AENSI Journals

Advances in Environmental Biology

ISSN-1995-0756 EISSN-1998-1066

Journal home page: http://www.aensiweb.com/AEB/

The Effect of Irrigation Intervals and Consumption of Super Absorbent Polymers on Yield and Yield Components of the Local Mung Beansinkhash Region

Ahmad Mehraban and Hamzeh Afrazeh

Department Of Science in Agriculture, Faculty member of Agriculture, Zahedan branch' Islamic azad university, zahedan, Iran

ARTICLE INFO

Article history:
Received 26 September 2014
Received in revised form 20 November 2014
Accepted 25 December 2014
Available online 2 January 2015

Keywords:
irrigation interval, super absorbent polymer, yield and yield component, mung beans.

ABSTRACT

Water is an integral part of every organisms and is one of the most important factors of life. According to limited water resources in Iran, the effective usage of it is so essential. Proper management practices and applying advanced technics are some effective actions for increasing water consumption efficiency. Super absorbent polymers are hydrophilic gels that absorb water and after drying of the environment, the absorbent water of the polymer would be gradually evacuated and damped the soil for a long time. The lack of soil water is the main factor that would result to decrease in growth and yield of mung beans in dry regions. Mung bean is a fine grain legume, summer crop, and with a short growing season. It is also one of the valuable grains and rich inphosphorusand protein. This research was accomplished in khash region to determine the effective irrigation intervals and consumption of super absorbent polymer on the yield and yield components of local mung beans. The experiments was performed in a split plot based on randomized complete block designanda Duncantestwas used to compare the means.The main plot was irrigation intervals in three levels (5, 10, and 15 days) and subplot was the consumption of super absorbent polymer in four levels (0, 15, 30, and 45 kilogram per hectare) in the depth of 10 cm. The local Sistanmung beans was used as the experimental cultivar. The results showed that the polymer consumption with amount of 45 kg/ha and irrigation interval with 10 days had the best and effective yield and yield components for the local mung beans.

To Cite This Article: Ahmad Mehraban and Hamzeh Afrazeh, The Effect of Irrigation Intervals and Consumption of Super Absorbent Polymers on Yield and Yield Components of the Local Mung Beansinkhash Region. ***Adv. Environ. Biol., 8(25),*** *118-121, 2014*

INTRODUCTION

Climate change and population growth are two important challenges facing agriculture today's world. Drought and stresses caused by it are the most common environmental stresses that limited the agricultural products, so that one of the most important limiting factors in agriculture products on semi dry lands [11]. Every agricultural operation with purpose of achieving high yield usually increase water consumption efficiency. The water consumption efficiency in plants related to plant type, environmental condition and weather condition [12]

Mung bean have a high ability in maintaining yield in low moisture condition [1].

The material that can absorb at least 20 times of its mass is named as a super absorbent. The amount of water absorption in these polymers depend on formulation, water and salt amount, and vary from 20 times to 2000 times of their mass. Mung beans, *vignaradiata (L.)* is a summer fine legume with a short growth season that is cultivated in rain fed method in central and south east of Asia [4].

The main key to save more water and improving irrigation efficiency and maintain sustainable irrigated agriculture, is the identification of irrigation critical time and irrigation timing (amount of water and time of irrigation) based to plant real requirement [8].

GhasemiGolozary *et al*. (1997), reported that moisture stress in the pea result in decreasing green covering percentage and decline the grain yield in area unit. Some of researchers reported the increasing of grain protein in drought stress and suggested that it would help osmotic adjustment and balance in moisture stress [2,3,5].

Shafiee [10], stated that using the super absorbents polymers could save the water consumption up to 50 % in addition to better plant growing and reducing negative effect of soil salinityon plants. The other advantages of super absorbents are maintaining water and nutrition for a long time, reducing number of irrigation, uniform

Corresponding Author: Ahmad Mehraban of Science in Agriculture, Faculty member of the Department of Agriculture, Zahedan branch' Islamic azad university, zahedan, Iran

Advances in Environmental Biology, 8(25) Special 2014, Pages: 118-121

application of water for plants, faster and more desirable roots growing, decreasing washing water and nutrition from soil, declining irrigation costs, effective use of chemical fertilizers, better soil aeration, possibility of cultivation in deserts and slopping areas, increasing the activity and proliferation of mycorrhizalfungi, strengthen the stability and porosityof the soil structure [9].

MATERIALS AND METHODS

The experiments were conducted in khash fields (South East of Iran) to determine the effects of water intervals and super absorbent polymers on yield and yield components of local mung bean. khash city is located in the geographical position of 61 degrees and 29 minutes east longitude and 31 degrees and 13 minutes north latitude and 489.2 meter altitude above sea level. The soil texture of experimental location was sandy loam. The results of chemical analysis of saturated distillate showed that the electrical conductivity (EC) of soil was 1.34 dS/m.

The experiments was fulfilled in split plot in completely randomized blocks with 3 replications. The main plot was irrigation interval in three levels of A1: 5 days irrigation, A2: 10 days irrigation, and A3: 15 days irrigation. The subplot was super absorbent polymer consumption in four levels of S1: 0, S2: 15 kg/ha, S3: 30 kg/ha, S4: 45 kg/ha. In this experiments was used dry granule type of stockosorbas the super absorbent polymer that was produced from DeimGostaranAtieh, Iran.

RESULT AND DISCUSSIONS

Stalk diameter:

The analysis of variance showed that the stalk diameter was not affected by irrigation intervals but the application of super absorbent polymer had a significant effect on stalk diameter.

Biologic yield:

The ANOVA showed that super absorbent treatment had a significant effect on biologic yield. The mean comparison of data also showed that the application of the super absorbent would increase the biologic yield. The most biologic yield was gained by using 45 kg/ha of polymer (2761 kg/ha) and the least amount of yield accrued in control (1919 kg/ha) that showed the increasing of yield by increasing the polymer consumption up to 30.5 % (Figure 2).

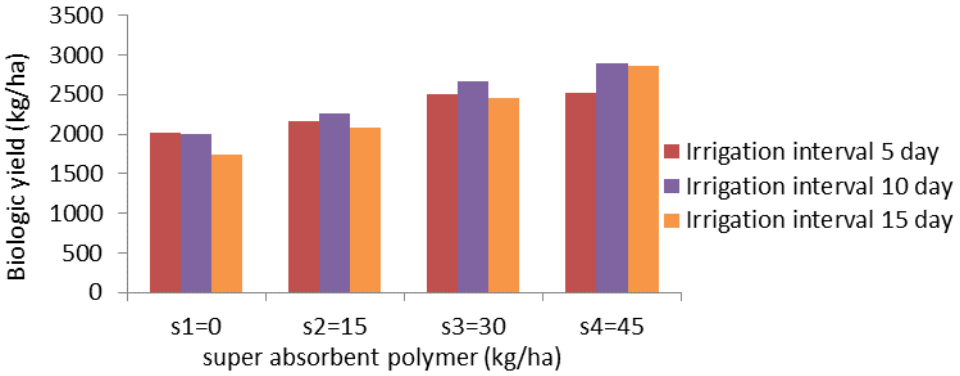

Fig. 1: Effect of interaction between irrigation intervals and super absorbent polymer consumption on the biologic yield of mung bean grain protein.

Grain yield (economic yield):

The results indicated that the effect of irrigation intervals and super absorbent polymers on the grain yield was significant at probability level of 1%. Mean comparison showed that the effect of irrigation interval with 10 days and 15 days watering had the 1087 and 785.8 kg/ha, respectively which revealed 31.39% difference in grain yield. The most average of grain yield was 1019 kg/ha with the use of 45 kg/ha super absorbent polymer and the least was 688 kg/ha that observed in control treatment (Table 1). The 32.49% difference between the treatments showed the increasing trend with the use of super absorbent compare to control treatment.

Advances in Environmental Biology, 8(25) Special 2014, Pages: 118-121

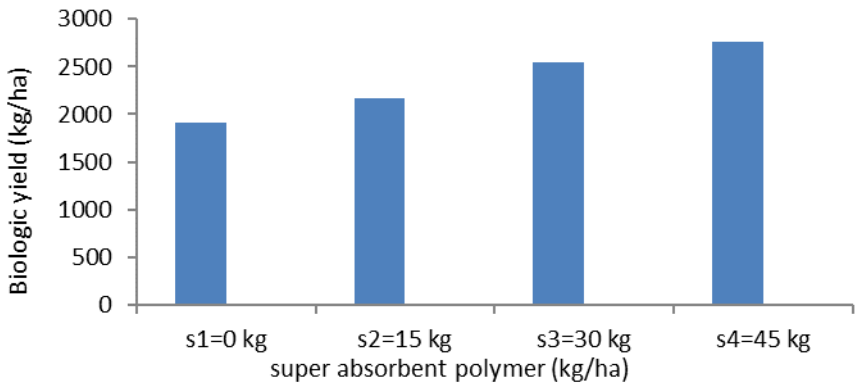

Fig. 2: Effect of super absorbent polymer consumption on the percentage of mung bean grain protein.

Harvest index:

Harvest indexis obtained by the division of grain yield to biologic yield multiplied by 100. The ANOVA showed that the irrigation interval had a significant effect on harvest index and increasing the drought stress decreased the harvest index so that the harvest index in 10 days irrigation interval (43.91) was 26.63% more than 15 days irrigation interval (Table 1). The same results was found in the other researchers studies in mung beans [6].

Protein percentage:

The percentage of protein is one of the quality characteristics that has a special value in the legumes. The results showed that the percentage of protein was affected significantly by irrigation intervals, super absorbent polymer consumption and interaction between them. The increasing in water loss would increase the percentage of grain protein (Table 1). Dehydration such as high temperature would increase protein so application of irrigation intervals in reproductive stage has imposed the most stress to mung bean. Increasing drought stress grain number and 1000-grain mass decreased so more amount of nitrogen was belonged to grains and the percentage of grain protein increased.

Mung beans protein is greatly affected by environmental conditions. These changes vary considerably between genotypes so that the seed protein in 6 environments changed from 23.59% to 27.49% and 7 genotypes with total average of 24.85% had higher percentage of protein among 20 genotypes [7].

The results of analysis of variance indicated that irrigation intervals and super absorbent polymer consumption and interaction between them had a significant effect on the percentage of seed protein (Figure 3). The highest protein content was occurred in 15 day (22.23%) irrigation interval compare to 5 (5.94%) and 10 (20.29%) day intervals. The mean comparison of super absorbent polymer consumption showed that the average of protein in the usage of 45 kg/ha was more than 11.18% compare to control treatment (Figure 4).

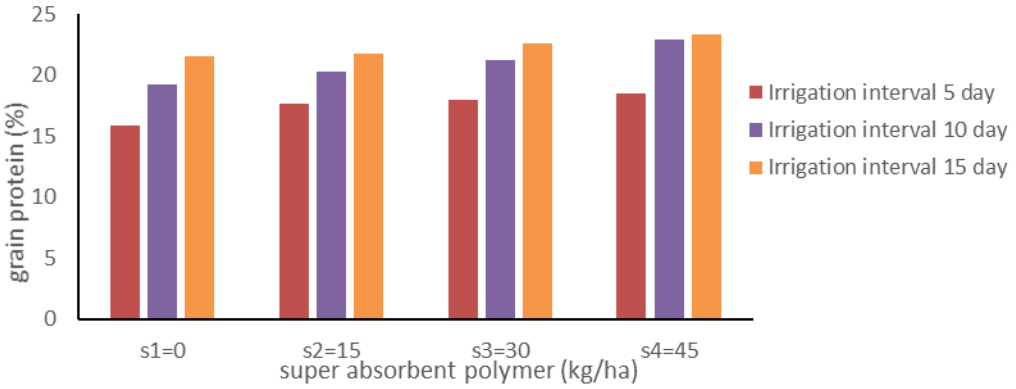

Fig. 1: Effect of interaction between irrigation intervals and super absorbent polymer consumption on the percentage of mung bean grain protein.

Advances in Environmental Biology, 8(25) Special 2014, Pages: 118-121

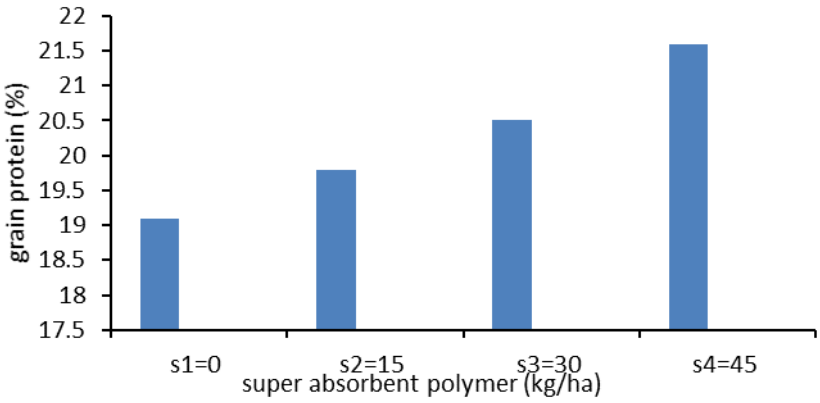

Fig. 2: Effect of super absorbent polymer consumption on the percentage of mung bean grain protein.

REFERENCES

[1] Bourgault, M., C.A. Madramootoo, H.A. Webber, G. Stulina, M.G. Horst and D.L. Smith, 2010. Effects of deficit irrigation and salinity stress on common bean (Phaseolus vulgaris L.) and mungbean (Vignaradiata (L.) wilczek) grown in a controlled environment .

[2] Easavand, H., A. Ahmadi, A. ShahnejatBoushehri, K. Poustini, M. R. Jahansouz, 2005. The effects of drought stress and timing of nitrogen fertilizer on nitrogen retransmit, quality of bakery, andwheat seed storage protein banding patterns. Journal of Iran agriculture science. 36.

[3] Ghorbanali, M., M. Niakan, 2005. Analysis of drought stress effect on the amount of soluble sugars, protein, prolin, phenolic components and the activity of nitratereductase of soybean cv. Gorgan. TarbiatMoalem University Journal of science, 5(1, 2).

[4] MajnoonHoseini, N., 1993. Legumes in Iran. Jihad Daneshgahi of Tehran University publication.

[5] Montajabi, N., Zh. Vaziri, 2004. The effect of irrigation management on yield and irrigation efficiency of wheat in golpayegan condition. Journal of soil and water science, 18(1).

[6] Moradi, A., A. Ahmadi, M. Vojody, 2005. Photosynthesis reaction and stoma conductivity of mung bean to severe and light drought stress in various growing stages. 1st national congress in Iran legumes.Ferdosi Mashhad University plant science institute, pp: 268-272.

[7] Naidu, N., V. Grosoiah, A. Satyanarayna and V. Raja Rajeswari, 1993. Variation in developmental and morphoœphysiological traits under different environments and their relation to grain yield of greengram (Vignaradiata (L.) Wilczek). Indian J of AgricSci, 63(8): 473-478.

[8] Ngouajio, M., G. Wang and R. Goldy, 2007.Withholding of drip irrigation between transplanting and flowering increases the yield of field-grown tomato under plastic mulch. Agric.Water Manage, 87: 285–291

[9] Parniazpour, A., D. Habibi, B. Roshan, 2007. What is super absorbent? Journal of natural resources and agriculture engineering, 4(15).

[10] Shafiei, Sh., 2002. The effect of super absorbent polymer on increasing soil moisture, fertilizer efficiency, growth and establishment of Panicum plant. 2ndspecialized industrial and agricultural use of superabsorbent hydrogel polymer Research Institute of Iran.

[11] Shig, S.F., 1989. Relating calculated leaf area index, evapotranspiration and irrigation methods of sugarcane. J. of Agron, 81: 111-115

[12] Vaezy, A., M. Homaee, J. Malakooty, 2003. Effect of fertilizer-irrigation on fertilizer and irrigation efficiency in . Journal of soil and water science, 16(2): 152-160.

[13] Whitmore, J.S., 2000. Drought management on farmland. Netherlands: Kluwer Academic Publishers, pp: 360.