technical Education in Baghdad, pp.54-58

[8] Al-Rawi Kh. Mahmoud, 1980, "Design and analysis of agricultural experiments", Dep. of Field Crops, Faculty of Agriculture and Forestry, Mosul University, University of Mosul.

[9] Meteorological Station of Erbil, Climate factors for 2015/2016.

[10] Researches Station of Erbil, Soil analyses, 2015/2016.

[11] Mohammed Othman, 2012, COMPARATIVE STUDY OF SOME DURUM WHEAT GENOTYPES UNDER THE RAIN FED CONDITION OF DUHOK GOVERNAT, Journal Tikrit Univ. For Agri. Sci. Vol. (12) No. (4). Page 170-173.

[12] Maroof et al, 2006, Evaluation of drought resistance in some local and newly introduced cultivars of wheat to Iraqi Kurdistan on the basis of growth, yield and quality. Zanco. J. Sci. 18(1).

[13] Pashkan et al, 2010, Effect of nitrogen levels and water stress on the yield and quality of two cultivars of wheat, Vol .3, No.1, pp.180-188.