Comparative Test of Varieties of Wheat for Increase Production (*Triticumaestivum* L.)

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Submitted By

Examination Roll
Sayed Amir Ali Hall No: 09046460
Registration No: 2003
Session: 2008-2009
Examination: 2012

Plant Breding and Gene Engineering Lab.
Department of Botany
University of Rajshahi

Rajshahi-6205, Bangladesh

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DEDICATED

TO MY

BELOVED PARENTS

CERTIFICATE

This is to certify that the work presented in this dissertation entitled **"Comparative test of varieties of wheat for increase production (*Triticumaestivum*L.)"**is basedon the work carried out by the examination Roll No. 09046460 under my supervision in the Department Botany, University of Rajshahi and the Project paper is suitable for submission as to the style and contents, for the partial fulfillment of the degree of B.Sc Hon's in Botany.

(Dr. M. MonzurHossain)
Research supervisor
Department of Botany
University of Rajshahi
Rajshahi, Bangladesh.

DECLARATION

I hereby declare that all the work reported in this project entitled **"Comparative test of varieties of wheat for increase production (*Triticumaestivum*L.)"**for degree of B.Sc Hon's in Botany of University of Rajshahi, is the result of my own investigation.

....
M. Quamaruzzaman
The Candidate

ABSTRACT

In the present work varieties of wheat is BARIGom-27, Prodip and Shatabdi used for research materials are used for it.

We cultivated the varieties in three upozilla in Rajshahi named Paba, Baraigram, Patnitala in winter season after Analysisthe Data we found that Prodip is most suitable variety for the farmer.

CONTENTS

INTRODUCTION

1.1 GENERAL INFORMATION OF WHEAT

Wheat is the leading grain crop of the temperate regions of the world, Just as rice is the leading grain crop in the tropics. It is second major cereal crop in Bangladesh after ricc and is widely adopted crop as it is grown from temperate irrigated to dry and high rainfall environments.

The common wheat ('*Tritium aestivum* L.) is a hexaploid (2n=6x=42) and belongs to the family Poaceae and is a world-wide popular grain crop. The cultivated wheat *fl\ aestivum)* was originated from tetraploid emmer wheat *Trilicumdicoccum* (2n-6x=14), (diploid wheat) and *Aegilopsspeltoides.(Pochlman* and Brothakur, 1969;Purscglove, 1972).

Wheat alone contributes a larger proportion of protein and calories to human being than all other foods or cereals. The whole grain contains approximately: Water 13%; protein 11%; fat 20%;1 carbohydrate 70%; fibre 2%; ash 1.5% (Purseglove, 1972). The nutritive composition of wheat, maize and rice is shown in **Table 1.**

Table: 1. Comparative nutrition values of wheat, maize and rice (Per 100 gm of grain).

Composition	**Wheat**	**Maize**	**Rice**
Energy (K. Calorie)	346.0	342.0	346.0
Protein (gm)	11.8	111.2	73
Fats (gm)	1.5	3.6	0.6
Minerals (gm)	1.6	1.5	0.7
Fiber (gm)	1.2	2.7	0.2
Carbohydrate (mg)	71.2	66.2	77.8
Calcium (mg)	41.0	10.0	10.0
Phosphorus (mg)	355.0	348.0	143.0
Iron (mg)	4.1	2.0	3.2
Carotene (mg)	64.0	90.0	3.0
Thiamine (gm)	0.5	0.4	0.2
Riboflavin (mg)	0.09	0.1	0.1
Niacin (mg)	4.3	1.8	3.8
Moisture (mg)	12.2	14.9	13.0

Source: IFNS,University of Dhaka (year 2000)

1.2 WHEAT IN BANGLADESH

Wheat is the first alternative food after rice for our people. It gradually assumed a significant position in Bangladesh during 1968 onwards as a result of HYV wheat introduced from Mexico. The yield of wheat, however, remained low in Bangladesh in comparison to other wheat growing countries of the world. Here the average yield is only 1930 kg/ha which is lower the world average (FAO, 1987).

Table 2. Wheat area, Production and yield in Bangladesh during 2001-2005.

Year	**Area (mha)**	**Production (in ton)**	**Yield (t ha^{-1})**
2000-2001	0.773	1.673	2.16
2001-2002	0.742	1.606	2.16
2002-2003	0.706	1.506	2.13
2003-2004	0.642	1.253	1.95
2004-2005	0.558	.976	1.75
Average	0.684	1.403	2.03

Source: Bangladesh Bureau of Statistics (year 2001)

Bangladesh is a sub-tropical country. The climate of Bangladesh is favorable for wheat production during rabi season. The Optimum temperature for the growth of this crop is 10-20°C (Fischer, 1981) and it prevails during the optimum growth of period of wheat in Bangladesh. 80% of the total wheat is grown after transplanted Amon rice under short and winter between Novembers to March.

The reasons for declining wheat area and yield are as follows (Sudan, 2005).

- ❖ About 80% wheat growing area is cultivated by a single variety kanchan that is highly suscptible to foliar mainly Bipolarize leaf light (BPLB).
- ❖ Expansion of boro rice, potato and maize area where irrigation facilities are available.
- ❖ Lack in efficient irrigation.
- ❖ Lack of proper weed management practice.

1.3 NEED FOR RESEARCH

Very little work has been done in our country to develop package of improved management practices required to achieve higher yield of this but potential cereal crop. The present study was undertaken for investigation on the performance of yield and yield components of wheat under irrigated and non-irrigated conditions.

1.4 AIMS AND OBJECTIVES

Therefore, the objectives of this ingestionwere-

- ❖ To study the effect of soil moisture on growth and grain yield of wheat.
- ❖ To identify the physio-morphological character of wheat associated with yield variation under application of soil moisture.
- ❖ Find out the-suitable variety for better growth, yield and quality.

REVIEW OF LITERATURE

Robins and Domingo (1962) reported that yield depression of 10 to 35% in spring wheat was due to soil moisture stress. Reductions were greatest when stress was imposed during or after heading. They observed that the grain yield responses to nitrogen were due to largely increased head population. There appears to be no benefit in the irrigation of spring wheat prior to the boot stage unless moisture stress as indicated by wilting or curling of leaves was observed.

Campbell (1968) reported that increasing or decreasing the soil moisture stress at various stages of growth had relatively little effect on the number of floret per head, or on the mean grain weight. The main components influencing grain yield"were the number of heads per plant and the percent of seed set.

Hurd (1968) conducted an experiment to study the root growth of seven varieties of spring wheal that were grown at two levels of moisture in glass-faced boxes. He found the yield of "Thatcher" was reduced less by moisture stress than of other varieties. Root of Thatcher penetrated the soil more quickly in dry soil than in wet soil and more quickly than the

Other varieties tested at both moisture levels. When soil dried out in surface lavcry, root growth of Thatcher increased in the moist layer just below. Two lines developed for the Canadian prairies were similar to Thatcher but yielded slightly less when moisture stress was high. 'Nainari 60', 'Lemhi 53' and especially 'Koga 11', produced more roots at high levels of moisture than Thatcher but suffered more under moisture stress. 'Narion 50' was earlier and lowers yielding but suffered less from moisture stress than most varieties help to explain their yield performances at different moisture levels.

El Nadi (1969) conducted an experiment to study the differential responses of a wheat crop to water stress during different stages of its growth. Evidence was predicated to show that both the flowering phase and the stage of grain filling and maturation were more sensitive to drought than the vegetative period of growth. He observed that the yield of wheat was not reduced during the vegetative period, if the crop received favorable water regimes thereafter. Efficiency of water utilization from different water treatment was assessed. There was no relation between the protein and starch contents of the grain and the type of water treatment.

Chauhan and Tripathi (1972) conducted and experiment when 40,60 and80% of available moisture was left in 0-20 cm soil layer, of 60,90 and 120 kg N/ha and of 0,40 and 80kg $P_20$5/ha on the yield of 'Sonora 64' variety of wheat. Grain and straw yields were significantly higher under higher soil moisture regimes.

Rajput (1975) found “that continuous soil moisture stress as created by missing irrigation at late tillering and booting stages resulted in a significant reduction in grain yield of wheat as compared to 5 irrigations.

Singh and Kumar (1976) reported that grain yield of barley was significantly more when one supplemental irrigation was given at the active tillering stages than when given at the milk stage, or 2 poorly timed irrigations were given at the flag leaf stage and at the active tillering stage and the flag leaf stage gave increased yields equal to yields obtained with three irrigations. The critical periods for adequate soil moisture were from tillering stages to flag leaf stage and flag leaf stage to milk stage. The optimum water use during these two stages was 2.25-2.65 mm/day. Water use from the milk stage to harvest could be minimized to 10.03 mm/day without any adverse effect on grain yield. The water use efficiency was highest (12.8 kg/ha-mm) with one irrigation at the active tillering stage, followed by two irrigations at the active tillering and flag leaf stages (12.45 kg/ha-mm).

Chauhan and Singh (1977) conducted an experiment with 3 soil -moisture regimes, on non-malting barley on sandy-loamy soil. They observed that the dry matter accumulation in whole plant and spike increased linearly up to crop maturity, where as it decreased in leaves after flowering and in stem after the hard-dough stage. Irrigation at 40 and 60% available soil moisture depletion produced more dry matter/plant than irrigation given at 80% depletion. Soil moisture regimes did not influence much the contribution of stem, leaves and spikes to the total dry matter.

Blian and Dhama (1977) conducted an experiment to study the relative response of wheat *(Triticiiniaestivum* L. and *Triticum durum deft)*, barley *(Hordeumvulgare*) and Indian mustard *(Brassica Juncea* L) to different frequencies and timings of irrigation scheduled at different critical stages and according to the climatic needs. Dwarf aestivum ‘K 852’, dwarf durum ‘HD 4519’ and"tallaestivum ‘K 68’ wheat and yellow seeded Indian mustard ‘KI’ yielded maximum at 3 irrigations, where as the response of barley ‘Jyoti’ and black seeded Indian mustard ‘Varuna’ ceased at 2 irrigations. The relative response to increasing levels of irrigation was highest in wheat ‘K 852’ and lowest in barley. It was found advisable to irrigate wheat and barley at the critical stages and mustard according to climatic needs when only 1 or 2 irrigations are available, but when 3 irrigations are available, the 2 approaches, viz., irrigation at critical stages and irrigation according to climatic needs, appeared to be equally good. Mustard gave better returns than wheat and barley. Barley was more remunerative than wheat up to 2 irrigations, but ‘K 852’ wheat proved more remunerative than barley at 3 irrigations.

Clarke and Simpson (1978) conducted growth analysis of *Brassica napus*CV. Tower and found that both seeding rates and irrigation influenced NAR and CGR. During the ripening phase NAR increased, suggesting increased photosynthetic efficiency at that time and leaf area index reached a maximum towards the start of flowering and then declined. No evidence of distinct optimum LAI was noticed.

Mian and khan (1979) observed in Mexican wheat that irrigation played a significant effect on the grain and straw yield at 1% level of probability. The highest yields of grain and straw were obtained with three irrigations. The grain and straw yield increased with the increase of irrigation frequency. Interaction due to fertilizer placement and irrigation failed to show any significant effect on any of the plant character under observation.

Bhuiyan*el al.* (1980) studied the effects of 3 different amounts of irrigation water on yield of wheat. They found that grain yield was reduced significantly by 30.72% with 18.5 hector-centimeter (18.0 acre inches) and by 69.93% with 13.88 hectare-centimeter (13.50 acre inches) of water applied during the growth period as compared with control in which 9.25 hectare-centimeter (9.0 acre inches) of water was applied by 3 irrigations at 20.40 and 60^{lh} days after sowing. El- Zahab, *et al.* (1980) observed that LAI in *Viciafaba* developed slowly at the early period of growth and then increased rapidly. They showed significant differences in LAI due to cultivars at six sampling dates.

Nazir*el al.* (1982) studied the response of wheat to soil moisture stress at early growth stage. They found that irrigation at 30 days after sowing (DAS) gave higher yield, but irrigation at 10-20 DAS had on effect on plant height and 1000 grain weight.

Singh, *el al*Hazarika and Srivastava*el al.* (1984) reported that in loam soil at an altitude of 850m in Meghalaya, Sonalika wheat *(Triticumaeslivum* L.) gave the highest yield (39q/ha) when it received 4 irrigations, 1 each at crown root initiation, jointing, flowering and milk ' stages: 2 irrigations, either at crown root initiation flowering or jointing milk stage also gave a substantial yield (30q/ha). Water use increased with frequency of irrigation, but its efficiency was less. Stress at the tillering and anthesis significantly reduced the grain yield in 'Kalyansona' Varieties of Wheat.

The effect of irrigation at different growth stages of wheat was studied by Quayyum and kamal (1986). The results revealed that application of irrigation at the critical stages significantly increased grain yield of wheat over control. Only one irrigation at the crown root initiation stage showed the highest response to irrigation in increasing the grain yield. Two irrigations, crown root initiation (CRI) and maximum tillering and grain filling stages were beneficial in increasing grain yield of wheat. Yield ranged from 2.07t/ha without irrigation to 4.09t/ha with four irrigations.

MATERIALS AND METHODS

3.1. MATERIALS

The materials for the study comprised four varieties of wheat *(Triticumaestivum* L.). This varieties were collected from the Regional Wheat Research Centre, Rajshahi, Bangladesh.

The study was carried out with four varieties of bread wheat *{TrilicumaestUum*L.) having different origin, namely as follows:

- ❖ Shatabdi (indicated here as Vi)
- ❖ Prodip (indicated here as V2)
- ❖ BARIGom-27 (indicated here as V3)

3.2. METHODS

The experiment was set in the research field during the period of November, 2005 to March, 2006. The experimental field was set behind the Life and Earth Science (3^{rd} science) building of Rajshahi University, Bangladesh, where the department of Botany is situated.

The experimental methods used in the present study comprised the following steps:

3.3. FIELD PREPARATION

The experiment was conducted in the experimental field during the winter season of 2005-2006. The soil of the experimental field was silly loam. The land was prepared by ploughing and harrowing to make the soil fine. During the land preparation, weeds and other stables of the previous crops were collected and removed from the land.

3.4. DESIGN AND SIZE OF THE EXPERIMENTAL FIELD

The experiment was arranged in split plot design with treatment and three replications. Each plot size was 4mxl.8m, where plot to plot distance was 2m, replication to replication distance was 2m, row to row distance was 20 cm and plant to plant distance was 5 cm. The border rows were not considered in the experiment because of the border effect.

3.5. SEED SOWING

The seeds of four wheat varieties were sown on three different times, the first was on November 20, 2005; the second was on November 30, 2005 and the third was on December 10, 2005 in three plots of the experimental fields. Before sowing a basal dose of Nitrogen (80 kg/hectare), Phosphate (40kg/hectare) and Potassium (40 kg/ hectare) was applied. Total rainfall (mm), temperature (°C, maximum and minimum) and humidity (%) during the crop season was shown in **Table 3.**

Table 3. Total rainfall, temperature (maximum and minimum) andhumidity during the crop season.

Monthly	**Rainfall (mm)**	**Temperature** (°C)		**Humidity.** (%)
		Maximum	**Minimum**	
November ‘05	00	29.1	17.1	77
December ‘05	00	26.1	12.0	74
January ‘06	08	23.9	9.8	74
February ‘06	35	27.0	12.5	68
March ‘06	19	31.7	19.6	58

Sources: Monthly Statistical Bulletin, Bangladesh (year 2005)

3.6. WEEDING

Two weeding operation were done to control weeds in the experimental field. The first weeding was done with hand on December 15, 2005, which was followed by thinning, and the second weeding was done on January 20, 2006.

3.7. IRRIGATION

After sowing of seeds, the field was irrigated. When seedling attained a height of 4-5 cm the first weeding was done. Excess plants (if any) were thinned out at the stage. During heading time the fields was irrigated again.

3.8. GENERAL OBSERVATION

General growth condition of the crop was satisfactory. No plant protection measures were taken, as the crop was not infected by insects, pests and diseases.

3.9. HARVESTING

For growth analysis seven harvests were done at equal intervals of ten days. Three plants were selected for each variety from each replication at each growth stage. The first harvest was taken 20 days after sowing (DAS). At each harvest plants were cut at the ground level and tops were dried separately into leaves, stem and panicle (when present). The plant parts were dried separately before weighting in an oven at about 85°C for 24 hours till they reached constant weight.

3.10. POST HARVEST OPERATION

After harvesting, crop of each replication was collected separately. After that threshing, cleaning and drying of grains were made separately replication wise. Then the grain and other quantitative characters of each plot were recorded.

3.11. COLLECTION OF DATA

Data wee collected at every 10 days interval. Data for the following characters were recorded:

3.12. PLANT HEIGHT (CM)

Three plants were selected randomly for each variety and height was measured in centimeter (cm) from the base of the plant to the tip of main tiller.

3.13. NUMBER OF LEAVES/PLANT

Total number of leaves per plant was counted of the selected plants.

3.14. LEAF AREA/PLANT

Leaf area was measured by the disc method. Three discs were used for calculation of leaf area. The area of the cork borers used for taking the disc and leaf area was calculated by using the following formula:

Area of leaves=$\frac{Area\ of\ discs \times Weight\ of\ leaves}{Weight\ of\ discs}$

3.15. TOTAL DRY MATTER/PER PLANT (GM)

Each part of the plants after harvest was oven dried at 80°C and weight of the grain was recorded in gram (gm).

3.16. DATA COLLECTION

Data use collected on the following parameters for all varieties during final harvest.

Plant Height (cm)

Plant height was recorded from the base of the stem to the tip of the spike of the tallest tiller including awns.

Fertile Tiller Numbers/hill

All ear bearing tillers/hill were recorded at the final harvest.

Extrusion Length (cm)

Intrusion length was measured in centimeter (cm) from the tip of the flag leaf sheath to the base of the panicle of the main tiller.

Spike Length (cm)

Spike length was measured in centimeter (cm) from the base of the spike to the tip of the awns.

Number of Spike lets per Spike

The longest spike of a plant was threshed and spikelets obtained per spike were counted to get the number of spikelets per spike.

Grain Number/Spike

The longest spike of a plant was threshed and grains obtained per spike were counted to get the grain number per spike.

Grain Yield/plant (gm)

Total grain per plant was collected, weighted and recorded in gram (gm).

RESULT

Three popular wheat varieties viz. BARIGom-27, Prodip and Shatabdi were cultivated in three different locations viz. Paba (Rajshahi district), Patnitala (Naogaon district) and Baraigram(Natore district) in RCBD with three replication. The data on grain yield at (metricton/hac) was recorded after the crop harvest. The results of the grain yield performance of three wheat cultivars are presented in **Table: 1.** and ANOVA is present in **Table: 2.**the results presented **Table: 1.**shows that grain yield (ton/hac) was found to vary with wheat cultivars and locations they were being cultivated.

The grain yield was found to vary significantly among the three wheat cultivars (**Table: 2.**)among the three cultivars the cv. Prodip was found to show the highest grain yield which is followed by BARIGom-27 and the Shatabdi. They yield performance of the cv.Prodip was recorded the highest in Paba and Baraigramupozilla. Where in Patnitalaupozilla cv. Shatabdi showed the highest grain yield performance.

The analysis of variance shows that the items, variety, locations, variety×location interaction are highly significant. The replication is also found significant.Which shows the soil heterogeneityamong the replicated plots.

Table: 1 Yield Performance of three varieties wheat under three location

Location	Variety	Range	Mean±SE
Paba	Barigom-27	3-4.5	3.85±0.26
	Prodip	3.5-4.8	4.07±0.66
	Shatabdi	3.2-5	3.81±0.30
Patnitala	Barigom-27	3.1-4	3.51±0.14
	Prodip	3-4.5	3.65±0.22
	Shatabdi	3.5-5	4.2±0.20
Baraigram	Barigom-27	2.5-4.5	3.36±0.28
	Prodip	3-5	3.83±0.74
	Shatabdi	1.5-4.35	2.74±0.32

4.1 ANALYSIS OF VARIANCE

The analysis of variance for all the four quantitative characters was done separately and the results are shown **Table: 2.**Fortesting the effect of main items and their interacting effects, a mixed model was followed. The variety (v) was highly significant for all of the quantitative characters and the replication (R) item was highly significant for all the characters.

Table: 2. Analysis of Variance of yield (ton/hac) of three varieties of wheat.

Source	df	SS	MS	F value	S/NS (5%)	S/NS(1%)
Replication	2	0.625	0.312	5.9792	*	ns
Variety	2	0.693	0.346	6.6335	*	*
Location	2	2.504	1.252	23.9745	*	*
V×L	4	1.818	0.455	8.7034	*	*
Error	16	0.836	0.052			
Total	26	6.476				

*= significant at 1% and 5% level, respectively

DISCUSSION

Crop production is a complex process. It includes the function of soil, climate, planting and management all of them together. A proper management of these factors may give higher yield. Among the various factors influencing crop growth, soil moisture is one of the most essential one. It influences plant growth and development in various ways. Like any other crop, growth and yield of wheat is under control of many environmental factors and soil moisture is one of these factors. Plants are not equally sensitive to soil moisture stress at various stages of growth.

A proper water budget for the crops requires a good knowledge of water requirement of crops. A review of the water requirement varies mainly with the length of vegetative period. The yield response to irrigation, water depends mainly on proper irrigation scheduling.' Irrigation scheduling based on growth stages does not always meet the water requirement of the crop properly. It may result in over irrigation sometimes and under irrigation in others and in both cases yield of the crop is affected (Rashid and Islam, 1986).

In the present investigation the results show that the plant height was significantly higher in all the growth stages under well-watered plants than that of the water-stressed plants. Similar result was observed by Bhati and Rathor (1982) and chaniara and Damor (1982) in mustard. Mannan, *cl al.* (1992); Morales and Carangal (1981) and Domingo (1981) in mungbean and El Nadi (1969) in beans observed similar trend of results. Hiler*cl al.* (1972) also observed less plant height in cowpea due to severe drought at all the stages of growth.

The harmful effects of drought are generally more pronounced in stages of growth and development like crown root initiation stage or heading stages where plants have a greater sensitivity to water stress. However, all the physiological process are not equally reacted by sill moisture stress (shaw and Laing, 1968). Under drought the plants become metabolically inactive and the photosynthesis and production of dry matter become practically nil. These effects are primarily attributed by the leaf. Soil water stress reduces the expansion and final size of the leaf and all these can be measured by leaf area parameters (Rahman*cl al.,* 2001; Yadav*cl a/.,* 2003 and Sivakumar and Shaw, 1978).

After germination, Leaf number increases very slowly at first for a long period and it follows a period of rapid expansion with variation in total leaf area of a plant due to the change in number of leaf and size of leaf per plant. The number of leaf present at a particular time is equal to the total number of leaves produced minus member of leaves that have been lost by abscission. The numbers of leaf is dependent on number of nodes, which is governed by the time during which leaves are produced and also by survival of the leaf. Finally, leaf size is determined by the number and size of cells of which a leaf is built (Paul *ct at;* 2002 and Haider and paul, 2003).

In the present study the result shows that the average leaf area was higher in the well-watered plants than that of the water-stressed plants at all the stages of growth. Similar result was reported in sunflower and soybean (Cox and Joliffe, 1987), in peanut (NageswaraRao*el ai*, 1988), in barley (Kirby, 1969). The increase of leaf area occurred due to increase of leaf expansion. Total leaf area of plant may be varied due to change either in leaf number or teaf size (Arnon, 1975). Ahmed (1988) also found lower number of leaves at 20% of plant available water in bathuas at the three stages of growth.

In the present experiment soil moisture had significant effect on total dry matter. The well-watered plants produced significantly higher total dry matter than the water-stressed plants. Similar result was reported by (Nagarajah and Schutze, 1983); Mondal and Paul, 1994; Begum and Paul, 1993) in mustard, (Kirby, 1969) in barley, (Sivakunar*el al.,* 1979) in sorghum. Total dry matter increased slowly at the vegetative stage, but increased rapidly with the advancement of the growth periods **Fig. 5.** The rapid increase of total dry matter at later stages was due to the continued increase in the stem and pod dry matter as leaf dry matter was declining (Allen *el al.,*1971; Scott *el al.,* 1973).

In the present investigations leaf, stem and penicle dry matter increased due to soil moisture. Similar results were reported in barley (Kirby, 1969), in mustard (Mandal*el al.* 1986; Singh *el al.* 1987; Haque*el al.* 1987; Begum and Paul, 1993; Mondal and Paul, 1994, 1995), in sorghum (Sivakunar*el al.* 1979). Total dry matter increased slowly at the early vegetative stages but increased rapidly with the advancement of the growth period.

Crop yield as a complex character depending upon a large number of morphological and physiological characters. In the present investigation, seed yield and most of the components of yield were affected by soil moisture.

Robins and Domingo (1962), Day and Intalap (1970) and Sairam*el al.* (1990) reported that grain yield of wheat were generally reduced by soil moisture stress. Singh and kumar (1976) reported that the number of effective tillers and grain yield increased with an increase in the number of irrigation in barley. Similar results were reported by Haider and Paul (2003) in wheat. Wright *el al.* (1983) reported that grain yield, single grain weight and number of grain/plants in the irrigated plants of sorghum had higher values than the rainfed plants.

The plants under irrigation showed better performance than the rainfed condition. Plant height, Extrusion length, Spike length, Spikelet no/Panicle, Grain no./ Panicle, 1000 grain weight, Total dry weight, vegetative weight, Grain yield (kg/h) were higher in plants under irrigated condition . The above parameters were lower in non-irrigation condition. Similar results were reported in barley. In wheat EI-Nadi (1969), Destro*el at.* (2001) reported that plant height, dry weight and grain yield were higher in the favorable water regime treatments. EI-Rab*el al* .(1988).

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