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EFFECTS OF IRRIGATION LEVELS AND IRRIGATION LAYOUTS ON THE YIELD ATTRIBUTES AND GRAIN YIELD OF GREEN GRAM

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ABSTRACT

The influence of irrigation levels and irrigation layouts on the yield attributes and grain yield of green gram in summer season revealed that irrigation at 0.60 IW/CPE ratio with 4 cm under flat ridges significantly increased the pods per plant, seeds per pod and hundred grain weight. The highest greengram grain yield was obtained under the irrigation level of 0.60 IW/CPE ratio with flat ridges.

KEY WORDS : Green gram, Irrigation Levels, Irrigation Layouts

Water influences crop growth directly through all physiological processes in plant taking place in an aqueous media. It also influences crop performance indirectly through its effect on the soil nutrients and soil microbes. Soil and crop management practices are also decided by the water availability and irrigation practices. Crops need water in optimum quantities and at specific intervals. Improper scheduling, over irrigation, lack of proper drainage etc. often lead to reduction in crop yields due to water logging and salt imbalance in soils. Pulses are grown during *kharif* season (first monsoon) under rainfed conditions as mixed crops with cereals and millets. There is need to grow these crops under irrigation in the present context of increased need and high price for these crops.

MATERIALS AND METHODS

A study was carried out with Co5 green gram during summer 1990 at the Central farm, Agricultural College and Research Institute, Coimbatore to investigate the effect of various irrigation levels as well as irrigation layouts on the yield attributes and grain yield. The experiment was laid out in randomised block design replicated three times. The treatments comprised (i) irrigation at 0.6 IW/CPE ration (I_1) (ii) irrigation at 0.75 IW/CPE ratio (I_2) (iii) irrigation at 0.90 IW/CPE ratio (I_3) (iv) basin (M_1) (v) ridges and furrows (M_2) (vi) flat ridges (M_3). Nine treatment combinations (3 irrigation levels and 3 irrigation layouts) were tested. The depth of irrigation was fixed as 4 cm. The gross and net plot sizes were 5.5 m x 3.5 and 5 m x 3m, respectively. Three to four seeds after treating with carbendazim were dibbled per hole in a spacing of 30 x 10 cm. One sowing and another life irrigation were given as common to all reatments to a depth of 4 cm. The plots were irrigated as per the schedule with measured quantity of water through a parshall flume.

RESULTS AND DISCUSSION

The results of the experiment revealed that irrigation levels and irrigation layouts significantly influenced the yield attributes (Table 1).

Table 1. Effect of irrigation levels and irrigation layouts on yield attributes.

Treatments	No. of pods/plant				No. of seeds/pod				100 grain wt. (g)			
	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean	M_1	M_2	M_3	Mean
I_1	23.20	25.70	24.43	24.44	12.70	13.60	13.90	13.40	3.39	3.42	3.47	3.43
I_2	20.83	22.33	23.10	22.07	12.30	13.80	12.90	13.17	3.39	3.41	3.43	3.41
I_3	20.60	20.47	21.07	20.71	12.40	13.40	13.07	12.96	3.37	3.40	3.46	3.41
Mean	21.54	22.83	22.87		12.63	13.60	13.29		3.38	3.41	3.45	
			SE_d	CD		SE_d	CD			SE_d	CD	
	I		0.31	0.65		0.14	0.29			0.004	0.008	
	M		0.31	0.65		0.14	0.29			0.004	0.008	
	I x M		0.53	1.12		0.24	0.50			0.006	0.010	

Number of pods per plant

The mean number of pods per plant varied to be significantly due to irrigation levels. Significantly highest mean number of pods per plant (24.44) was recorded by I_1 (0.6 IW/CPE) followed by I_2 (0.75 IW/CPE) and I_3 (0.90 IW/CPE) with 22.07 and 20.71 pods per plant, respectively. Among the irrigation layouts, flat ridges recorded 22.87 pods per plant which was on par with ridges and furrows (22.83 pods per plant). The treatment flat ridges (M_3) and M_2 gave statistically higher pod number over M_1 (21.54). The interaction of irrigation levels and irrigation layouts was also significant.

Irrigation plays a vital role in production of pods. In the present study, it was inferred that the maximum number of pods resulted from 0.60 IW/CPE ratio. Similar results were obtained by other workers (Anon., 1981a) in green gram and (Anon., 1981b) in black gram.

Number of seeds per pod

Among the irrigation levels, higher mean number of seeds per pod was recorded by I_1 followed by I_2 which were on par with each other. The treatment I_2 was comparable with I_3. Regarding irrigation layouts, the ridges and furrows (M_2) has recorded significantly higher number of seeds per pod followed by (M_3) with 13.29 seeds per pod. Basin (M_1) gave 12.63 seeds per pod. The interaction between irrigation levels and irrigation layouts were found to be significant. Since this character is mostly governed by genetical means they are little altered by any of the treatments tried under the study as observed by Nagarajan (1980).

Hundred grain weight

Significant influence was exerted by irrigation levels and irrigation layouts on hundred grain weight. The treatment I_1 was superior to the rest of the treatments registering 3.43 g as hundred grain weight. An average hundred grain weight of 3.45 g. 3.41 g and 3.38 g was registered by M_3, M_2 and M_1 respectively and they were statistically differing with each other. The increased hundred grain weight could be due to optimum soil moisture level available to the crop.

Grain yield

The results of the experiment revealed that irrigation levels and irrigation layouts significantly influenced the grain yield (Table 2). Among the irrigation levels, the treatment I_1 recorded higher grain yield of 1263 kg per ha, while I_2 and I_3 recorded 1170 kg per ha and 1068 kg per ha respectively. Increased yield achieved by the treatment I_1 was due to the optimum moisture environment of the treatment on the yield attributes *viz.*, number of pods per plant, number of seeds per pod and hundred grain weight. The treatment of 0.60 IW/CPE ratio resulted in higher grain yield of green gram as reported by Balyan and Malik (1981).

Among the irrigation layouts, M_3 recorded grain yield of 1194 kg ha^{-1} and was statistically on par with M_2 which recorded 1192 kg per ha of grain yield, followed by M_1 with 1116 kg per ha of grain yield. This could be attributed to the fact that flat ridges and ridges and furrows allowed water to flow only at the root zone and ensured the maximum availability through maintaining the field

Table 2. Effect of irrigation levels and irrigation layouts on grain yield (kg ha^{-1}) and water use efficiency (kg ha cm^{-1}).

Irrigation levels (IW/CPE)	Grain yield (kg ha^{-1}) Irrigation layouts				Water use efficiency (kg ha cm^{-1}) Irrigation layouts			
	Basin (M1)	Ridges & furrows (M2)	Flat ridges (M3)	Mean	Basin (M1)	Ridges & furrows (M2)	Flat ridges (M3)	Mean
0.6	1225	1288	1276	1263	23	29	28	27
0.7	1110	1171	1230	1170	19	25	26	23
0.9	1013	1116	1075	1068	15	21	19	18
Mean	1116	1192	1194	-	19	25	24	-

(Statistically not analysed)

	SE_d	CD
I	13.14	27.85
M	13.14	27.85
I x M	22.75	NS

at optimum available soil moisture conditions. Yield increase due to ridges and furrows over basin was earlier observed by Rasve *et al* (1983) in groundnut. The interaction between irrigation levels and irrigation layouts was not significant.

The experimental results revealed that I_1 recorded higher grain yield. The treatment I_3 recorded the lower grain yield. Regarding irrigation layouts, higher grain yield of 1194 kg per ha was registered by flat ridges closely followed by ridges and furrows (1192 kg per ha). The basin method ranked third accounting for an average yield of 1116 kg per ha.

Water use efficiency

The water use efficiency was higher at the irrigation levelof I_1 than at I_2 and Irrigation at I_1 recorded the maximum water use efficiency of 27 kg of grains per ha cm of water used in green gram. The higher water use efficiency under I_1 was due to less water consumption in this treatment than I_2 and I_3. As regard to the irrigation layouts, ridges and furrows has recorded slightly higher water use efficiency as compared to flat ridges which may be considered similar. As compared to basin method. The difference between the ridges and furrows and flat ridges was meagre. The increase in water use efficiency due to adoption of ridges and furrows and flat ridges was mainly due to less water used compared to basin (Table 2).

Higher mean number of pods per plant was recorded by I_1 among the irrigation levels. Regarding the irrigation layouts, the flat ridges was found to have more mean number of pods per plant followed by ridges and furrows and basin. Among the irrigation levels, higher mean number of seeds per pod was recorded by I_1. Ridges and furrows were found to be better than basin but ranking next to flat ridges.

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