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Efficacy of botanicals and bioagents on growth parameters of sponge gourd

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ABSTRACT

The sponge gourd, *Luffa cylindrica* (L.) Roem., is a member of the Cucurbitaceae family. Towel gourd, smooth loofah, vegetable sponge, and dishcloth gourd are further names for sponge gourd. The principal locations for Luffa commercial cultivation are China, India, Korea, Japan, and Central America. The young, delicate fruits are eaten as steamed vegetables. The mature, fibrous endocarp, which may be used to scrub with a loofah, is well-liked by customers in the United States, Japan, and Asia. Insect pests and illness cause the sponge gourd to produce at a low rate. Sponge gourds are susceptible to a number of diseases, including Alternaria leaf blight, Cercospora leaf spot, powdery mildew, downy mildew, and anthracnose, the latter of which is shown to be particularly destructive across the states. In this experiment, *Trichoderma viride* and botanicals were employed, which not only helped to manage the condition but also helped to maintain healthy soil and were not hazardous to the environment. The result of the present experiment revealed that treatment T5 (neem oil + *Trichoderma viride* @ 2.5 +2.5%) was found effective in growth parameters like plant height, number of leaves, and number of branches.

Key words **:** *Growth parameters, Luffa cylindrica, Neem oil, Trichoderma viride.*

Introduction

India is a developing country which has achieved self- sufficiency and a good degree of stability of food production. Vegetables are an important component of agriculture due to their high productivity, use in diversification, nutritional richness and export potential. Vegetables play an important role in a balance diet by providing not only energy but also supplying vital protective like providing micro nutrients, vitamins, antioxidants, fibres and induce alkaline reaction inside human body. Sponge gourd also is known as a towel gourd, smooth loofah, vegetable sponge, and dishcloth gourd. The immature, tender fruits of these two species are consumed as cooked vegetables. The mature, fibrous endocarp can be used as a sponge, the loofah scrubbing sponge, and is popular with consumers in the U.S.A., Japan and Asia. China, India, Korea, Japan and Central America are the major regions of commercial cultivation of *Luffa*. Great variability for fruit size, shape and the colour is observed in both species of *Luffa* (Dhillon *et al.,* 2016).

Vegetable provides nutritional security which is a major issue in our country. Moreover, more economic growth can be achieved by producing vegetables per unit area which will ultimately uplift the socio-economic condition of the farmers. Therefore, by concerning the urgent need it is important to increase the production and productivity of veg-

etables. In India, largest number of vegetable crops are grown as compared to any other country of the world (Maheswari *et al.,* 2007).

Sponge gourd is fast becoming an indispensable crop due to its wide industrial applications. The potential and industrial applications of sponge gourd highlighted by Boynard and D'Almeida (1999), Bal *et al.* (2004) and Demir *et al.* (2008) and now it is becoming a highly demanding natural fiber worldwide. Luffa sponge is a suitable natural matrix for immobilization of microorganisms and has been successful in the process of biosorption of heavy metals from waste water. Therefore, it is vital to explore the potential of sponge to develop as natural fiber and contribute to the industry as well as to the export market.

Luffa sponge products are readily available in the cosmetic and bath section of department stores, discount stores, pharmacies and specialty shops. Luffa sponge mainly composed of cellulose, hemicellulose and lignin, thus *L. cylindrica* is called as lignocellulosic material. *L. cylindrica* has a fibrous vascular system that can allow removal of water pollutants. Moreover, many environmentally conscious consumers appreciate that luffa products are biodegradable, natural and renewable resources. The tough fibers can promise as being processed into industrial products such as filters, insulation and packing materials.

Materials and Methods

The present investigation titled "Effect of botanical and bioagents on growth parameter Sponge gourd [*Luffa cylindrica* (L.) Roem.]" was carried out with a view to analyse effect of botanicals and bioagents on Sponge gourd by using *Trichoderma viride* and essential oils as a seed treatment. The present investigation was carried out during Zaid season 2021 at the central research field of the Department of Plant Pathology, the Sam Higginbottom University of Agriculture, Technology and Science, Prayagraj. A field experiment was laid out in a Randomized block design with three replications. In the experiment, Randomized Block Design (RBD) will be adopted. The analysis of variance (ANOVA) technique will be applied for drawing conclusions from data. The calculated values will be compared the tabulated values at 5% level of probability for the appropriate degree of freedom. details of treatment was given below in table.

Details of Treatments

Preparation and application of seed treatment

Neem Oil: Neem oil was measured at 5 ml with the help of a measuring cylinder, and was then mixed thoroughly with 100 g of seeds in a conical flask. The seeds were treated until they were saturated which is around 25-30 minutes. It adhered to the seeds due to its sticky nature and was sown in the furrow 2 seeds at each point keeping the spacing at 30 cm in between.

Castor oil: Castor oil was measured at 5 ml with the help a of measuring cylinder, and was then mixed thoroughly with 100 g of seeds. The seeds were treated until they were saturated which is around 5-10 minutes.

Clove oil: Clove oil was measured at 5 ml with the help of a measuring cylinder, was then mixed thoroughly with 100 g of seeds. The seeds were treated until they were saturated that is around 5-10 minutes.

Bio-agent, *Trichoderma viride*: *Trichoderma* sp. was isolated from the soil of the experimental field with the help of serial dilution technique. Culture proliferation was done with the help of single spore technique. Thereafter, with the help of scalpel 5 g of mycelium was taken and mixed with talc powder. The prepared powder formulation was then used for seed treatment.

Neem oil + *Trichoderma viride*: Neem oil was measured 2.5 ml with the help of measuring cylinder

S.No.	Treatments	Treatment details	Concentration (% w/w)	References
1	T0	Control (untreated check)	–	– –
2	T1	Neem oil	5%	Maheshwari *et al.,*(2017)
3	T2	Clove oil	5%	Ragupathi *et al.*(2020)
4	T3	Castor oil	5%	Subhadarshini *et al*. (2020)
5	T4	*Trichoderma viride*	5%	Sriraj *et al.* (2014)
6	T5	Neem oil+ *Trichoderma viride*	2.5%+2.5%	Subhadarshini *et al*. (2020)
7	T6	Castor oil + *Trichoderma viride*	2.5%+2.5%	Madhuri *et al*. (2021)

and 2.5 g of bio-agent power was measured, then mixed thoroughly with 100 g of seeds

Castor oil + *Trichoderma viride*: Castor oil was measured 2.5 ml with the help of measuring cylinder and 2.5 g of bio-agent power was measured, then mixed thoroughly with 100 gm of seeds.

Results and Discussion

Effect of different treatments on vine length at different time intervals of 30,60 and 90 days of Sponge gourd (*Luffa cylindrical* L.)

Length of vine (cm) at 30 DAS

The data presented in Table 1 and depicted in Figure 1 reveals that length of vine significantly increased in treatment T5 - Neem oil+ *Trichoderma viride* (18.92 cm) followed by T6 – castor oil + *Trichoderma viride* (17.01cm), T4 – *Trichoderma viride* (16.29 cm), T1- Neem oil (15.6cm), T2- Clove oil (14.62cm), T3 – Castor oil (13.16cm) as compared to control T0 – Control (11.30cm).

Comparing the treatment with CD value (0.552), all treatments were found to be significant over control and with each other.

30 DAS vine length of Sponge gourd

Treatment	T5	T6	T4	T1	T2	T3	T0
Mean	18.92	17.01	16.29	15.6	14.62	13.16	11.30

Length of vine (cm) at 60 DAS

The data presented in Table 1 and depicted in Figure 1 reveals that length of vine significantly increased in treatment T5 - Neem oil+ *Trichoderma viride* (115.12cm) followed by T6 – castor oil + *Trichoderma viride* (102.81cm), T4 – *Trichoderma viride* (95.42 cm), T1- Neem oil (93.09 cm), T2- Clove oil (88.75cm), T3 – Castor oil (85.91cm) as compared to control T0 – Control(81.95cm).

Comparing the treatment with CD value (2.722), all treatments were found to be significant over control. The treatment T4 and T1 were found to be non-significant to each other.

60 DAS vine length of Sponge gourd

Treatment	T5	T6	T4	T1	T2	T3	T0
Mean	115.12	102.81	95.42	93.09	88.75	85.91	81.95

Length of vine (cm) at 90 DAS

The data presented in Table 1 and depicted in figure 4.1 reveals that length of vine significantly increased in treatment T5 - Neem oil+ *Trichoderma viride* (205.38 cm) followed by T6 – castor oil + *Trichoderma viride* (187.76 cm), T4 – *Trichoderma viride* (185.5 cm), T1- Neem oil (184.48 cm), T2- Clove oil (178.57 cm), T3 – Castor oil (173.34 cm) as compared to control T0 – Control (167.76 cm).

Comparing the treatment with CD value (0.762), all treatments were found to be significant over control. The treatment (T6 T4), (T4 T1) were found to be non- significant to each other.

Number of leaves at 30 DAS

The data presented in Table 2 and depicted in Figure 2 reveals that Number of leaves significantly increased in treatment T5 - Neem oil+ *Trichoderma viride* (7.66) followed by T6 – castor oil + *Trichoderma viride* (6.86), T4 – *Trichoderma viride* (5.6), T1- Neem oil (5.13), T2- Clove oil (4.73), T3 – Castor oil @ 5% (3.86) as compared to control T0 – Control (2.46).

Comparing the treatment with CD value (0.534), all treatments were found to be significant over control. The treatment (T1 T2), (T1 T4) were found to be non – significant to each other.

S. No.	Treatment	Treatment Name	Concentration	Length of vine (cm)		
				30 DAS	60 DAS	90 DAS
1	T0	Control	_	11.30	81.95	167.76
2	T1	Neem oil	5%	15.6	93.09	184.48
3	T2	Clove oil	5%	14.62	88.75	178.57
4	T3	Castor oil	5%	13.16	85.91	173.34
5	T4	Trichoderma viride	5%	16.29	95.42	185.5
6	T5	Neem oil + *Trichoderma viride*	2.5%+2.5%	18.92	115.12	205.38
7	T6	Castor oil + *Trichoderma viride*	2.5%+2.5%	17.01	102.81	187.76
		F-Test		S	S	S
		C.D. (0.5%)		0.552	2.722	2.758
		S.Ed. (+)		0.250	1.235	1.252

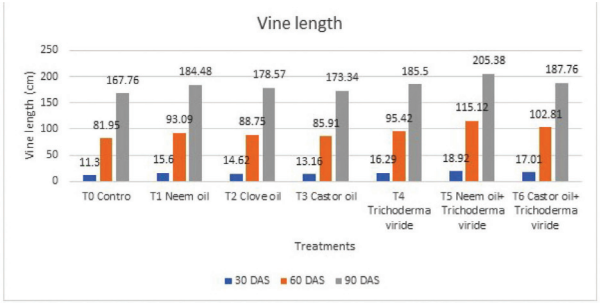


Fig. 1. Comparison on effect of different treatments on number of leaves at different time intervals on Sponge gourd (*Luffa cyclindrica* L.)

Number of leaves at 30 DAS of Sponge gourd

Treatment	T5	T6	T4	T1	T2	T3	T0
Mean	7.66	6.86	5.6	5.13	4.73	3.86	2.46

Number of leaves at 60 DAS

The data presented in Table 2 and depicted in Figure 2 reveals that Number of leaves significantly increased in treatment T5 - Neem oil+ *Trichoderma viride* (24.06) followed by T6 – castor oil + *Trichoderma viride* (22.2), T4 – *Trichoderma viride* (19.06), T1- Neem oil (17.33), T2- Clove oil (15.66), T3 – Castor oil (16) as compared to control T0 – Control (13.06).

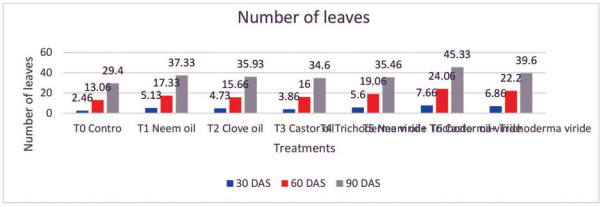
Comparing the treatment with CD value (0.874), all treatments were found to be significant over control. The treatment T2 and T3 were found to be non-significant to each other

Number of leaves at 60 DAS of Sponge gourd

Treatment	T5	T6	T4	T1	T2	T3	T0
Mean	24.06	22.2	19.06	17.33	15.66	16	13.06

Number of leaves at 90 DAS

The data presented in Table 2 and depicted in Figure



2 reveals that Number of leaves significantly increased in treatment T5 - Neem oil+ *Trichoderma viride* (45.33) followed by T6 – castor oil + *Trichoderma viride* (39.6), T4 – *Trichoderma viride* (35.46), T1- Neem oil (37.33), T2- Clove oil (35.93), T3 – Castor oil (34.6) as compared to control T0 – Control (29.4).

Comparing the treatment with CD value (1.624), all treatments were found to be significant over control. The treatment (T1 T2), (T2 T3) were found to be non- significant to each other.

Number of leaves at 90 DAS of Sponge gourd

Treatment	T0	T5	T6	T4	T1	T2	T3
Mean	29.4	45.33	39.6	35.46	37.33	35.93	34.6

Comparison on effect of different treatments on number of branches at different time intervals on Sponge gourd (*Luffa cyclindrica* L.)

Number of branches at 30 DAS

The data presented in Table 3 and depicted in Figure 3 reveals that the number of branches significantly increased in treatment T5 - Neem oil+ *Trichoderma viride* (3.53) followed by T6 – castor oil + *Trichoderma viride* (3.26), T4 – *Trichoderma viride* (2.93), T1- Neem oil (2.66), T2- Clove oil (2.26), T3 – Castor oil (1.73)

Comparing the treatment with CD value (0.328), all treatments were found to be significant over control. The treatment (T5 T6), and (T1 T4) were found to be non – significant to each other.

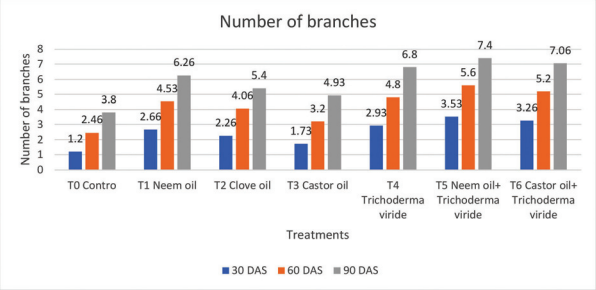
S. No.	Treatment	Treatment Name	Concentration	Number of leaves		
				30 DAS	60 DAS	90 DAS
1	T0	Control	_	2.46	13.06	29.4
2	T1	Neem oil	5%	5.13	17.33	37.33
3	T2	Clove oil	5%	4.73	15.66	35.93
4	T3	Castor oil	5%	3.86	16	34.6
5	T4	*Trichoderma viride*	5%	5.6	19.06	35.46
6	T5	Neem oil + *Trichoderma viride*	2.5%+2.5%	7.66	24.06	45.33
7	T6	Castor oil + *Trichoderma viride*	2.5%+2.5%	6.86	22.2	39.6
		F-Test		S	S	S
		C.D. (0.5%)		0.534	0.874	1.624
		S.Ed. (+)		0.243	0.397	0.737

30 DAS number of branches of Sponge gourd

Treatment	T5	T6	T4	T1	T2	T3	T0
Mean	3.53	3.26	2.93	2.66	2.26	1.73	1.2

Number of branches at 60 DAS

The data presented in Table 3 and depicted in Figure 3 reveals that the Number of branches significantly increased in treatment T5 - Neem oil+ *Trichoderma viride* (5.6) followed by T6 – castor oil + *Trichoderma viride* (5.2), T4 – *Trichoderma viride* (4.8), T1- Neem oil (4.53), T2- Clove oil (4.06), T3 – Castor oil (3.2) as compared to control T0 – Control (2.46).



Comparing the treatment with CD value (0.658), all treatments were found to be significant over control. Treatments were non-significant to each other except treatment T2 and T3.

60 DAS number of branches of Sponge gourd

Treatment	T5	T6	T4	T1	T2	T3	T0
Mean	5.6	5.2	4.8	4.53	4.06	3.2	2.46

Number of branches at 90 DAS

The data presented in Table 3 and depicted in Figure 3 reveals that Number of branches significantly increased in treatment T5 - Neem oil+ *Trichoderma viride* (7.4) followed by T6 – castor oil + *Trichoderma viride* (7.06), T4 – *Trichoderma viride* (6.8), T1- Neem oil (6.36), T2- Clove oil (5.4), T3 – Castor oil (4.93) as compared to control T0 – Control (3.8).

Comparing the treatment with CD value (0.502), all treatments were found to be significant over control. Treatments were non-significant to each other expect T1 and T2.

90 DAS number of branches of Sponge gourd

Treatment	T0	T5	T6	T4	T1	T2	T3
Mean	3.8	7.4	7.06	6.8	6.36	5.4	4.93

Conclusion

The use of chemicals like fertilizers, and pesticides are deteriorating soil quality. These chemicals are a major source of soil pollution and are threatening to human life and are not environment friendly. The biological approach to promote plant health and growth parameters is economical and environmentally friendly, hence we should opt for this more often. As per the result obtained from this study, it was shown that neem oil + *Trichoderma viride* was found to be effective in all the growth parameters like vine length, number of leaves, and number of branches.

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S. No.	Treatment	Treatment Name	Concentration	Number of branches		
				30 DAS	60 DAS	90 DAS
1	T0	Control		_	1.2	2.46
3.8						
2	T1	Neem oil	5%	2.66	4.53	6.26
3	T2	Clove oil	5%	2.26	4.06	5.4
4	T3	Castor oil	5%	1.73	3.2	4.93
5	T4	*Trichoderma viride*	5%	2.93	4.8	6.8
6	T5	Neem oil + *Trichoderma viride*	2.5%+2.5%	3.53	5.6	7.4
7	T6	Castor oil + *Trichoderma viride*	2.5%+2.5%	3.26	5.2	7.06
		F-Test		S	S	S
		C.D. (0.5%)		0.328	0.658	0.502
		S.Ed. (+)		0.149	0.299	0228

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