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EFFECT OF IRRIGATION SCHEDULES AND PLANTING METHODS ON GROWTH, PRODUCTIVITY AND WUE OF GREEN GRAM (*PHASEOLUS RADIATE* L.) UNDER RICE-WHEAT-GREEN GRAM CROPPING SYSTEM

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Abstract

A field experiment was conducted during winter season of 2010-11 at Research Farm, N. D. University of Agriculture and Technology, Kumarganj, Faizabad (U.P.), India to study the effect of four irrigation levels, based on irrigation water (IW): cumulative pan evaporation (CPE) ration and planting method, on green gram the plant height, leaf area index and yield attributes increased significantly with increase in IW/CPE ratio. However, water use efficiency (WUE) bereaved with increase in IW: CPE ratio and was maximum at IW: CPE 0.6 among the planting method maximum WUE was obtained with Raised method (46.81 Kg ha^{-1}) and minimum with Flat method (38.87 kg ha^{-1}). The maximum plot height (54.76 cm) leaf area index (3.25), yield per ha (13.7 ha^{-1}) water use efficiency (46.81 kg ha^{-1}) were recorded with Raised method of planting. Among different irrigation schedule maximum plant height (57.38), leaf area index (3.77) and yield per hectare (14.46 q) were noted with the IW: CPE 1.0 at 6 am depth while maximum WUE (49.12 kg ha^{-1}cm) was recorded with IW: CPE ratio 0.6.

Key words : Water use efficiency (WUE), irrigation schedule, green gram, planting method.

Introduction

Green gram (*Phaseolus radiate* L.) is one of the important pulses crop. Contributing 11 percent to the total production of pulses in the country. After the harvest of *rabi* crops, a vast area in Northern area in brought under cultivation only with the onset of monsoon. The yield of green gram during summer season is much higher than the *kharif* with the availability of short durations varieties of green gram due to less infestation of disease, insects and pest. Till now most of the work or scheduling the irrigation of crops is based or either soil or plant parameter as a guide. There is a need of quality the irrigation need of pure crop on the basis of latest approach of scheduling irrigation *i.e.* irrigation water (IW): cumulative pan evaporation (CPE) ratio. Among other agronomic practices proper method of planting may considerably increase the production of green gram. Ideal planting geometry is precious and important for better and efficient utilization of available plant growth. Resources in order to get maximum productivity. Therefore, it is necessary to evaluate irrigation need as well as suitable planting method to obtain more plant growth, yield and WUE. Hence, a study was taken up to evaluate the optimum level of irrigation and planting method for summer green gram under rice wheat – green gram cropping system.

Materials and Methods

A field experiment was conducted at Agronomy Research Farm, N.D. University of Agriculture & Technology, Kumarganj, Faizabad (U.P.), India during summer 2009. The soil of the experiment field was silt loam is texture, slightly alkaline in reaction (8.1 pH), low in organic carbon (0.287) low in available nitrogen (100.45 kg ha^{-1}), phosphorus (18.50 kg ha^{-1}) and medium in potassium (290 kg ha^{-1}) the bulk density and field capacity were 1.38g cm^{-3} and 22.6%, respectively. The texture class determined by triangular method and bulk density using core sample method (Badman, 1942). The field experiment was conducted in split plot design with four irrigation schedules in main plots (0.6, 0.8, 1.00 IW/CPE ratio and 10 days interval at 6 cm. depth) and three planting methods (Flat, Ridge and Raised bed) in sub–plots, followed with four reaction. Green gram Narendra moong I was sown on 9 april 2009 in 30 × 10 cm distance using a seed rate 39 kg ha^{-1}.

Table-1: Effect of plorting methods and irrigation schedule on growth productivity and WUE of grain gram

Treatment / Plorting method	Plant height (cm)	No. of branch plant^{-1}	Dry matter (gm^{-1})	LAI (%)	Num of pod plant^{-1}	Num of seed plant^{-1}	Yield (2Iha)	WUE (Kg/ha)	Total water received (cm)
Flat	52.06	12.40	12.92	3.01	16.65	7.71	11.35	38.87	
Ridged	53.70	13.72	13.61	3.16	17.87	8.88	12.80	46.61	
Raised	54.76	14.25	13.98	3.25	18.49	9.27	13.74	46.81	
CD=5%	1.46	0.40	0.39	0.12	0.57	0.26	0.76		
Irrigation schedule									
IWCPEO.6	48.11	9.92	11.38	2.43	13.96	5.96	2.26	49.12	
0.8	52.74	12.34	12.81	3.05	16.35	7.66	12.28	49.41	
1.0	57.38	16.86	15.67	3.77	21.10	11.38	14.46	39.24	
10 days interwals	1.85	14.72	14.15	3.33	19.27	9.50	14.37	38.99	
CD= 5%	1.85	0.51	0.50	0.15	0.72	0.33	0.94		

A common recommended dose of fertilizer used for moong 30 kg N, 50 kg P_2O_5 and 30 kg ko/ha. Single super phosphate and muriate of potash were used as the source of nitrogen, phosphorus and potassium, respectively. Half the N and full of P_2O_5 and k_2O were applied basal at the time of sowing and the remaining half N was applies a month after sowing just after the first common irrigation.

The requisite irrigation depth was maintain by parshall flume, having a throat width of 7.5 cm installed at the head of experiment plot. The time required, it irrigate the plot is calculated and the water was applied accordingly. The number of irrigation were 3, 4, 6, at IW; CPE ratio 0.6, 0.8, 0.1 respectively number an 6 at 10 days intervals the total water applied on the basis of average was 18.35, 24.85, 36.85 and 36.83, respectively. The water requirement of moong was calculated on the basis of irrigation water applied; effective rainfall and moisture difference between sowing and harvesting of the crop.

Results and Discussion

Effect of plorting pattern

Growth characters

Growth parameters V12- plant height, no. of branches/plant, dry matter accumulation/plant, leaf area index were influenced by different plorting methods. Raised method of planting recorded the maximum improvement in growth parameters, which was superior to ridge and flat system of plorting. The improvement in growth attributes could be assigned to higher moisture availability for crop sowing to better moisture conservation under these planting system. These result Carbohydrate the findings of V.S. Rathore *et al.* (2005).

Yield attributes

Yield attributes like number of pod/plant and number of seed/pod varies significantly due to planting method. Significantly higher number of pod/planted number of seed/pod were observed with raised bed system of planting compared to other system of planting. Maximum grain yield of 3.74 2ha^{-1} was recorded with raised bed system. The higher yield obtained under these planting system might be owing to cumulative effect of number of seed/pod due to improvement of soil – moisture and mineral nutrient availability Dhindwal *et al.* (2006) and Tripathi and Singh (2007) reported similar findings.

Water use efficiency

Planting pattern resulted in considerable variation in water use efficiency (WUE) in term of grain yield of green gram. Significantly higher WUE of green gram recorded under raised bed system of plotting. Higher moisture availability, increased plant growth and grain yield might be responsible increased WUE under these planting system Dhirdwal *et al*. (2006) reported similar findings.

Effect of irrigation methods

Growth characters

The plant height no. of branches/plant, dry matter accumulation/plant and leaf area index of green gram increase significantly in the level of irrigation. Maximum plant height and LAI were recorded under 6 irrigation schedule through (IW: CPE ratio 1.0 while minimum at IW: CPE ratio 0, 6, this was because the good establishment of roots due to depurate moisture supply in soil which performed higher nutrient mobilization and uptake. This findings is in conformity with Bharti *et al.* (2007).

Yield attributes and yield

Yield attributes of green gram were significantly influenced by different levels of irrigation. Among the level of irrigation, irrigation schedule through/IW: CPF 1.0 recorded the maximum number of seed/pod maximum grain yield 13.742 ha^{-1} was recorded with IW: CPE ratio 1.0 while minimum $9.28_2 ha^{-1}$ with IW: CPE ratio 0.6, number of seed/pod and grain yield decrease with subsequently decrease in the level of irrigation. This was because the water stress resulted in imposed on nutrient translocation, photosynthesis and metabolic activity in the planting system. This result corroboration the findings of Bharti *et al.* (2007).

Water use efficiency

Water use efficiency decrease with increase in irrigation level. Maximum water requirements of green gram was recorded under 6 irrigation at IW: CPE 1.0, which was significantly higher than other treatments, where as the minimum water requirements increased with increase in IW : CPE ratio. This might be due to the fact under more irrigations, evaporation was at potential rate due to availability of more water than the crop irrigated with less irrigations, this findings is in close conformity with Bhunia *et al.* (2006) and Bharti *et al.* (2007).

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