Minimizing Harmful Effect of Extreme Environment (Water Stress) on Mungbean(Vigna Radiata L.)by using Potassium Fertilization

تقليل التأثير الضار للبيئة الحرجة (الاجهاد المائي) على نبات الماش (*Vigna Radiata* L.) باستخدام التسميد البوتاسي

م.د.غسان فارس عطية
قسم علوم الحياة/ كلية التربية/ جامعة سامراء
Ghassan .F .Al-Samarai
Department of Biology, College of Education
University of Samarra, Samarra, Iraq

Abstract

A field experiment carried out in summer season 2010, to study the effect of two irrigation period (7-14) days, and three levels of potassium (0, 50, 100) Kg/ha on growth and yield of Mung Bean(*Vigna Radiata* L.). The results of irrigation period showed a superiority of the plants which irrigated every 7 dayshighest rate of number of branch ,Length of plant and number of pods/plant(10, 73 and 23)respectively.While the Level of fertilization using potassium with (100) kg\ harecorded higher percentage of all characteristics under study compared with 0 and 50 kg/

ha.Interaction between irrigation and fertilization(7 days and 100 hg/ha) by given maximum value of branch number and plant length while,treatment (7 days and 50 hg/ha) recorded higher number of pods/plant .

Keywords: Water Stress, Potassium fertilizing,Mung bean, Extreme Environment.

1. Introduction

The water resources are considered to be one of the most important natural resources the life depends on, and to preserve these resources is considered to be granted, aggregation sector is considered to be the main consumer of these resources and there is an increasing worries concerning these resources future, considering its limitation many calls focused on keening on the optimum use of these Irrigation resources.Recently, some of the agricultural applications were followed, aiming to overcome the physiological syndromes that could happen to the plants growing in thehard environment; thirst, Drought, groundwater shortage, that all contribute to supply the plants with the water need[1]. It is noticed that that the plants that are exposed to severedrought gradually in its growing season would be more resistant when exposing to another drought era if we compare it with other plants that have never experienced drought ever before [2].

The mungbean*(Vignaradiata L.)*is a summer legume that is widely planted in Iraq field, because it has a short growing season (90-120) days, and it can bearthe drought

in all growing phases except for blossoming phase[3].The mung bean is planted to get its seeds that have an high nourishment values for humans and animals, because it is rich with the alimentary elements, protein percentage in its seeds (20%), Carbohydrate (65%) whereas oil percentage (1.5%), as well as the usage of mung beanas a green grass, and for feeding the animals, and using it as a green fertilizer to enhance the quality of the soil, and considering the importance of this harvest, it become important to thoroughly study the requirement of its growth and production[4].Iraqi soils are generally characterized by low organic matter content, high pH and high concentrations CaCo3[5]. This leads to a decrease in the availability of most of the nutrients found in the soil, including potassium. Which has proved that studies have an important role to influence directly or indirectly in the activation of more than 120 enzyme, including responsible for energy activation and representation of nitrogen and breathing[6].Considering all above importance, a field study has been carried out to study the effect of the irrigation periods and the potassium fertilizingon growth and yield mungbean.

2. Materials and Working Methods

2.1 Experiential

A field experiment was held in summer season 2013 in the field of one of the farmers on the banks of the Euphrates river inIraq. Soil with physical and chemical characteristics illustrated in the Table.1

Table.1: Physical and chemical characteristics of the field soil before planting.

The Characteristic	Value
Electrical conductivityds.m^{-1}	2.35
The degree of soil interaction	7.35
Nutrients	
Instant nitrogen PPm	64.2
WP-ready PPm	13.7
Organic matter g/kg	1.09
Apparent density mg.g/m^{٣}	1.22
Volumetric distribution of separate soil)G. kg$^{١-}$soil)	
Sand	144
Clay	320
Silt	536
Conception	clay alluvial Fusion
Percentage soil moisture when pulling 33 KPa	31.4
Percentage soil moisture when you lift 1500 kPa	16.6

The phosphate fertilizer was added at one time before planting in a form of triple superphosphate (45% P) with the reality of 75 Kg /h (Alfahdawi, 2004).Whereas the Nitrogen fertilizer was added as urea (46% N) Kg /h with four doses, the first dose was added directly after the germination, the second dose after 21 days from the first dose, the third with the start of flowering, and the fourth dose when starting forming the pods /plant.R.C.B.D design was used in three duplications. The experimental field was plowed, softened ,straightened and divided to trial units to 3x3m every single

trial unit has 6 lines with 0.50m, between the lines and the distance between the hole 0.25 with leaving a safe distance of 2 meters between a duplicates, and 1.5m between a treatment units to control the movement of the water.

2.2 Characteristics of Study

The characteristics where studied were number of branches per plant, number of leaves per plant and the seed yield.

2.3 Statistical Analysis

The experimental data were subjected to one-way analysis of variance (ANOVA). The significant differences between mean values were determined using LSD multiple range test ($P \leq 0.05$). The ANOVA statistical analysis was performed using SPSS version 19-2012 (SPSS Inc, Chicago, USA).

3.Results and Discussion

3.1Number of Branches /Plant

Results indicated in Table.1 and Figure 1, It was shows the influence of water deficit and potassium fertilizer on the number of branches per plant. It was showed that irrigation treatment a significantly influenced on the plant height. The results showed the superiority of the plants it was irrigated every (7) days at with (100kg/hg)with recorded highest rate for number of branches per plant was (10)branch/plant, with a significant difference from the plants was irrigated other treatments.Whilelawest rate registerd with irrigated plant after 14 dayes with dosge(0) kh of potassium with vaule(7.33)branch/plant.

Table 1: Effect of Potassium and Potassium Application on Number of branchesin Mungbean

Potassium kg/ha			
100	**50**	**0**	**Irrigation(days)**
10a	**9.65b**	**8.50d**	**7**
9.33b	**8.95c**	**7.33e**	**14**

***Means sharing the same letters do not differ significantly, at 5% probability level by LSD test**

The reason of that the availability of the soil moisture through the stages of growth has led to increased photosynthesis speed and increase the number of absorbed elements from the root which reflected positively in increased cell division and elongation thereby increasing the total plant growth and plant height of it, this result is consistent with who was found a decrease in the plant height when exposed to water deficit [7].Also may be availability of the soil humidity and potassium in the soil may be led to increase the photosynthesis and that reflected positively growth [8].

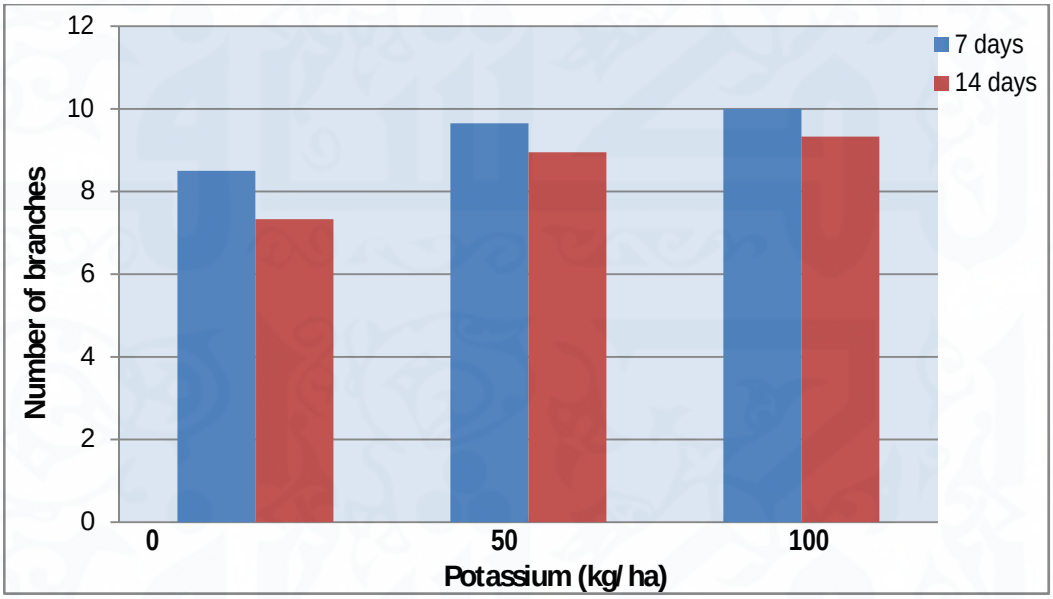

Figure.1 effect of Irrigation (days) and potassium fertilizer(kg/gh)on the number of branches per plant.

3.2 Length of Plant(cm).

The results of the table2and Figure.2 showed the impactof water deficit and potassium fertilizer on the Length of branches (cm).That irrigation treatmentsshowed a significantly influenced on the Length of branches (cm). The plants it was irrigated every (7) days recorded the highest rate for Length of branches (73), with a significant difference from the plants that was irrigated every 14 days it has given (63). From other hand the lengh of plant showed increase with increasing amount of potassium The water shortage is causing a slowdown in the member growth may be reduced of leaf area under the influence of water deficit is the behavior of the plant was shown to avoid drought[9].

Table 2: Effect of Irrigationand Potassium Application on Length of Mungbean

Potassium kg/ha			
100	**50**	**0**	**Irrigation(days)**
73a	**68c**	**63d**	**7**
70b	**61e**	**60ef**	**14**

***Means** sharing the same letters do not differ significantly, at 5% probability level by LSD test

The finding current study come out the long length of plant reached with interactions of (7 days) and (100 kg/h) potassium which, significant difference from all other interactions, while the lowest (65cm)lengthwerewith treatment of (14 days) and (0 kg/ha) of potassium. The positive effect of potassium in increasing the length of branches, perhaps due to the importance in the collecting of food was manufactured by photosynthesis, which led to increased division and elongation in thebranches cells[10].

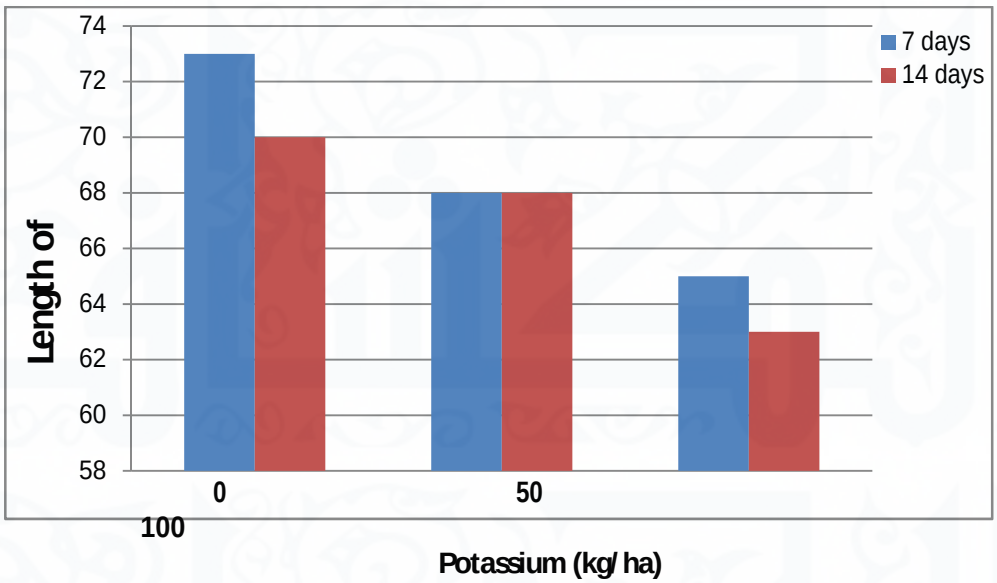

Figure.2Effect of Irrigation (days) and potassium fertilizer(kg/gh)on the Plant Length(cm).

3.3Number of pods/plant

It can be seen from the results in the table 3 and Figure 3the impactof water deficit and potassium fertilizer on Number of seeds/branches. That irrigation treatments showed a significantly influenced on the Number of seeds in plants irrigated every 7 days (23), compared with 14 days it has given (16).While the amount 50 kg/ha of potassium recoded highest and statistically from (0 and 100 kg/ha) which differences between theme.

Table 1: Effect of Irrigationand Potassium Application on Number of pods/plant.

Potassium kg/ha			
100	50	0	Irrigation(days)
21b	23a	17e	7
19c	18d	14f	14

***Means sharing the same letters do not differ significantly, at 5% probability level by LSD test**

That the lack of water may be has led to an imbalance in the physiological processes of the plant[11], where the drought lead to a reduction of the vegetative and proliferative growth, thus the plant growth is negatively affected under water deficit conditions, which directly affects the cell division process in the plant, which in turn leads to a lack of cells and the inhibition of cell-widening process [12].

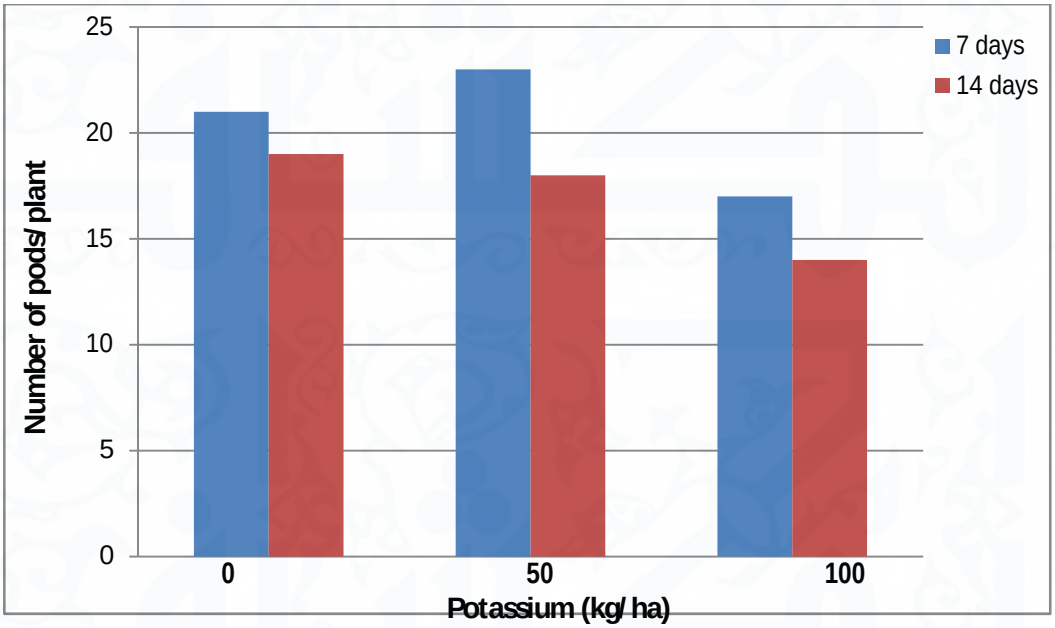

Figure.3 Effect of Irrigation (days) and potassium fertilizer(kg/gh) on nNumber of pods/plant

The results in the Table 3 showed the outweigh that interactions 7 days and 50 (Kg/h) potassium in the highest rate of the number of Number of pods/plant () with a significant difference from the other interactions, while the lowest rate Number of pods/plantat the interactions 14 days and (0) potassium. This may be due to the direct effect of potassium in the control of plant hormones ,which have a relationship with the composition and pollinate on the flowers and fertilized,in addition to the positive effect in facilitating the movement of manufactured materialswich industrialize in the photosynthesis of their manufacturing nutrientsto the sites of new development in the reproductive stage of plants (flowers), which increases the rate of fertilization and thus increase the number of seeds[13, 14].

4.conclusion

The current study concluded to possibility reducing of effect drought under extreme environment with using high level of potassium in agricultural land planted with mung bean. In future research need focus on more studies todecrease the negative impact of water stress with the emergence of the problem of lack of water resources and then need to find suitable solutions.

References

1. Islam, m., et al., gentic diversity analysis in mungbean [vigna radiata (l.) Wilczek] under water stress. International journal of agriculture environment & biotechnology, 2015. **3**(2).

2. Nur, a., isolation and characterization of nodule bacteria from mungbean and investigation its to drought water stress on soybean plant. 2014.

3. Alzarqaa, a., et al., he physiological response of mungbean (vigna radiata) to water deficit stress and meloidogynejavanica infection. Sustainable irrigation and drainage v: management, technologies and policies, 2014. **185**: p. 89.

4. Das, s. And r.k. Kar, role of hormones in differential growth responses of mung bean vigna radiata l. Wilczek seedlings under water stress. 2013.

5. Abdullah, a.s., minimum tillage and residue management increase soil water content, soil organic matter and canola seed yield and seed oil content in the semiarid areas of northern iraq. Soil and tillage research, 2014. **144**: p. 150-155.

6. Majid, s.n., analysis of organic functional groups and some trace heavy metals in the settleable dust particles (dustfall) of sulaimani city/kurdistan region-iraq. 2016.

7. Holzman, m.e., r. Rivas, and m. Piccolo, estimating soil moisture and the relationship with crop yield using surface temperature and vegetation index. International journal of applied earth observation and geoinformation, 2014. **28**: p. 181-192.

8. Shahzad, n., et al., foliar application of potassium mitigates negative impact of water deficit stress and improves physiological growth of mungbean (vignia radiata)., 2014: p. 402-402.

9. Boyle, r., i. Dodd, and m. Mcainsh, effects of deficit irrigation frequency on plant growth, water use and physiology of pelargonium x hortorum and tomato (solanum lycopersicum l. Cv. Ailsa craig). 2015, lancaster university.

10. Saa, s., et al., foliar application of microbial and plant based biostimulants increases growth and potassium uptake in almond (prunus dulcis [mill.] Da webb). Frontiers in plant science, 2015. **6**.

11. Krashes, m.j., physiology: forecast for water balance. Nature, 2016. **537**(7622): p. 626-627.

12. Ghadami firouzabadi, a., et al., non-destructive estimation of sunflower leaf area and leaf area index under different water regime managements. Archives of agronomy and soil science, 2015(ahead-of-print): p. 1-11.

13. Battie-laclau, p., et al., influence of potassium and sodium nutrition on leaf area components in eucalyptus grandis trees. Plant and soil, 2013. **371**(1-2): p. 19-35.

14. Osakabe, y., et al., osmotic stress responses and plant growth controlled by potassium transporters in arabidopsis. The plant cell, 2013. **25**(2): p. 609-624.

13-A study of cytogenetic effects of Indomethacin and glucosamine drugs in some fertility genes in male Albino rats

Lecturer : Zubaida Adnan Aljashammi
Applied/Tikrit university
Assistant Lecturer: Nibras Sirhan Kudair

14-Measuring the level of homocysteine and some reproductive hormones in the serology of women with PCOS

Shaymaa Ahmed Salih
Wasan Nazhan Hussien

15-The Response of Maize(Zeamays L.) to Spraying of Potassium and Zinc

Assistant teacher:Aiymen Ahmed A.K. Al-Abassi

16-Study the effect of honey on the value of sugar in the blood compared with the sugar plant in the white mice that developed diabetes

Assis.:Qutaiba Hommadi Mahmood Al-Samarraie

17-Developing a group of bacteria on the standard cultural media and the manufactured local medium (Eggplant Aubergine)and detecting the genetic changes by using finger printing technology .

Rasheed H.Hassan
Huthaifa R.Alwan

18-Minimizing Harmful Effect of Extreme Environment (Water Stress) on Mungbean (Vigna Radiata L.)by using Potassium Fertilization

Ghassan .F .Al-Samarai