International Journal of Farming and Allied Sciences
Available online at www.ijfas.com
©2013 IJFAS Journal-2013-2-S/1241-1254
ISSN 2322-4134 ©2013 IJFAS

Physiological Aspects of (Panicum miliaceum L.) under different water supply, weeding, herbicide and growth regulators combination for competitive ability against weed

Masoud Erfani[1], Omid alizadeh[2*], Hamid Reza Miri[1]

1. Department of Agriculture Arsanjan branch, Islamic Azad University, Arsanjan, Iran
2. Department of Agriculture shiraz branch, Islamic Azad University, shiraz, Iran

Corresponding author: Omid alizadeh

ABSTRACT: Plant growth regulators are the main factors in formation of grain yield. But their physiological roles are not well known. In example, about the roles of Auxins in grains growth regulations are not similar viewpoints. Drought stress is one of the most important and effective factors on crops growth & performance decrease. This work assesses physiological aspects of (Panicum miliaceum L.) under different water supply, weeding, herbicide and growth regulators combination for competitive ability against weed. Hence, Farm experiment was carried out in a factorial arrangement based on randomized complete block design (RCBD) in four replications during, during 2010-2011seasons in Fars agricultural and natural recources resresearch center located in Zarqan, Fars, Iran. Irrigation regime (drought stress) as the main factor involved two levels of irrigation at field capacity moisture content and 50% of field capacity moisture content.The second factor involves the application of atrazine, 2,4-D, 2,4-D + flamprop-m isopropyl (Suffix BW), 2,4-D + flufenprop-isopropyl in combination with auxin and tryptophan hormones, hand weeding and free weed control. Irrigation period was performed for non-stress and stress treatments every 10 and 14 days, respectively. Herbicides were applied at 3-4 leaved stage of weeds and after that the hormone treatment were done. To assess treatments sampling were done at five growth stages of millet involves Anthesis, Ear Emergence stage, Pollination, grain filing,and harvest maturity stage. In addition, millet plant height, number of leaves, stems, spike, dry weight of root, leaf, stem and Spike were measured. In this research, results showed that drought stress in more growth stage of millet reduced the plant height, number of leaves, stems and spike of millet. In all treatments, application of Suffix BW with auxin and tryptophan hormones increased the millet height, number of leaves, number of stems, number of spike, stem dry weight, leaf dry weight and spike dry weight in more growth stages. It should be noted that at all, application of Suffix BW in combined with auxin and tryptophan hormones at none-stress condition was most effective at increasing of millet morphological traits at different growth stages.

***Keywords*:** Integrated Weed Management (IWM), Competition, Millet, herbicide application, weed control, drought stress, plant growth regulator

INTRODUCTION

Earth's population has been growing steadily; the population in 1930 was only two billion people, in 1990, reached to 5.3 billion people and in 2000 exceeds to 6 billion (Nielsen et al., 2006). More than 4.3 of the world population is in developing countries and Unfortunately, the lion's share of the population of these countries now face the problem of hunger and malnutrition, So that 20 percent of the population who are already undernourished. And population growth in these countries means increased number of hungry people (Gallagher, 1984). From the standpoint of plant physiology, Drought is the imbalance between supply and demand for water and in terms of agriculture, a lack of water at critical stages of plant growth is called drought stress (Blum, 1996).The main effects of drought stress, in difference between potential and actual yield may be manifested (Nazeri, 2004) .Water is a key factor in crop production. Crop yields in many areas by living or non-living environmental stresses were limited and therefore considerable differences between the actual yield and the potential yield of crops was observed. Due to limited water requirement per unit volume of water used in the production of agricultural products is obvious (Kochaki, 1988). Effects of drought stress on grain yield and protein content of *Pannisetum americanum* was evaluated and it was concluded that water deficit during grain filling stage reduced the grain yield and thousand grain weight (Arnon, 1972).Drought is one of the most important environmental factors that affect seed germination and seedling establishment (Falleri, 1994). Germination ability under drought stress, establishment of plants and leads higher density, which is resulting increased yield (Baalbaki et al., 1999). However, the time between planting and seedling establishment in farm has a significant effect on yield. In this regard, the rate of germination and emergence of seedlings are most importance (Bradford, 1995). Weeds are one the main limiting factor in Crop production (Tollenaar et al., 1994). In conventional farming systems the use of herbicides is becoming more and more limited, due to changes in the regulatory environment. In recent years, herbicides are used in greater quantities (Shaw, 1982). Herbicide use can impose restrictions on subsequent rotational crops, limiting grower's options for weed control (Tawaha et al., 2002).Simply replacing herbicides by other direct control measures is inadequate. Instead, weed management should be seen as a component of integrated crop management.(Wall, 1993). Management methods that decrease requirement for agricultural chemicals are needed to reduce adverse environmental impacts (Cattivelli et al., 2008).Cultural, mechanical and chemical methods are commonly used for controlling weeds. No doubt cultural methods are still useful tool but are getting expensive and time consuming, so chemical control is an important alternative. The adverse effects of various weeds on growth and yield of crops may be attributed to the fact that weeds compete with crops for important factors such as nutrients, water, light and space for their growth and reproduction (Harbur et al., 2004). Increase the efficiency of water use and water use may increase the efficiency of distribution, efficient use of water by plants or increase the tolerance of plants to drought stress (Cox et al., 2001). Closing of the stomata to reduce transpiration cause increase in leaf temperature, and it resulting was increased difference water vapor pressure between the plant and the air and Transpiration efficiency decreases. Also, this may also increase plant respiration. Thus improving the efficiency of water use through stomatal closure is neutral (David, 2003). In previous study, three varieties of maize response to drought stress and recovered six days after re-irrigation, Found that seedling growth under control and drought stress conditions was continued. However, growth was significantly under higher drought stress condition in plants, after recycling and recovery re-irrigation period was lower compared in control plants (Efeoglu et al., 2008). Observed that the net photosynthetic rate and soluble protein in wheat flag leaves after flowering and starting the process of aging was reduced, AB acid sprayed after flowering, the slope of the decline will accelerate (Xie et al., 2004). As growth regulators are involved in altering growth processes in plants, it is possible that they might even reduce the detrimental effects of water stress by stimulating growth. Auxins are used commercially for enhancing crop production and regulation plant growth and development rapid growth such as shoot tissue, young leaves and developing seeds, elongation but do promote lateral root development (Defelice et al., 1993). Weed problem in dryland crop and cropping systems vary from one vegetation zone to another. Even within the same vegetation zone, variation in weed flora as well as intensity of weed infestation occurs because of differences in cropping systems, intensity of land use, rainfall, soil fertility and method of weed control used in individual crops. Differences in plant growth, architecture, morphology, growth cycle and canopy development influence what weed species will be most competitive in a given crop or cropping system particularly in the dryland zones (Ramakrishna and Tripathi, 1995). Traditional methods of weed control include hand tools such as the sickle or animal drown mechanical implements which is also used for line sowing and inter row cultivation e.g. blade harrows.. Many countries have developed effective and time-saving hand tools such as hand operated wheel-hoes, cultivators, and bullock drawn blade hoes for inter row cultivation in recent years (Rao *et al.,* 1989). It should be pointed that, Auxins plays a major role on regulating plant growth. For example, it controls vascular tissue development, cell elongation, and apical dominance (Wang et al., 2001). Plants respond to drought and adapt to drought stress through various biochemical changes (Monneveux and Belhassen, 1996), including changes of the endogenous hormone levels, especially that of abscisic acid (ABA). Atrazine and EPTC (S-ethyl dipropylthiocarbamate) were used as pre-plant incorporated herbicides to get maximum weed control. The~e herbicides were highly toxic to weeds like Johnson grass and nutgrass (Roeth, 1973; Chenault and Wiese, 1979). Post emergence herbicides that can be sprayed over corn are 2,4-0, dicamba, cyanazine and atrazine (Greez et al*.,* 1978). Atrazine must be sprayed with a surfactant or phytobland oil in the carrier to increase foliar uptake by weeds (Wiese, 1983). Application of 2, 4-D at 1 kg ai/ha was found to be effective in controlling weeds in wheat crop when applied at full tillering stage to avoid crop injury (Wiese, 1983). Bromoxylin mixed with MCPA increased the spectrum of weed control when applied at the two to three leaf stage (Pea body, 1976). Integration of suitable herbicides with other cultural practices like hand weeding and hoeing, tillage, fertilizer, irrigation, crop rotation, intercropping etc. were more efficient in control ofweeds than use of herbicides alone in dryland crop and cropping systems (Ramakrishna and Tripathi, 1995).However, other reports have shown that the adaptation to drought was accompanied with an increase in the Auxin content (Pustovoitova et al., 2004). (Xie *et al*. ,2003) report that drought stress significantly decreased AUXIN and GA concentration in leaves than that of control. It may be due to decreased AUXIN and GA synthesis (Xie *et al*., 2004) or increase in the destruction of AUXIN and GA by increasing the activity of oxidase (Davenport et al., 1980). Also, increase seed weight and pod number (Amal *et al*., 2009). However, auxin application increase pod numbers, seed weight or seed yield in pea, but this based on varietals sensitivity and correct application timing (Amal et al., 2009). (Hussain et al., 2011) report that AUXIN was useful for the increase of growth and yield. Also, Auxin concentrations of 50-100 mg/L showed significant effect on plant growth and yield as compared to control.

L-Tryptophan is known to be a physiological precursor of auxins in higher plants. It is investigated that L-Tryptophan has more positive effect on plant growth and yield as compared to pure auxins (Zahir et al., 1999). L-Tryptophan has more positive effect on plant growth and yield as compared to pure auxins (Zahir et al., 1999). L-Tryptophan is an amazing amino acid. It may act as an osmolyte, ion transport regulator, modulates stomatal opening and detoxify harmful effects of heavy metals (Rai, 2002). There is increasing concern over herbicide impact on the environment and human health, and consequently, a need for research to develop new methods of weed control that rely less heavily on herbicide use especially in arid and semi-arid regions. Also, in recent research, the role of foliar application of plant growth regulators at different growth of stages of millet was determined .Therefore, the objective of this work was to evaluate Physiological Aspects of (Panicum miliaceum L.) under different water supply, weeding, herbicide and growth regulators combination for competitive ability against weed.

MATERIALS AND METHODS

This experiment was carried out during two years (2010-11) at experimental field of Fars agricultural and natural recources resresearch center located in Zarqan, Fars, Iran. This field has been located in a warm and semiarid region with hot summers and cool and relatively dry winters having low precipitations, 1596 m above sea level in 29° 47´N & 52° 43E, with 330 mm average 30 years rainfall, 2212 mm average annual evaporation, maximum temperature of 43.8 °C and mean temperature of 13.8 °C. One genotype of milt (*Panicum miliaceum* L.) –var. Brassica seeds were bought from Agricultural Research Center, Karaj, Iran. The growth duration this varieties is 90-75 day, Medium- mature cultivar and 1000 seed weight is 0.5 – 2 (gr).

This experiment was implemented using a factorial, using Randomized Complete Block design (RCBD) with four replications. 27 plots were established initially according to experimental design study. Thus each experimental plot area had a surface area of 16, with 4×4 dimensions and total area equals to 800 m^2. Soil was a clay loam with a pH of 7.2, 0.096 ppm of organic matter, 960 ppm of total N, 14.3 ppm exchangeable phosphate,140 ppm exchangeable potassium, and 1 milimos Ec. NPK were added at the rate of 50 kg N/ hectare as ammonium nitrate 46% N, 60 kg P2O 5 /hactar as superphosphate 15.5% PO (before sowing) and 0-90- 180 kg K2 O /ha as potassium sulfate 48% K O at treatments fertility. Each plot was consisted of ten plant lines and six meter length. It should be pointed out that plant density per hectare comes to 175000 plants and Sowing depth 3-2 cm. Plough, two vertical disks, leveling, furrow, mound were used regarding plot making. The soil texture was loamy silt clay as well. In recent experiment, main factor consisted various irrigation regime (drought stress) as the main factor involved two levels of irrigation at field capacity moisture content and 50% of field capacity moisture content. In addition, The second factor involves the application of atrazine (0.5 kg/ha) , 2,4-D (1.5 lit/ha), 2,4-D + flamprop-m isopropyl (Suffix BW) (3 lit/ha), 2,4-D + flufenprop-isopropyl in combination with auxin and tryptophan hormones (3lit/ha). Hand weeding weeds and No weeding weeds during recent experiment was performed.

Drought stress treatments methods: four weeks after planting millet, all treatments were irrigated every week. After this time the millet seedling growth was relatively good and could be found to deal with stress. With a four-day delay in irrigation (fifty percent soil moisture field capacity).According to field capacity, half of the plots in each replication stress was applied as the first factor. On the other hand, non- stress plots was irrigated every 10- days and drought stress plots was irrigated every 14 days. Treatments herbicides induce methods and combinations of herbicides and hormones: Three-to four-leaf stage of weeds, application of selective herbicides and after application herbicide, with use of hormones, The influence of different morphological traits were measured. The treatment method of weeding and non- weeding: in weeding treated plots, initially at two-to three-leaf stages of weeds, with mechanical tools and labor, was removed. Plots were under continuous visits, it was attempting to remove weeds. So that the whole growth period, these plots were free from the weeds. Also, in non- weeding plots, there wasn't any management actions to control weeds.To assess treatments sampling were done at five growth stages of millet involves Anthesis, Ear Emergence stage, Pollination, grain filing,and harvest maturity stage.The distance between replicates was 3m, between main factors was 1.5m and it was 1m between minor factors. Preparing field began by plowing. Cultivating seeds was performed in 20 May. In order to have a good green percentage on field, analysis was carried out in12 June. The sparseness of plants should be performed after 3 weeks of cultivation (stage of 3-4 leafs) in order to regulate plant density in surface unit. The irrigation method was leakage in this experiment. Weeding was performed manually every 10 days. The first sampling was done in1 July and dryness stress and fertilizer treatments began in 2 July. Sampling was done every 15 days during plant growth in order to study and analyze of plant growth indices under low level of water and identifying effective factors on plant growth and performance. The sampling was in this method that after omitting 0.5m from the beginning and end of cultivation lines and also omitting aside lines in order to delete marginal effects such as water penetration, sampling was done randomly in the length of 0.5m (0.25m^2). 10 plants were chosen from mentioned surface and were put into plastic bags and sent to seed reformation and preparation research institute of agriculture faculty in Zarqan. At each sampling, the plant height, number of leaves, number of branches, number of spike, dry weight, shoot dry weight, leaf and spike dry weight were measured. The samples were divided into different parts of leaf and stem after weighting. The surface index of leaf was weighed by leaf area meter and was put into paper packets. They were put into oven and they were weighed again by a high accuracy weigh after drying.

Statistical analysis

A farm experiment was conducted at Agriculture Research Station of Zarqan, Fars, in Iran during 2011-2012 growing season (located at 29°, 47´N & 52°, 43E) For the purpose of traits measurements, 10 Millet plants were selected from each plot Statistical calculations were performed using ANOVA appropriate for RCBD with SAS ver. 9.1. In addition, analysis of variance was performed using MSTATC and MiniTab softwares. Excel software was used for charts adjustments as well. It should be pointed out for means comparison we applied DunCan's multiple range test at 0.05 probability levels when the F values were significant.

RESULTS AND DISCUSSION

Results analysis of variance for morphological traits in Millet at Anthesis

The results analysis of variance was illustrated that there was significant difference in Drought stress treatments on plant height and dry weight millet spikes at Anthesis at 1% and 5% levels, respectively. Also, results analysis of variance was showed that significant differences between herbicide and the hormone combination treatments in terms of plant height, leaves dry weight and panicle dry weight at Anthesis existed. In addition, interactions between drought stress and hormones and herbicide combination treatments on dry weight millet spikes at Anthesis at 5% level was significant(Table 1).

Table1. Summary of analysis of variance(mean of squares) for morphological traits in Millet at Anthesis

S.O.V	df	Plant height(cm)	dry weight millet spikes(g)	leaves dry weight(g)	panicle dry weight(g)	number of spikes plant	number of branch
Replication	3	19.63*	0.09n.s	2.7n.s	1.39n.s	28.36n.s	0.08n.s
stress	1	234.08**	3.91*	1.3n.s	0.23n.s	18.75n.s	0.02n.s
Herbicide*hormon	5	236.3**	2.58*	5.62**	2.12n.s	2.68n.s	0.18n.s
Stress* Herbicide*hormon	5	24.33n.s	2.24*	0.65n.s	3.38n.s	10.05n.s	0.53n.s
Error	23	17.24	0.78	0.94	1.82	9.16	0.25
CV	-	6.71	30.58	32.67	26.7	26.42	32.67

Ns,* and**:Non significant,significant at the 5% and 1% levels of probability,respectively

Results analysis of variance for morphological traits millet plant at Ear Emergence

Results presented in (Table 2) exhibited that effect of drought stress treatments on plant height at Ear emergence stage at (1% level) was significant. There was a significant difference (at 1% level) between drought stress treatments on dry leaves weight and number of spikes plant at Ear emergence stage existed. On the other hand, at Ear emergence stage in millet between herbicide and hormone combination treatments for plant height, number of branch, numbers of spikes, millet panicle dry weight were significant differences. Results of interaction between drought stress treatments and herbicide and the hormone combination treatments on plant height and number of branch had significant differences (at 1% level) Ear emergence stage of millet.

Table 2. summary of analysis of variance(mean of squares) for morphological traits in Ear Emergence stage

S.O.V	df	Plant height(cm)	dry weight millet spikes(g)	leaves dry weight(g)	panicle dry weight(g)	number of spikes plant	number of branch
Replication	3	3.96n.s	13.55n.s	2.27n.s	16.37*	16.58n.s	0.74n.s
stress	1	221.02**	4.94n.s	16.47**	4.38n.s	285.19**	2.52n.s
Herbicide*hormon	5	203.42**	5.44n.s	2.59n.s	32.52**	61.88*	5.67**
Stress* Herbicide*hormon	5	88.62**	14.43n.s	2.50n.s	12.86n.s	20.54n.s	6.47**
Error	23	23.36	6.84	1.27	5.44	21.18	1.12
CV	-	7.05	31.7	28.93	34.56	35.01	21.63

Ns,* and**:Non significant,significant at the 5% and 1% levels of probability,respectively

Results analysis of variance for morphological traits millet plant at Pollination stage

Based on the results of the analysis of variance there wasn't significant difference between different treatments of drought stress on any of morphological traits millet plants at pollination stage. However, results analysis of variance was revealed that between herbicide and hormone combination treatments for plant height, number of plant leaves and number of spikes and dry spike weight significant differences was existed. Hence, Interactions between drought stress and hormones and herbicide combination treatments on dry weight millet spikes at pollination stage (at 1% level) was significant (Table 3).

Table 3. summary of analysis of variance(mean of squares) for morphological traits at Pollination stage

S.O.V	df	Plant height(cm)	dry weight millet spikes(g)	leaves dry weight(g)	panicle dry weight(g)	number of spikes plant	number of branch
Replication	3	69.02*	12.33n.s	2.73n.s	7.99n.s	18.35n.s	8.19*
stress	1	9.91n.s	0.7n.s	3.8n.s	10.27n.s	0.52n.s	1.69n.s
Herbicide*hormon	5	335.44**	8.43n.s	5.05n.s	39.69**	151.99**	4.07n.s
Stress* Herbicide*hormon	5	57.04n.s	22.3n.s	3.37n.s	22.81**	24.34n.s	3.44n.s
Error	23	6.57	11.3	2.11	4.07	18.44	2.7
CV	-	6.57	30.19	24.49	15.6	23.29	24.73

Ns,* and**:Non significant,significant at the 5% and 1% levels of probability,respectively

Results analysis of variance for morphological traits in Millet at grain filing stage

Results analysis of variance showed that differences between different treatments of drought stress for morphological traits in Millet at grain filing stage weren't significant. According to results of obtained from analysis of variance, there was significant differences between drought stress treatments on plant height and dry leaves weight traits in millet at grain filing stage was recorded. Also, Results of the analysis of variance had significant differences between herbicide and hormone combination treatments on plant height, number of spikes, dry leaves, and dry spikes weight were showed. Based on the analysis of variance interaction between drought stress and hormones and herbicide combination treatments on dry leaves weight and dry branches weight at grain filing stage were significant (Table 4).

Table 4. summary of analysis of variance(mean of squares) for morphological traits at grain filing stage

S.O.V	df	Plant height(cm)	dry weight millet spikes(g)	leaves dry weight(g)	panicle dry weight(g)	number of spikes plant	number of branch
Replication	3	56.67n.s	6.51n.s	3.57n.s	16.17n.s	11.13n.s	21.85*
stress	1	261.33*	34.09n.s	39.6**	0.023n.s	0.19n.s	1.69n.s
Herbicide*hormon	5	147.9*	58.42**	23.14**	16.39n.s	231.47**	9.92n.s
Stress* Herbicide*hormon	5	48.23n.s	19.48n.s	7.8*	46.59**	13.14n.s	5.89n.s
Error	23	51.94	12.06	3.27	11.23	36.3	4.94
CV	-	9.3	17.57	19.69	20.67	26.08	26.89

Ns,* and**: Non significant,significant at the 5% and 1% levels of probability, respectively

Results analysis of variance for morphological traits in Millet at harvest maturity stage

Based on the results analysis of variance statistical significant differences between drought stress and hormones and herbicide combination treatments at harvest maturity stage were obtained. Results analysis of variance for dry leaves weight and dry spikes weight in millet plants were significant (at 1% and 5% levels), respectively. In addition, significant differences between drought stress and hormones and herbicide combination treatments at harvest maturity stage for dry leaves weight, dry spikes weight and dry branches weight was seen. Interactions between drought stress and hormones and herbicide combination treatments on dry leaves weight and dry branches weight in millet at harvest maturity stage (at 1% level) was significant (Table 5).

Table5.summary of analysis of variance(mean of squares) for morphological traits harvest maturity stage

S.O.V	df	dry weight millet spikes(g)	leaves dry weight(g)	panicle dry weight(g)
Replication	3	79.75**	1.26n.s	2.73n.s
stress	1	17.15n.s	81.22**	86.83*
Herbicide*hormon	5	67.58**	31.2**	49.74*
Stress* Herbicide*hormon	5	71.91**	33.71**	18.35n.s
Error	23	16.83	16.83	18.3
CV	-	16.51	16.51	15.6

Ns,* and**:Non significant,significant at the 5% and 1% levels of probability,respectively

Results Comparison means of morphological traits of millet at different stages of sampling

Plant height of millet at different stages of sampling

Plant height of millet at the Anthesis

Results comparison means Plant height of millet at the Anthesis was exhibited that this trait under non-stress condition compare to stress condition had significant differences. So that plant heights of millets under non-stress condition were higher than stress condition evaluated. However, in drought stress conditions plant height of millets at this stage were lower levels. According to results of present study in (Fig 1) plant height millets at the Anthesis under stress and non-stress conditions 59.67 and 64.08 cm, respectively were obtained. It should be pointed that plants at early growth stages are more sensitive to stress conditions in other word this factors mentioned can result in lower plant height millets under stress conditions than non-stress conditions at this stage of sampling might be related to this. (Parolin ,2001) described the critical role of water for meristematic activities. Therefore, water availability appeared to be more crucial during cell division and elongation. These findings are comparable to (Chaves et al.,2003), who also described the significance of water availability during vegetative growth.

Significantly fewer nodes and lower dry weights of stems and leaves of water-stressed plants compared to those of the control were reported by (Pace et al., 1999).

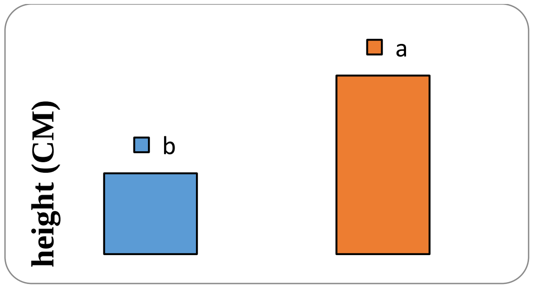

Figure 1. Means comparison of drought stress and non-stress conditions on plant height millets at Anthesis (similar letters in each column indicate wasn't significant difference) (a=5% DunCan's)

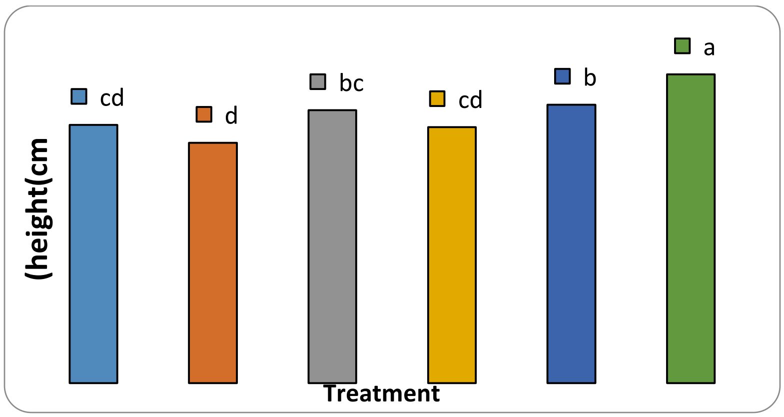

Figure 2. Means comparison hormones and herbicide combination treatments on plant height millet at Anthesis (similar letters in each column indicate wasn't significant difference) (a=5% DunCan's)

Results Means comparison hormones and herbicide combination treatments on plant height millet at Anthesis was demonstrated that there was statistically significant difference between treatments in this experiment. On the other hand, minimum plant height belongs to application of Atrazine herbicide was obtained that with application 2,4-D and hand weeding control treatments' hadn't significant differences. In addition, Results presented in (Fig 2) demonstrated that maximum plant height with means average 71 cm was belongs to application Suffix BW and tryptophan and Auxin hormones combination. It seems that the use of these hormones act as growth factors and the effect of herbicide Suffix BW had decreased. Plant height millet with application Suffix BW and 2,4-D combination and hand weeding control treatments at the beginning stages of pregnancy 64 and 62.75 cm, respectively were evaluated that that there weren't statistically significant difference between treatments in this experiment (Fig 2). These observations are in lines with (Scholes et al.,1995 and Shekari ,2001) who found that treating millet with plant growth regulators mitigated the deleterious effect of salinity and drought stress on plant growth and yield.

Plant height millets at Ear emergence stage

As in the beginning stages of Anthesis means comparisons plant height millet at Ear emergence stage between stress and non-stress conditions there were statistically significant differences. So that under non-stress condition plant height millets was higher than under stress conditions. According to results of present study in (Fig 3) plant height millet with 66.37 and 70.67 cm were belongs to stress conditions and non-stress conditions, respectively. This indicated that commencement of early periods of drought had more drastic effects on plant height.(Parolin ,2001) described the critical role of water for meristematic activities. Therefore, water availability appeared to be more crucial during cell division and elongation. It was reported by (Zhao et al., 2006) that drought affected plant height due to hormonal imbalance (cytokinin, abscisic acid) that affected growth due to changes in cell wall extensibility. The adverse effect of water stress may also be decreased by increasing the availability of water to the plant due to reduction in transpiration by partial closure of stomata (Alfredo and Setter, 2000; Hoad et al., 2001).

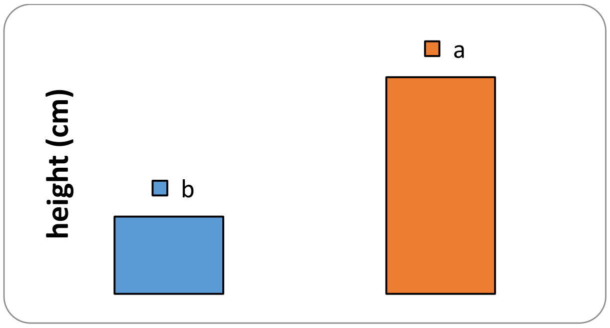

Figure 3. Means comparison of drought stress and non-stress conditions on plant height millets at Ear emergence stage (similar letters in each column indicate wasn't significant difference) (a=5% DunCan's)

Means comparisons of different combinations of herbicides and hormones treatments on plant height of millets at Ear emergence stage was demonstrated in Fig 4. Significant differences between treatments on plant height in millets at Ear emergence stage were observed. Results exhibited that lower plant height at this stage was related to application atrazine herbicide that there wasn't significant differences with non-weeding control treatment. Also, Results presented in (Fig 4) demonstrated that maximum plant height with means average 71 cm was belongs to application Suffix BW herbicide and tryptophan and Auxin hormones combination. After this treatment, there were application 2,4-D herbicide, application Suffix BW and 2,4-D combination and hand weeding control treatments had maximum plant height with mean values 68.5, 70.62, 69.75 cm and there wasn't statistical significant differences between each others. (Foda ,1987), (Sharaf El-Din et al*.,* 1987 and Mohamed et al., 1989) found that tryptophan and Auxin hormones increased Plant height of millett plant.

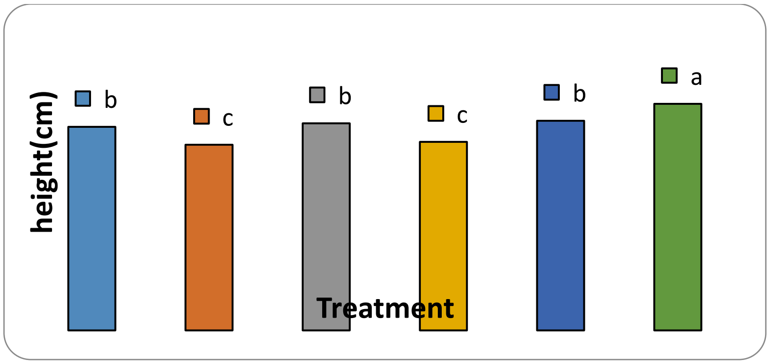

Figure 4. Means comparison hormones and herbicide combination treatments on plant height millet at Ear emergence stage (similar letters in each column indicate wasn't significant difference) (a=5% DunCan's)

Result means comparison was showed that effects of drought stress and herbicide with hormone combinations treatments on plant height millets at Ear emergence stage was statistically significant. On the other hand, maximum plant height millet with mean value (80.5 cm) belongs to non-stress condition with application Suffix BW herbicide and tryptophan and Auxin hormones combination was recorded. Hence, minimum plant height millet with mean value (80.5 cm) belongs to stress condition with non hand weeding control treatments was evaluated. Overall plant height of millet under drought stress conditions in most treatments of herbicides only, herbicides and hormone combinations treatments compared to non-stress conditions was lower (Fig 5). Previous published results indicate that exogenous application of auxin leads to IAA, GA3 and cytokinin accumulation and ABA reduction, which was responsible for changes in growth, development and fruiting of crop plants (Deyab, 1989; Hathout et al., 1993b).

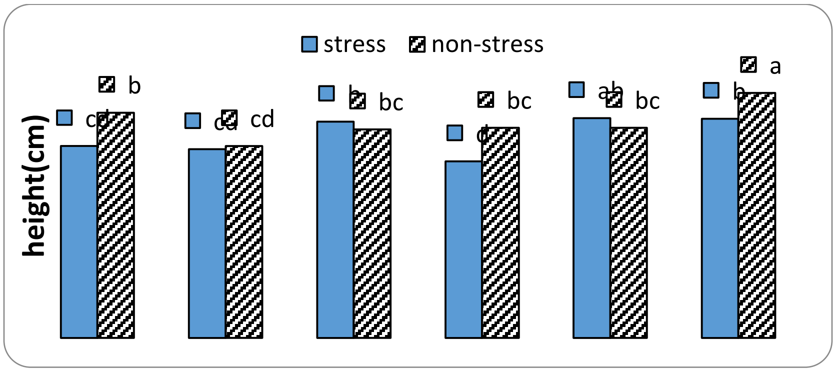

Figure 5. means comparison interaction effects of drought stress and non-drought stress and application herbicide and hormones combination on plant height millet at Ear emergence stage (similar letters in each column indicate wasn't significant difference) (a=5% DunCan's)

Plant height millets at Pollination stage

Based on result analysis of variance, there wasn't significant difference between stress and non-stress conditions for plant height trait at Pollination stage (Table 3). However, comparison means showed that average plant height millet under non-stress condition treatment was higher than stress condition treatment (Fig 6). Scientists report that water stress considerably affect, shoot height during rapid vegetative stage (Ashraf et al., 2007). Other authors reported that drought stress effects were significant for plant height (Ludlow et al., 1990).

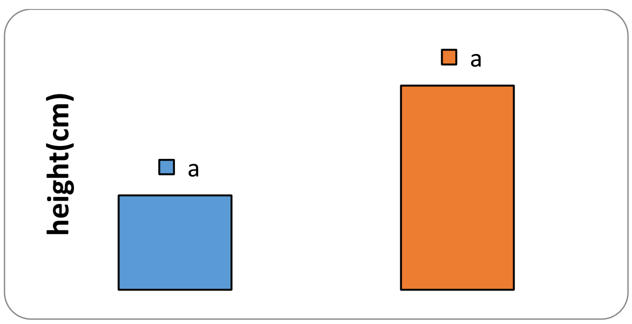

Figure 6. means comparison drought stress and non-drought stress on plant height millet at Pollination stage (similar letters in each column indicate wasn't significant difference) (a=5% DunCan's)

Results means comparison different treatments application herbicide and hormones combination on plant height millet at Pollination stage as two before stages was indicated that there are significant differences between experimental treatments. Also, First steps and emergence of Anthesis stage with maximum mean value 80 cm belongs to application Suffix BW herbicide and tryptophan and Auxin hormones combination was recorded that of course with application Suffix BW and 2,4-D herbicides treatments hadn't statistical significant differences. Minimum plant height millet with mean value 61.75 cm belong to non-weeding control treatment was observed. After this treatment in present study, minimum plant height millets with mean value 74.87 and 74.25 cm belongs to weeding control and application 2,4-D herbicide treatments respectively, were recorded that they hadn't significant differences with each other's (Fig 7). (Evans et al., 2003 and Friesen ,1987) reported similar results.

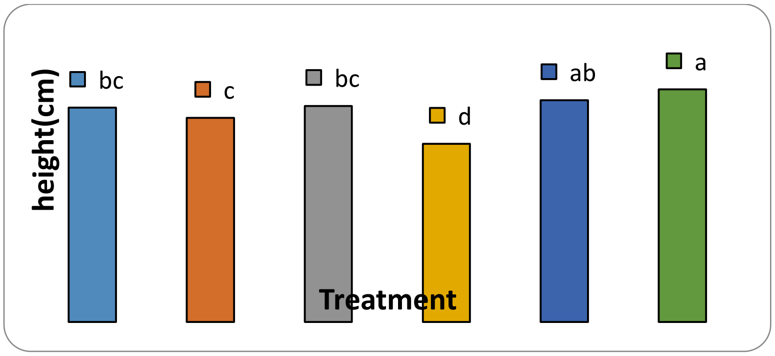

Figure 7. means comparison application herbicide and hormones combination on plant height millet at Pollination stage (similar letters in each column indicate wasn't significant difference) (a=5% DunCan's)

Plant height millets at grain filling stage

Results means comparison of plant height millet at grain filling stage demonstrated that under non-stress condition treatment compared to stress condition treatment was statistical significant differences.So that plant height millet under non-stress conditions was higher compared to drought stress condition. Results presented in (Fig 8) exhibited that plant height millets under non stress condition and drought stress condition 79.93 and 75.17 cm, respectively were recorded. Plant height may be reduced due to dehydration of protoplasm; decrease in relative turgidity associated with turger loss and decreased cell expansion and cell division (Hussain et al., 2008). During grain development of wheat, appropriate soil water status is of key importance for accumulation assimilates in grains and thus formation of grain yield and quality (Ahmadi and Baker, 2001).

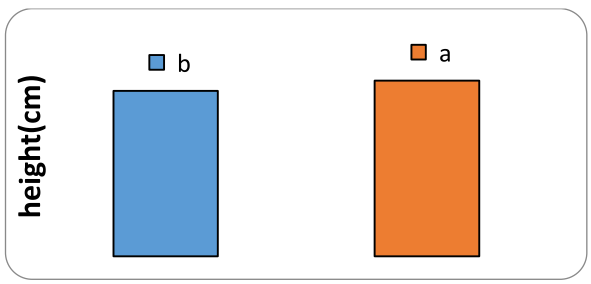

Figure 8. means comparison drought stress and non-drought stress on plant height millet at grain filling stage (similar letters in each column indicate wasn't significant difference) (a=5% DunCan's)

In present study, results means comparison application herbicide and hormones combination on plant height millet at grain filling stage was illustrated that there was statistical significant differences between experimental treatments. Results showed that maximum and minimum plant height millets at grin filling stage with means values 84.75 and 73.75 belongs to application Suffix BW herbicide and tryptophan and Auxin hormones combination and non-weeding control treatments were obtained (Fig 9). This finding was in agreement with (Evants et al., 2003 and Halford et al., 2001).

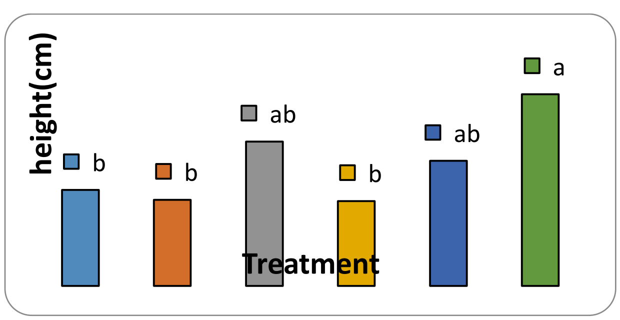

Figure 9. means comparison application herbicide and hormones combination on plant height millet at grain filling stage (similar letters in each column indicate wasn't significant difference) (a=5% DunCan's)

Investigate trend variation plant height millets at different stages of sampling

Results investigate variation plant height millets at different stages of sampling was indicated that plant height millet under non- stress condition were high. As we seen in (Fig 10), plant height millets at different stages of sampling was affected by drought stress treatment and compared to non-stress condition plant height millets were decreased. However, this plant height decrease was not significant because millet crop water requirements relatively were low and resistant to dehydration. According to plant height millet were measured until the end of Ear emergence stage, therefore trend variation plant height millets at the end of growth stage was ascension. (Tanner et al., 1982 and Lorens et al., 1987) reported similar results.

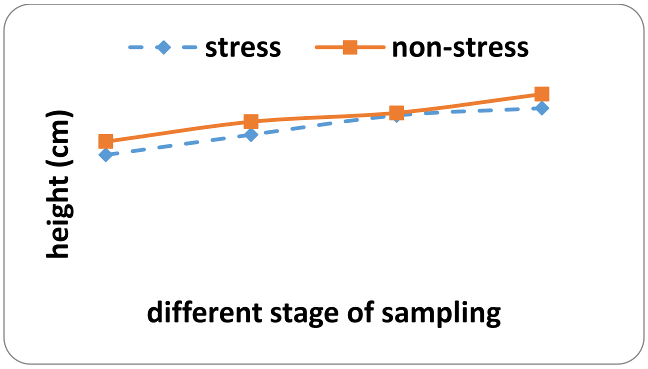

Figure 10. trend variation plant height millets at different stages of sampling

Trend variation plant height millets evaluations at different stages of sampling indicated that there were differences between different treatments. As we seen in (Fig11) application Suffix BW herbicide and tryptophan and Auxin hormones combination had highest plant height millets at different stages sampling. After this treatment, trend variation plant height millets in application Suffix BW and 2,4-D herbicides combination with weeding control treatment had highest plant height millets at different stages sampling. Results presented in (Fig 11) also was exhibited that plant height millets in weeding treatment in most of stages sampling were lower compared with the other treatments. As mentioned before maximum plant height millets were obtained from application suffix BW herbicide and tryptophan and auxin hormones combination. Indeed, this treatment had three types' compound which was the combination of two groups of hormones. Naturally one of the effects of the hormone increase stem axis and plant height millets were increased with this treatment. Thus, this factor cause plant height millets increased compared to the other treatments. Our results concur partly with observations made by (kudsk et al., 2003) and (Mclachlan et al.,1993 and payne et al., 1947).

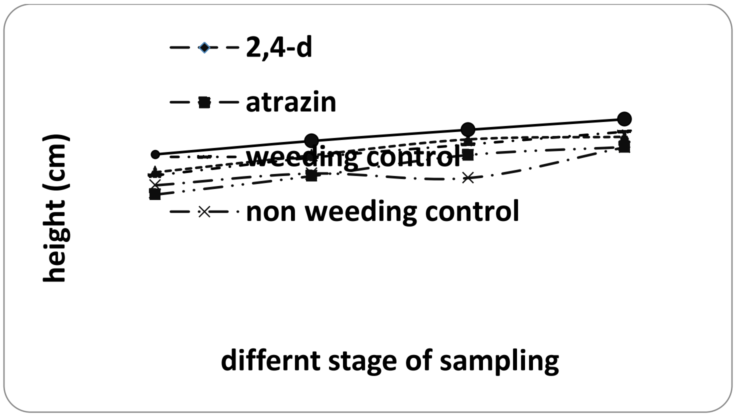

Figure 11. trend variation plant height millets against different treatments of application herbicide and hormones combination at different stages of sampling

CONCLUSION

The principle of integrated weed management (IWM) is the management of all factors that affect the crop yield related to the weed population, in order to allow the crop to express its potential productivity. The IWM is to provide the maximization of resources with maximum efficiency. Moreover, the integrated management searches to equalize the environmental, economic and social issued in order to make the production system sustainable in long term. In this regard, some initiatives in combination of control methods are being used. But we are still far from the IWM. In Iran, as in other parts of the world, the integrated management is not practiced, but we practice an integration of methods which provide a satisfactory control of weeds at lowest cost. Some examples in millet illustrate the shortage of IWM, among them systems of weeding, herbicide and growth regulators combination for competitive ability against weed in dry land Agriculture helping in the management of weeds of emergency sequential to the culture as a tool to reduce the seed bank of other weeds in the crop. The combination of chemical control with the use of growth regulators combination and weeding also a further alternative in the control of various weeds, besides helping reducing the use of post-emergence Herbicide. From a technical standpoint, the IWM must consider the biology and the ecological relationships of species. seeking to understand the dynamics of nutrient cycling between compositions of weeds and crop. Relating the pressure of pathogens and pests to the presence or absence of weeds at the site and understand their symbiosis. All these aspects show how important and multidisciplinary the adoption of integrated management systems is, as well as our need to improve our research. Hence in dry land agriculture, the concept of integrated weed management aims at minimizing losses due to weeds by combining' improved agronomic management techniques, mechanical cultivation, and optimum use of herbicides and their combinations.

In recent study, the effects of drought stress on *(*Panicum miliaceum L*.)* were significant. Concurrently management of millet plant in zarqan, Fars, Iran region with high potential of millet yield is inevitable. As a conclusion, drought stress has positive effect on yield and its components. Based on the results presented here it was affirmed that application flamprop-m isopropyl (Suffix BW) herbicide and tryptophan and Auxin hormones combination had highest plant height millets at different stages of AnthesisyEar emergence, pollination, grain filling and harvest ripening. Result indicated that in all treatments, application of Suffix BW with auxin and tryptophan hormones increased the millet height, number of leaves, number of stems, number of spike, stem dry weight, leaf dry weight and spike dry weight in more growth stages. It should be noted that at all, application of Suffix BW in combined with auxin and tryptophan hormones at none-stress condition was most effective at increasing of millet morphological traits at different growth stages.

REFERENCES

Ahmadi A, Baker DA. 2001. The effect of water stress on the activities of key regulatory enzymes of the sucrose to starch pathway in wheat. Plant Growth Regul. 35: 81-91.

Alfredo ACA and TL Setter .2000. Response of cassava to water deficit: Leaf area growth and abscisic acid. Crop Sci. 40: 131-137.

Amal M, Shraiy E, Hegazi AM. 2009. Effect of acetylsalicylic acid, indole-3- butyric acid and gibberellic acid on plant growth and yield of Pea (Pisum Sativum L.). Basic App Sci. 3(4): 3514-3523.

Arnon I. 1972. Crop production in dry regions. Background and principles. Leonard Hill books. London. 650p.

Ashraf M, Foolad MR .2007. Role of glycine betaine and proline in improving plant abiotic stress resistance. Environ. Exp. Bot., 59: 206- 216.

Baalbaki RZ, RA Zurayk ,MM Blelk and SN Tahouk. 1999. Germination and seedling development of drought tolerant and susceptible wheat under moisture stress. Seed. Sci and Technol. 27:291-302.

Blum A. 1996. Crop responses to drought and the interpretation of adaptation. Plant Growth Regul. 20 :135-148.

Bradford KJ. 1995. Water relation analysis of seed germination rates. Plant Physiol. 94: 840-849.

Cattivelli L, F Rizza, FW Badeck ,E Mazzuotelli, A Tondelli and C Mare. 2008. Drought tolerance improvement in crop plants: An integrated view from breeding to genomics. Field Crop Res. 105:1-14.

Chenault EW and Wiese AF. 1979. Proc.South Weed Sci. Soc., 32: 121.

Chaves MM, PP Maroco and JS Pereira. 2003. Understanding plant responses to drought-from genes to the whole plant. Funct. Pl. Biol.,30: 239–64.

Cox WJ and DJR Cherney. 2001. Row spacing, plant density, and nitrogen effects on corn silage. Agron. J. 93: 597-602.

David D. 2003. Foxtail Millet and proso Millet. In.J.junicr(ed). rproyress in new crops. Pp:182-190

Davenport TL, Morgan PW, Jordan WR. 1980. Reduction of auxin transport capacity with age and internal water deficit in cotton petioles. Plant Physiol. 65: 1023-1030.

Deyab MA. 1989. Studies on some enzymic and hormonal activities in germinating grains and seeds of some graminaceous and leguminous plants. Ph.D. Thesis, Fac. Sci., Tanta Univ., Egypt.

Defelice MS and A. Kendig. 1993. Control of perennial broad Leaf weeds in missouri field. Crops. Agricultural Publication G4875. University of Missouri,Columbia

Efeoglu B, Y Ekmekçi and N Çiçek. 2008. Physiological responses of three maize cultivars to drought stress and recovery. South African Journal of Botany, 75:1, 34-42.

Evans SP, SZ Knezevic, JL Lindquist and CA Shapiro. 2003. Influence of nitrogen and duration of weed interference on corn growth and development. Weed Sci. 51:546-556.

Falleri E. 1994. Effect of water stress on germination in six provenances of Pinus pinaster L. Ait. Seed. Sci Technol. 22:591-599.

Friesen GH. 1987. Wild mustard(Sinapis arvensis)control in sunflowers (Helianthus anuus) with fluorochlo ridone.Weed Sci.35:228-230.

Foda EAA. 1987. Growth dynamics of millet. M.Sc. Thesis,Fac. Sci., Tanta Univ., Egypt.

Gallagher EJ. 1984. Cereal production. Butter worths. 345 pp.

Greez H. 1978. In: Oklahoma State Univ. Extn. Facts No. 2747.

Halford C, AS Hamill, J Zhang and C Doucet. 2001. Critical period of weed control in no till soybean (Glycine max) and corn (Zea mays).Weed Technol. 15:737-744.

Harbur MM and MDK Own. 2004. Response of three annual weeds to corn population density and nitrogen fertilization timing.Weed Sci. 52:545-553.

Hathout TA, SA Shetawi and SM Khallal. 1993b. Effect of mode of application of some growth regulators on the physiology of tomato plants. IV. Effect of nicotinamide on the endogenous hormonal contents. Egyptian J. Physiol. Sci., 17: 201–21

Head SP, G Russell, ME Lucas and IJ Bingham .2001. The management of wheat, barley and oats root systems. Adv. Agron. 74: 193-246.

Hussain M, MA Malik, M Farooq, MY Ashraf and MA Cheema .2008. Improving drought tolerance by exogenous application of glycinebetaine and salicylic acid in sunflower. J. Agron. Crop Sci., 194: 193-199.

Hussain KH, Hussain M, Nawaz KH, Majeed A, Hayat-Bhatti KH. 2011. Morphochemical response of chaksu (Cassia absus L.) to different concentrations of inddole acetic asid (IAA). Pak J Bot. 43(3): 1491-1493.

Kochaki A. 1988. Aspects of drought resistance in Sorghum. The Journal of Agricultural Science and Technology. Volume 2 Issue 2. Page 79-77.

Kudsk P and JC Streibig. 2003. Herbicide a two – edged sword. Weed Res. 43: 90-102.

Lorens GF, JM Bennett and LB Loggale. 1987. Difference in drought resistance between two corn hybrids.Water relation and root length density.Agron.J. 79:802-807.

Ludlow MM and RC Muchow. 1990. A critical evaluations of traits for improving crop yield in water- limited environment. Adv. Agron. 43: 107-153.

Mc Lachlan SM, C Tollenaar, J Swanton, and SF Weise. 1993. Effect of corn induceded shading on dry matter accumulation, distribution, and architecture of redroot pigweed (Amaranthus retroflexus). Weed Sci. 41:568-573.

Mohamed YAH, A Sharf El–Din and E Foda. 1989. Role of nicotinamide and alicylaldehyde on some growth parameters in millet. Phyton, 29: 33–41.

Monneveux P, Belhassen E. 1996. The diversity of drought adaptation in the wild. Plant Growth Regul. 20: 85-92.

Nazeri M. 2004. Reaction of triticale genotypes to drought conditions limit at various developmental stages. Agriculture thesis. College of Agriculture and Natural Resources, Tehran University.

Nielsen DC, Vigil MF, Benjamin JG. 2006. Forage yield response to water use for dryland corn, millet and triticale in the central Great Plains. Agron. J. 98, 992–998.

PACE PF, CRALLE HT, El-HALAWANY SHM, COTHREN JT AND SENSEMAN SA. 1999. Drought induced changes in shoot and root growth of young cotton plants. Journal of Cotton Science, 3(4) : 183-187.

Parolin P. 2001. Morphological and physiological adjustments to waterlogging and drought in seedlings of Amazonian flood plain trees. Oecologia, 128: 326–35.

Payne MG and JL Fults. 1947. Some effects of 2,4-D, DDT and Colorado 9 on root nodulation in common bean. J. Am. Soc. Agron. 39:52-55.

Peabody DV. 1976. Western Washington weed control guide: Winter wheat, USDA co-operative Extn. Service Em: 4007, Washington State Univ., Pullman.

Pustovoitova TN, Zhdanova NE, Zholkevich VN. 2004. Changes in the levels of IAA and ABA in cucumber leaves under progressive soil drought. Russ J Plant Physiol. 51: 513-517.

Rai VK .2002. Role of amino acid in plant responses to stresses. Biol. Plantarum J., 45: 481-487.

Ramakrishna A and Tripathi B. 1995. In: Sustainable Development ofDryland Agriculture in India (Singh, R.P.Ed). Scientific Publishers, Jodhpur. pp 425-444.

Rao MR . 1989. In: Soil, Crop and Water Management in The Sudano-Sahelian Zone, ICRISAT Sabelian Cenbe, Niamey, Niger. Pp. 303-316.

Roeth FW. 1973. Weed Sci., 21: 474-476.

Scholes C , SA Clay and K Brix-Davis. 1995. Velvetleaf (Abutilon theofrasti) effect of corn (Zea mays) growth and yield in South Dacota. Weed Technol. 9:665-668.

Shekari A. 2001. Plant density and planting date on yield and yield components of foxitail millet.university of Islamic Azad. Varamin unit (M.Sc. Thesis). pp: 98.

Sharaf El–Din AY, YAH Mohamed and S Foda. 1987. Role of nicotinamide and salicylaldehyde on mineral content in millet. Delta J. Sci., 11: 2021–35.

Shaw WC. 1982. Integrated weed management system technology for pest management. Weed Sci. 30:2-12.

Tanner CB and TR Sinclar. 1983. Efficient water use in crop production: research or research. In limitations to efficient water use in crop production (ed. Taylor, H. M., W. R. Jordan, and T. R. Sinclair).p 1-270. Amer. Soc. Agron., Madison, Wisconsin.

Tawaha AMM, A Turk and GA Maghaireh. 2002. Response of barley to herbicide versus mechanical weed control under semi-arid conditions. J. Agron. Crop Sci. 188, 106—112.

Tollenaar, M., S. P. Nissanka, A. Aguilera, S. F. Weise, and C. J. Swanton. 1994. Effect of weed interference and soil nitrogen on four corn hybrids. Agron. J. 86:596–601.

Wall DA. 1993. Wild mustard (Sinapis arvensis L.) competition with navy beans. Con. j. plant Sci. 73:1309-1313.

Wang Y, Mopper S, Hasentein KH.2001. Effects of salinity on endogenous ABA, AUXIN, JA, and SA in Iris hexagona. J Chem Ecol. 27: 327-342.
Wiese AF. 1983. In: Dryland Agriculture (Dregne, H.E. and Willis, W.O. Eds.). Published by ASA, CSSA, and SSSA Madison, Wisconsin, USA Agronomy Monograph. No. 23. Pp. 463-488.
Xie Jiang D, Dai T, Jing Q, Cao W. 2004. Effect of exogenous ABA and cytokinin on leaf photosynthesis and grain protein accumulation in wheat ears cultured In vitro. Plant Growth Regul. 44: 25-32.
Xie ZJ, Jiang D, Cao WX, Dai TB, Jing Q. 2003. Relationships of endogenous plant hormones to accumulation of grain protein and starch in winter wheat under different post anthesis soil water statuses. Plant Growth Regul. 41: 117-127.
Xie Z, D Jiang, T Dai and W Cao. 2004. Effect of exogenous ABA and cytokinin on leaf photosynthesis and grain protein accumulation in wheat ears cultured in vitro. Plant Growth Regul. 44: 25-32.
Zahir AZ, MAR Malik and M Arshad. 1999.Effect of auxins on the growth and yield of rice. Pakistan J. Agri. Sci., 36: 3-4.
Zhao TJ, S Sun, Y Liu, J M Liu, Q Liu, YB Yan and HM Zhou .2006. Regulating the droughtresponsive element (DRE)-mediated signaling pathway by synergic functions of trans-active and transinactive DRE binding factors in Brassica napus. J. Biol. Chem., 281: 10752-10759.