

## Original Research Article

# Effect of Substitution of Nutritional Source through Organics and Bio-Inputs on Growth, Seed Yield of Ashwagandha (*Withania Somnifera* L.) cv. Poshita

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## ABSTRACT

A field experiment was conducted during *kharif*, 2017-18 at College of Horticulture, Venkataramannagudem, Dr. Y.S.R. Horticultural University, West Godavari District (Andhra Pradesh), India. To study the 'Effect of substitution of nutritional source through organics and bio-inputs on growth, seed yield of ashwagandha (*withania somnifera* L.) cv. Poshita.' The experiment was conducted in a randomized block design with organics and bio-inputs. The organic treatments were vermicompost, FYM while the bio-inputs *Azotobacter*, *Phosphate Solubilising Bacteria*, *Potassium Releasing Bacteria* and *Vesicular Arbuscular Mychorrhizae* (1g) will be applied through seed treatment by immersing the seeds in the slurry @625 g ha<sup>-1</sup>. The fourteen treatment combinations were replicated thrice. Among the treatments, application of 80% RDF + 20% RDN through VC + bio-inputs recorded maximum plant height (49.97cm), Plant spread (571 cm<sup>2</sup>), number of primary branches (2.19), Number of berries per plant (156.27) and seed yield (9.86 g/plant), (0.18 kg/plot) and (2.45 q/ha).

### Keywords

Ashwagandha,  
Organics, Bio-  
inputs, Growth and  
seed yield

## Introduction

Ashwagandha roots and occasionally its leaves and seeds are used in ayurvedic and unani medicines preparations. Traditionally, fresh leaves were used topically to heal joint pains, skin sores and to reduce swelling. The use of ashwagandha in ayurvedic tonics and mixtures is generally through addition of dried and ground roots and berries. The important alkaloid present in the roots is withanine constituting 50 per cent of the total alkaloids. Other alkaloids recorded are

somniferine, somniferinine, somnine, pseudowithanine, withanine 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 (Sreerexha *et al.*, 2004).

## Materials and Methods

A field experiment was conducted during *kharif*, 2017-18 at College of Horticulture, Venkataramannagudem, Dr. Y.S.R.

Horticultural University, West Godavari District (Andhra Pradesh), India, The experiment was laid out in randomized block design with 14 treatments, viz., T<sub>1</sub>: 100% RDF, T<sub>2</sub>: 100% RDF + bio-inputs, T<sub>3</sub>: 90% RDF + 10% RDN through FYM, T<sub>4</sub>: 90% RDF + 10% RDN through FYM + bio-inputs, T<sub>5</sub>: 80% RDF + 20% RDN through FYM, T<sub>6</sub>: 80% RDF + 20% RDN through FYM + bio-inputs, T<sub>7</sub>: 90% RDF + 10% RDN through VC, T<sub>8</sub>: 90% RDF + 10% RDN through VC + bio-inputs, T<sub>9</sub>: 80% RDF + 20% RDN through VC, T<sub>10</sub>: 80% RDF + 20% RDN through VC + bio-inputs, T<sub>11</sub>: 100% RDN through FYM, T<sub>12</sub>: 100% RDN through FYM+ bio-inputs, T<sub>13</sub>: 100% RDN through VC, T<sub>14</sub>: 100% RDN through VC+ bio-inputs (Recommended dose of fertilizers (NPK 60: 50: 40 Kg/ha<sup>-1</sup>), Bio-inputs namely *Azotobacter* (1g), *Phosphate Solubilising Bacteria* (1g) *Potassium Releasing Bacteria* (1g) and *Vesicular Arbuscular Mycorrhizae* (1g) will be applied through seed treatment by immersing the seeds in the slurry @ 625 g ha<sup>-1</sup>. In T<sub>3</sub>, 10% RDN will be met through FYM based on the actual percentage of N in the Farm yard manure which will be used in the experiment. Same is the case with the treatment.

Seeds were sown in 3 m x 2.4 m plots with a spacing of 30 cm x 20 cm. The crop was fertilized with 10 t of FYM along with NPK @ 60: 50: 40 Kg/ha<sup>-1</sup> as basal. Two third's of the nitrogen was applied as top dressing in two equal splits i.e. at 20 and 40 DAS. Need based cultural and plant protection operations were taken up to the leaf harvest.

Five plant samples from each replication were selected at random to record data on morphological, yield and quality attributing characters. The experimental data was analysed statistically as outlined by Panse and Sukhatme (1995).

## Results and Discussions

### Morphological characters

Morphological characters such as plant height, Plant spread and number of primary branches per plant (Table 1), Number of berries per plant and seed yield (Table 2) showed significant variation with different organics and bio-inputs treatments. Among the organics, seed inoculation with 80% RDF + 20% RDN through VC + bio-inputs recorded highest plant height at harvest (49.97cm), Plant spread (571 cm<sup>2</sup>) and number of primary branches at harvest (2.19) at 150 days after sowing.

This increasing trend in growth parameters might be due to recommended dose of fertilizers along with bio-inputs resulted in significant positive influence on vertical growth and branching from the beginning of the plant growth. It could be attributed to the quick and ready availability of major nutrients like N, P and K to plants at earlier stages of plant growth at the 80% RDF + 20% RDN through vermicompost and FYM along with bio-inputs. The results obtained in the present investigation are in agreement with earlier findings of Rana *et al.*, (2005), Snezana *et al.*, (2012) in buckwheat and Shinde *et al.*, (2013) in ashwagandha.

This might be due to application of inorganic fertilizers combined with organics and helped in the uptake of macro and micro nutrients essential for plant growth which turn in increase in plant height, number of primary branches and more number of leaves per plant. These were potential sources of photosynthesis and helped in maximum dry matter accumulation. Similar findings were by Sujatha and Krishanappa (1995) and Vastrad (1999) in ginger.

**Table.1** Growth parameters as influenced by combined application of inorganic, organic fertilisers and bio-inputs in Ashwagandha

Treatments	Plant height (cm)	Plant spread (cm <sup>2</sup> )	Number of primary branches per plant
T <sub>1</sub> : 100% RDF	36.89	494	1.88
T <sub>2</sub> : 100% RDF + bio-inputs	37.60	496	1.90
T <sub>3</sub> : 90% RDF + 10% RDN through FYM	38.91	506	1.91
T <sub>4</sub> : 90% RDF + 10% RDN through FYM + bio inputs	41.12	531	1.98
T <sub>5</sub> : 80% RDF + 20% RDN through FYM	41.01	518	1.95
T <sub>6</sub> : 80% RDF + 20% RDN through FYM + bio inputs	42.89	558	2.02
T <sub>7</sub> : 90% RDF + 10% RDN through VC	39.15	511	1.93
T <sub>8</sub> : 90% RDF + 10% RDN through VC + bio-inputs	41.69	545	1.98
T <sub>9</sub> : 80% RDF + 20% RDN through VC	41.41	520	1.97
T <sub>10</sub> : 80% RDF + 20% RDN through VC + bio-inputs	49.97	571	2.19
T <sub>11</sub> : 100% RDN through FYM	30.38	480	1.79
T <sub>13</sub> : 100% RDN through VC	30.92	485	1.84
T <sub>14</sub> : 100% RDN through VC+ bio-inputs	34.61	490	1.86
Mean	38.57	513.79	1.93
SEm±	0.72	0.919	0.04
CD at 5%	2.11	2.686	0.12

RDF: Recommended Dose of Fertilizers, Bio-inputs: *Azotobacter*, Phosphorus Solubilising Bacteria, Potassium Releasing Bacteria, Vesicular Arbuscular Mycorrhiza, VC: Vermicompost, FYM: Farm Yard Manure, DAS: Days after Sowing

**Table.2** Seed yield parameters as influenced by combined application of inorganic, organic fertilisers and bio-inputs in Ashwagandha

Treatments	Number of berries per plant and seed yield			
	Berries/plant	g/plant	kg/plot	q/ha
T <sub>1</sub> : 100% RDF	108.27	4.17	0.11	1.51
T <sub>2</sub> : 100% RDF + bio-inputs	108.62	4.29	0.11	1.56
T <sub>3</sub> : 90% RDF + 10% RDN through FYM	110.73	4.47	0.12	1.79
T <sub>4</sub> : 90% RDF + 10% RDN through FYM + bio-inputs	150.60	7.02	0.13	1.85
T <sub>5</sub> : 80% RDF + 20% RDN through FYM	139.33	6.22	0.13	1.79
T <sub>6</sub> : 80% RDF + 20% RDN through FYM + bio-inputs	150.67	8.25	0.16	2.17
T <sub>7</sub> : 90% RDF + 10% RDN through VC	127.07	6.14	0.13	1.79
T <sub>8</sub> : 90% RDF + 10% RDN through VC + bio-inputs	150.53	7.39	0.14	1.89
T <sub>9</sub> : 80% RDF + 20% RDN through VC	140.93	6.49	0.13	1.83
T <sub>10</sub> : 80% RDF + 20% RDN through VC + bio-inputs	156.27	9.86	0.18	2.45
T <sub>11</sub> : 100% RDN through FYM	87.60	4.00	0.08	1.15
T <sub>12</sub> : 100% RDN through FYM+ bio-inputs	106.67	4.12	0.10	1.44
T <sub>13</sub> : 100% RDN through VC	102.36	4.10	0.10	1.41
T <sub>14</sub> : 100% RDN through VC+ bio-inputs	108.26	4.13	0.11	1.49
Mean	124.51	5.76	0.12	1.72
SEm±	0.684	0.472	0.003	0.055
CD at 5%	1.998	1.381	0.008	0.159

RDF: Recommended Dose of Fertilizers, Bio-inputs: *Azotobacter*, Phosphorus Solubilising Bacteria, Potassium Releasing Bacteria, Vesicular Arbuscular Mycorrhiza, VC: Vermicompost, FYM: Farm Yard Manure, DAS: Days after Sowing

## Yield and yield attributes

The yield and yield attributing characters, such as Number of berries per plant, seed yield g/plant, kg/plot and q/ha (Table 2) were also showed significant variation among the different organics and bio-inputs. Among the application of 80% RDF + 20% RDN through VC + bio-inputs recorded maximum Number of berries per plant (156.27) and seed yield (9.86 g/plant), (0.18 kg/plot) and (2.45 q/ha).

There were appreciable increase in the number of berries per plant due to better growth and development of root and shoot particularly more assimilatory area on account of balanced and timely supply of all the essential nutrients which in turn led to better partitioning of photosynthates from source to the sink (seeds). Similar results were reported by Shrivastav and Sahu (2013) in ashwagandha.

The enhanced seed yield with the application of 80% RDF + 20% RDN through VC + bio-inputs as well as 80% RDF + 20% RDN through FYM + bio-inputs might be due to availability of nutrients in the soil throughout the growing phase and also due to enhanced carbohydrates synthesis and translocation of the photosynthates to the sink. These results are in line with the findings of with Pakkiyanthan *et al.*, (2004), Panchabai *et al.*, (2005) in ashwagandha

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