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## Effect of organics along with azospirillum (Root and Soil Isolate) on growth and leaf yield in *Gymnema* (*Gymnema sylvestri* R.Br)

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### Abstract

The experiment on the effect of organics along with Azospirillum (Root and soil isolate) on growth and leaf yield in *Gymnema sylvestri* R.Br was carried out at the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar. There were totally seventeen treatments viz., T<sub>1</sub>-Vermicompost (0.5kg) + Azospirillum (Root isolate), T<sub>2</sub>-Vermicompost (1.0kg) + Azospirillum (Root isolate), T<sub>3</sub>-Decomposed coir pith (2.5kg) + Azospirillum (Root isolate), T<sub>4</sub>-Decomposed coir pith (5.0kg) + Azospirillum (Root isolate), T<sub>5</sub>- FYM (5.0kg) + Azospirillum (Root isolate), T<sub>6</sub>- FYM (10.0kg) + Azospirillum (Root isolate), T<sub>7</sub>- Pressmud (2.5 kg)+ Azospirillum (Root isolate), T<sub>8</sub>- Pressmud (5.0 kg)+ Azospirillum (Root isolate), T<sub>9</sub>-Vermicompost (0.5kg) + Azospirillum (Soil isolate), T<sub>10</sub>- Vermicompost (1.0kg) + Azospirillum (Soil isolate), T<sub>11</sub>- Decomposed coir pith (2.5kg) + Azospirillum (Soil isolate), T<sub>12</sub>- Decomposed coir pith (5.0kg) + Azospirillum (Soil isolate), T<sub>13</sub>- FYM (5.0kg) + Azospirillum (Soil isolate), T<sub>14</sub>- FYM (10.0kg) + Azospirillum (Soil isolate), T<sub>15</sub>- Pressmud (2.5 kg)+ Azospirillum (Soil isolate), T<sub>16</sub>- Pressmud (5.0 kg)+ Azospirillum (Soil isolate), T<sub>17</sub>-Control. There were established in the pot culture and observed for certain growth characters like Plant height, Number of laterals plant<sup>-1</sup>, Number of leaves lateral<sup>-1</sup>, Leaf length (cm), Leaf breadth (cm), Leaf area (cm<sup>2</sup>), Single leaf weight (gm.), 100 Leaves weight (gm.), Fresh leaf yield plant<sup>-1</sup> (gm.) and dry leaf yield were recorded four months of planting. The Treatment T<sub>2</sub>-Vermicompost (1.0kg) + Azospirillum (Root isolate (10gm.)) recorded highest plant height (264.36), Number of laterals/plant (52.19), Number of leaves/lateral (110.13), Leaf length (7.88cm), Leaf breath (5.87cm), Leaf area (17.55cm<sup>2</sup>), Single leaf weight (0.44gm.), 100 leaves weight (44.18gm.), Fresh leaves yield/plant (3.86kg.) and Dry leaves/plant (2.91kg.). This was followed by T<sub>4</sub>- Decomposed coir pith (5.0kg) + Azospirillum (Root isolate 10 gm.).

**Keywords:** *Gymnema sylvestri*, Organics, Azospirillum

### Introduction

*Gymnema sylvestri* R.Br is one of the very important and rare medicinal plants which have been used for quite a longtime as an anti-diabetic. The active principle occurring as a secondary metabolite in the plant is called gymnemic acid, a triterpenoid saponin which is responsible for the hypoglycaemic activity. The various parts of gymnema especially leave and roots are used for medicinal value. The leaves of this plant have been used to treat stomach, urinary ailments, cough, and eye ailment etc. Shanmugasundaram *et al.* (1981) reported that blood pressure and glucose level return to normal level after 60 days and oral administration, an addition, the pancrease islet number and b-cell number were doubled. There exists a tremendous need to popularize this important medicinal plant which has got wide adaptability under humid tropical condition. The performance of a crop differs in different photoperiod, temperature and other climatic conditions. In the present day context of organic farming, application of biofertilizer finds an important place. Among the various biofertilizers, nitrogen fixing bacteria belonging to the genus Azospirillum is known to increase the yield by 5 to 20 percent with saving of N up to 40 per cent of the recommended dose (Dart, 1986) [3].

The present investigation was aimed to study the combined effect of organic manures and Azospirillum isolated from root and soil. The growth of *Gymnema* in pots mainly depends upon the physical conditions and nutrient content of the growing medium ensures compact and profuse growth with larger leaves. The organic amendments in the growing medium are considered as a fertile source of nutrients to grow *Gymnema* in pots.

### Materials and Methods

The experiment on the effect of organics along with Azospirillum (Root and soil isolate) on growth and leaf yield in *Gymnema sylvestri* R.Br was carried out at the Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar.

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The experiment was carried out in the principles of completely Randomized design. There were totally seventeen treatments viz., T<sub>1</sub>. Vermicompost (0.5kg) + Azospirillum (Root isolate), T<sub>2</sub>. Vermicompost (1.0kg) + Azospirillum (Root isolate), T<sub>3</sub>. Decomposed coir pith (2.5kg) + Azospirillum (Root isolate), T<sub>4</sub>. Decomposed coir pith (5.0kg) + Azospirillum (Root isolate), T<sub>5</sub>. FYM (5.0kg) + Azospirillum (Root isolate), T<sub>6</sub>. FYM (10.0kg) + Azospirillum (Root isolate), T<sub>7</sub>. Pressmud (2.5 kg)+ Azospirillum (Root isolate), T<sub>8</sub>. Pressmud (5.0 kg)+ Azospirillum (Root isolate), T<sub>9</sub>. Vermicompost (0.5kg) + Azospirillum (Soil isolate), T<sub>10</sub>. Vermicompost (1.0kg) + Azospirillum (Soil isolate), T<sub>11</sub>. Decomposed coir pith (2.5kg) + Azospirillum (Soil isolate), T<sub>12</sub>. Decomposed coir pith (5.0kg) + Azospirillum (Soil isolate), T<sub>13</sub>. FYM (5.0kg) + Azospirillum (Soil isolate), T<sub>14</sub>. FYM (10.0kg) + Azospirillum (Soil isolate), T<sub>15</sub>. Pressmud (2.5 kg)+ Azospirillum (Soil isolate), T<sub>16</sub>. Pressmud (5.0 kg)+ Azospirillum (Soil isolate), T<sub>17</sub>-Control.

### Result and Discussion

In the Indian scenario of agriculture, expenditure on fertilizers is a major recurrent expense for the farmers. Hence there is a need to develop sustainable practice which requires low fertilizer inputs. The continuous use of chemical fertilizers and pesticides in the cultivation of horticultural crops leads to decreased soil fertility, environmental degradation and also cause health hazards to human beings, in addition to degrading the quality of produces like fruits and vegetables as well as the medicinal plants when they are commercially cultivated. Organic cultivation is a conventional method without the use of chemicals and it keeps the soil alive and in good health without affecting the growth of the plants and also take care of ecological aspect. Organic inputs are the cheap source of nutrients which are available in enormous quantity as biological wastes.

In the present day context of organic farming, application of biofertilizer finds an important place. Among the various biofertilizers, nitrogen fixing bacteria belonging to the genus *Azospirillum* is known to increase the yield by 5 to 20 percent with saving of N up to 40 per cent of the recommended dose (Dart, 1986)<sup>[3]</sup>. The present investigation was aimed to study the combined effect of organic manures and *Azospirillum* isolated from root and soil. The growth of *Gymnema* in pots mainly depends upon the physical conditions and nutrient content of the growing medium ensures compact and profuse growth with larger leaves. The organic amendments in the growing medium are considered as a fertile source of nutrients to grow *Gymnema* in pots.

### Growth characters

The results of the present investigation had shown that there were significant differences on the growth of *Gymnema* viz., plant height, number of laterals vine<sup>-1</sup>, number of leaves lateral<sup>-1</sup>, leaf length, leaf breadth and leaf area due to application of vermicompost, coir pith, FYM and pressmud. Growth is one of the essential parameters which determine the yield attributes of any crop. The results revealed that plant height, number of laterals vine<sup>-1</sup>, number of leaves per lateral<sup>-1</sup>, leaf length, leaf breadth and leaf area were significantly increased due to the application of different organic media when compared with control. Among the various organic media combination of decomposed coir pith 5 kg pot<sup>-1</sup> + root isolate of *Azospirillum* recorded highest plant height of 268.18 cm at 120 DAP. This result was in line with findings

of Arulnithi (2007)<sup>[1]</sup> in Aloe. The reasons for the increased plant height might be due to the fact that FYM increased the soil organic carbon by 0.03 percent and improved the physical properties of the soil, (Khanna *et al.*, 1975)<sup>[6]</sup>, Khiani and More (1984)<sup>[7]</sup> observed that manuring with FYM appreciably improved the soil physical properties as well as chemical properties like available nitrogen, phosphorous and potassium. The *Azospirillum* apart from its role in nitrogen fixation from atmosphere might have been involved in the production of phytohormones like IAA, GA and cytokinin like substances (Reynders and Vlasak, 1982<sup>[13]</sup>, Tien *et al.*, 1979<sup>[15]</sup>, Govindan and Purushothaman, 1984). Significant increase in plant height due to the above phytohormones produced by *Azospirillum* had also been reported in onion (Musmade and Konde, 1986)<sup>[10]</sup>.

The maximum number of laterals per vine and maximum number of leaves per lateral was recorded in the treatment T<sub>2</sub> which received vermicompost @ 1 kg<sup>-1</sup>pot + root isolate of *Azospirillum*. The increase in growth parameters due to application of vermicompost may be due to the presence of growth substances (Gavrilov, 1962), nitrogen fixers (Loquet *et al.*, 1977)<sup>[9]</sup>, other essential nutrients (Bano *et al.*, 1987)<sup>[2]</sup> and also due to higher N fertilization by an associative symbiotic nitrogen fixing bacteria *Azospirillum* as reported by Dart (1986)<sup>[3]</sup>. The results of the present study indicated that the leaf length, leaf breadth and leaf area was found to be maximum in the treatment T<sub>2</sub> in which vermicompost @ 1 kg and root isolate of *Azospirillum* was incorporated. Incorporation of vermicompost promotes the lush growth of plants which may be due to the presence of plant growth promoters like auxins and cytokinins in vermicompost (Radha *et al.*, 1986)<sup>[12]</sup> which are responsible for the cell division and cell elongation. Jaya jasmine (1993)<sup>[5]</sup> reported that in amaranthus cv. Co-2 and co-4 application of *Azospirillum* @ 2 kg ha<sup>-1</sup> increased the plant height and leaf area.

### Yield attributes

Yield in general, is a highly complex parameter influenced by many factors (or) yield components and the ultimate goal of any crop management practice is to achieve increased yield. In the present study of *Gymnema* yield and yield attributing characters viz., single leaf weight, hundred leaves weight, fresh leaf yield plant<sup>-1</sup> and dry leaf yield plant<sup>-1</sup> were greatly influenced by the application of organic manures along with inoculation of root isolate of *Azospirillum*. The single leaf weight, hundred leaves weight, fresh leaf yield plant<sup>-1</sup> and dry leaf yield plant<sup>-1</sup> was higher in the treatment combination of vermicompost 1 kg pot<sup>-1</sup> + root isolate of *Azospirillum*. The increased fresh and dry leaf yield of the plant was the result of better plant growth as reflected by increased plant height, more laterals, higher number of leaves and leaf area. Higher production of dry matter by the plant could be due to the fact that organic manures have high amounts humus, facilitate N-fixation by microbes, growth promoters (Krishnamurthi and Subramanian, 1954)<sup>[8]</sup>.

Regulate the nitrogen supply to the plant and also help in the production of plant. Higher yields due to application of vermicompost may be attributed to the high levels of nutrients along with growth stimulating substances excreted by earthworms into their casts. Tomati *et al.* (1988)<sup>[16]</sup> emphasized the influence of microbial, hormone like substances on the plant metabolism, growth and development by vermicompost. Increased yield due to inoculation of *Azospirillum* was reported by Sujaikumar

(2001) in glory lily and Velayutham (2005) [17] in *Hybanthus enneaspermus*.**Effect of organics along with Azospirillum (Root and Soil Isolate) on growth and leaf yield in *Gymnema* (*Gymnema sylvestre* R.Br)**

Treatments	Plant height (cm)	No. of laterals Vine <sup>-1</sup>	No. of leaves lateral <sup>-1</sup>	Leaf length (cm)	Leaf breadth (cm)	Leaf area (cm <sup>2</sup> )	Single leaf weight (gm.)	100 leaves weight (gm.)	Fresh leaf yield Plant <sup>-1</sup> (kg)	Dry leaf yield plant <sup>-1</sup> (kg)
T <sub>1</sub> Vermicompost 0.5 kg + ARI	245.26	47.33	96.39	7.16	5.15	14.85	0.39	39.26	3.02	2.37
T <sub>2</sub> Vermicompost 1.0 kg + ARI	264.36	52.19	110.13	7.88	5.87	17.55	0.44	44.18	3.86	2.91
T <sub>3</sub> DCP 2.5 kg + ARI	241.44	46.52	94.10	7.04	5.03	14.40	0.38	38.4	2.88	2.28
T <sub>4</sub> DCP 5.0 kg + ARI	268.18	51.38	107.84	7.76	5.75	17.10	0.43	43.36	3.72	2.82
T <sub>5</sub> FYM 5 kg + ARI	222.34	42.27	96.39	6.44	4.43	12.15	0.34	34.34	2.18	1.83
T <sub>6</sub> FYM 10 kg + ARI	214.70	40.85	75.78	6.20	4.19	11.25	0.32	32.70	1.90	1.65
T <sub>7</sub> Pressmud 2.5 kg + ARI	237.62	45.71	89.52	6.92	4.91	13.95	0.37	37.62	2.74	2.19
T <sub>8</sub> Pressmud 5 kg + ARI	256.72	50.57	103.26	7.52	5.51	16.20	0.41	41.72	3.44	2.64
T <sub>9</sub> Vermicompost 0.5 kg + ASI	233.80	44.90	87.23	6.80	4.79	13.50	0.36	36.80	2.60	2.10
T <sub>10</sub> Vermicompost 1.0 kg + ASI	260.64	48.95	105.55	7.64	5.63	16.65	0.42	42.54	3.58	2.73
T <sub>11</sub> DCP 2.5 kg + ASI	229.98	44.09	84.94	6.68	4.67	13.05	0.35	35.98	2.46	2.01
T <sub>12</sub> DCP 5.0 kg + ASI	249.08	49.76	98.68	7.28	5.27	15.30	0.40	40.08	3.16	2.46
T <sub>13</sub> FYM 5 kg + ASI	218.52	41.66	82.65	6.32	4.31	11.70	0.33	33.52	2.04	1.74
T <sub>14</sub> FYM 10 kg + ASI	210.88	40.04	80.36	6.08	4.07	10.80	0.31	31.88	1.76	1.56
T <sub>15</sub> Pressmud 2.5 kg + ASI	226.16	43.28	78.07	6.56	4.55	12.60	0.35	35.16	2.32	1.92
T <sub>16</sub> Pressmud 5 kg + ASI	252.90	48.14	100.97	7.40	5.39	15.75	0.40	40.90	3.30	2.55
T <sub>17</sub> Control	207.06	39.23	73.49	5.96	3.95	10.35	0.31	31.06	1.62	1.47
General mean	237.61	45.69	96.34	6.91	4.91	13.95	0.37	37.61	2.18	1.83
SED	1.80	0.29	1.09	0.03	0.04	0.11	0.03	0.30	0.04	0.03
CD (0.05%)	3.70	0.70	2.18	0.07	0.09	0.34	0.06	0.70	0.09	0.06

ARI – Azospirillum root isolate, ASI – Azospirillum soil isolate, DCP-Decomposed coir pith.

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