

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 7, July 2017

Response of Water Hyacinth as a Source of Potassium in the Production of Potato

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ABSTRACT: This paper illustrates about the study of water hyacinth (*Eichhornia crassipes*) as a source of bio manure in potato field. *Eichhornia crassipes* is an aquatic weed that pollutes all fresh water bodies. To check its vigorous growth, control measures are required. The potato crop (*Solanum tuberosum* L) was treated by using compost derived from *Eichhornia crassipes*. The potato was allowed to grow in potato cultivate session and the effect was studied by comparing with control. The physical parameters studied of crop were percentage germination, day of emergence of first leaf, weight of potato tuber after final harvest, fresh weight of potato, biomass of potato after final harvesting. The results signify the use of *Eichhornia crassipes* as the bio manure.

KEYWORDS:, *Solanum tuberosum* L., *Eichhornia crassipes*, Manure, Water Hyacinth

I. INTRODUCTION

Potato (*Solanum tuberosum* L.) is the major vegetable, and its importance in agro-based economy is next to cereals like rice, wheat and maize. It is highly recommended foods that can safe guard low-income countries from the risk posed by risking international food prices. It is source of both food and income in many of the densely populated area of the India and many under developing countries. Taking into consideration the prospect for the growth in the market for the production of potatoes and the current international market condition characterized by high cereals, potato can be taken as a good benchmark for rural development in India. For the good yield of Potato, Potassium is one of the major macronutrients. Potassium is taken up in significant quantities and this nutrient plays important roles in tuber yield and quality. Its presence is of great importance for soil health and plant growth. Low K is associated with an increased incidence of internal black spot bruising of potato. Primary function of potassium in the plant is its role in the maintenance of osmotic pressure and cell size, thereby influencing photosynthesis and energy production as well as stomata opening and carbon dioxide supply, plant turgor and translocation of nutrients. As such, the element is required in relatively large proportions by the growing plant [1]. Currently in Jharkhand most commonly used fertilizer types are Di-ammonium Phosphate (DAP) and urea while potassium is ignored that causes the decreased rate of potato production. Potash that is used for the production of potato is generally costly and not easily available. This problem can be overcome by the use of Water Hyacinth because of its high content of potassium, cost-effectiveness and eco-friendliness. Water hyacinth is free- floating perennial hydrophytes, belonging to the family pontederiaceae. The leaves are broad, thick, glossy, and ovate and float above the water surface. They have long spongy and bulbous stalk. The feathery, freely hanging roots are purple- black. It is one of the most productive plants on the earth and is considered the world's worst aquatic weed [2]. It tolerates annual temperatures ranging from 21.1°C to 27.2°C and its pH tolerance is estimated at 5.0 to 7.5. The 'beautiful blue devil' water hyacinth, grows rapidly as a dense green mat over stagnant water bodies such as lakes, streams, ponds, waterways, ditches and backwaters and is recognized by its lavender flowers and shining bright leaves[3]. Chemistry of water hyacinth is 95.5% moisture, 0.04% N, 1.0% ash, 0.06% P₂O₅, 0.20% K₂O, 3.5% organic matter. On a zero-moisture basis, it is 75.8% organic matter, 1.5% N, and 24.2% ash. The ash contains 28.7% K₂O, 1.8% Na₂O, 12.8% CaO, 21.0% Cl, and 7.0% P₂O₅. The crude protein (CP) contains,

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per 100g, 0.72g methionine, 4.72g phenylalanine, 4.32g threonine, 5.34g lysine, 4.32 g isoleucine, 0.27 g valine, and 7.2 g leucine[4]. It has high amount of potassium that is essential for the production of potato tuber. To improve soil fertility, water hyacinth is organic manure that is rich of potassium and it is useful for the large amount production of potato.

II. MATERIAL AND METHODS

Classification of Water hyacinth

Division: Spermatophyta **Sub – Division:** Angiospermae

Class: Monocotyledonae

Series: Coronariae

Family: Pontederiaceae

Genus: Eichhornia

Species: *E. crassipes*

Collection and Preparation of Water Hyacinth Manure

Eichhornia crassipes was collected from Hazaribag Lake, Hazaribag Jharkhand in the month of October- November, 2016. About 4 kg of the plant material was cut into small pieces and composted in soil for forty five days under shade. Water will be sprinkle in order to maintain moisture content. The heap of water hyacinth will turn up side down regularly to maintain aeration.

Manure Treatment

The test plot was thoroughly ploughed two times and harrowed once to a fine texture before clearing and levelling. Experiment was performed with variety “*Kufri Pokhraj*” which is one of the most often grown potato cultivars in Jharkhand. The experiment was carried out under open space conditions during the period of potato cultivation.

1.25 kg potato was seeding in test plot, length 15 feet and width is 30 feet. The area was divided into five part, one part was taken as a control, three parts was treated with water hyacinth and fifth part was treated with DAP, urea and potash. Morph metric data was collected.

Following parameter were taken in consideration

- ✓ Height of plant.
- ✓ Day of emergence of first leaf.
- ✓ Weight of potato tuber after final harvest.
- ✓ Fresh weight of potato
- ✓ Dry weight of potato
- ✓ Biomass of potato after final harvesting.

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III. RESULTS AND DISCUSSIONS

Experimental Design and Treatments

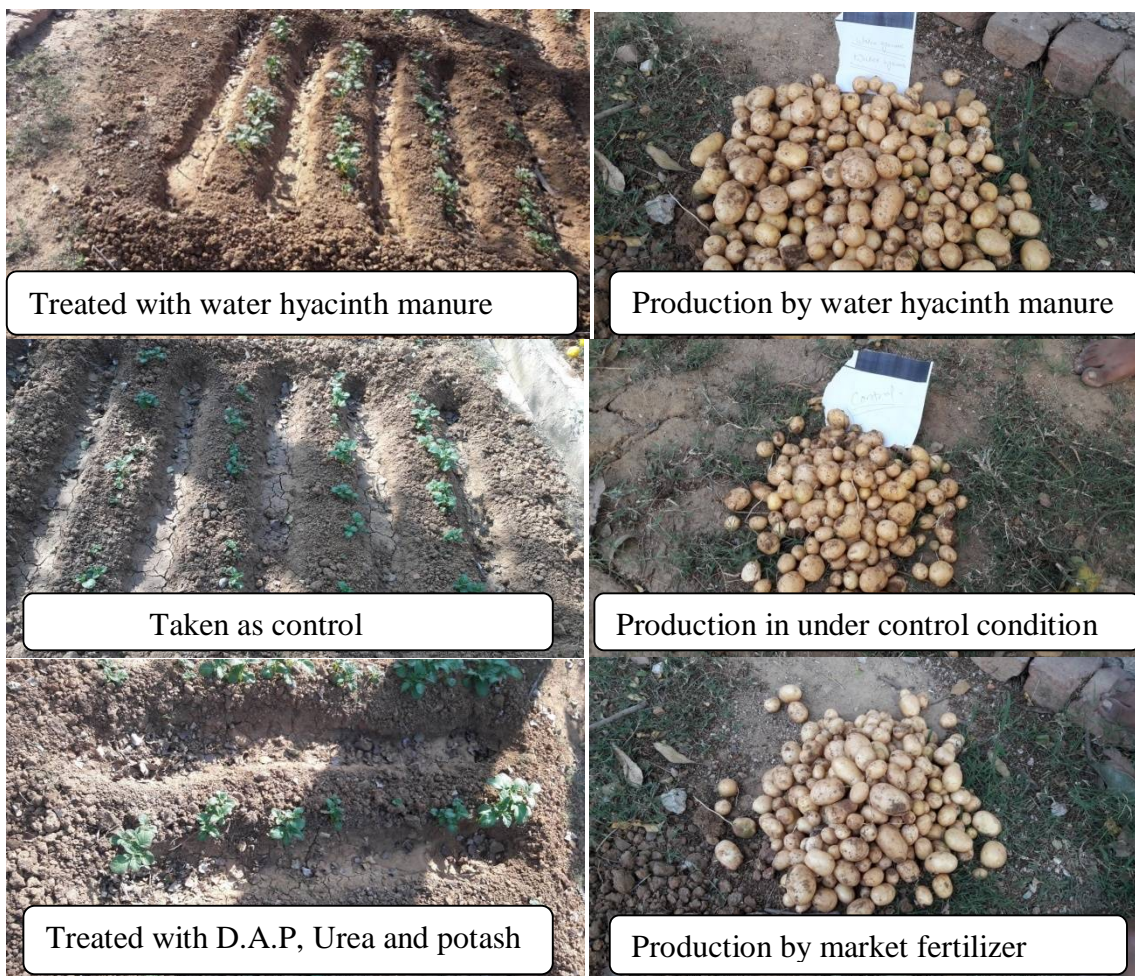


Fig:-Showing experimental design and treatment.

Serial Number	Experiment plot	Date of seeding	Day of emergence of first leaf.	Height of plant.	Seeding quantity of potato(gm)	Fresh weight of potato (gm)	Dry weight of potato (gm)	Biomass of potato after final harvesting. (gm)
1.	Control	26/12/2016	09/01/2017	8to12 inches	250	1000	200	800
2.	Treated by urea, potash and DAP	26/12/2016	08/01/2017	8to12 inches	250	1500	315	1185

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3.	Treated by Water hyacinth	26/12/2016	06/01/2017	12to 15inches	250	2000	420	1580
4.	Treated by Water hyacinth	26/12/2016	06/01/2017	12to 15inches	250	2000	420	1580
5.	Treated by Water hyacinth	26/12/2016	06/01/2017	12to 15inches	250	2000	420	1580

The study of water hyacinth as biomanure revealed that the incorporation of water hyacinth into soil crop system increased the yield and quality of potato tuber of the Potato tuber. Majid have reported enhancement in yield/plant in rice, corn, sesame, brinjal, onion and gourd, using water hyacinth compost. Majid also reported the increased yield in above plants with both compost as well as manure of water hyacinth used in combination with other aquatic weeds[5][6][7]. Our results are in agreement with previous findings[8]. Our result also highlighted that using composted water hyacinth material could serve as quality manure for improving soil fertility conditions and thus crop yields on the whole. Previous study suggest that water hyacinth enhance the productivity of tomato [9] and rice [10], indicated the soil fertility potential of water hyacinth compost and revealed its enhanced affect on productivity of *Zea mays* crop. With this result it can be suggested that, by the addition of water hyacinth manure into cultivation which affected the performance of test plant may be probably due to the increase of nitrogen availability released from water hyacinth during the process of mineralization. This is in agreement with [11] who mentioned that quality and quantity of added organic materials into soil may influence the decomposition rate and mineralization process. The same phenomenon was also reported [12]. The differences in the growth attributes of potato tuber after the addition of water hyacinth manure may be due to the physical and biochemical properties of the soil [13].

IV. CONCLUSION

Potash is getting very expensive day to day, so many local farmer are not able to use potash. Potash is those parameters of potato that determine its quality and the taste. Water hyacinth acts as bio-manure it is an eco friendly process and it influences the production rate of potato, in this process we can also reduce the water pollution. The aquatic weed water hyacinth (*Eichhornia crassipes* .), besides being a nuisance in nutrient-enriched public water bodies, is a low-cost alternative source of organic fertilizer in plentiful supply. The weed is a good absorber of nitrogen, phosphorus and potassium from water and can be used as a good source of compost material. The possible ways of combating its proliferation and the various methods of eradicating this “weed” not proved much. Hence the present investigation aims towards the exploration of “best out of waste”. Thus its utilization may become a way of its management. The results also signify the use of *Eichhornia crassipes* as the organic manure.

V. ACKNOWLEDGEMENTS

The authors are grateful to the Dean faculty of science (Porff. Dr. M.A. Mallick) Vinoba Bhave University Hazaribag, for support and encouragement to carry out this research activity.

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