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Effect of organic compost and PSB on growth and yield of chives (*Allium tuberosum* L.)

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Abstract

A field experiment was carried out at the horticultural experimental field of the Department of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, Utlou from December 2018-June 2019. The experiment was carried out in Randomized Block Design (RBD) consisting of three replications and seven treatment viz., control (T₁), Vermicompost (T₂), Phumdi (T₃), Phosphate Solubilizing Bacteria (T₄), Vermicompost+Phumdi (T₅), Vermicompost +Phosphate Solubilizing Bacteria (T₆) and Vermicompost + Phumdi +Phosphate Solubilizing Bacteria(T₇). Local cultivars of chives saplings were bought from a local market and were planted on a bed size of 1m² at spacing of 15cm x 15cm respectively. The data revealed that the treatment T₇ (Vermicompost + Phumdi +Phosphate Solubilizing Bacteria) showed maximum significant effect on growth and yield parameters. The maximum plant height was recorded at 30DAS(5.66cm), 60DAS(9.40cm), 90DAS(11.80cm), 120DAS(14.73cm), 150DAS(18.13cm), 180DAS(22.53cm); maximum number of leaves was recorded at 30DAS(8.73cm), 60DAS(14.00cm), 90DAS(20.13cm), 120DAS(24.20cm), 150DAS(25.66cm), 180DAS(29.86cm); maximum number of clumps was recorded at 30DAS(2.46cm), 60DAS(4.26cm), 90DAS(5.46cm), 120DAS(6.46cm), 150DAS(7.13cm), 180DAS(8.20cm); maximum root weight 20.18g; and maximum total yield with 27.93g. Therefore, from the analysis of data, it can be concluded that the application of the Vermicompost + PSB + Phumdi significantly influenced the growth and yield of chives.

Keywords: Chives, vermicompost, Phumdi, PSB

Introduction

Garlic Chives/Chinese Chives/Chinese leeks/Asian leeks belonging to the family amaryllidaceae is a flowering plant of the genus allium and is native to Asia, Southern China and have been cultivated in other parts of the world. It is a very popular seasoning vegetable in NE. India Chives is a rhizomatous clump forming herbaceous perennial plants growing from a small elongated bulb of about 10mm, tough and fibrous with a strapped shaped leaves with triangular base about 12cm long, 1/4 across and are linear with parallel veins, flattened and solid in cross section. Basal leaves are floppy and curved downward near the middle. They are green or greyish green but turn yellow and wither after the flower blooms. It produces many white flowers in round cluster (umbel) on stalks, tall and grows slowly in expanding perennial clumps. The root system consists of an elongated bulb with fibrous roots at the bottom. This plant reproduces by its seeds and vegetative effect. It requires full or partial sun, moist or dry condition, rich and loamy soil. This plant is winter hardy in all areas. They contain 3.27% protein, 0.67% fat, 2.4% carbohydrates, 0.97% ash and some vitamin such as A, B and C, 12% Iron, 12% Magnesium, 12% Manganese, 8% phosphorous and 6% potassium.

Composting is an ancient technology, practised today at every scale from the backyard compost pile to large commercial operations. It is a process of decomposition or the natural breakdown process of organic residues. It transforms raw organic waste materials into biologically stable compost and is easier to handle than manure and other raw organic materials. Besides, providing phosphorus to the plant, the PSB also increase the growth of plants by stimulating the efficiency of biological nitrogen fixation. The use of PSB as inoculants simultaneously increases phosphorus uptake the plants and crop yield.

In Manipur, Chive is grown in large scale, especially in Imphal East district. It is an integral item of Manipur's cuisine, so a cultivation practices is needed to be developed keeping in view that it restores the soil properties both physically and chemically. With this view, the present work was taken up to find out the best treatment combination for growth and yield of Chives

(*Allium tuberosum* L.) and also to find out the effect of PSB, Vermicompost and Phumdi (floating biomass) on growth and yield of chives (*Allium tuberosum* L.).

Materials and Methods

The present study was carried out at the Horticultural experimental field of the Department of Horticulture, Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, Utlou which comes under sub-tropical climate and experimental farm is located at an elevation of 770m above mean sea level, at latitude of 24°43'23"N and longitude of 93°51'34"E. The experiment was laid out in Randomized Block Design (RBD) with three replications. Each treatment was grown in a plot of 1m x 1m per plot with spacing of 15cm x 15cm. All the cultural practices were followed. The field was ploughed by a tractor and the experimental field was divided into a unit plot size of 1m x 1m according to the experimental design. Vermicompost, Phumdi and the PSB were applied as per treatment on each unit plot. Five randomly selected equally competitive plants from each row in each replication were tagged for the purpose of recording the observations on 6 characters viz. plant height (cm), number of leaves, number of clumps per plant, total yield per plant (g) and total weight of root per plant (g). The observations were recorded at 30, 60, 90, 120, 150 and 180 days after sowing.

Results and Discussion

In this study, the result of plant height was influenced by the various treatments (Control, Vermicompost, Phumdi, PSB (Phosphate Solubilising Bacteria), Vermicompost+Phumdi, Vermicompost+PSB and Vermicompost + PSB + Phumdi). The results revealed that the effects of the various treatments on plant height were found significant which were taken at 180 days of final crop cycle after transplanting. The treatment of Vermicompost+Phumdi+PSB (T₇) 22.53 cm was found highest plant height and minimum (18.30cm) was recorded under control treatment (T₁). It was found p value of 0.015285. Thus, the result is significant at $p < 0.05$. In results, alpha ($\alpha = 0.05$) and p-value = 0.015285, since alpha > p-value, we reject null hypothesis (H₀). At the 5% significance level, we would say that the results of plant height impacted by different treatments was statistically significant and we have reasonably strong evidence that difference in mean height for Chives plant grown under different treatments are unlikely to be due to chance alone. Effects of the various treatments on number of leaves were found significant which were taken at 180 days of final crop cycle after transplanting. The treatment of Vermicompost+Phumdi+PSB (Phosphate Solubilising Bacteria) (T₇) 29.86 was found highest number of leave and minimum (21.20) was recorded under control treatment (T₁). It was found p value of 0.0086. Thus, the result is significant at $p < 0.05$. In results, alpha ($\alpha = 0.05$) and p-value = 0.015285, since alpha > p-value, we reject null hypothesis (H₀). At the 5% significance level, we would say that the results of number of leaves impacted by different treatments was statistically significant and we have reasonably strong evidence that difference in mean height for Chives plant grown under different treatments are unlikely to be due to chance alone. The present result agreed with previous findings obtained on allium (Abbey and Kanton, 2004; Gambo *et al.*,

2008) ^[1, 2], tomato (Babajide *et al.*, 2008) ^[3] and broccoli (Ouda and Mahadeen, 2008) ^[4]. In the result of number of leave influenced by the various treatments (Control, Vermicompost, Phumdi, PSB (Phosphate Solubilising Bacteria), Vermicompost + Phumdi, Vermicompost + PSB and Vermicompost + PSB + Phumdi). The treatment of Vermicompost + PSB + Phumdi (T₇) 24.00 was found highest number of leave and minimum (17.00) was recorded under control treatment (T₁). It was found p value of 0.0086. Thus, the result is significant at $p < 0.05$. In results, alpha ($\alpha = 0.05$) and p-value = 0.015285, since alpha > p-value, we reject null hypothesis (H₀). At the 5% significance level, we would say that the results of number of leaves impacted by different treatments was statistically significant and we have reasonably strong evidence that difference in mean height for Chives plant grown under different treatments are unlikely to be due to chance alone. The present findings are also in agreement with the results of Islah (2010) ^[5] in garlic.

Clump plant⁻¹ was influenced by the various treatments (Control, Vermicompost, Phumdi, PSB (Phosphate Solubilising Bacteria), Vermicompost + Phumdi, Vermicompost + PSB and Vermicompost + PSB + Phumdi). The results revealed that the effects of the various treatments on number of clump per plant were found significant which were taken at 180 days of final crop cycle after transplanting. The application of Vermicompost+Phumdi+ PSB (Phosphate Solubilising Bacteria) (T₇) 8.20 was found highest number of clump and minimum (6.46) was recorded under control treatment (T₁). It was found p value of 0.0003. Thus, the result is significant at $p < 0.05$. In results, alpha ($\alpha = 0.05$) and p-value = 0.0003, since alpha > p-value, we reject null hypothesis (H₀). At the 5% significance level, we would say that the results of number of clump per plant impacted by different treatments was statistically significant and we have reasonably strong evidence that difference in mean clump number for Chive plant grown under different treatments are unlikely to be due to chance alone. The study are agreement with the findings of Nasreen *et al.* (2009) ^[6], Patil *et al.* (2007) ^[7] and Islah (2010) ^[5] in garlic.

Yield per plant was found to be influenced by the various treatments such as Control, Vermicompost, Phumdi, PSB (Phosphate Solubilising Bacteria), Vermicompost + Phumdi, Vermicompost + PSB and Vermicompost + PSB + Phumdi). The corresponding analysis of variance is presented in the appendix. The results revealed that the effects of the various treatments on yield per plant was found significant which taken were taken at 180 days of final crop cycle after transplanting the combination of Vermicompost+Phumdi+PSB (T₇) 27.93 was found highest number of yield and minimum(20.00)was recorded under control treatment(T₁). It was found p value of 0.015. Thus, the result is significant at $p < 0.05$. In results, alpha ($\alpha = 0.05$) and p-value= 0.015, since alpha > p-value, we reject null hypothesis (H₀). At the 5%, we would say that the results of number of yield per plant impacted by different treatments was statistically significant and we have reasonably strong evidence that difference in mean height for Chives plant grown under different treatments are unlikely to be due to chance alone. Similar result found Yogita and Babu (2012) ^[8] in onion reported similar kind of results.

Table 1: Effect of organic compost and PSB on plant height (cm), number of leaves plant⁻¹, Number of clumps plant⁻¹, Total yield plant⁻¹ and Total root weight plant⁻¹

Treatment No.	Treatment details	Plant height (cm)						Number of leaves plant ⁻¹						Number of clumps plant ⁻¹						Total yield plant ⁻¹	Total root weight plant ⁻¹
		30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS	180 DAS	180 DAS	180 DAS
T ₁	Control	4.46	6.80	10.00	12.33	13.40	18.30	6.26	10.06	12.26	15.26	18.66	21.20	1.73	2.80	3.93	4.60	5.60	6.46	20.00	14.29
T ₂	Vermicompost	5.66	9.40	11.80	14.73	18.13	20.20	8.76	13.33	18.46	22.26	24.40	28.86	2.53	4.00	5.00	6.06	7.26	8.00	25.00	17.00
T ₃	Phumdi	6.20	8.83	11.66	14.13	16.73	20.20	7.40	12.66	15.33	18.33	22.80	26.80	2.40	3.66	4.73	5.53	6.46	7.73	25.00	17.00
T ₄	PSB (Phosphate Solubilising Bacteria)	6.13	9.60	12.20	14.14	18.06	22.06	8.73	14.00	20.13	24.20	25.66	25.60	2.46	4.26	5.46	6.46	7.13	7.80	26.00	17.82
T ₅	Vermicompost + Phumdi	5.60	7.93	10.80	13.40	15.93	21.13	6.13	10.46	16.00	21.93	22.20	26.53	2.00	3.33	4.46	5.26	6.13	8.00	25.00	17.00
T ₆	Vermicompost + PSB	5.73	8.73	11.467	14.53	17.13	20.73	6.46	10.73	15.66	19.00	20.46	26.06	1.93	3.13	4.60	5.86	6.20	7.46	24.00	19.00
T ₇	Vermicompost + PSB + Phumdi	5.66	8.33	10.60	13.33	17	22.53	12.06	12.73	14.66	19.33	21.80	29.86	2.06	3.86	5.20	6.46	6.86	8.20	27.93	20.18
	F-test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
	S.Ed. (±)	0.9323	1.4327	1.4695	1.6845	1.7603	1.7248	2.4974	2.2922	2.0004	3.1142	3.8529	4.1582	0.5287	0.7450	0.7333	0.7821	0.7899	0.5852	4.0	4.0
	CD (0.05%)	1.9763	3.1215	3.1153	3.5709	3.7316	3.6564	5.2943	4.8592	4.2147	6.6019	8.1679	9.0600	1.1208	1.5794	1.5546	1.6580	1.6745	1.2406	1.28	1.28

Root weight per plant was also influenced by the various treatments (Control, Vermicompost, Phumdi, PSB (Phosphate Solubilising Bacteria), Vermicompost + Phumdi, Vermicompost + PSB and Vermicompost + PSB + Phumdi). Results revealed that the effects of the various treatments on root weight per plant were found significant which were taken at 180 days of final crop cycle after transplanting. The combination of Vermicompost+Phumdi+PSB (T_7) 20.18 was found highest number of weight per plant and minimum (14.29) was recorded under control treatment (T_1). It was found p value of 0.015. Thus, the result is significant at $p < 0.05$. In results, alpha ($\alpha = 0.05$) and p-value = 0.015, since alpha $>$ p-value, we reject null hypothesis (H_0). At the 5% significance level, we would say that the results of number of root weights per plant impacted by different treatments was statistically significant and we have reasonably strong evidence that difference in mean height for Chives plant grown under different treatments are unlikely to be due to chance alone.



Fig 1: General view of Experimental Field

Conclusion

The present investigation on application of Organic compost and PSB revealed significant variations for all growth and yield parameters. Among all the treatments, combined application of Vermicompost+Phumdi+PSB was rated the best treatment in terms of growth and yield parameters. Therefore, with the aim to achieve more yield and high economic returns it is recommended to implement organic compost and PSB for the production of Chives. Vermicompost+Phumdi and PSB (T_7) are cost effective and are easily available in market and are affordable by farmers and most importantly they are environmental friendly.

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