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Response of Different Varieties to Irrigation Intervals on Growth and Dry Seeds Yield of Broad Bean (Vicia Faba L)

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Abstract--- *The experiment was conducted in vegetable research field at Technical Agricultural College, Mosul. It was intended to investigate the effects of two factors, namely, three irrigation intervals (4, 8 and 12 days) and four varieties (Local, Syrian, Turkish, and French). The effect of these factors was examined in relation to plant growth and total dry seed yield of board bean at north of Iraq, specifically Nineveh Governorate. The study results showed that the first treatment with irrigation interval of (4 days) as a supplementary considerably improved all characters of growth including height of plant, branches number, as well as dry seed yield components represented by the number of pods/plant, the number of seeds/pod, pod length and seed yield/plant. Hence, the total dry seed yield was 7.235 tons/hec. The French variety demonstrated a significant increase represented by 8.276 tons/hec in terms of all characters as compared to other varieties, namely, local, Syrian, and Turkish.*

Keywords--- *Broad Bean, Irrigation Interval, Variety, Growth, Seed.*

I. INTRODUCTION

Legumes are second only to cereals as a source of human food and animal feed. As food, they are important due to having high content of protein. Legumes' grain protein is the natural supplement to cereal grain protein. Moreover, they provide fat and carbohydrates, high minerals levels of bone and building, as well as vitamins necessary for good health (Ali et al., 2006). Faba bean is the most important food legume and is considered a daily meal for poor people in many countries. It represents the main daily meal of the lower and middle classes of society. Chemical properties of faba bean seeds represent important indicators of quality and nutritional values. This bean has multipurpose use and is consumed as dry seed, green seeds or as processed food (Sainte, 2011)

In Iraq, many efforts have been made to improve yield and protein content of legumes through breeding, fertilization and genetic engineering. Bio fertilizers are inputs containing microorganisms that can convert non-usable nutritive elements to usable elements through biological processes; as well as including the nitrogen fixing. Broad bean productivity is strongly affected by the soil, climatic conditions and the way of cultivation. Al-Suhaibani (2009) concludes that drought at regimes significantly enhanced the protein content of seed with lower level of applied water by less than 4000 m /ha. As for the moisture content of seed, data reported that drought severely retarded seed yield. On the other hand, water supplies have increased soil moisture up to 7000 m /ha, which could be conserved for growing broad bean. High level of water supply has increased seed moisture in the dry environment of Saudi Arabia.

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In the wetter year, the simplified systems have produced seeds with higher germination and affected germination energy, but they have no effect on broad bean germination. Sprinkler irrigation and N-fertilization have no effect on the content of sugars studied in the broad bean seed. Elsafi (2003) has studied the vegetative growth of Black Cumin (Nigella sativa L) in Sudan. The results showed that the continuous irrigation intervals (14 days) have caused a significant increase in the characters of vegetative growth, including: height of plant and branches number; besides, yield component represented by the number of pods/plant and seeds/pods. Abd El Aziz (2008) demonstrated that the third treatment of supplementary irrigation (two rounds of irrigation) significantly increased plant height and the number of branches of faba bean plant. In addition, it led to increasing all characters of plant growth like the number of seeds/pods and the number of pods /plant. Also, Abd Eaziz and Mohammad (2009) find that the two-time irrigation significantly outperformed the one-time irrigation in all growth characters. After 84 days, the increase reached 32.03% in economic yield. El-Dakroury (2008) finds that increasing irrigation treatment from 60 to 100% significantly increased criteria of growth at 5% level, plant height, the number of branches, pods/plant and total yield. Kakahy et al. (2012) have conducted a study in Kirkuk, Iraq, and find that there were significant differences for the three varieties of broad bean (Spanish, Turkish and local) based on percentage of plant growth, plant height, branches of plant, pod length and the number of seed plant with average values of 94.8 %, 35.8 cm 87.5 cm and 10.3 cm, respectively. The aim of conducting the current study is to find out the response of some broad bean varieties from different origins to irrigation periods in areas where supplemental irrigation is followed to avoid the shortfall in the water plant needs and meet the production process requirements for this crop. Moreover, Hussein (2014) found that the highest seed yield of cowpea (1.12 ton/fedan) was observed with fully irrigation; while the lowest yield (0.67 ton/fed) represented 60% of field capacity. This lowest value of seed yield was associated wih low number of pods/plant and small increase in the number of seeds /plant. Al-Janabi and Hamdi (2016) found that Italian variety ranked the highest in terms of the number of seed in pod (5.89), seed/ pod, seeds yield (6.371 ton/ ha) in Ramady city, Iraq as compared with Spinach, Holland and local varieties.

II. MATERIALS AND METHODS

The experiment was conducted during autumn season (2017-2018) at research vegetable field of Plant Production Department, Technical Agricultural College, Mosul. It aimed at investigating the effect of two factors: seeds of four varieties (Local, Syrian, Turkish and French) of broad bean and three irrigation intervals (4, 8 and 12 days) as supplementary irrigation. The experiment was laid out in Randomize Complete Block Design as factorial experiment with three replications. The size of each unit plot was two hills, 3 meters length, and 75 cm width. Seeds used in planting (25 cm) between plants were three seeds in each hole after complete germination then thinning operation by leaving two plants in the hole. Planting date of seeds was on the first week of November. Intercultural operations were done as and when required, and the top dressing of N was done within 30 days after planting. The fertilizer was applied between the rows after weeding and inter-cultivation. Ten plants were randomly selected from each plot. Seeds were extracted manually and shriveled seeds were sorted out by hand at harvest (25 May). At the end of the grown season, some growth characters were measured, data were recorded on plant height (cm), the number of branches, the number or pods /plant, the number of seeds/pods, pod length, plant yield (gram) and total

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dry seed yield (kg/hectare). At harvesting time, treatment means where F-test showed a significant difference were compared using Duncan's New Multiple Range Test at 0.05% as reported by Steel and Torrie (1981).

III. RESULTS AND DISCUSSION

As clarified in table (1), the first irrigation period (4 days) significantly exceeded the other two irrigation intervals, namely, 8 and 12 days for most traits except for the number of seeds per century. An increase occurred but did not reach the level of significance. This explains the clear response of the leguminous crop to irrigation. This could be attributed to the vegetative growth of the plant and the fixation of nitrogen in Bacterial nodes in the roots, especially in the three critical stages (vegetative growth, the flowering period and the decade period), the formation of pods, and the absence of flowering. This confirms that supplementary irrigation is carried out in an attempt to bridge the shortfall in the rainfall. One century led to the emergence of significant differences in the yield of one plant and the total sum of the unit area. In addition, water tightness during the period of vegetative growth, flower formation and the period of fullness of the filling stage led to a shortage of the soybean plant. These results are consistent with the findings of Brown et al. (1985) El-Shamma (1994).

Table 1: Effect of Irrigation Intervals on Growth and Components of Dry Seed Yield of Three Varieties of Cotton (Gossypium hirsutum L.)*

Irrigation intervals	Plant height (cm)	Number of branches	Number of pods/plant	Number of seeds/pod	Length of pods	Seed yield/ plant (gm)	Total seed yield ton/hectare
4	103.9 a	4.6 a	30.1 a	5.8 a	18.2 a	169.4 a	7.235 a
8	90.5 b	3.8 a	25.4 b	5.3 ab	15.1 b	150.3 b	6.477 b
12	75.9 c	3.5 b	18.9 c	4.4 b	13.6 c	140.7 c	5.887 c

- Numbers that share the same alphabet indicate that there are no significant differences between them, according to Duncan's New Multiple Range Test, less than 5% probability level.

Table (2) shows that plant height showed a significant effect among varieties. The maximum plant height was recorded from French, Turkish, Syrian and local varieties (105.5, 104.6, 92.1 and 74.5 cm), respectively. The plant characters included the number of pods /plant, seeds/pod, pods length, seed yield /plant and total dry seeds (8.276, 7.271, 5.360, and 5.556 tons/hec.), respectively. This result could be attributed to the increases in the number of branches, pods/plant, and seed/ pods. This supports the results of Abd El Aziz (2008), El-Dakroury (2008), Abd El Aziz and Mohammed (2009) and Kakahy et al. (2012). As clarified in Table (2), varieties of broad bean from different origins were affected and that the French variety significantly increased in all characteristics, except for the height of the plant where the Turkish variety outperformed, but it was not significant. The differences between the varieties were unstable significantly in the characteristics of the number of branches, the number of pods in one plant, the number of seeds per century and the yield of the plant from dry seeds. The differences were significant in the total yield of dry seeds. The French cultivar has the highest yield of 8,276 tons /ha, compared to the Syrian cultivar with 5,606 tons /ha. Perhaps the reason for this difference in varieties is due to the nature of plant growth resulting from the genetic behavior of each variety. The adaptation of the French variety to new local environmental conditions in high proportions made it superior to other varieties under study. This is consistent with the result of Mitika and Wolde (2015).

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Table 2: Effect of Varieties on Growth and Components of Dry Seed Yield of Cotton (Gossypium Hirsutum L.) *

varieties	Plant height(cm)	Number of branches	Number of pods/plant	Number of seeds/pod	Length of pods	Seed yield/ plant (gm)	Total seed yield ton/hectare
Local	74.5 c	4.2 ab	26.0 b	5.8 a	14.8 b	156.4 b	5.556 c
Syrian	92.1 b	4.0 ab	29.7 c	5.5 ab	13.8 c	147.0 c	5.360 c
Turkish	101.6 a	3.8 b	30.1 d	5.3 b	16.7 c	159.5 d	7.271 b
France	105.5 a	4.7 a	31.2 a	5.9 a	16.9 a	182.5 a	8.276 a

- Numbers that share the same alphabet indicate that there are no significant differences between them, according to Duncan's New Multiple Range Test, less than 5% probability level.

Tabl (3) shows the interaction between intervals of irrigation and varieties on growth and components of dry seed yield of cotton (Gossypium hirsutum L.). It is observed that a significant response has occurred to the French variety with the first irrigation period (4 days) compared to the Turkish, Syrian and local varieties and other irrigation periods (8 and 12 days). This could be due to the lack of rain falls through daily observations in the vegetative growth period of the crop, which led to a response to the converged irrigation period and reflected on the components of the yield. In addition, the different thermal requirements of the plant in the flowering stage led to a clear variation in the proportion of the nodes of the varieties under study. Perhaps this increase is due to an increase in the number of seeds / pod and the number of pods per plant and pod length. This results from the different varieties of beans in their genotype, in the nature of their growth and morphological form, and their influence on environmental factors surrounding the agricultural area. This result supports the result of Tayel and Sabreen (2011) in Egypt, who found that the differences in investigated characters among regimes of irrigation were significant at 5% level. This may be due to one or more of the following reasons: pressure of water reduced photosynthesis of plant and subsequently characters of growth; pressure of water reduced the number of nodules, which represent the active sites for gaseous N-fixation symbiotically; wilting of leaves; closing of pores and abscission of leaves and flower. For the two varieties of broad bean Giza 461 and Giza Blanka, the obtained data indicated that the variety GB exceeded the G461 in all characters of growth under study, excepting plant height.

Table 3: Effect of Interaction between Irrigation Intervals and Varieties on Growth and Components of Dry Seed Yield of Cotton (Gossypium Hirsutum L.) *

varieties	irrigation intervals	Plant height (cm)	Number of branches	Number of pods/ plant	Number of seeds/ pod	Length of pods	Seed yield/ plant (gm)	Total seed yield ton/hectare *
Local	4	92.4 cd	4.8 ab	32.0 a	6.2 a	16.2 bc	169.8 cd	6.166 cd
	8	82.9 d	3.9 bc	26.0 c	5.4 ab	16.1 bc	158.9 de	5.978 de
	12	77.2 gh	3.6 bc	24.1 de	4.1 bc	15,2 cd	140.5 ef	4.526 e
Syrian	4	97.3 bc	4.4 dc	29.3 b	5.8 ab	14.8 de	173.7 bc	5.841 de
	8	90.6 de	3,7 bc	25.1 cd	5.1 b	13.6 ef	137.2 ef	5.2 08 de
	12	75.1 gh	3.1 de	22.6 ef	4.1 bc	12.9 fg	130.1 fg	5.032 de
Turkish	4	109.1 ab	4.1 bc	25.8 cd	5.3 ab	14.9 dc	138.8 ef	8.046 ab
	8	94.2 cd	3.5 bcd	24.1 de	5.0 bc	13.2 ef	124.7 fg	7.205 bc
	12	71.1 h	3-0 e	22.8 g	4.0 c	11.1 g	120.6 g	6.563 c
France	4	116.9 a	5.2 a	33.8 a	6.2 a	18.6 a	195.1 a	8.888 a
	8	95.1 cd	4.5 dc	29.9 b	5.7 ab	17.2 ab	180.5 b	8.515 a
	12	80.5 fg	4.1 bc	26.4 c	5.5 ab	15 1 cd	171.6 bc	7.425 bc

- Numbers that share the same alphabet indicate that there are no significant differences between them, according to Duncan's New Multiple Range Test, less than 5% probability level.

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IV. CONCLUSION

Through the results, it is possible to conclude the different cultivated varieties in terms of the core traits, especially the dry seed yield and the moral response to the French cultivar with converged irrigation periods (4 days). This treatment period led to an increase in the efficiency of the varieties in water needs and the physiological processes necessary for vegetative growth. The effect of this was reflected in the total quotient in terms of quantity and quality. It is recommended to conduct further research in other agricultural areas of Iraq, due to the importance of the food and economic crop and achieving a qualitative boom in the production process that meets the needs of farmers and the labor market.

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