

## Effect of Irrigation Frequencies on Growth and yield of Soybean

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**Abstract:** Experiments were conducted at Sindh Agriculture University, Tandojam to study the impact of irrigation frequencies on the growth and yield of soybean Cv. Bragg. The experiment was laid out in Randomized Complete Block Design with four replications. The irrigation frequencies were 2, 3, 4, 5, and 6 irrigations. It was observed that the growth, yield components and oil content were highly significantly affected by irrigation frequencies. Maximum plant height, more branches and pods per plant, seed index and seed yield, and oil content percentage were found superior with the application of 6 irrigations followed by 5 irrigations. Whereas, lowest number of irrigations decreased all the traits adversely.

**Key Words:** Soybean, Irrigation, Growth, Yield

### Introduction

The soybean *Glycine max W. Merrill* seldom attains its full yield potential because of limitations on physiological processes imposed by environmental stresses. Being a leguminous crop it is grown under a wide variety of climatic and soil conditions because of its ability to utilize atmospheric nitrogen, when the crop is properly inoculated and frequently does not respond to larger inputs of inorganic nitrogen. The water deficiency is considered the most important in the cases where soybean is cultivated as irrigated crop. (Kadhem *et al.*, 1985) concluded that yield and other agronomic responses are sensitive to the timings of water stress during growing seasons. (Cox and Jolliff, 1986) reported that moisture stress reduced grain yield from 27-87% when the crop was subjected to a moisture deficit of 18-70%. (Khan and Safdar, 1971) reported that first irrigation should be given after 3-4 weeks and subsequently after 15-20 days interval. (Ritter *et al.*, 1983) reported that full season irrigations should be applied from flowering stage to maturity.

(Huck *et al.*, 1984) noted that the water stress decreased the seed weight and Boquet and Walker (1984) reported that number of seeds per plant are affected by water deficit. Further, (Charlson *et al.*, 1982) reported yield reduction due to moisture stress varying from 20-50%. Considering paramount importance of proper use of irrigation for growth and high yields of soybean, the present study was designed to investigate the effect of irrigation frequencies on the growth and yield of soybean under agro-climatic conditions of Tandojam, Pakistan.

### Materials and Methods

Experiments on soybean variety Bragg were conducted at Sindh Agriculture University, Tandojam, Pakistan on silt loam soil. The experiment was laid out in a Randomized Complete Block Design with four replications and 5 treatments having a ultimate plot size of 3x7.5 meters. The details of irrigation frequencies (treatments) were: 2 irrigations at 40 and 60 days intervals, 3 irrigations at 30, 50 and 70 days intervals, 4 irrigations at 30, 45, 60 and 75 days intervals, 5 irrigations at 30, 40, 50, 60 and 70 days intervals, and, 6 irrigations at 30, 40, 50, 60, 70 and 80 days intervals. All the

agronomic practices were carried out uniformly in all the treatments.

Seed yield estimation was made at the time of harvest. For this purpose 0.5 meter border strip was left and from rest of the area the growth and yield components were studied and same area was harvested treatment wise separately, threshed, winnowed and weighed for yield estimation and yield per hectare was calculated. Similarly, oil content was determine treatment wise by soxhlet apparatus procedure. In which seed samples of each treatment were grinded in the grinder and same material was kept in the oven at 100°F for an hour and 2gm per sample was kept in the extractor of soxhlet apparatus for 20-24 hours after that some samples were again kept in the oven at 100°F for an hour to remove the solvent. Further the weight of samples were taken again and the loss in weight was calculated as oil content percent of soybean, which in turn is called as oil content percent on moisture free oven dried weight basis.

### Results and Discussion

The mean squares for all the growth, yield components, yield and oil content percentage of soybean as affected by irrigation frequencies are presented in Table 1 and their mean performance as Table 2.

Data demonstrated that all the growth, yield traits and oil content percentage were highly significantly affected by irrigation frequencies (Table 1). Further data depicted that maximum plant height (34.17 cm), branches per plant (5.32), pods per plant (79.10), seed index (136.78 g), seed yield per plot (2.53 kg), seed yield per hectare (1124.00 kg) and oil content percentage 24.40 were recorded with 6 irrigation frequencies at 30, 40, 50, 60, 70 and 80 days intervals during growth period followed by 5 irrigations. All the traits were minimum in control where 2 irrigations at 40 and 60 days interval were applied during growing season.

The findings of this study are in close agreement with the results of Fisher (1965) who reported 10-20 days interval between irrigations during growth period. Khan and Safdar (1971) noted that first irrigation should be applied after 3-4 weeks and subsequently after about 15-20 days intervals. Yazdi Samadi and Saadat (1980) reported that high amount of irrigation increased the plant height, branches per plant, pods per plant, seed

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**Table 1: Mean Squares of Plant Characters Affected by Irrigation Frequencies**

Source of variance	Replications	Irrigation Frequencies	Error
D.F	3.000	4.000	12.000
Plant height	67.173	64.268 *	14.193
Branches per plant	0.667	3.075**	0.208
Pods per plant	7.555	24.351**	3.459
Seed index	3.554	25.663**	0.752
Seed yield per plot	0.008	0.277**	0.006
Seed yield per hectare	27.857	54355.886**	21.224
Oil content percent	0.171	25.715**	0.298

**Table 2: Mean of Crop Parameters as Affected by Irrigation Frequencies**

Treatments Interval (Days)	Plant Height (cm)	Branches Per Plant	Pods Per Plant	Seed Index (g)	Seed Yield/Plot (Kg)	Seed Yield/ha (kg)	Oil Content (%)
2 Irrigations (40 and 60)	25.25	3.75	73.27	130.55	1.99	885.80	18.08
3 Irrigations (30,50 & 70)	34.00	4.25	75.17	134.60	2.04	910.50	20.26
4 Irrigations (30,45,60 & 75)	27.30	4.50	77.42	135.03	2.43	1080.20	21.77
5 Irrigations (30,40,50,60 & 70)	29.00	5.00	78.70	136.70	2.52	1120.00	23.51
6 Irrigations (30,40,50,60, 70 & 80)	34.17	5.32	79.10	136.78	2.53	1124.00	24.40

	S.E. of Irrigations	Cd i	Cd ii
Plant height (cm)	1.6848	3.67	-
Branches per plant	0.3448	0.751664	1.05164
Pods per plot	0.8318	1.813324	2.53699
Seed index (g)	0.3878	0.8454	1.1827
Seed yield/ plot	0.0338	0.073684	0.10309
Seed yield/hectare	2.0603	4.491454	6.283915

weight and seed yield. Heatherly (1985) reported significant increase in seed yield due to increased number of irrigations. Boquet (1984) concluded that irrigations substantially increases number of branches. Mayaki et al. (1976) reported that aerial components were adversely affected by soil water stress, Cox and Jolliff (1986) reported that moisture stress reduced grain yield from 27-87% when the crop was subjected to a moisture deficit of 18-70%.

Furthermore, the results are in contradictions to Heatherly (1985) who reported that seed oil content percent tended to decrease with increase in irrigation rate. It is therefore, concluded that drought consistently lowered growth yield traits and oil content percentage of soybean and all the traits were maximum with 5 to 6 irrigations under agro-climatic conditions of Tandojam.

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