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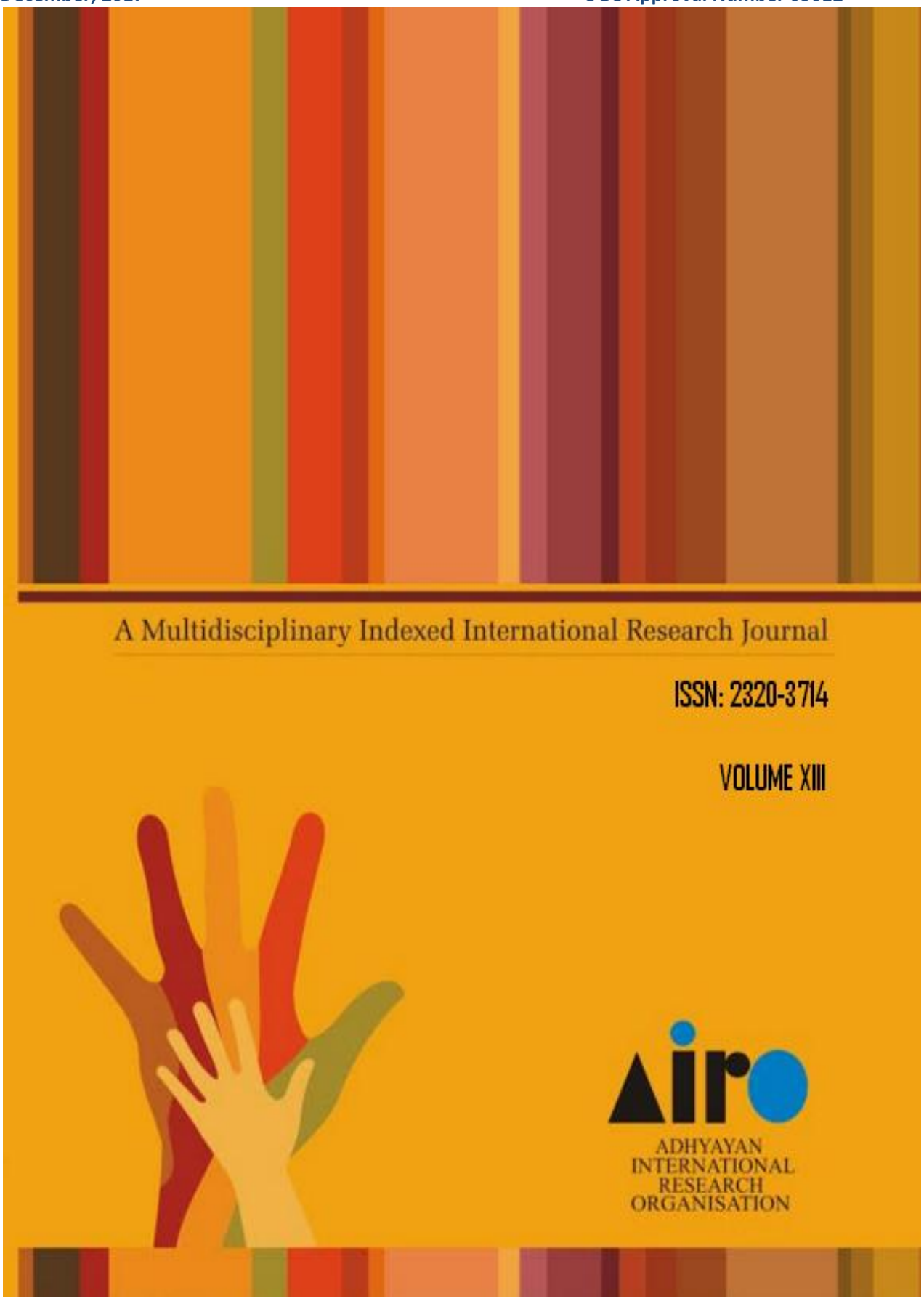

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Influence of Vermicompost on the yield of Ashwagandha (*Withania somnifera* L. Dunal)

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ABSTRACT

Ashwagandha is well known for its medicinal benefits and has a tremendous demand from the pharma industry.The effect of vermicompost on the growth of Ashwagandha was observed along with the comparison of leaf litter and normal soil. No chemical fertilizers were used. The plant growth parameters like shoot length, root length, shoot fresh weight, root fresh weight, shoot dry weight, root dry weight, number of leaves were observed in all the three controls. More growth was observed in vermicompost as compared to others.

Key words: *Withania somnifera*, Vermicompost, Leaf litter.

INTRODUCTION

Ashwagandha is used in many medicines, so it is considered as a medicinal plant. Due to its importance it is grown in many states of India[1]. Ashwagandha is also called as winter cherry due to the restorative property of its roots (Withania somnifera Dunal)[2] . It is of the Solanaceae family. It is a small woody shrub or herb and grows to maximum 30 to 50 cm height[3]. Ashwagandha is basically important for its roots as it contain number of alkaloids which also has Withanine and Somniferine and also has a reducing sugar phytosterol,ipuranal and also mixture of saturated and unsaturated fatty acids. It also gives resistance to stress and improves the stamina and helps in promoting the good

health of humans[4]. It has lot of demand for its roots and its roots estimated production is somewhat about 1500 tonnes [5]. Ashwagandha root has also proved important in Ayurveda[6].It is also used in the treatment of inflammation of joints,rheumatic pain,nervous disorders,impotence and immature ageing and so it is also called as 'Indian ginseng'[7].[8].Vermicompost is formed by biodegrading and stabilizing of organic material by the earthworm with the union of other microorganisms[9]. Vermicompost contains the nutrients like auxins, gibberellins and cytokinins [10] , which are required by the plants for their healthy growth. It also contains materials like humic acid. Most nutrients are available in the form of phosphates , nitrates and exchangeable calcium and soluble potassium [11]. It is also found that use of Vermicompost also suppresses the growth of various fungi like Pythium, Rhizoctonia and Verticillium[12] . So vermicompost is found to exhibit similar effects on growth and yield of plants as by applying inorganic fertilizers or any other plant growth regulators or hormones[13]. The present study is focused on the effect of vermicompost on yield of W*itania somnifera*.

MATERIALS AND METHOD

Experimental setup

The experiment was conducted at Botanical Garden of THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA , BARODA, GUJARAT, INDIA in 2016. The seeds of Ashwagandha were taken from The Directorate of Medicinal and Aromatic Plants Research (DMAPR) Anand, Gujarat National Research Institute. The medicinal plant, W. sominifera was used to measure the manurial quality of different fertilizers. The treatments were arranged based on a completely randomized design with 8 replications. The treatments were of different kinds of organic fertilizers like (Vermicompost (V), Leaf letter (L)) along with Control (C). Soil was provided from the Botanical Garden of THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA , BARODA, GUJARAT, INDIA .

24 pots were taken of the diameter of 10*10 and then they were marked 2 inches from the top of the pot and then filled with normal soil and then this soil was weighted. It was 5 Kg. Then 8 pots were filled with this normal soil and then these pots were labelled as N1,N2,N3,N4,N5,N6,N7,N8 respectively.

This is our control. Then 1.5 Kg of Vermicompost was taken and mixed with the normal soil(5kg) and make it to fill the pot till marking done. Same way the other pots were filled with vermicompost and were labelled as V1,V2,V3,V4,V5,V6,V7,V8 respectively. Then 1.5Kg Leaf litter was taken and mixed with the normal soil and made it to fill the marking done. Same way the other pots were filled with leaf litter and normal soil and were labelled as L1,L2,L3,L4,L5,L6,L7,L8 respectively. Then 8 seeds of Ashwagandha (native cultivator) were planted in each pot on Dec 21st, 2016. The botanical garden received natural light during day time. After planting the seeds in the pots then the water was supplied to the plants regularly so as to help the plant grow without any stress. Weeds were controlled by removing with the hands manually. Then the time taken for germination was recorded and then on the fifth day of germination of the seeds, the length of the shoot was recorded with a scale and also the number of leaves grown were recorded. Then 3 plants randomly from the Control pots were uprooted and kept them in a separate bag and labelled them as N1,N2,N3 respectively. Then 3 plants randomly from the Vermicompost pots were uprooted and kept them in a separate bag and labelled them as V1,V2,V3 respectively. Then same was repeated with leaf litter and labelled them as L1, L2,L3 respectively. Then the number of leaves on each plant were counted and recorded in the record book.

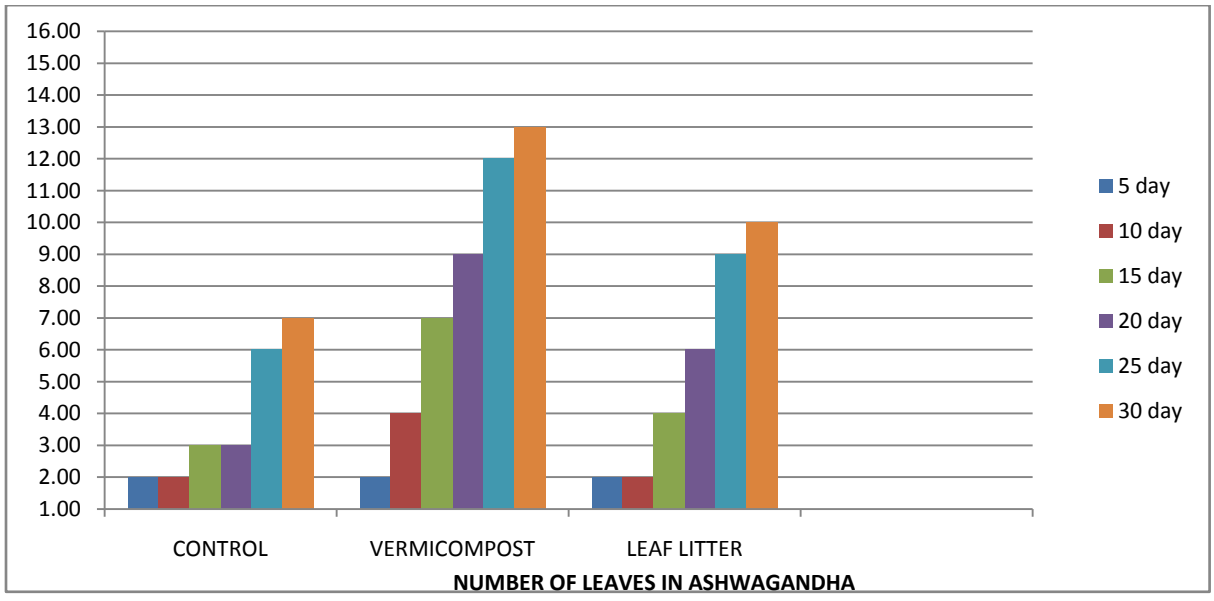
Table 1: Increase in plant biomass of Ashwagandha(*Witania somnifera*) with different soil

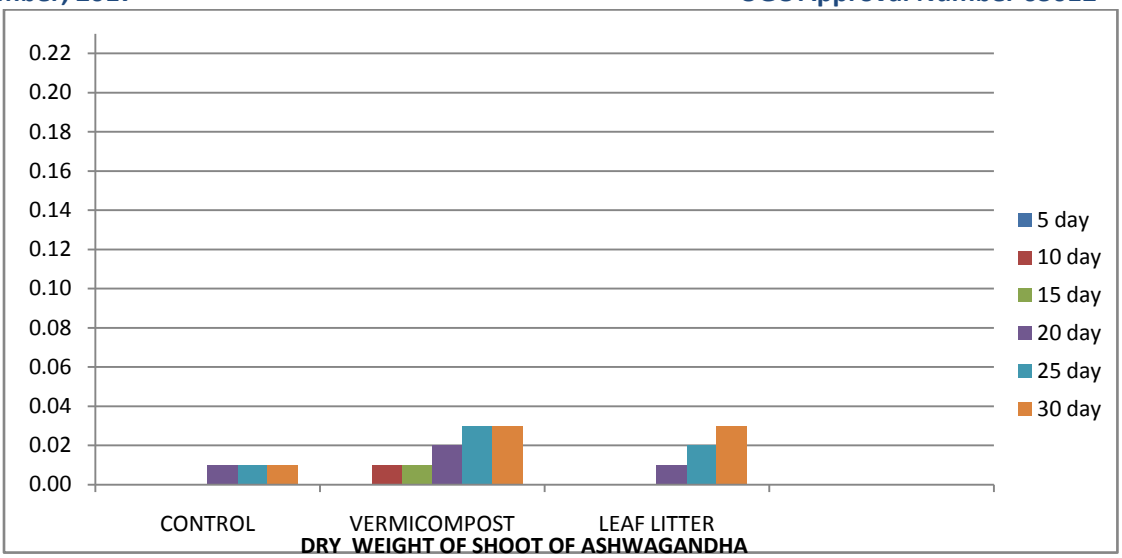
	Day	Shoot Length (cm)	Shoot Fresh wt (g)	Shoot Dry wt (g)	Root Length (cm)	Root Fresh wt (g)	Root Dry wt (g)	No. of Leaves
Control	5	1.30	0.02	-	2	0.01	-	2
Vermicompost	5	2.33	0.03	-	3	0.01	-	2
Leaf Litter	5	1.20	0.03	-	2	0.01	-	2
Control	10	2	0.03	-	3.5	0.01	-	2
Vermicompost	10	3	0.06	0.01	5	0.01	-	4
Leaf Litter	10	2	0.03	-	3.33	0.01	-	2
Control	15	2.40	0.05	-	4.33	0.01	-	3

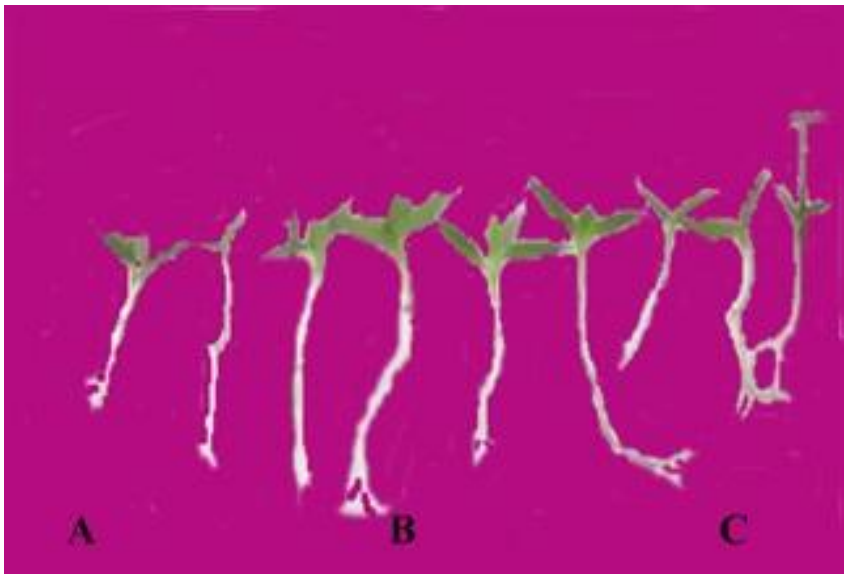
Vermicompost	15	3.30	0.10	0.01	5.10	0.02	-	7
Leaf Litter	15	2	0.17	-	4	0.01	-	4
Control	20	3.5	0.06	0.01	4.40	0.01	-	3
Vermicompost	20	5.5	0.23	0.02	5.66	0.04	-	9
Leaf Litter	20	4	0.16	0.01	4.66	0.02	-	6
Control	25	3.5	0.09	0.01	4.83	0.02	-	6
Vermicompost	25	6.33	0.26	0.03	7.33	0.07	0.01	12
Leaf Litter	25	5.66	0.20	0.02	5	0.03	-	9
Control	30	5.00	0.12	0.01	5	0.04	-	7
Vermicompost	30	7.66	0.30	0.03	8.33	0.09	0.01	13
Leaf Litter	30	6	0.22	0.03	5.10	0.04	-	10

(Replicates of 3 plants were taken.)

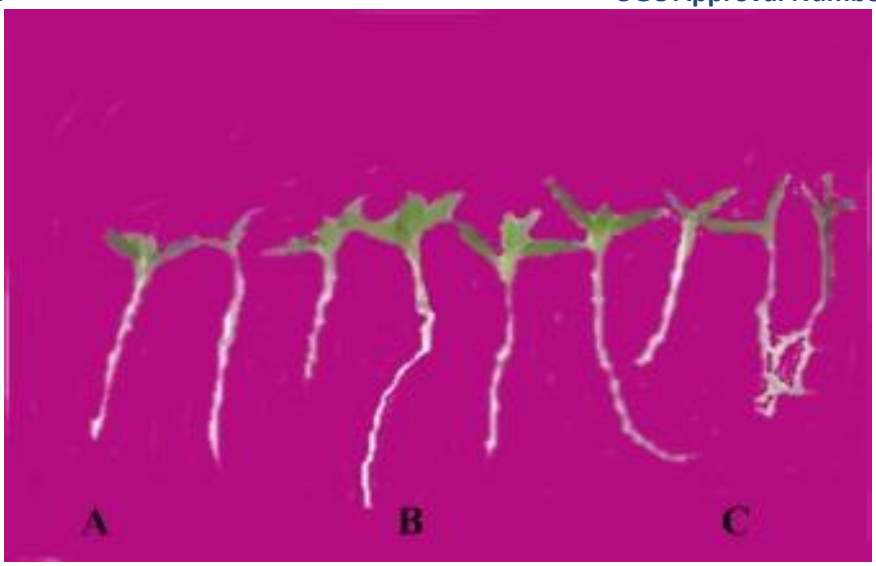
Representation of data in tabular format for Ashwagandha





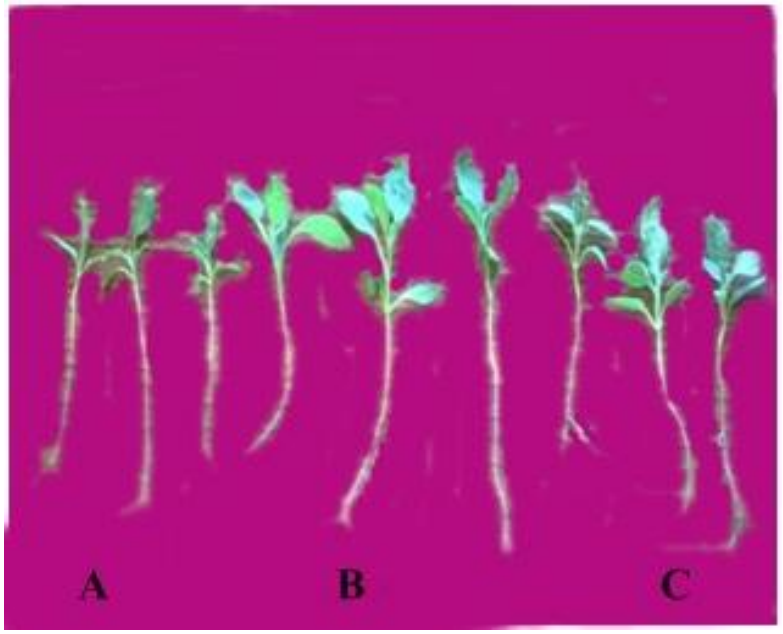


5 Day Pic: A: Normal B: Vermicompost C: Leaf litter.



10 Day Pic: A: Normal B: Vermicompost C: Leaf litter.

15 Day Pic: A: Normal B: Vermicompost C: Leaf litter.



20 Day Pic: A: Normal B: Vermicompost C: Leaf litter

25 Day Pic: A: Normal B: Vermicompost C: Leaf litter.

30 Day Pic: A: Normal B: Vermicompost C: Leaf litter.

Measurements

The vegetative growth parameters measured were: plant height, dry weight of shoot and roots, fresh weight of shoot and roots, number of leaves on 5^{th} day, 10^{th} day, 15^{th} day, 20^{th} day and 25^{th} day respectively. To determine the dry weight (DW), plant parts (shoot and root) were dried in an oven at 80^{o}C for 24 hr.

Data Analysis

The results were listed in the tabular format so as to make the comparison easy.

Results and Declaration

Vermicompost treatment significantly increased all measured characters including plant height, root length, shoot dry weight, root dry weight, number of leaves per plant.

Vegetative growth

The results in **Table-1** indicates that there are significant differences among application of Vermicompost, Leaf litter and Control.

Maximum growth in plant height was observed in Vermicompost than in all other. Positive effects of Vermicompost on improving crop growth might be due to

increase in nitrogenase activity and synthesis of growth promoting substances by phosphate solubilizing (S) and N fixing bacteria(A) has helped to increase the shoot dry weight.

Root length and dry wet were positively affected by the application of Vermicompost. This may be due to increase in the nitrogen fixing bacteria's inoculation. If more nutrients is available then it could result in vigorous plant growth and dry matter production giving rise to more flowering and pods information[14].

Generative Growth

Application of the Vermicompost showed the highest biological yield. This might be because of the bacteria present in the Vermicompost helped the growth of root by giving the required nutrients to the plant. So the bio physiochemical properties of soil plant system which build up yield attributes and also the seed yield[15].

IV CONCLUSION

Application of Vermicompost significantly improved the growth rate in Ashwagandha. This fertilization of Ashwagandha plant with Vermicompost can be recommended. Application of Vermicompost improved the root system and created deeper and more abundant branching system which in turn help the plant to absorb more nutrients from the soil and use it in growth.

In this study, application of Vermicompost gave best results in increasing the growth rate of the plant.

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