



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
www.agronomyjournals.com
2024; SP-7(12): 661-664
Received: 14-09-2024
Accepted: 20-10-2024

RB Gohil
M.Sc. (Agri.), Department of
Agronomy, Department of
Agronomy, College of Agriculture,
Junagadh Agricultural University,
Junagadh, Gujarat, India

GS Vala
Associate Research Scientist, Fruit
Research Station, Junagadh
Agricultural University, Mahua,
Gujarat, India

CA Gorasiya
Ph.D. Scholar, Department of Soil
Science and Agricultural
Chemistry, College of Agriculture,
Junagadh Agricultural University,
Junagadh, Gujarat, India

Corresponding Author:
RB Gohil
M.Sc. (Agri.), Department of
Agronomy, Department of
Agronomy, College of Agriculture,
Junagadh Agricultural University,
Junagadh, Gujarat, India

Effect of cow based bio-enhancers & irrigation scheduling based on IW/CPE ratio on growth & yield of summer green gram

RB Gohil, GS Vala and CA Gorasiya

DOI: <https://doi.org/10.33545/2618060X.2024.v7.i12Sj.2296>

Abstract

A field experiment entitled “Response of summer green gram (*Vigna radiata* L.) to irrigation scheduling based on IW/CPE ratio and cow based bio enhancers” was carried out during summer-2021 at the Instructional Farm, Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh. The experiment was laid out in split-plot design comprising 12 treatment combinations, involving main plot with three levels of irrigation scheduling at 0.6 IW/CPE ratio (I_1), 0.8 IW/CPE ratio (I_2) and 1.0 IW/CPE ratio (I_3) and sub plot with four levels of absolute control (F_0), RDF @ 20:40:00 N:P₂O₅:K₂O kg ha⁻¹ (F_1), 5 t ha⁻¹ FYM + *Jeevamrut* @ 500 Liters ha⁻¹ at sowing, 30 and 45 DAS (F_2) and 5 t ha⁻¹ FYM + *Panchagavya* @ 3 % as foliar spray at 20, 35 and 50 DAS (F_3) in three replications. The results revealed that scheduling irrigation at an IW/CPE of 1.0 recorded significantly higher values of plant height, number of branches per plant, dry matter accumulation per plant, root nodules per plant, pods per plant, pod length, seeds per pod, seed and stover yield over other IW/CPE ratios. Markedly next to RDF @ 20:40:00 N:P₂O₅:K₂O kg ha⁻¹, application of 5 t ha⁻¹ FYM + *Jeevamrut* @ 500 Liters ha⁻¹ (at sowing, 30 and 45 DAS with irrigation), all the growth characters, yield attributes, protein content, seed and stover yield. As a resulted data of Interaction between irrigation scheduling and cow based bio enhancers was also found significant for dry matter accumulation, pods per plant, seed and stover yield under treatment combination of 1.0 IW/CPE ratio and application of RDF @ 20:40:00 N:P₂O₅:K₂O kg ha⁻¹ were closely followed by combination of 1.0 IW/CPE ratio and application of 5 t ha⁻¹ FYM + *Jeevamrut* @ 500 Liters ha⁻¹ (at sowing, 30 and 45 DAS with irrigation).

Keywords: Green gram, *Vigna radiata* L., irrigation scheduling, IW/CPE ratio, *Jeevamrut*, *Panchagavya*

1. Introduction

Pulses, including green gram (*Vigna radiata* L.), are essential to sustainable agriculture and nutrition, particularly in protein-deficient diets. As a short-duration, drought-resistant crop, green gram thrives across diverse farming systems, offering significant nutritional benefits such as high protein content and essential nutrients. Its role in nitrogen fixation also enhances soil fertility, contributing to environmental sustainability. Effective irrigation management is critical for optimizing green gram productivity, as the crop is sensitive to moisture stress. Additionally, organic inputs like *Panchagavya* and *Jeevamrut* have emerged as eco-friendly alternatives to chemical fertilizers, promoting soil health and sustainable farming. This study investigates the combined effects of irrigation schedules and cow-based bio-enhancers on green gram's growth, yield, quality, water use efficiency, and economic viability, aiming to enhance sustainable agricultural practices. Despite its importance, the productivity of green gram in India remains suboptimal, primarily due to rainfed cultivation and poor soil fertility. Addressing these limitations requires an integrated approach that combines efficient irrigation management and the use of organic inputs. To this end, the present study was undertaken.

2. Materials & Methods

The present investigation entitled “Response of summer green gram (*Vigna radiata* L.) to irrigation scheduling based on IW/CPE ratio and cow based bio enhancers” was conducted under medium black calcareous soil, at Instructional Farm, Department of Agronomy, College

of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) during summer season of the year 2021. The field experiment comprising of total twelve different treatment combinations in which Main plot is 3 levels of irrigation schedules (0.6, 0.8 & 1.0 IW/CPE) and sub plot included 4 levels of fertilizer and cow based bio-enhancers (F1: Control, F2: RDF, F3: 5 t/ha FYM+*Jeevamrut* @500 Liter/ha & F4: 5 t/ha FYM+*Panchagavya* @ 3%) were laid out in split plot design concept with three replications. Green gram variety GM-4 released in 2001 from GM 3 X Pusa 9333 through Pedigree selection for general cultivation in Gujarat. This high yielding variety of green gram was selected for present study due to it's under irrigated as well as rainfed condition and very high degree of resistance against disease and pest. The crop was raised with all the standard package of practices and protection measures also timely carried out as required. *Jeevamrut* application at sowing, 30 and 45 DAS with irrigation water & *Panchagavya* application at 20, 35 and 50 DAS as foliar spray. The experimental data recorded for growth and yield parameters were statistically analysed for level of significance.

3. Result & Discussion

A) Effect of Irrigation schedules

1. Effect on growth parameters

At harvest, the highest plant height (51.73 cm) was obtained with 1.0 IW/CPE ratio (I_3) which was significantly higher than 0.8 and 0.6 IW/CPE ratio. While significantly, lower plant height (46.09 cm) was noted with 0.6 IW/CPE ratio (I_1). These results are similar to those reported by Yadav and Singh (2014), Singh *et al.* (2018) ^[14]. Significantly higher dry matter accumulation was recorded when crop was irrigated at 1.0 IW/CPE ratio (I_3), while lower dry matter accumulation was produced under 0.6 IW/CPE ratio (I_1). Significant reduction in dry matter accumulation under 0.6 IW/CPE ratio (I_1) due to soil moisture stress which resulted lower water supply impairs the photosynthesis and ultimately the lower dry matter accumulation, while improvement in dry matter accumulation under 1.0 IW/CPE ratio (I_3) might be due to the higher irrigation frequency increased availability of adequate moisture and nutrients in root zone of plant, thus enhance the uptake of nutrients which in turn boost up the meristematic activities, increases size of cells and formation and functioning of protoplasm resulted in higher dry matter accumulation. The results confirm the findings of Kaur (2014) ^[4], Karande *et al.* (2019) ^[3].

2. Effect on yield attributes

Number of pods per plant and pod length at harvest was increased significantly with increases in levels of irrigation schedules. Significantly higher number of pods per plant and pod length at harvest was recorded under scheduling irrigation at 1.0 IW/CPE ratio (I_3) followed by 0.8 IW/CPE ratio (I_2). More number of pods per pods and pod length at harvest observed with 1.0 IW/CPE ratio (I_3) was evidently because due to maintenance of optimum soil moisture condition enhancing the growth processes resulting in number pods per plant. These results are in conformity with the findings of those reported by Behera (2015) ^[1].

The number of seeds per pod was significantly higher under irrigation treatment 1.0 IW/CPE ratio (I_3), while lower number of seeds per pod was observed under 0.6 IW/CPE ratio (I_1). Less number of irrigation becomes detrimental for plant growth which resulted in poor seed setting and grain filling at 0.6 IW/CPE ratio (I_1). Optimum moisture condition prevailed in the

root zone at optimum IW/CPE ratio resulted in better yield attributes reported by Parmar and Thanki (2007) ^[11]

3. Effect on yield

Seed yield of green gram significantly increased with increases in levels of irrigation. Significantly the higher seed yield (1224 kg ha⁻¹) was recorded under 1.0 IW/CPE ratio (I_3). While significantly lowest seed yield (1015 kg ha⁻¹) was recorded with 0.6 IW/CPE ratio (I_1). The higher seed yield observed with 1.0 IW/CPE ratio (I_3) might be due to adequate available soil moisture in the root zone throughout the crop growth period. It is reflected in higher growth parameters and dry matter production, which also reflected in development of better yield components and finally in pod yield. The present findings are in accordance with the findings of Patel *et al.* (2005) ^[12]. The results of stover yield showed an increasing trend with each successive irrigation schedule based on IW/CPE ratio. Significantly higher stover yield (2140 kg ha⁻¹) was recorded under 1.0 IW/CPE ratio (I_3). While, significantly lower stover yield (1722 kg ha⁻¹) was observed under 0.6 IW/CPE ratio (I_1). Maximum stover yield under 1.0 IW/CPE ratio (I_3) followed by 0.8 IW/CPE ratio (I_2) due to increased irrigation frequency increases the soil moisture status which in turn resulted into higher leaf water potential, stomata conductance and higher photosynthesis consequently increased the dry matter production and ultimately increased haulm yield. Increase in stover yield under higher irrigation level was also observed by Patel *et al.* (2005) ^[12], Prajapati *et al.* (2006) ^[13].

B) Effect of Fertilizer & cow based bio-enhancers

1. Effect on growth parameters

At harvest, significantly the higher values of growth parameters viz., plant height at harvest, number of branches per plant and dry matter accumulation per plant were observed with treatment of RDF @ 20:40:00 N:P₂O₅:K₂O kg ha⁻¹ (F₁), which was at par with treatment of 5 t ha⁻¹ FYM + *Jeevamrut* @ 500 Liters ha⁻¹ with irrigation water at sowing, 30 and 45 DAS (F₂) and 5 t ha⁻¹ FYM + *Panchagavya* @ 3 % as foliar spray at 20, 35 and 50 DAS (F₃). While the lower value of growth parameters were observed in the treatment control (F₀). Moreover the presence of growth enzymes in *Panchagavya* might have increased the activities of beneficial microorganisms in soil by application of FYM which ultimately resulted into improved nutrient availability for longer period and thus, beneficial effects on growth parameters of green gram. Similar findings have been reported by Panchal *et al.* (2017) ^[10], Singh *et al.* (2018) ^[14], Sutar *et al.* (2019) ^[15] and Machhar *et al.* (2021) ^[6].

2. Effect on yield attributes

The treatment RDF @ 20:40:00 N:P₂O₅:K₂O kg ha⁻¹ (F₂) excelled yield attributes viz., number of pods per plant, length of pod, number of seeds per pod and test weight, followed 5 t ha⁻¹ FYM + *Jeevamrut* @ 500 Liters ha⁻¹ with irrigation water at sowing, 30 and 45 DAS (F₂) and FYM @ 5 t ha⁻¹ + *Panchagavya* @ 3 % as foliar spray at 20, 35 and 50 DAS (F₃). While, significantly the lowest values of these yield attributes were recorded under the treatment control (F₀).

The treatment as 5 t ha⁻¹ FYM + *Jeevamrut* @ 500 Liters ha⁻¹ with irrigation water at sowing, 30 and 45 DAS (F₂) found superior than 5 t ha⁻¹ FYM + *Panchagavya* @ 3 % as foliar spray at 20, 35 and 50 DAS (F₃). In case of *Jeevamrut*, all the yield attributing parameters were found higher which might be due to favorable effects of IAA, GA₃, macro and micronutrients. The increase in the number of pod per plant might be due to the

better availability of nutrients which enabled the increased yield. The increase in pods per plant and number of seeds per pod due to *Panchagavya* might be due to accumulated metabolites which get translocated towards the reproductive sinks and these in turn resulted in stimulation of different yield attributes. The quantities of IAA and GA present in *Panchagavya* when applied as foliar spray could have hastened length of pod resulting in maximum number of seed setting. It might have facilitated instant uptake of nutrients at optimum level which lead to the conversion of vegetative phase to reproductive phase. The present findings are in accordance with those earlier reported by Matai (2012)^[8], and Bhalodia (2018)^[2].

3. Effect on yield

Significantly the higher seed and stover yields were recorded under the treatment of RDF @ 20:40:00 N:P₂O₅:K₂O kg ha⁻¹ (F₁) which remained stastically at par with 5 t ha⁻¹ FYM + *Jeevamrut* @ 500 Liters ha⁻¹ with irrigation water at sowing, 30 and 45 DAS (F₂) and 5 t ha⁻¹ FYM + *Panchagavya* @ 3 % as foliar spray at 20, 35 and 50 DAS (F₃). Whereas, significantly the lower seed and stover yields were registered under the control (F₀). Since, yield of the crop is a function of several yield components which are dependent on complementary interaction between vegetative and reproductive growth of the crop. As most of growth and yield attributes contributed in seed yield of green gram evidently resulted in higher yield in treatments which get nitrogen and phosphorus through chemical fertilizers or FYM with bio enhancers appears to be on account of their influence on dry matter production might be due to greater

synthesis of carbohydrate and their translocation and indirectly via increase in plant height, number of branches and possibly a result of higher uptake of nutrients. The present findings are in close agreement with the results obtained by Swaminathan *et al.* (2007)^[16], Manimekalai *et al.* (2010)^[7], Patil *et al.* (2012)^[3].

C) Interaction effect of both

Interaction effect between irrigation schedules and cow based bio enhancers were found significant with respect dry matter accumulation at harvest, number of pods per plant, seed and stover yield per hectare. The combination of irrigation scheduling at 1.0 IW/CPE ratio and application of RDF @ 20:40:00 N:P₂O₅:K₂O kg ha⁻¹ (I3F1) recorded significantly maximum dry matter per plant and which was remained at par with combination of I₂F₁, and I₃F₃. Significantly highest number of pods per plant under treatment combinations of irrigation scheduling at 1.0 IW/CPE ratio and application of RDF @ 20:40:00 N:P₂O₅:K₂O kg ha⁻¹ (I3F1) as compared to rest of the combinations and which was at par with combinations of I₂F₁, I₃F₂ and I₃F₃. Significantly higher seed yield per plant was recorded under the combination of irrigation scheduling at 1.0 IW/CPE ratio and application of RDF (I₃F₁), but it was remained at par with I₃F₂ and I₃F₃, which was significantly superior over rest of treatment combination. This was ascribed due to significant interactive effect of irrigation scheduling and chemical fertilizer application. Similar results were also reported by Kumar *et al.* (2017)^[5], Mondal *et al.* (2018)^[9] and Singh *et al.* (2018)^[14].

Table 1: Effect of Irrigation schedules & Cow based bio-enhancers on growth & yield of green gram var. GM-4

Treatments	Plant height (cm) at harvest	Dry matter accumulation per plant at harvest (g)	Number of pods per plant at harvest	Pod length (cm) at harvest	Number of seeds per pod	Test weight (g)	Seed yield (kg ha ⁻¹)	Stover yield (kg ha ⁻¹)	Harvest index (%)
Irrigation schedule: I									
I ₁ : 0.6 IW/CPE ratio	46.09	10.53	18.86	6.78	8.27	38.99	1015	1722	36.89
I ₂ : 0.8 IW/CPE ratio	47.09	12.59	21.54	7.00	8.43	39.87	1103	1975	35.88
I ₃ : 1.0 IW/CPE ratio	51.73	14.21	23.17	7.64	9.21	40.12	1224	2140	36.35
S.Em.±	1.13	0.33	0.51	0.17	0.22	1.01	34	71	1.12
C.D. at 5 %	4.44	1.28	2.00	0.66	NS	NS	134	277	NS
C.V. %	8.11	9.10	8.34	8.17	8.85	8.86	10.64	12.55	10.68
Fertilizer and cow based bio enhancers: F									
F ₀ : Control	43.16	10.17	19.54	6.70	7.48	38.33	887	1728	34.02
F ₁ : RDF @ 20:40:00 N:P ₂ O ₅ :K ₂ O kg ha ⁻¹	51.58	14.05	22.58	7.37	9.26	39.52	1214	2072	36.94
F ₂ : 5 t ha ⁻¹ FYM + <i>Jeevamrut</i> @ 500 Liters ha ⁻¹	50.15	13.21	21.73	7.32	9.20	40.53	1197	2041	37.02
F ₃ : 5 t ha ⁻¹ FYM + <i>Panchagavya</i> @ 3 %	48.34	12.35	20.91	7.18	8.60	40.26	1158	1941	37.52
S.Em.±	1.17	0.33	0.58	0.17	0.21	1.07	29	53	0.94
C.D. at 5 %	3.48	0.97	1.72	0.51	0.62	NS	85	158	NS
C.V. %	7.28	7.85	8.19	7.24	7.26	8.07	7.71	8.18	7.73
Interaction (I x F)									
S.Em.±	2.03	0.56	1.00	0.30	0.36	1.85	50	92	1.62
C.D. at 5 %	NS	1.68	2.98	NS	NS	NS	147	273	NS

4. Conclusion

On the basis of results obtained from one year field experimentation, it seems quite logical to conclude that higher growth, yield & quality from summer green gram (var. GM 4) can be secured by application of irrigation at 1.0 IW/CPE ratio (6-7 days interval) and 5 t ha⁻¹ FYM + *Jeevamrut* @ 500 Liters ha⁻¹ (at sowing, 30 and 45 DAS with irrigation) under medium black calcareous clayey soil of South Saurashtra Agro-climatic zone.

5. References

1. Behera BS, Das M, Behera AC, Behera RA. Weather based irrigation scheduling in summer groundnut in Orissa condition. *Int J Agric Sci Res.* 2015;5(5):247-259.
2. Bhalodia BH. Evaluation of some cow-based bio-enhancers and botanicals for organic cultivation of coriander (*Coriandrum sativum* L.). M.Sc. (Agri.) Thesis (Unpublished), Junagadh Agricultural University, Junagadh; 2018.

3. Karande BI, Patel DD, Patil SB, Vasani MJ. Influence of irrigation level and row spacing on yield and yield attributing character of mung bean varieties (*Vigna radiata* L.). Int J Curr Microbiol Appl Sci. 2019;8(2):464-473.
4. Kaur N. Growth yield and water productivity of bed planted summer mung in relation to irrigation regimes. Legume Res. 2014;12(8):1146-1148.
5. Kumar S, Datt N, Sandal SK, Sharma SK. Effect of cow urine and bio-fertilizers based fertigation schedule at varying levels of drip irrigation on yield, growth, quality parameters and economics of cucumber under protected condition. Int J Curr Microbiol Appl Sci. 2017;6:1242-1249.
6. Machhar RG, Chauhan SA, Shaikh AA, Pargi SB. Effect of foliar application of organic and inorganic nutrients sources on growth, yield and quality of green gram (*Vigna radiata* (L.) Wilczek). The Pharma Innovation J. 2021;10(12):139-141.
7. Manimekalai C, Renganayaki PR, Lakshmi S. Efficacy of organic invigorant seed on field productivity in black gram (*Vigna mungo*). Green Farming. 2010;1(4):363-365.
8. Matai PD. Response of summer greengram (*Vigna radiata* (L.) Wilczek) to varied concentrations of Panchagavya. M.Sc. (Agri.) Thesis, S.D.A.U., Sardarkrushinagar; 2012.
9. Mondal R, Ali J, Biswas S, Das S, Dutta D, Sarkar 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. Int J Chem Stud. 2018;6(1):386-390.
10. Panchal P, Patel PH, Patel AG, Desai A. Effect of Panchagavya on growth, yield and economics of chickpea (*Cicer arietinum*). Int J Chem Stud. 2017;5(2):265-267.
11. Parmar PP, Thanki JD. Effect of irrigation, phosphorus and bio-fertilizer on growth and yield of rabi green gram (*Vigna radiata* L.) under south Gujarat condition. Crop Res. 2007;34(1 & 3):100-102.
12. Patel IC, Patel BS, Patel MM, Patel AG, Tikka SB. Effect of varieties, levels of irrigation and date of sowing on yield and monetary returns of summer cowpea under north Gujarat condition. Indian J Pulse Res. 2005;18(2):217-218.
13. Prajapati MN, Patel JJ, Gedia KM. Influence of different irrigation schedules and growth regulators on summer green gram (*Vigna radiata* L.). Agron Dig. 2006;6(3):23-24.
14. Singh R, Singh V, Singh P, Yadav RA. Effect of phosphorus and PSB on yield attributes, quality and economics of summer green gram (*Vigna radiata* L.). J Pharmacogn Phytochem. 2018;7(2):404-408.
15. Sutar R, Sujith GM, Devakumar N. Growth and yield of cowpea [*Vigna unguiculata* (L.) Walp] as influenced by Jeevamrut and Panchagavya application. Legume Res. 2019;42(6):824-842.
16. Swaminathan C, Swaminathan V, Vijayalakshmi K. Panchagavya boon to organic farming. Int Book Distributing Co., Lucknow, India; c2007. p. 20-63.