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Performance of *rabi* blackgram (*Vigna mungo* L.) to soil amendments and irrigation schedules

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Abstract
Field trial was carried out in split plot design at Advanced Post Graduate Centre, Lam, Guntur. The treatments comprised of irrigation schedules as main plots *viz*., one irrigation at pre-flowering stage (I_1), one irrigation at pod formation stage (I_2), two irrigations at pre-flowering and pod formation stages (I_3) and soil amendments as sub plot treatments *viz*., soil application of humic acid @ 20 kg ha^{-1} (S_1), soil application of hydrogel @ 2.5 kg ha^{-1} (S_2) and soil application of FYM @ 5 t ha^{-1}(S_3). Among different irrigation schedules I_3 was found to be superior in recording the highest growth parameters when compared to other two irrigation treatments. Maximum yield was recorded with (I_3) which was comparable with (I_1). Higher water productivity was realized with one irrigation at pre-flowering stage (I_1) when compared to two irrigations at pre-flowering and pod formation stages (I_3). Soil amendment hydrogel @ 2.5 kg ha^{-1} was found to be better in recording higher growth and yield parameters when compared to FYM @ 5 t ha^{-1}. Significant difference in water productivity of blackgram was not observed with regard to soil amendment treatments.

Keywords: Humic acid, hydrogel, blackgram, irrigation, growth, yield, water productivity

Introduction
Humic Acid (HA) is an organic growth stimulant, with positive effects on enzyme activity, plant nutrient absorption. It also increases the infiltration rate and water-holding capacity of the soil and there by increases the yields of the crops. It absorbs the nutrients from fertilizers and these exchanged nutrients are slowly released. Hydrogel may be a practically convenient and economically feasible option to achieve the goal of agricultural productivity under conditions of water scarcity.

Materials and Methods
The field experiment was conducted on clay soils during the *rabi* season of 2019-20 at Advanced Post Graduate Centre, Lam, Guntur. The experimental site was geographically situated at an altitude of 315 m above mean sea level, 16° 36´ N latitude and 80° 43´ E longitude and falls under Krishna Agro-climatic Zone of Andhra Pradesh, India. The experiment was laid out in split plot design and replicated four times. The treatments comprised of three main plots *viz*., one irrigation at pre-flowering stage (I_1), one irrigation at pod formation stage (I_2) two irrigations at pre-flowering and pod formation stages (I_3) and three sub plot treatments *viz*., soil application of humic acid @ 20 kg ha^{-1} (S_1), soil application of hydrogel @ 2.5 kg ha^{-1} (S_2) and soil application of FYM @ 5 t ha^{-1}. The soil of the experimental site was clay with pH 8.3, medium in organic carbon (0.6 %) and low in available nitrogen (183 kg ha^{-1}), medium in available phosphorus (17 kg ha^{-1}) and potassium (189 kg ha^{-1}). Recommended dose of fertilizer @ 20 kg N ha^{-1} and 50 kg P_2O_5 ha^{-1} was applied uniformly to all the experimental plots at the time of sowing as basal. The commercial product of humic acid namely Humirate marketed by Ag crop chem (P) limited Hyderabad, is a free flowing crystalline shiny dark black flakes was mixed with sand and applied basally at the time of sowing. Hydrogel with trade name of "Water Force" was mixed with sand in 1:10 proportion respectively and was then applied in soil at a depth of 20-25 cm before sowing of blackgram seed in the experimental plots.

Results and Discussion

Growth

Taller plants at harvest of blackgram (39.24 cm) were observed in (I_3) treatment when compared to I_1 and I_2 treatments. Soil application of hydrogel @ 2.5 kg ha^{-1} recorded taller plants (38.55 cm) when compared to FYM @ 5 t ha^{-1} treated plot but comparable with humic acid @ 20 kg ha^{-1} treated plot. Significantly higher number of branches (5.93) were observed with I_3 treatment when compared to other irrigation treatments. Soil application of hydrogel @ 2.5 kg ha^{-1} recorded significantly more number of branches plant^{-1} (5.75) when compared to FYM @ 5 t ha^{-1} but comparable with humic acid @ 20 kg ha^{-1}. FYM @ 5 t ha^{-1} treated plot recorded less branches per plant (5.35). Maximum dry matter accumulation (3399 kg ha^{-1}) was noticed in I_3 when compared to I_1 and I_2 treatments. Among the soil amendments, soil application of hydrogel @ 2.5 kg ha^{-1} recorded maximum value (3312 kg ha^{-1}) compared to application of FYM @ 5 t ha^{-1} and on a par with soil application of humic acid @ 20 kg ha^{-1} treated plots. These findings lead support with those of Anupama and Parmar (2012) [1], Pradeep Kumar and Rajkumara (2016) [5], Lende and Patil (2017) [3], Singh *et al.* (2017) [6], Mondal *et al.* (2018) [4].

Yield Attributes and Yield

Maximum number of yield attributes *viz.*, number of clusters plant^{-1}, pods cluster^{-1}and test weight (g) (3.8, 6.2, and 4.81g) were observed in I_3 treatment and minimum were recorded in one irrigation at pod formation stage (3.2, 5.5 and 4.23 g). Among soil amendments, hydrogel @ 2.5 kg ha^{-1} recorded more number of clusters plant^{-1}, pods cluster^{-1} and test weight (g) (3.6, 6.1 and 4.73 g). The highest seed yield of 847 kg ha^{-1} was reported in the treatment having more number of irrigations i.e I_3 and lowest was observed with one irrigation at pod formation stage (673 kg ha^{-1}) but comparable with one irrigation at pre-flowering stage (782 kg ha^{-1}). Higher yield was realized (811 kg ha^{-1}) with hydrogel @ 2.5 kg ha^{-1} but comparable with humic acid @ 20 kg ha^{-1} (772 kg ha^{-1}). Similar observations were reported by Pradeep Kumar and Rajkumara (2016) [5]. Irrigation at I_3 (pre flowering+ pod formation stages) recorded the highest haulm yield of 1767 kg ha^{-1}and comparable with I_1 (1665 kg ha^{-1}). Maximum haulm yield of 1720 kg ha^{-1} was observed in hydrogel @ 2.5 kg ha^{-1} treated plot when compared to the treatment which received FYM @ 5 t ha^{-1} (1554 kg ha^{-1}) and comparable with treatments which received application of humic acid @ 20 kg ha^{-1} (1665 kg ha^{-1}). Significant difference in harvest index of blackgram was not noticed with irrigation and soil amendment treatments. Similar findings were reported by Gomaa *et al.* (2014) [2], Pradeep Kumar and Rajkumara (2016) [5]. I_1 treatment realized more water productivity (0.440 kg m^{-3}) and less value was recorded in I_3 (0.367 kg m^{-3})**.** Pradeep Kumar and Rajkumara (2016) [5] reported similar findings in chickpea crop.

Table 1: Effect of irrigation and soil amendments on Plant height (cm), Number of branches plant^{-1}, Dry matter accumulation (kg ha^{-1})

Treatments	Plant height (cm)	Number of branches plant^{-1}	Dry matter accumulation (kg ha^{-1})
Irrigation schedules (I)			
I_1- One irrigation at pre-flowering stage	36.53	5.45	3097
I_2- One irrigation at pod formation stage	34.53	5.29	2955
I_3-Two irrigations at pre-flowering and pod formation stages	39.24	5.93	3399
SEm ±	0.73	0.12	85.6
CD (P=0.05)	2.52	0.41	296
CV%	6.85	7.31	9.4
Soil amendments (S)			
S_1 -Humic acid @ 20 kg ha^{-1}	37.10	5.55	3159
S_2 -Hydrogel @ 2.5 kg ha^{-1}	38.55	5.75	3312
S_3 - FYM @ 5 t ha^{-1}	35.23	5.35	2980
SEm ±	0.55	0.16	55.9
CD (P=0.05)	1.65	0.25	166.9
CV%	5.21	5.20	6.1
Interaction (I X S)	NS	NS	NS

Table 2: Irrigation and soil amendments effect on Number of clusters plant^{-1}, Number of pods cluster^{-1}, Number of seeds pod^{-1}, 100 seed weight (g) of blackgram

Treatments	Number of clusters Plant^{-1}	Number of Pods cluster^{-1}	Number of seeds Pod^{-1}	100 seed weight (g)
Irrigation schedules (I)				
I_1- One irrigation at pre-flowering stage	3.5	5.9	6.1	4.37
I_2- One irrigation at pod formation stage	3.2	5.5	6.0	4.23
I_3-Two irrigations at pre-flowering and pod formation stages	3.8	6.2	6.3	4.81
SEm ±	0.06	0.11	0.10	0.1
CD (P=0.05)	0.21	0.36	NS	0.35
CV%	5.87	6.18	6.26	7.74
Soil amendments (S)				
S_1 -Humic acid @ 20 kg ha^{-1}	3.5	5.8	6.1	4.48
S_2-Hydrogel @ 2.5 kg ha^{-1}	3.6	6.1	6.3	4.73
S_3- FYM @ 5 t ha^{-1}	3.3	5.6	6.0	4.21
SEm ±	0.05	0.10	0.11	0.09
CD (P=0.05)	0.16	0.28	NS	0.27
CV%	5.32	5.58	6.26	6.91
Interaction (I X S)	NS	NS	NS	

Table 3: Effect of irrigation and soil amendments on seed, haulm yield and harvest index of blackgram

Treatments	Seed yield (kg ha^{-1})	Haulm yield (kg ha^{-1})	Harvest index (%)
Irrigation schedules (I)			
I_1- One irrigation at pre-flowering stage	782	1665	31.50
I_2- One irrigation at pod formation stage	673	1507	30.80
I_3-Two irrigations at pre-flowering and pod formation stages	847	1767	32.41
SEm ±	18.86	34.19	0.71
CD (P=0.05)	65.26	118.32	NS
CV%	8.50	7.19	7.72
Soil amendments (S)			
S_1 -Humic acid @ 20 kg ha^{-1}	772	1665	31.61
S_2-Hydrogel @ 2.5 kg ha^{-1}	811	1720	32.10
S_3- FYM @ 5 t ha^{-1}	720	1554	31.42
SEm ±	18.23	29.12	0.49
CD (P=0.05)	54.40	86.89	NS
CV%	8.22	6.13	5.38
Interaction (I X S)	NS	NS	NS

Table 4: Effect of irrigation and soil amendments on Water productivity (kg m^{-3}) of blackgram

Water productivity (kg m^{-3})				
Soil amendments (S)	**Irrigation schedules (I)**			
	I_1	**I_2**	**I_3**	**Mean**
S_1 -Humic acid @ 20 kg ha^{-1}	0.443	0.438	0.368	0.416
S_2-Hydrogel @ 2.5 kg ha^{-1}	0.448	0.443	0.380	0.423
S_3- FYM @ 5 t ha^{-1}	0.430	0.425	0.353	0.403
Mean	0.440	0.435	0.367	
	SEm±	CD (p=0.05)	CV (%)	
Irrigation schedules (I)	0.01	0.02	5.64	
Soil amendments (S)	0.01	NS	6.91	
Interaction (IX S)	NS	NS		

Conclusion

Two irrigations scheduled at pre-flowering and pod formation stages realized taller plants, more number of branches per plant and dry matter accumulation and yield parameters when compared to other irrigation treatments. Application of hydrogel @ 2.5 kg ha^{-1} realized more growth and yield when compared to FYM @ 5t ha^{-1} but comparable with soil application of humic acid @ 20 kg ha^{-1}. Significant difference in water productivity of blackgram was not observed with regard to soil amendment treatments

References

1. Anupama, Parmar BS. Pusa hydrogel- An indigenous semi synthetic super absorbent technology for conserving water and enhancing crop productivity. Success Story IARI, New Delhi 2012, 14.
2. Gomaa MA, Radwan F, Khalil AM, Kandil EE, El-Saber MM. Impact of humic acid application on productivity of some maize hybrids under water stress conditions. Middle East Journal of Applied Sciences 2014;4(3):668-673.
3. Lende N, Patil H. Irrigation management on growth, yield and quality of chickpea (*Cicer arietinum* L.). Journal of Pharmacognosy and Phytochemistry 2017;6(5):528-533.
4. Mondal R, Ali J, Biswas S, Das S, Dutta D, Sarka T. Effect of different levels of irrigation and nutrient on growth and yield of Summer Green gram *cv*. *Bireswar* in New Alluvial Zone of West Bengal. International Journal of Chemical Studies 2018;6(1):386-390.
5. Pradeep Kumar HM, Rajkumara S. Effect of irrigation and hydrogel application on chickpea varieties in Malaprabha Command area. Journal of Farm Sciences 2016;29(2):208-211.
6. Singh I, Verma RR, Srivastava TK. Growth, yield, irrigation water use efficiency, juice quality and economics of sugarcane in pusa hydrogel application under different irrigation scheduling. Sugarcane technology 2017;1(20):29-3.