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Research Article

EFFECT OF IRRIGATION AND METHANOL ON YIELD AND YIELD COMPONENTS IN SOYBEAN *(GLYCINE MAX)*

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ABSTRACT
In order to evaluate irrigation management and methanol on seed yield of JK varieties soybean. The experimental design was a randomized complete block with three replications was conducted in the city Roodsar. Main plots without irrigation (I_1), irrigation with around 6 days (I_2), with around 1_2 day irrigation (I_3), with around 18 day irrigation (I_4) and irrigation frequency of 24 days (I_5) and sub-plots in two of methanol containing non-methanol (M_1) and 20% methanol (M_2), respectively. Analysis of variance showed a significant effect of irrigation management on seed yield. The highest seed yield of 2249 kg per ha was treated with I_2. Three of I_3 and I_4 and I_5 least significant difference was observed in plots treated with 1585 kg per hectare without irrigation. Irrigation management also had a significant effect on harvest index. Methanol had no significant effect on seed yield. Yield on treatment with methanol 20% (M_2) with 2,000 kg per hectare and seed yield of 1798 kg per hectare was zero or methanol. It also found that methanol has no significant effect on plant height; plant height 109.7 cm. Management of methanol had no significant effect on harvest index.

Keywords: *Soybean, Irrigation Management, Methanol, Yield, JK Varieties*

INTRODUCTION
Soy is one of the oldest cultivated plants and is a major source of vegetable oil and vegetable protein. In terms of oil production in the world's top oil-producing plants is between. The amount of water needed by plants and plant density per unit area of two important factors and it is important for the growth and development of soybean and can have a significant impact on the production performance of the plant. Plant dry matter content decreases with increasing stress. Many researchers believe that the growth and development of plants, the amount of water consumed. Freebon (2003) and Hussein (2004) Effects of water stress on growth and yield reduction in soybean reported. Generative processes that are involved in determining the yield of formation of flowers formed pods, seeds per pod formation and growth (filling) that seeds are placed all those affected by the drought. Board (2002) saw stages of flowering and pod of the most sensitive life stages of soybean drought ever. One of the most important environmental factors is determining seed yield, soil moisture status. Drought stress is one of the factors limiting growth in Svyast, as defined in the vegetative stage of plant growth is reduced (Desclaux *et al.,* 2000). One factor in plant growth, water consumption and that it is necessary to continue the growth of plants. But more or less of it at any stage of growth, may be detrimental to plants (Sullivan *et al.,* 2001). Irrigation and reduce carbon dioxide uptake and water use efficiency. Board (2002) said stages of flowering and pod of the most sensitive life stages of soybean drought ever. Andersen *et al.,* (2006) work on the water system of the strengths and weaknesses of the system and its impact on soybean production in Denmark examined. Gregory *et al.,* (2000) and Popp *et al.,* (2002) Is a drought has weakened the vegetative stage, did not affect seed yield of soybean. According to studies, Dogan and Copur (2007) on the effect of water stress on the growth of soybean five steps that Turkey was in a semi-arid climate, The results also suggest that drought stress during pod filling stage of each species, seed formation and seed filling occurs, leading to decreased performance compared with the irrigated treatments Purcel *et al.,* (2000) also observed that among different soybean cultivars, varieties that are more droughts tolerant, they shoot dry weight were significantly greater than the susceptible cultivars. Soybeans to germinate at 50% of their weight in water and needs extra moisture rising from the ground, needed (John, 2001). Kpoghomou *et al.,* (1990) in the soybean shoot height of tension, an appropriate factor to predict tolerance to dehydration varieties have

been introduced. Ramos *et al.,* (1995) and soybean exposed to drought stress was observed that leaf nitrogen content decreased. Soybean cultivars in response to drought stress were different but Nitrogenase enzyme activity was low in all varieties. Foster *et al.,* (1995) found that moderate drought stress does not damage the distribution of nitrogen, but the nitrogen stress impairs the hard drive. The most important factors that can affect the structure and function of plants, the amount of available water in the plant and its economic are problems at the cellular level (Sunka *et al.,* 2003). They stated that drought stress during seed development reduced yield, short term seed filling and final seed size reduces. Stress at pod formation stage increased flower and pod loss, leading to a reduction in the number of seeds per plant. Kokubun *et al.,* (2001) found that under conditions of water stress, growing beans in the pod filling period was less sensitive Freebon (2003) also reported that methanol increased stem length, leaf area and dry weight of stems and florets of the daisy plant. Methanol can reduce the effects of stress and increase the percentage of protein and fat. As a result of this study was to evaluate soybean seed yield response to drought stress and methanol was carried.

MATERIALS AND METHODS

The experiment was in 2013, located in city Roodsar. Meteorological data were collected from stations Roodsar city. Total precipitation during the growth period was 220 mm. For the characterization of soil testing, fertilizer before planting and before adding a few random samples from depths of 0 to 20 and 20 to 40 cm soil samples were taken. Clay loam soil with a pH of about 55.7 testing, electrical conductivity (EC) dS approximately 0.495 square meters, the physical and chemical soil analysis results in Table 1 are shown. About two months before running the tests in order to provide a test bed, the plowing was done on the main floor. Ground in spring 2013 ready-made lining and leveling.

Table 1: Meteorological data for the study area

Sunshine	Max. Humidity (%)	Min.Humidity (%)	Max Temp (C)	Min Temp (C)	Months
277.5	91.6	57.1	29	18.3	Jun
284.9	89.9	55.2	32	21.2	Jul
316	89.3	45.7	33.7	20.5	Aug
195.1	122.2	60.9	28.9	19.2	sep
184.8	96.3	70.4	25.5	17.9	oct

To evaluate the effect of methanol and water management on growth and yield of soybean cultivars, J. K, Experiment in a randomized block design in a split plot design with three replications was conducted in 1392 in the village Kldrh Roodsar city. Irrigation management, including, without irrigation (I_1), irrigation with around 6 days (I_2), with around 12 day irrigation (I_3), with around 18 day irrigation (I_4) and irrigation frequency of 24 days (I_5) two levels of methanol without methanol and 20% methanol, respectively. First sprayed on 27 August, 60 days after planting and spraying were done at 90 days after planting. In this experiment, the five water management was a key factor assigned to main plots and sub plots were randomly divided into two levels of methanol on subplots were chosen. Irrigation management, including, without irrigation (I_1), irrigation with around 6 days (I_2), with around 1_2 day irrigation (I_3), with around 18 day irrigation (I_4) and irrigation frequency of 24 days (I_5) two levels of methanol without methanol and 20% methanol, respectively. First sprayed on 27 August, 60 days after planting and spraying were done at 90 days after planting. The spraying was done in this case on all plant parts of soybean liquid droplet flow, wet weather so that the limb. Motorized backpack sprayer was used to spray out. In each plot was 6 rows of 4 m length and spaced 50 cm between rows and 10 cm on each row of seeds were planted. Between blocks 1.5 cm in ever meter was main plots. To ensure the achievement of the desired concentration of intact seeds were planted in each of two when thinning to adjust the distance of 10 cm between the rows of plants, plant additional excluded. Irrigation management after thinning in the opening stage of the third trifoliate leaf on the main stem, ie when the plants were

fully deployed, was applied. The amount of water needed for irrigation treatments for each sub-set of the meter was installed Farm underground water source that is provided by the pump. Irrigation treatments from the fourth week onwards, In other words, when the plants are fully established, they were applied. The effect of irrigation on soybean growth was development and division.

Depth development of roots with randomly sampled from the main plot, was determined before watering. To enter the exact amount of water needed per plot from the water meter was connected to plastic tubing. Irrigation amount to an average of 90 liters per plot was at every start. First sprayed on 27 August, 60 days after planting and spraying were done at 90 days after planting. The spraying was done in this case on all plant parts of soybean current solution droplets, so that, shoots, wet, were. Motorized backpack sprayer was used to spray out.

Time of spraying was 17 to 19 hours. Plants were sprayed until runoff using a drop of solution on the plant continued. Motorized backpack sprayer was used for spraying Which has a volume of 12 liters and tried to nozzle sprayer at a height of 40 cm above the plants are placedFertilizer application before sowing was done during the preparation of the 100 (kg/ha) urea and 50 (kg/ha) of potassium chloride was added to the ground. Weed is way out of hand weeding during early development and plant pests and diseases through chemistry was a struggle. Harvested was 124 days after planting. In all plots were harvested on October. Final harvest as early as October of each plot marginal lines And the forgoing of 50 cm from each line were planted in a square.

To withdraw after removing plot margins, an area of 1 square meter plant in the center of each plot to measure yield was harvested. Yellowing of the plant is harvested by hand and then began more than 95% of the pods. To determine seed yield, after separation plant pods, seed weight, plant height was measured. At each stage of maturity of five plants per plot were randomly selected and were cut off from the ground. Height from the ground to the tip of the longest pod maturity was calculated. To determine and calculate the height of five plants per plot were randomly selected with due consideration of the margin, we measure height in centimeters; the average height of a 5 plant height is calculated. To determine the yield of the area of a square meter of soil surface due consideration of the margin of the plants were harvested, then unplug the pod and pod weight and pod yield will be calculated.

The seeds from the pods removed, weighed to calculate the yield. 3. To determine the total biomass of plants per plot were randomly selected and were cut off from the ground. The stems, leaves and pods are removed and placed in an envelope to the laboratory oven at 70 ° C for 48 hours to dry. After drying and weighing samples, the total weight of leaf, stem and pod biomass was calculated. Growth includes dry matter and leaf area index was calculated. Harvest index was obtained by dividing the yield on biomass yield. To determine the number of pods per plant, 5 plants from each plot we randomly selected. We'll count the number of pods per plant, number of pods per five then the five plants averaged to obtain the number of pods per plant. Analysis of variance and statistical using software attributes were MSTATC.

RESULTS AND DISCUSSION

Seed Yield

Management of irrigation had a significant effect on seed yield, Seed yield in irrigation management so that the maximum amount of 2249 kg per hectare was obtained 6 days the lowest seed yield of rainfed irrigation management amount to 1585 kg per hectare, respectively. But in the three irrigation management 12, 18 and 24 days was respectively, at a rate of 1859 kg per hectare in 1916 and 1889 and found no significant differences. Analysis of variance showed a significant effect of methanol at 1% and this suggests that Methanol yield increases. The interaction between irrigation regime and methanol showed no significant effect on seed yield. According to the comparison results, the highest average seed yield of 20% methanol in water for 6 days and were dedicated the lowest yield without irrigation management I_1M_1 that happened without methanol. And between treatments I_3M_1, I_3M_2, I_5M_2 significant

differences in seed yield was observed. The most important trait of seed yield in seed crops such as soybeans is evaluated. This attribute affects the yield and quality is affected by this.

Table 2: Analysis of Irrigation and methanol on yield and yield components in soybean

SOV	df	Number of pods per plant	100-Seed weight	Harvest Index	Plant Height	Seed yield
	2	39.160 ^{ns}	9.354 ^{ns}	114.722 *	167.129^{ns}	186120.56*
Irrigation (A)	4	110.879 ^{ns}	38.873 ^{ns}	149.354**	279.888^{ns}	335237.024**
Error (A)	8	91.402	20.963	113.824	84.637	23816.208
Methanol (B)	1	17.541 ^{ns}	11.532 ^{ns}	88.752*	984.987*	308621.146**
Interaction (A×B)	4	73.638 ^{ns}	31.106 ^{ns}	4.465 ^{ns}	219.258 ^{ns}	14465.291^{ns}
Error (B)	10	87.057	44.209	9.020	139.679	1622.883
CV (%)		11.62	19.73	6.67	11.37	6.71

*ns = Non significant; * and ** = Significant at 5% and 1% probability level, respectively.*

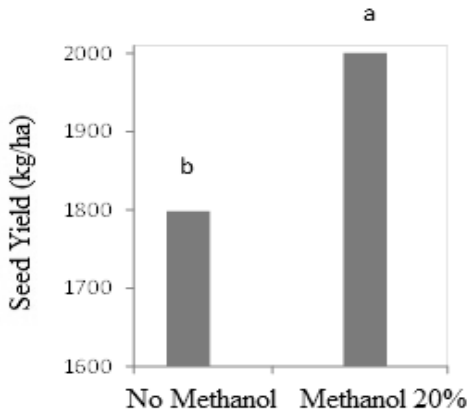

Figure 1: Effect of methanol on seed yield in soybean

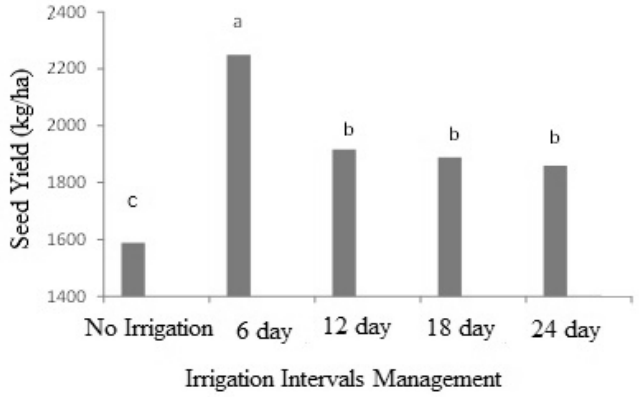

Figure 2: Effect of Irrigation on seed yield in soybean

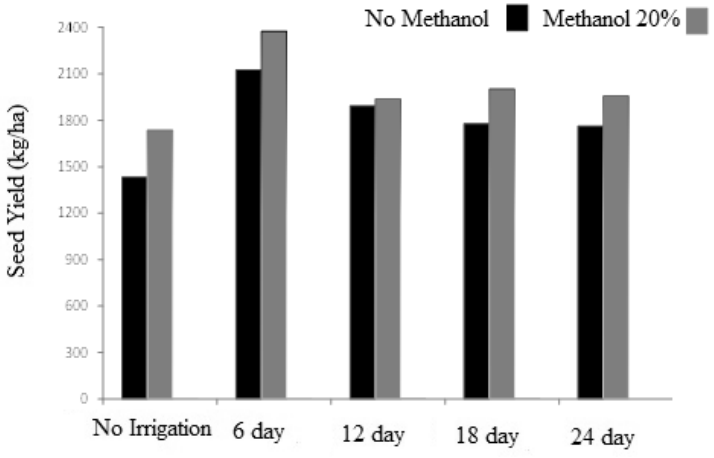

Figure 3: Interaction of Irrigation and methanol on Seed yield in soybean

Plant Height

Irrigation had no significant effect on plant height, which was due to the amount of rainfall during the growing season; because the plant has enough water and irrigation increased plant growth was not affected by the increase. The plant height of 115.5 cm value was allocated to the 18 day irrigation

management and a minimum height of 6 day old irrigation 99.3 cm was obtained. Rate at 1 per cent methanol plant height showed a significant effect, So that the maximum height of 20% methanol and treated with 109.7 cm height and lowest for zero methanols 98.2 cm height was dedicated. Interaction of water and methanol treatments on plant height showed significant differences at 5% level the highest plant height at 18 days of treatment I_4M_2 the management of water and methanol, and 20% occurred the minimum height of the interaction I_3M_1 treated with 90.6 cm. It should be noted between treatments I_5M_1, I_4M_1, I_2M_2, I_1M_2 no significant difference in stem height. According to the results, a significant effect of irrigation on soybean plant height did not This is contrary to the results of other researchers as they Reduction in plant height due to water deficit can be understood in terms of reducing the number of nodes. Poor results with the findings of Kokubun *et al.,* (2001) were not the same. An effect of methanol on soybean was significant and the result Sunka *et al.,* (2003) is consistent. The methanol plant soybeans will increase. It seems Sytvknyyn spraying methanol increased production and increased cell division, stimulate growth and Height of treated plants is triggered (Major *et al.,* 2003). According to the results obtained with methanol to increase the height of the soybean plant.

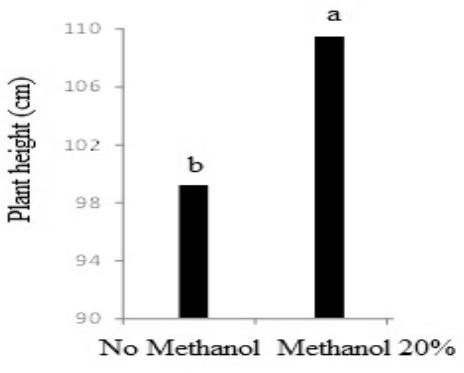

Figure 4: Effect of methanol on plant height in soybean

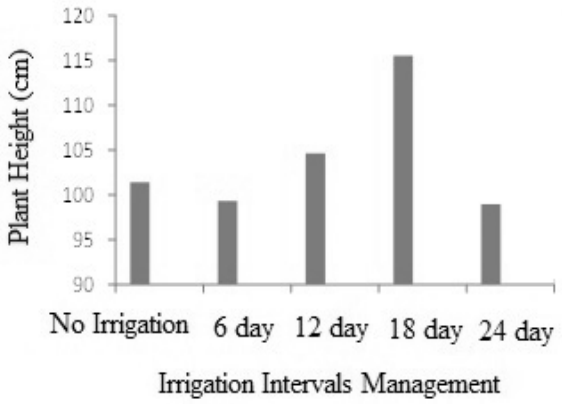

Figure 5: Effect of methanol on plant height in soybean

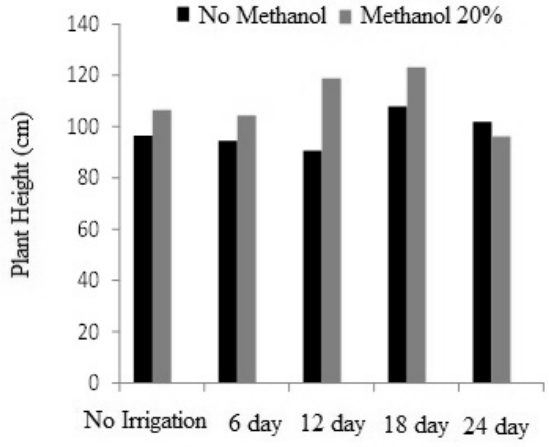

Figure 6: Interaction of Irrigation and methanol on plant height in soybean

Harvest Index

Irrigation management is a significant effect on harvest index showed a 1% probability level. The mean harvest index for 6 days with 51% of the irrigation management by reducing water use from 6 days to 12 days, 18 days and 24 days Rainfed conditions, the values were 45, 45, 44 and 37% decreases. Harvest

index was lest concerned about the management and administration of three 12, 18 and 24 days, No significant differences were observed. Methanol effect on harvest index was significant at the 5% level, the highest harvest index of 20% methanol and treated with 46.7% and lowest harvest index was the percentage of non use of the 43.3 methanol. The interaction between irrigation management and methanol showed no significant differences in harvest index. The mean harvest index for the treatment I_2M_2, 6-day management of irrigation was 20% methanol and Harvest Index is the least of I_1M_1 treatment, Ie dryland management and methanol, as well as between treatments I_5M_2, I_3M_2, I_3M_1 no significant difference in the mean Harvest Index. According to the results of irrigation has a significant effect on harvest index. According to the comparison, we can conclude with the water 6 days increased the harvest index. Mentioned treatments, seed yield and biomass were greate increasing the attribute can affect the increased harvest index, the numerator is increased with increasing seed yield, harvest index, which indicates the increase. After spraying the plants were able to spend more of their products to produce seed.

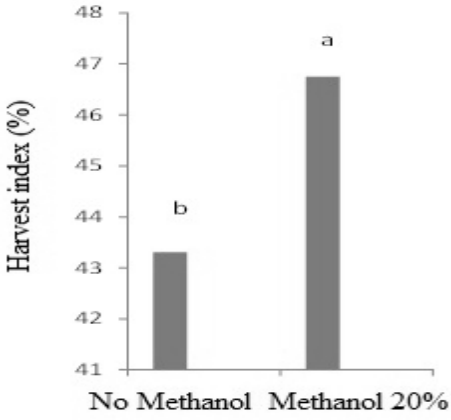

Figure 7: Effect of methanol on harvest index in soybean

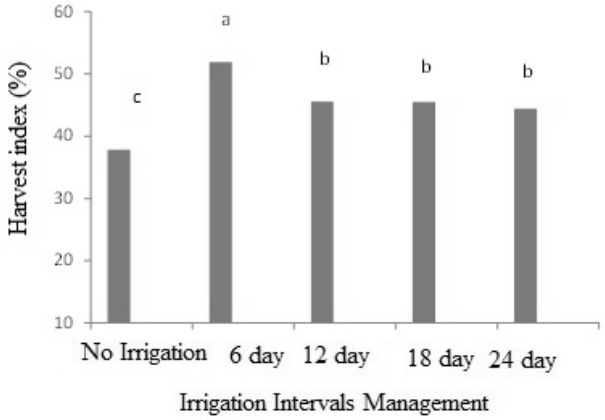

Figure 8: Effect of methanol on harvest index in soybean

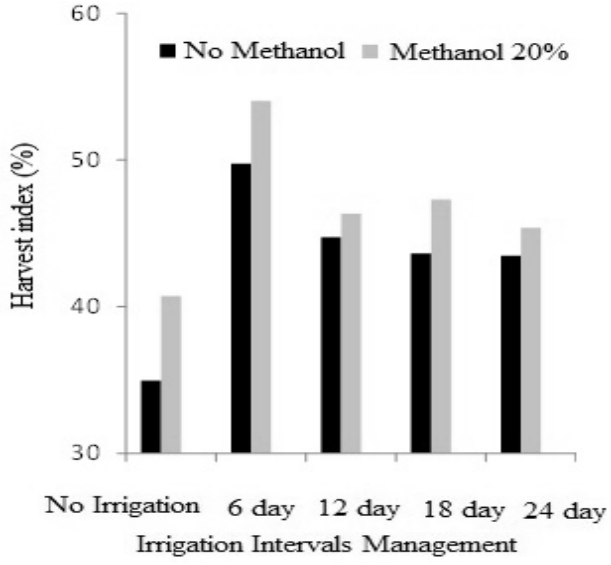

Figure 9: Interaction of Irrigation and methanol on harvest index in soybean

100-Seed Weight

Irrigation was no significant difference in seed weight. Methanol also had a significant effect on seed weight. The interaction between water management and methanol had no significant effect on seed

weight. Results of irrigation had no significant effect on 100- seed weight. The results of some research also suggest significant effect on seed weight is water deficit. stress during flowering and pod filling, Most traits reduces the maximum damage caused yield loss as the flowers have Then reduced seed weight due to stress at pod filling stage was significant. Because of lines at the end of the growth period to be determined and the plants under water deficit were not likely. In addition to the devastating effects of the indirect tension was eased enough this is contrary to the results. 100-Seed weight is a genetic trait in different experiments are less affected Meanwhile Lecorcur and Ney (2003) in his experiments concluded that methanol had a positive effect on soybean 100-seed weight.

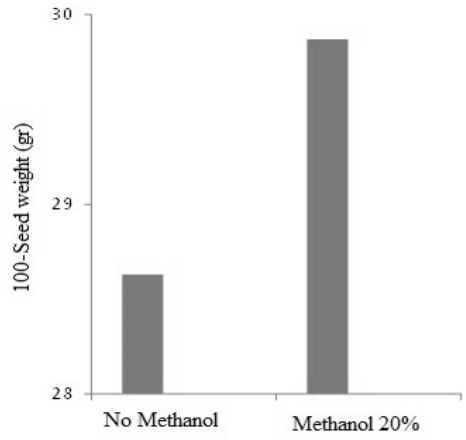

Figure 10: Effect of methanol on 100-Seed weight in soybean

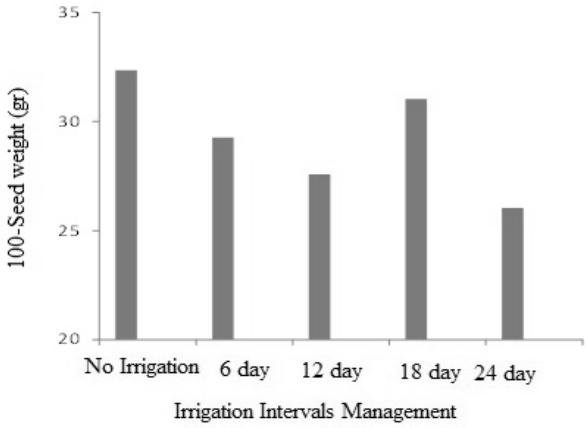

Figure 11: Effect of methanol on 100-Seed weight in soybean

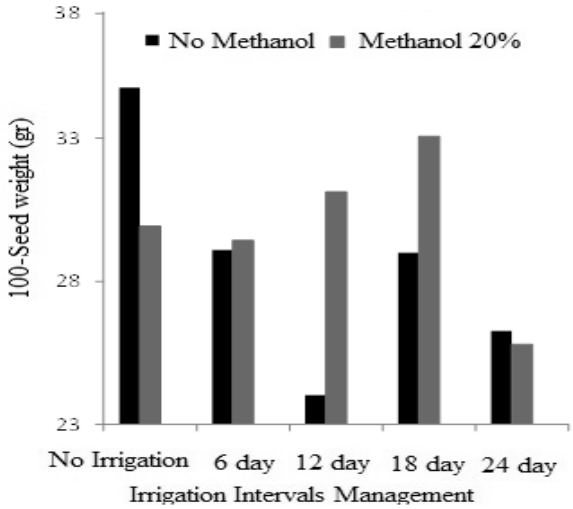

Figure 12: Interaction of Irrigation and methanol on 100-Seed weight in soybean

Number of Pods per Plant

Irrigation had no significant effect on the number of pods per plant. Methanol also had a significant effect on the number of pods per plant. The interaction between water management and methanol had no significant effect on the number of pods per plant. The highest number of pods per plant is about 20% methanol and 81 pods per plant; number of pods was the lowest in the treatment of non-use of methanol 79.5 sheath. Pods in water deficit can be made up of mud and Flower and pod pod less and increase the amount of loss attributable to irrigate large distances. Full irrigation, plant utilizes all suitable

environmental conditions and adequate development and production of photosynthetic vegetative organs, the highest number of pods produced, but the stress and reduces the production and supply of pods per plant photosynthesis is reduced.

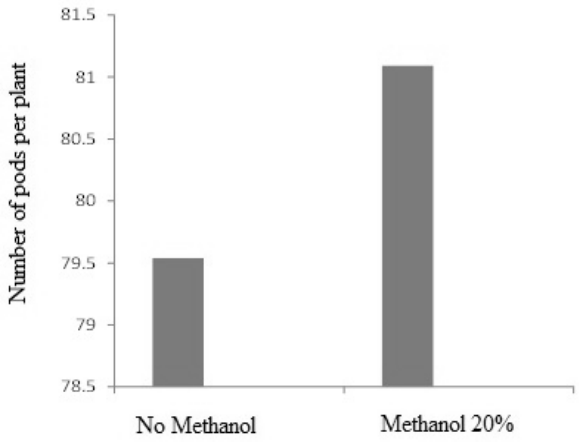

Figure 13: Effect of methanol on Number of pods per plant in soybean

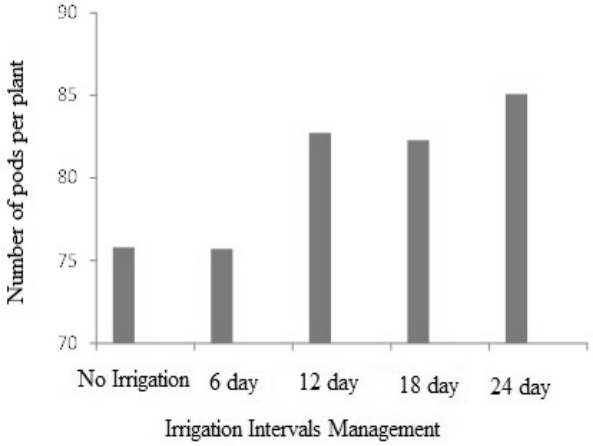

Figure 14: Effect of methanol on Number of pods per plant in soybean

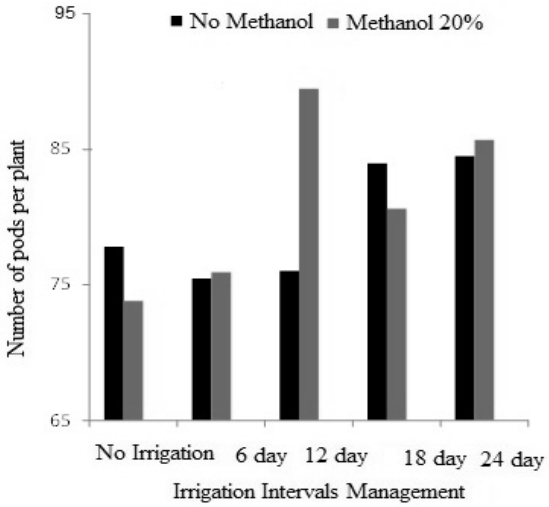

Figure 15: Interaction of Irrigation and methanol on the number of pods per plant in soybean

Conclusion

Results showed a significant effect of irrigation management on seed yield. The highest seed yield of 2249 kg per ha was treated with I2. Three of I3 and I4 and I5 least significant difference was observed in plots treated with 1585 kg per hectare without irrigation. Irrigation management also had a significant effect on harvest index. Methanol had no significant effect on seed yield. Yield on treatment with methanol 20% with 2,000 kg per hectare and seed yield of 1798 kg per hectare was zero or methanol. It also found that methanol has no significant effect on plant height; plant height 109.7 cm. Management of methanol had no significant effect on harvest index.

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