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BIOCOMPOST AS SOIL SUPPLEMENT TO IMPROVE VEGETATIVE GROWTH AND YIELD OF *SOLANUM NIGRUM* (L.)

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ABSTRACT

A pot culture experiment was conducted with black nightshade (*Solanum nigrum*) as the test crop to evaluate the influence of biocompost. Different treatments were used. C –control, T_1- compost 1 (Raw corncob composted by using *Pleurotus sajor-caju* (5t ha^{-1})), T_2- compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t ha^{-1})), T_3- compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})), T_4- compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t ha^{-1})), T_5- compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t ha^{-1})) and T_6- compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})). Plant samples at various stages (25, 50, 75 DAS) were analyzed for shoot length, root length, number of leaves, number of flowers, number of fruits/per plant, fresh weight, dry weight. On 90th day yield parameters like number of fruits/plant, diameter of fruit, number of seeds/fruit, fruit fresh weight and fruit dry weight were analyzed. The results of the study showed that the treatment T_6 and T_3 significantly increased the vegetative and yield parameters of the test crop.

KEY WORDS: C- Control, DAS- Days After Sowing *Eudrilus eugeniae, Pleurotus sajor-caju*, *Solanum nigrum*, T- Treatment.

INTRODUCTION

Organic farming is an exclusive and biological process to produce food. Organic farming has grown rapidly throughout the world in recent years. Its main objective is to maintain healthy soil that produces healthy plants and create a balance between the interconnected system of

health of people, soil organisms, plants and animals. Agro industrial wastes are considered as a rich source of macro and micro nutrient. *Solanum nigrum* is an important green leafy vegetable belongs to the family solanaceae. It is commonly known as black nightshade. They are rich in mineral salts like calcium, iron, vitamin A and vitamin C. It is used as diuretic, anti-inflammatory, laxative, anti-oxidative, antiulcerogenic and immune modulating ailments. The present investigation therefore was undertaken to study the effect of biocomposted corncob and coirpith on growth and yield characteristics of *Solanum nigrum.*

MATERIALS AND METHODS

Collection of agro industrial waste

The agro-industrial waste corncob and coirpith was collected in large amount from Tamil Nadu Agricultural University, Coimbatore. Seeds of *Solanum nigrum* were collected from Sri Sakthi Agroservice, Coimbatore.

Compost pit preparation

The process of composting consists of six pits of 1.5 feet length and 4 square feet width. They were named as compost 1 (C_1), compost 2 (C_2), compost 3 (C_3), compost 4 (C_4), compost 5 (C_5) and compost 6 (C_6).

Corncob compost process

The corncob waste was subjected to decomposition by various ways and means to achieve the good quality bio compost.

Compost 1: The sundried corncob waste was transferred to C_1 pit. In this 20 g of *Pleurotus sajor-caju* spawn was uniformly spread. Above this a layer of one kg of corncob waste was sandwiched. This process was repeated the heap reaches a height of above one meter.

Compost 2: C_2 pit was filled with corncob waste. It was allowed for decomposition for 30 days. Vermicomposting process adopted.

Compost 3: C_3 pit was filled by corncob. It was predigested by using *Pleurotus sajor-caju* spawn and then vermicomposting process adopted.

Coirpith compost preparation: Above same procedure was repeated instead of corncob (C_1, C_2 and C_3) coirpith was used in the following composting pits compost 4 (C_4), compost 5 (C_5) and compost 6 (C_6) respectively.

Experimental tray preparation: (Earthworm *Eudrilus eugeniae* used)

After pre-decomposition predigested material was transferred to the plastic trays (30×20×20 cm) C_2, C_3, C_5 and C_6. In this fifteen exotic earthworms (*Eudrilus eugeniae*) were inoculated in to each tray. Water was sprayed regularly twice a day to maintain the moisture content. These experimental units were kept undisturbed in the shady place for 60 days. After composting the samples were taken and sieved at 90th day.

Pot culture experiments

The pots were filled with 7kg of sandy clay loam soil. The six different biocompost (5t ha-^{1}) was applied to the respective pots and mixed thoroughly. Viable seeds were selected and five seeds were sown in each pot with three replications. After germination three healthy plants were maintained per pots. There were seven treatments viz. C –control, T_1- compost 1(Raw corncob composted by using *Pleurotus sajor-caju* (5t ha^{-1})), T_2- compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t ha^{-1})), T_3- compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})), T_4- compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t ha^{-1})), T_5- compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t ha^{-1})) and T_6- compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})). Root length was measured from ground level to the tip of the root and shoot length was measured from ground level to the shoot apex. Fresh weight and dry weight of the shoot and root was weighed in grams by digital balance. Number of leaves and flowers were counted manually. On 90th day number of fruits/plant, diameter of fruit, weight of fruit, number of seeds/fruit, fresh weight and dry weight of fruit were analyzed.

Statistical analysis

The data obtained on 25 DAS, 50 DAS and 75 DAS on vegetative growth root length, shoot length, number of leaves, number of flowers, fresh weight and dry weight and on 90 DAS for yield parameters like number of fruits/plant, diameter of fruit, weight of fruit, number of seeds/fruit, fresh weight and dry weight of fruit was subjected to the statistical analysis (one way and two way ANOVA) and based on the results inference were drawn.

RESULTS AND DISCUSSION

The experimental result pertaining to the biocomposting of agrowaste corncob and coirpith on vegetative and yield parameters on *Solanum nigrum* was given in table 1, 2 and 3.

Table: 1 Effect of Biocomposted Corncob and Coirpith on Vegetative Parameters of *Solanum nigrum* (L.)

Treatment	Root length(cm)			Shoot length(cm)			Number of leaves		
	25DAS	50DAS	75DAS	25DAS	50DAS	75DAS	25DAS	50DAS	75DAS
C	10.23	15.30	18.13	13.43	26.53	58.13	7.67	14.67	17.67
T_1	11.17	17.10	29.07	16.10	28.53	64.17	21.00	46.33	61.00
T_2	11.17	27.13	32.10	18.30	36.33	75.13	36.33	70.33	110.67
T_3	13.10	37.50	51.10	25.20	52.10	79.17	53.33	70.67	140.67
T_4	12.10	23.20	28.17	19.50	42.33	77.27	46.67	66.67	105.67
T_5	12.40	22.07	35.10	20.77	43.10	75.20	40.33	56.67	121.00
T_6	18.60	41.53	60.10	26.07	55.33	90.47	61.00	81.33	180.33
SED	0.07559			0.07274			0.82936		
CD ($p<0.05$)	0.15259			0.14683			1.67410		
CD ($p<0.01$)	0.20397**			0.19627**			2.23780**		

** - Significant at 1% ($P<0.01$); DAS – Days After Sowing

C- control

T_1- compost 1 (Raw corncob composted by using *Pleurotus sajor-caju* (5t ha^{-1}))

T_2- compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t ha^{-1}))

T_3- compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1}))

T_4- compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t ha^{-1}))

T_5- compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t ha^{-1}))

T_6- compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})).

Table: 2 Effect of Biocomposted Corncob and Coirpith on Vegetative Parameters of *Solanum nigrum* (L.)

Treatment	Number of flowers	Number of fruit /plant	Fresh weight (gm)			Dry weight (gm)		
	50 DAS	75 DAS	25DAS	50 DAS	75DAS	25DAS	50 DAS	75 DAS
C	6.33	17.67	15.06	33.06	40.53	2.86	3.84	4.06
T_1	12.00	52.00	17.23	36.57	41.36	3.06	3.87	4.32
T_2	12.67	70.33	18.35	38.38	43.81	3.25	3.98	4.37
T_3	26.33	76.00	22.03	45.65	50.06	3.76	4.27	5.43
T_4	24.67	51.00	20.04	40.06	44.06	3.65	4.11	5.38
T_5	16.00	62.33	19.08	38.57	46.92	3.74	4.08	5.34
T_6	28.67	110.33	25.33	46.98	55.47	3.92	4.86	6.17
SED	0.6667	0.6424		0.00885			0.00713	
CD (p<0.05)	1.4300	1.3780		0.01786			0.01439	
CD (p<0.01)	1.9847**	1.9125**		0.02388**			0.01923**	

** - Significant at 1% (P<0.01); DAS – Days After Sowing

C- control

T_1- compost 1 (Raw corncob composted by using *Pleurotus sajor-caju* (5t ha^{-1}))

T_2- compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t ha^{-1}))

T_3- compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1}))

T_4- compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t ha^{-1}))

T_5- compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t ha^{-1}))

T_6- compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})).

Table: 3 Yield Parameters of *Solanum nigrum* (L.) Influenced By Corncob and Coirpith Biocompost (90thDAY)

Treatment	Number of fruit /plant	Diameter of fruit (cm)	Number of seeds/fruit	Fruit fresh weight (gm)	Fruit dry weight (gm)
C	29.77	0.97	44.33	0.11	0.01
T_1	55.22	1.30	46.33	0.11	0.01
T_2	79.11	1.37	47.00	0.12	0.02
T_3	110.33	1.57	55.67	0.20	0.05
T_4	65.77	1.40	50.67	0.12	0.02
T_5	74.09	1.50	53.00	0.19	0.02
T_6	135.66	1.73	56.67	0.20	0.06
SED	2.7603	0.0356	0.8545	0.0005	0.0008
CD ($p<0.05$)	5.9208	0.0764	1.8329	0.0011	0.0016
CD ($p<0.01$)	8.2174**	0.1061 **	2.5439**	0.0015**	0.0023**

** - Significant at 1% ($P<0.01$); DAS – Days After Sowing

C- control

T_1- compost 1 (Raw corncob composted by using *Pleurotus sajor-caju* (5t ha^{-1}))

T_2- compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t ha^{-1}))

T_3- compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1}))

T_4- compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t ha^{-1}))

T_5- compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t ha^{-1}))

T_6- compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})).

POT CULTURE EXPERIMENTS

VEGETATIVE GROWTH (25, 50 & 75 DAS)

ROOT LENGTH AND SHOOT LENGTH

Thc trcatmcnt T_6 - compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})) showed an increase in root length on all the three days examined, 25 DAS (18.60 cm), 50 DAS (41.53 cm) and 75 DAS (60.10 cm). Lowest root length was observed in control (10.23cm, 15.30 cm and 18.13 cm) when compared to the other treatment. Similar results were obtained by [1] who reported that the application of vermicomposted coirpith enhanced the root length 4.5 cm over control 3.5 cm in *Vinca rosea*. A significant increase in shoot length was observed in T_6 - compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})) followed by T_3- compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae*

(5t ha^{-1})) on 25 (26.07 cm, 25.20 cm), 50 (55.33 cm, 52.10 cm) and 75 (90.47 cm, 79.17 cm) DAS when compared to the control (13.43 cm, 26.53 cm, 58.13 cm).

The result is in agreement with the result of [2] who reported increased shoot length of 32 cm in *Solanum lycopersicum* in 5t ha^{-1} of vermicompost. Similar observations were reported by[3] in chilies with the combined application of vermicompost + NPK over control of 48.17 cm in 90 days after sowing. Combined application of biocompost act as a catalytic agent in accelerating cell division and photo assimilation which, boosts plant growth and also improved the plant building structures.

NUMBER OF LEAVES

Appreciable increase in the number of leaves/plant was recorded in all the treatments (T_1 to T_6) from 25 to 75 DAS as recorded in table -1.

Numbers of leaves were more in T_6 - compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})), T_3- compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})) and T_4- compost 4 (Raw coirpith composted by using *Pleurotus sajor-caju* (5t ha^{-1})) on 25 DAS (61.00, 53.33, 46.67). T_6 - compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})), T_3- compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})) and T_2- compost 2 (Predigested raw corncob + *Eudrilus eugeniae* (5t ha^{-1})) on 50 DAS (81.33, 70.67, 70.33) respectively. T_6 - compost 6 (Raw coirpith predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})), T_3- compost 3 (Raw corncob predigested by using *Pleurotus sajor-caju* and *Eudrilus eugeniae* (5t ha^{-1})) and T_5- compost 5 (Predigested raw coirpith + *Eudrilus eugeniae* (5t ha^{-1})) on 75 DAS (180.33, 140.67, 121) when compared to control. The present result is in accordance with [4] who found a significant increase in number of leaves/plant (12.3) inoculated with 1:1 ratio of vermicompost in *Abelmoschus esculentus*. Maximum number of leaves is due to the available nitrogen and organic matter present in the biocompost improved the vegetative growth and photosynthesis.

NUMBER OF FLOWERS (50 DAS)

The effect of combined application of predigested coirpith+earthworm+ *Pleurotus sajor-caju* carrier based compost (T_6) showed a significant result in increasing the number of flowers (28.67) per plant of black nightshade when compared to the control (6.33). This is also in

agreement with the results obtained by [4] who reported an increase in number of flowers 5.66 in *Abelmoschus esculentus* with the application of vermicompost over the control (3.0). Combined application of biocompost in the soil enhances photosynthetic activity throughout the vegetative and reproductive phase.

NUMBER OF FRUITS (75 DAS)

Maximum number of fruits were recorded in T_6 (110.33), T_3 (76.00) followed by T_2 (70.33) on 90 DAS as compared to the control (17.67). The present finding is in conformity with [2] who found a 6folds increase in number of fruits/plant compared to the control in tomato with the application of vermicompost (20t ha^{-1}) and NPK fertilizer (200%).

FRESH WEIGHT AND DRY WEIGHT

Plant fresh weight was increased in T_6 on 25 DAS (25.33 gm), 50 (46.98 gm) and 75 DAS (55.47 gm) when compared to the control (15.06 gm, 33.06 gm, 40.53gm). The highest dry weight was noted in T_6 (3.92 gm, 4.86 gm, 6.17gm) in all the three days followed by T_3 (3.76gm, 4.27gm, 5.43gm) when compared to the control (2.86 gm, 3.84 gm, 4.06gm) on 25, 50, 75 DAS respectively. This result was also confirmed by the findings of [2] in tomato. The increase may be due to the availability of macro and micro nutrients through the mechanism of reduction, chelation and favorable changes in soil.

YIELD PARAMETERS (90 DAS)

A substantial increase in number of fruits/plant was examined in T_6 (135.66) followed by T_3 (110.33) on 90 DAS as compared to the control (29.77). The result is on par with the result of [5] who also reported that the combined application of vermicompost at rate of 4t ha^{-1} and ½ NPK (120: 50: 75) produced significant increase in fruits/plant (6.63) in *Gloriosa superba.* The diameter of the fruit was increased in T_6 (1.73 cm), T_3 (1.57 cm) and T_5 (1.50 cm) and also T_6 and T_3 treatments were significantly increased over the control (0.97 cm). The maximum number of seeds/fruit was seen in T_6 (56.67) followed by T_3 (55.67) over the control (44.33). The present findings is in conformity with [6] who found a significant increase in number of seeds/fruit of 289.78 over control of 190.45 in chilies with the application of biocompost 3kg/pot. The fruit fresh weight was increased in T_6 (0.20 gm) when compared to the control (0.10 gm). The fruit dry weight was highest in T_6 (0.06 gm) followed by T_3 (0.05 gm) over the control (0.01gm). The result is on par with the result of [7] who also reported maximum fruit fresh weight (6.1 gm) and dry weight (2.5 gm) due to the application of 50% vermicompost supplemented with 50% RDCF (W/W) in chilies. In the

present investigation T_6 and T_3 enhanced the humus content and improved soil conditions which resulted in healthier and more yield status of plants.

CONCLUSION

From our results, it was concluded that T_6 and T_3 treatment of biocompost to soil increased vegetative growth and yield parameters of black nightshade plant (*Solanum nigrum*). It is evident that the biocomposted corncob and coirpith utilized as organic manure for promoting growth and yield of *Solanum nigrum*. This information will encourage the small scale producers to grow this plant with biocomposted corncob and coirpith which is organically and environmentally friendly.

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REFERENCES

1. Saikrithika S, Santhiya KR, Gayathri VK. Effects of Different Substrates on Vermicomposting Using *Eudrilus Eugeniae* on the Growth of *Vinca Rosea.* IJSRP, 2015; 5(9): 1-10.
2. Kashem MA, Sarker A, Hossain I, Islam MS. Comparison of the effect of vermicompost and Inorganic Fertilizers on Vegetative Growth and Fruit Production of Tomato (*Solanum lycopersicum* L.). OJSS, 2015; 5: 53-58.
3. Yadav H, Vijayakumari B. Influence of vermicompost with organic and inorganic manures on biometric and yield parameters of chilli (*Capsicum annuum* (L.) var. Plri]. Crop Res, 2003; 25(2): 236-243.
4. Abbiramy KS, Ross RP. Efficacy of vermicomposted coir pith on the growth physiology of *Abelmoschus esculentus.* International Journal of Environmental Biology 2012; 2(3): 153-155.
5. Gupta LM, Kumar S, Gupta M, Sharma V. Integrated nutrient management for growth and yield in Glory Lily (*Gloriosa superba* L.). JMPR, 2013; 7(43): 3197-3201.
6. Rahman MA, Rahman MM, Begum MF, Alam MF. Effect of bio compost, cow dung compost and NPK fertilizers on growth, yield and yield components of chili. International Journal of Botany, 2012; 2(1): 51-55.

7. Sekar J, Jayanthi L, Parthasarathi K. Efficiency of vermicompost supplementation with inorganic fertilizers on growth and yield in chilli (*Capsicum annuum* L.). Review of Research, 2013; 3(3): 1-6