

Efficacy of Water Hyacinth as green manure on test crop, green gram

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SUMMARY

An *in vitro* investigation was carried out with water hyacinth (WH) as green manure in different concentrations to assess its efficiency on test crop, green gram. The statistical scrutiny of the results of the study revealed that among the five treatments (T₁- control, T₂-NPK standard check, T₃-70mg WH, T₄-140 mg WH and T₅ 210 mg WH). T₅ treatment (210 mg-WH) was found to be efficient in enhancing the biometric parameters like plant height (from 35.23 to 83.93 cm), number of leaves /plant (from 11.33 to 23.33cm), root volume (from 0.72 to 4.96cm), root nodules /plant (increased from 10.33 to 35.33) nodule weight upto 50 days and declined to 18.33 at harvest), fresh and dry weight of plants (from 0.95 to 2.26g) and (from 0.14 to 0.27g), respectively over the control, T₁. The yield parameters like number of flowers /plant and pods /plant (from 10.33 to 15.33 and from 11.33 to 16.67, respectively), length of pod (from 4.5 to 6.53cm), pod weight (from 0.23 to 0.45g) and number of seeds /plant and hundred seed weight (from 8 to 10g and from 0.87 to 3.32 g, respectively) also showed a significant increase compared to absolute control, T₁. Thus, it may be deduced from the present investigation that the nuisance weed, water hyacinth, a source of high concentration of nutrients can be effectively utilized either as a fertilizer or as a green manure to enhance the growth and yield of crops.

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Green manures seem to be an attractive alternative source to meet a substantial portion of nitrogen requirement and provide organic matter to the soil. Water hyacinth, *Eichhornia crassipes* (Mart) Solms is a free floating perennial aquatic plant with broad, thick and glossy ovate leaves. The leaves are supported above the water surface by long, spongy and bulbous stalks and the feathery, freely hanging roots. Water hyacinth has been considered as an uncontrolled nuisance many a time. The capacity of water hyacinth to invade and overtake aquatic habitat is astounding. It can quickly dominate natural areas and can dramatically alter the species composition, structure and function of native plant and animal communities. Water hyacinth plant contains organic matter -75.8 per cent, N-1.5 per cent, Na-1.8 per cent, and Ca-12.8 per cent. Decayed water hyacinth was found to be the perfect medium to cultivate straw mushrooms, a low cost organic fertilizer for farms. If the water hyacinth is

returned to the land, then the nutrients are taken back to the land in an improved form. Water hyacinth can also be used as mulch, compost and as fertilizer, produced by mixing with organic materials and phosphate rock (Sabale and Mane 2006).

The objective of the present investigation was to analyze the efficiency of WH as a green manure on the biometric and yield parameters of green gram (*Vigna radiata*, L.) which belongs to the family Leguminosae.

MATERIALS AND METHODS

A pot culture experiment was conducted at department of Botany in Avinashilingam Deemed University, Coimbatore in 2008, with five treatments, each with three replications, following a randomized block design (RBD). The pots were filled with 7kg of red sandy loam soil and about seven seeds of green gram were sown in each pot. After germination and establishment, three healthy plants were maintained per pot. The plant samples were carefully uprooted at 30, 50 and 70 DAS to analyze the biometric and yield parameters of green gram.

Treatment details:

There were five treatments as detailed below, which were evaluated against the T₁- control, T₂-NPK, T₃-WH-

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green manure (70mg), T₄-WH–green manure (140mg), T₅-WH – green manure (210 mg).

The biometric and yield parameters of green gram recorded at 30,50 and 70 DAS were plant height, weight of number of leaves / plant, number of nodules/plant, fresh and dry weight/ plant, number of flowers/plant, number of pods /plant, length of pod, single pod weight, number of seeds /pod and weight of hundred seeds.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been summarized under following heads:

Biometric parameters: (Table 1)

Plant height:

The treatment T₅ (WH – GM, 210 mg application) showed maximum increase in plant height from 35.23 cm to 83.93 cm followed by T₄ from 28.73 cm to 71.77 cm over control, T₁(from 22.27 cm to 49.93 cm).

The present finding was at par with the finding of Neelamagam *et al.* (2007). They reported that the soil amended with water hyacinth as green manure (3% concentration) enhanced the seedling growth (total length) in black gram from 13.12 cm to 19.10 cm, among the different *Rhizobium jaboricum* and water hyacinth concentration (0.1, 0.5, 1.0 and 3%) treatments.

Number of leaves / plant:

Among the treatments, the maximum increase in the number of leaves recorded was in T₅ (from 11.33 to 23.33) when compared to the control, T₁.

Similar result was obtained by Widajajanto *et al.* (2003).who observed that among the different types of crops, such as lettuce, spinach, Chinese cabbage, radish, okra, green gram, soybean and corn, a stronger response in terms of vegetative growth like plant height, number of leaves/ plant and number of branches / plant was shown by radish, okra, green gram, soybean and corn at a higher application of water hyacinth as green manure.

Root volume:

A significant increase in root volume was observed in T₅ which ranged from 0.72 to 4.96 cu.mm over the control, T₁ (from 0.30 to 0.55 cu.mm).

The present finding was at par with the result of Padmaja *et al.* (2007). They observed an increase in root volume from 0.97 to 1.23 cu.mm than the control from 0.38 to 0.48 cu.mm in lady’s finger with 140 mg *Aloe vera* leaf peel as green manure.

Treatments	Plant height (cm)			Number of leaves/plant			Root volume (cu.mm)			Number of nodules/plant			Fresh weight of plant (g)			Dry weight of plant (g)		
	30	50	70	30	50	70	30	50	70	30	50	70	30	50	70	30	50	70
T ₁ (Control)	22.27	40.77	49.93	3.33	8.00	10.67	0.30	0.37	0.55	1.33	2.67	7.00	0.23	0.51	0.77	0.05	0.67	0.70
T ₂ (70mg)	31.53	40.77	67.10	5.67	11.00	18.00	0.67	0.79	3.23	8.67	37.33	12.67	0.83	1.08	2.17	0.13	0.73	0.22
T ₃ (140mg)	26.67	41.20	66.90	8.00	12.00	15.67	0.75	0.66	2.39	7.33	23.33	9.67	0.58	0.99	1.07	0.09	0.77	0.16
T ₄ (210mg)	28.73	42.67	71.77	8.67	13.00	18.33	0.57	0.76	3.73	7.33	28.33	9.33	0.87	1.23	1.67	0.12	0.75	0.16
T ₅ (210mg)	35.23	47.60	83.93	11.33	17.67	23.33	0.72	0.86	4.96	10.33	35.33	18.33	0.95	1.29	2.26	0.17	0.76	0.27
S.E.D.		1.67			1.53			0.77			0.20			0.07			0.08	
C.D. (P<0.05)		1.77			1.22			0.76			0.07			0.12			0.02	

Table 2 : Effect of WH –GM on yield parameters of green gram

Treatments	Number of flowers /plant		Number of pods/plant		Pod length (cm)		Single pod weight (g)		Number of seeds/pods		100 Seed weight (g)	
	50	70	50	70	50	70	50	70	50	70	50	70
T ₁ –absolute control	2.67	5.33	2.00	6.67	2.07	3.57	0.10	0.29	2.30	3.00	0.35	1.71
T ₂ – NPK	8.33	14.33	8.33	14.67	4.23	4.43	0.21	0.31	4.33	8.67	0.84	2.99
T ₃ – WH-green manure (70mg)	7.00	11.33	7.67	11.33	4.63	5.17	0.15	0.32	5.00	5.33	0.71	2.54
T ₄ –WH-green manure (140mg)	8.00	12.00	8.67	12.33	5.10	5.70	0.21	0.36	7.00	8.00	0.81	2.98
T ₅ –WH-green manure (210mg)	10.33	15.33	11.33	16.67	4.50	6.53	0.23	0.45	8.00	10.00	0.87	3.32
S.E. ±	1.26		1.71		0.32		0.22		0.99		0.15	
C.D. (P<0.01)	4.00		4.9		1.0		0.06		3.13		0.41	

Number of nodules / plant:

A substantial increase in the number of root nodules / plant, was recorded in T₅ (WH – GM- 210 mg) which showed an increase from 10.33 to 35.33 nodule weight upto 50 DAS and declined gradually to 18.33 nodule.

Similar finding was reported by Rajan (2000), who also observed an increase in the number of nodules /plant from 2 to 40 and from 3 to 58 in soybean plants inoculated with Bradyrhizobial strain SB 117 and SB 113, respectively.

Fresh and dry weigh of plant:

A significant increase in fresh and dry weight of plant was noticed in T₅ (WH –GM -210 mg) which ranged from 0.95 to 2.26g and from 0.14 to 0.27g, respectively when compared to control, T₁ (fresh weight from 0.23 to 0.74g and dry weight from 0.06 to 0.10g).

The present finding is in conformity with the results of Seethalakshmi and Padmaja, (2007). They reported that, the *Aloe vera* leaf powder (140 mg) recorded maximum increase in fresh and dry weight from 1.25 to 12.8 g and from 0.41 to 6.99g, respectively than the control (from 0.41 to 2.44g and from 0.14 to 1.03g, respectively) in cluster bean.

Yield parameters: (Table 2)**Number of flowers/plant:**

A significant increase in the number of flowers was recorded in T₅ (WH –GM, 210mg) which varied from 10.33 to 15.33 over the control, T₁ (from 2.67 to 5.33).

Similar result was reported by Seethalakshmi and Padmaja (2007). They obtained an increase in the number of flowers /plant due to the incorporation of *Aloe vera* leaf peel powder – 140mg. The increase was from 5.7 to 8.7 than the control (1.7 to 2.3)

Number of pods/ plant:

The number of pod/plant registered in T₅ (WH-GM,

210mg) was significantly higher which ranged from 11.33 to 16.67 than the control, T₁ form (2.00 to 6.67).

Similar result was obtained by Padmaja *et al.* (2007). They reported that the incorporation of *Aloe vera* leaf peeling powder (140 mg) showed maximum increase in number of pods per plant (7.0) and length of pod (11.4cm) over the control in lady's finger.

Length of pod:

The treatment T₅ (WH –GM-210 mg) recorded maximum increase in length of pod from 4.50 cm to 6.53 over the control, T₁ (from 2.07 cm to 3.57 cm) from 50 to 70 DAS.

Single pod weight:

Maximum increase in pod weight was registered in T₅ from 0.23 g to 0.45g than the control, T₁ from 0.10 to 0.29g.

Number of seeds/pod:

A significant increase in number of seeds per pod was registered in T₅ (10.00) and T₄ (18.00) and the least number was in control, T₁ (3.00).

Hundred seed weight:

The hundred seed weight was maximum in T₅ (WH-GM-210 mg) treatment 3.32g compared to control T₁ (1.71g).

Conclusion:

Thus, it can be deduced from the present investigation that the nuisance weed, water hyacinth, a source of high concentration of nutrient, can be effectively harnessed either as a fertilizer or as a green manure to enhance the growth and yield of crops.

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