

Original Research Article

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## Effect of Different Types of Organic Source of Nutrition on Growth, Yield and Quality of Ashwagandha Roots (*Withania somnifera* Dunal.)

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### ABSTRACT

The present investigation has been carried out to find out the most effective organic source for better plant growth attributing characters of ashwagandha (*Withania somnifera* Dunal.). The experimental findings were taken on plant growth attributing characters. In present study growth attributing characters such as plant height (40.60 cm) was found significantly superior with application of vermicompost (5 ton/ha) has been found inferior in control (16.40 cm). Data on plant spread (cm<sup>2</sup>) indicated that non-significant variation observed the maximum plant spread (24.20 cm<sup>2</sup>) was measured with the application of vermicompost (5 ton/ha). Number of branches per plant indicated that significant variation observed with the application of various organic treatments. The maximum number of branches per plant (5.13) was found with the application of vermicompost (5 ton/ha) as compared to other organic treatments and all the vermicompost doses were significantly superior over the control. Plant and stem length data observed with the application of different organic treatments. The maximum stem length (37.40 cm) was found in the application of vermicompost (5 ton/ha) as compared to other organic treatments and all the vermicompost doses were significantly superior over the control.

#### Keywords

Organic, Pressmud, Vermicompost, PSB, Growth parameters, etc

#### Article Info

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### Introduction

Ashwagandha or Asgandh (*Withania somnifera* Dunal.) popularly known as 'Indian Ginseng' belongs to the family Solanaceae chromosome no. 48. It is found in wild state in the Mediterranean region of North Africa. In India it is mainly cultivated in Mandsaur district of Madhya Pradesh, adjoining villages of Kota district of Rajasthan, Punjab and Karnataka. It is also found wild in forest grazing grounds in Mandasur and forest land in Bastar district of Chattisgarh, all over the

foot hills of Punjab, Himachal Pradesh and western Uttar Pradesh (Nigam and Kandhalkar, 1995).

Ashwagandha is cultivated over an area of 10,780 ha in India. The annual demand of the root was increased due to necessitated expansion of area under this crop with improved productivity (CIMAP, 2006). Due to increasing demand of roots in recent times and considering its future demand, there exists much scope for extensive cultivation of this crop in India.

Ashwagandha roots and occasionally its leaf and seeds are used in ayurvedic and unani medicines preparations. The important alkaloid present in the roots is with a nine constituting 38 per cent of the total alkaloids. Other alkaloids recorded are somniferine, somniferinine, somnine, withanine, pseudowithanine, withananinine and withasomine (Majumdar, 1955). The total alkaloid content of the Indian roots is reported to vary between 0.13 to 0.31 per cent. Apart from roots, alkaloids have also been reported in leaves and berries (Sreerekha *et al.*, 2004).

The roots are prescribed in medicines for hiccup, several female disorders, bronchitis, rheumatism, dropsy, and stomach and lung inflammation and skin diseases. They are mostly used for curing general and sexual debilities. Roots are having anti-aging property. The leaves are used to cure eye balls, and swellings of hands and feet, in treatment of syphilis, to kill the lice infecting the body. The leaf decoction is used for treatment of haemorrhoids and arthritis. Warm leaves are sometimes used for providing comfort in eye diseases (Nigam and Kandalkar, 1995). The root bark is administered to patients of asthma and other chest complaints. The green berries are used for treating ringworm. It is also a potential antimicrobial agent with antifungal activity and moderate antibacterial activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa* (Choudhary *et al.*, 1995).

Several researches had been conducted for the application of chemical fertilizers in the ashwagandha crop but research targeting the use of organic source of nutrition is at infant stage. Use of organic source of nutrition not only improves the soil health but also improves the quality of alkaloids obtained from the ashwagandha roots. It can be a step toward sustainable method of cultivation as application of chemical fertilizers is depleting

the soil health. The experiment aims to check the effect of application of organic sources of nutrition for crop yield and quality.

### **Materials and Methods**

In the present study ashwagandha cultivar Nimitli-118 was taken as experimental material to find out the “Effect of different types of organic sources on growth, root yield and quality of Ashwagandha (*Withania somnifera* Dunal.)” The experimental site is located at Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad at a distance of 42 km away from Faizabad district head quarter. Geographically it is situated at 26.47° N Latitude, 88.12 longitudes and at an attitude of 113 meter from mean sea level (MSL). The site is located in typical saline alkali belt of indo-gangetic plains of eastern Uttar Pradesh. After preparation of land, the experiment was laid out as per treatment combination. There were 33 plots and net size of plot was 4×2.4 m<sup>2</sup>. The each plot was well connected with sub-irrigation channel. Total 11 treatments were taken following different combinations of Pressmud, Farmyard manure, PSB (Phosphorus solubilising Bacteria) and Vermicompost. Five plants were randomly selected from each treatment and tagged for recording the observation and average of these five plants were taken for the study. The observations recorded during the course of investigation are as follows.

### **Plant growth character**

Plant height was recorded at harvesting time with the help of meter scale from ground level to the tip of the main shoot of the plant and the average was calculated on the basis of five plants and expressed in centimeter. Spread of plant measured at harvesting time with a meter scale in East-West and North-South directions and average was calculated on the basis of five

plants. Total number of branches per plant was counted visually at the crop at harvesting time. Stem length was recorded at harvesting time with the help of meter scale from ground level to the distal end of the main shoot of the plant and the average was calculated on the basis of five plants and expressed in centimeter. The length of root was measured after harvesting from the proximal cut end to distal end of root tip with the help of meter scale in centimeter. The girth of root was measured after harvesting with the help of vernier calipers at the three portion of root *i.e.* upper, middle and lower and the average value of these were recorded for girth of roots in millimeter.

### Statistical Analysis:

Statistical analysis of the data obtained in different set of experiment were calculated, as suggested by Panse and Sukhatme (1985).

### Analysis of variance

The standard error ( $SE_{m\pm}$ ) of the difference between two treatment means were computed as follows:

$$SE_{m\pm} = \sqrt{\frac{2MSE}{r}}$$

## Results and Discussion

### Growth attributing characters

Data pertaining to plant height is influenced by the use of different organic treatments as source of nutrition clearly indicated that vermicompost (5 ton/ha) has been found significantly superior (40.60 cm) and inferior in control (16.40 cm). Organic nutrition that promotes soil health with enhancement of soil biological activity and maintenance of soil productivity is considered necessary for sustainable crop production. Although these

organic sources influenced plant height significantly higher measured with the use of vermicompost might be due to containing higher organic matter as well as NPK. It is fact that vermicompost gives strength in the rooting media *i.e.* soil. It indicates that these vermicompost doses influenced the plant height in a test way and all the vermicompost doses, individually has been found significantly superior over control. Similar results were observed by Swathi *et al.*, (2010), Aishwath (2004) in ashwagandha and Karuppaiah (2005) in French marigold.

Data on plant spread ( $cm^2$ ) indicated that non-significant variation observed due to application of various organic treatments. The maximum plant spread ( $24.20 cm^2$ ) was measured due to the application of vermicompost (5 ton/ha) than other organic treatments. Moreover, all the vermicompost doses increase the plant spread except control which may be because of their role in influence in plant spread of ashwagandha. Similar results were observed by Swathi *et al.*, (2010) in ashwagandha, Joy *et al.*, (2005) in black musli and Ram *et al.*, (2008) in kalmegh (Table 1).

Data on number of branches per plant indicated that significant variation observed due to application of various organic treatments. The maximum number of branches per plant (5.13) was found with the application of vermicompost (5 ton/ha) as compared to other organic treatments and all the vermicompost doses were significantly superior over the control, which might be due to the role of vermicompost increasing in number of branches per plant. Similar results were observed by Shinde *et al.*, (2013) in ashwagandha and Nagarani (2008) in mentha.

Data pertaining to stem length indicated that significant variation observed due to application of different organic treatments.

**Table.1** Effect of different organic source of nutrition in plant growth characters

Sr. No.	Treatments	Plant growth Attributing characters					
		Plant height (cm)	Plant spread (cm <sup>2</sup> )	No. of branches (N)	Stem length (cm)	Root length (cm)	Girth of root (cm)
1	Control	16.40	17.43	2.26	12.80	10.64	0.63
2	FYM (5 ton/ha)	21.13	16.93	3.86	17.60	11.18	0.71
3	FYM (10 ton/ha)	21.60	18.13	3.06	18.33	13.02	0.79
4	Vermicompost (2.5 ton/ha)	33.26	24.13	4.66	30.06	14.98	0.86
5	Vermicompost (5 ton/ha)	40.60	24.20	5.13	37.40	15.59	0.99
6	Pressmud (5 ton/ha)	33.46	21.70	3.93	29.93	11.96	0.60
7	Pressmud (10 ton/ha)	34.26	19.40	3.00	31.00	13.25	0.78
8	Bio-fertilizer PSB (10 kg/ha)	32.60	20.66	4.00	29.13	13.81	0.80
9	FYM (5 ton/ha) + PSB (10 kg/ha)	25.33	18.40	2.80	21.73	14.02	0.83
10	Vermicompost (2.5 ton/ha) + PSB (10 kg/ha)	26.06	17.23	2.93	22.66	14.15	0.84
11	Pressmud (5 ton/ha) + PSB (10 kg/ha)	23.36	17.26	2.33	19.93	14.86	0.98
	SEM	<b>1.32</b>	<b>2.02</b>	<b>0.34</b>	<b>1.30</b>	<b>0.78</b>	<b>0.07</b>
	C.D. at 5%	<b>3.88</b>	<b>NS</b>	<b>1.00</b>	<b>3.84</b>	<b>2.29</b>	<b>0.20</b>

The maximum stem length (37.40 cm) was found due to application of vermicompost (5 ton/ha) as compared to other organic treatments and all the vermicompost doses were significantly superior over the control, which might be due to the role of vermicompost in increasing of stem length. Similar results were observed by Swathi *et al.*, (2010) and Aishwath (2004) in ashwagandha.

The maximum plant height (40.60 cm) was recorded with the application of vermicompost 5 ton/ha as compare to other treatments. The maximum plant spread (24.20 cm<sup>2</sup>) and number of branches (5.13) was observed with the application of vermicompost 5 ton/ha as compare to other treatments. The maximum stem length (37.40 cm) was recorded with the application of vermicompost 5 ton/ha as compare to other

treatments. The maximum root length (15.59 cm) and girth (0.99 cm) were recorded with the application of vermicompost 5 ton/ha as compare to other treatments.

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