Original Research Article

EFFECTS OF VERMICOMPOST AND INORGANIC FERTILIZERS ON GROWTH AND YIELD OF SESAME

ABSTRACT

A field experiment was conducted at the BINA substation farm, Ishwardi, Pabna during 2021- 2022 to see the combined effects of vermicompost and inorganic fertilizer on sesame. Five treatments combination were used in the experiment. The treatments were T_1=Native soil fertility (No fertilizer and manure), T_2=100% Chemical Fertilizers (CF), T_3= Vermicompost (VC) @ 5 tha^{-1}, T_4=50% CF + 2.5 tha^{-1} VC, T_5=70%CF + 1.5 tha^{-1} VC. Yields and yields contributing characters of sesame were significantly influenced with the different treatments. The treatment T_4 (50% CF + 2.5 tha^{-1} VC) gave the highest seed yield of sesame. The results indicated that treatment T_4 enhanced more crop growth which influenced on greater seed yield of sesame. The lowest seed yield was recorded at T_1 treatment. However, considering maximum yields the treatments T_4 could be used for more production of sesame with less use of chemical fertilizers.

Keywords: Vermicompost, inorganic fertilizers, combined use, sesame yield

1. INTRODUCTION

Sesame (*Sesamum indicum* L.) is an annual, self-pollinated, indeterminate minor oil crop which belongs to the family Pedaliaceae. It is a significant oil-producing crop which grows widely in different parts of the world [1]. Sesame production in Bangladesh is 500-600 (kg)ha^{-1} which can be increased to 1200 (kg)ha^{-1} by practicing improved variety and production technology [2]. Among the various oil crops grown in Bangladesh, sesame ranks next to mustard in respect of both cultivated area and production. The crop is grown in bothRabi and Kharif seasons in Bangladesh but the Kharif season covers about two-thirds of the total sesame area[3]. For the perfection and improvement of market economy, chemical fertilizers are used indiscriminately which decreases soil fertility and nutrient quality of crops. Organic matter, the primary attributes of the sustainable cultivating frameworks is lost by the excessive use of chemical fertilizers [4]. The use of inorganic fertilizer to maintain cropping was found to increase yield just for exactly couple of years, however, on a long run, it has not be effective and prompts soil degradation [5]. Uses of only inorganic sources of fertilizers, unplanned disposal of wastes, use of pesticides and their run-off etc. are also detrimental for the ecosystem and create pollution to the environment[6-8].

Vermicomposts are natural materials separated by collaborations between smaller microorganism and earthworms and finally produced completely balanced out natural soil amendments with low C:N proportions [9]. Earthworm which excretes beneficial soil organisms and secretes polysaccharides, proteins and different nitrogenous compound into the dirt and thus enhance soil fertility and raise crop productivity [10-11]. Vermicompost also contains some plant growth hormones and humic acids which improve the growth and yield of plant crops [12]. Vermicomposting is one of the

biological process in which the organic wastes has been converted into nutrient rich manure by the action of earthworms. The characteristic feature of vermicompost such as high porosity and moisture holding capacity increases the growth of pathogen free plants[13].

The combined use of vermicompost and chemical fertilizers help in keeping up yield stability through correction of minimal lacks of auxiliary and micronutrients, improving effectiveness of connected supplements and providing favorable soil physical conditions [14].It has been shown that vermicompost stimulates plant flowering, increases the number and biomass of the flowers [15] as well as increases fruit yield [16]. The high yield and growth of the plants due to the usage of vermicompost increases the commercial value and agricultural sustainability [17].

2. MATERIAL AND METHODS

A field experiment was conducted at the BINA substation farm, Ishwardi, Pabna during 2021-22 to see the effects of various fertilizer doses with vermicompost on sesame. The experiment site lies between 25-27°N latitude, 8.5°E Longitude and 98 meters altitude. The climate is characterized by the alternate hot rainy season. The treatments were T_1=Native soil fertility (No fertilizer and manure), T_2=100% Chemical Fertilizers (CF), T_3= Vermicompost (VC) @ 5 tha^{-1}, T_4=50% CF + 2.5 tha^{-1} VC, T_5=70%CF + 1.5 tha^{-1} VC.Nutrient contents of vermicompost are given at Table 1.

Table 1. Nutrient contents in Vermicompost

Items	Percent
Organic Carbon	15.2
N	1.42
P	1.45
K	1.52
S	0.35

The experiment was carried out in a RCB design with three replications. Unit plot size was 12 m^2(3m × 4m). At sowing time soil moisture was 45% in the experimental field. So, the condition of germination for seed of sesame was well in field condition. Seeds of sesame var.(Binatil-2) were sown on 10 March 2022. Fertilizers were applied on the soil test and the rates of fertilizer have been given in the Table 3. TSP, MoP, gypsum, zinc and boron were applied before the sowing of sesame seeds. Urea was top dressed in two equal splits i.e. 14 days after sowing (DAS) and 30 DAS. Weeding, thinning, irrigation, application of pesticide etc. were done when necessary. The sesame crop was harvested on the 15 June 2022. Yield and yield contributing characters were recorded from 5 randomly selected plants from each plot. Data were then analyzed by analysis of variance (ANOVA) using Statistix10 package and the means were compared according to Least Significant Different Test at 1% level of significance.

Table 2.Physico-chemical properties of initial soil

Soil analysis interpretation	Texture	pH	O.C (%)	Total N (%)	P (µgg^{-1})	K (meq %)	S (µgg^{-1})
	Silt loam	7.1 Alkaline	0.87 Low	0.11 Low	17.0 Medium	0.13 Low	14.0 Low

Table 3.Rates of fertilizer applied in the experiment (kgha^{-1})

Treatments	N	P	K	S	Zn	B	VC
T1= Native soil fertility	-	-	-	-	-	-	-
T2= 100% CF	27	10	17	8	1.3	0.5	-
T3= 5 tha-1 VC	-	-	-	-	-	-	5000
T4= 50% CF+2.5 tha-1 VC	13.5	5	8.5	4	0.65	0.25	2500
T5= 70% CF+1.5 tha-1 VC	9.45	7	11.9	5.6	0.91	0.35	1500

3. RESULTS AND DISCUSSION

Sesame yield was significantly affected by combined effect of vermicompost and inorganic fertilizers. The results stated that highest yield was found at T4 treatment (1.47 t ha^{-1}) and lowest yield was found at control or T_1 treatment (0.93 tha^{-1}) which was statistically similar with other three treatments (Table-5). Pandiyan, [18] reported that vermicompost used properly with other fertilizers considerably improves the plant's development and yield parameters. In addition, adding vermicompost increases the soil's porosity, ability to hold water, and macronutrient content. Yield contributing characters of sesame were also influenced with the combined application of chemical fertilizers and vermicompost. The results showed the significant variations for plant height, among the five treatments, T_4 produced the tallest plant (129.06 cm), which is statistically different from other treatments. Plant height at 30 days interval is given at bar diagram. (Fig.1). Number of branches/plant, number of leaves/plant and pod length were not significantly affected by five different treatments (Table 4). Here the number of branches was higher in T_4 treatment (3.83) than other treatments. Lower number of branches was obtained in T_5 treatment (3.06). The sesame plant obtained higher leaves at T_5 treatments (80) and lower leaves were T_1 treatments (63). Longer pod length of sesame was found at T_3 treatments (2.63) and smaller pod length was observed at T_5 treatments (2.33). In the current analysis, the plots treated with 50% chemical fertilizers and 2.5 t ha^{-1} Vermicompost showed the significant results on growth of the plants compared to the plots treated with other treatments [19]. In case of spinach, Syed,[20] found that vermicompost and NPK fertilizers significantly improved vegetative growth parameters of Spinach. **(((what aretherelationship between sesame and Spinach)))**

Yield attributes such as number of seeds/pod, number of pod/plant and 1000-seed weight of sesame plants were positively affected by the use of vermicompost with chemical fertilizers. In table 5, the results show that T_4 treatment produced more pod in sesame plant (74.11) than other treatments. Less pod number was found in T_5treatment (53.45). Similar trend was found in case of seeds/pod which significantly affected by five treatments. In T_5 treatment, 62 seeds was found on one sesame pod which was higher than other four treatments. 1000 seed weight of sesame was not significantly affected by five different treatments. Higher 1000-seed weight was found at T_4 treatments (4.02) and lower 1000-seed weight was seen at T_2 treatments (2.90).

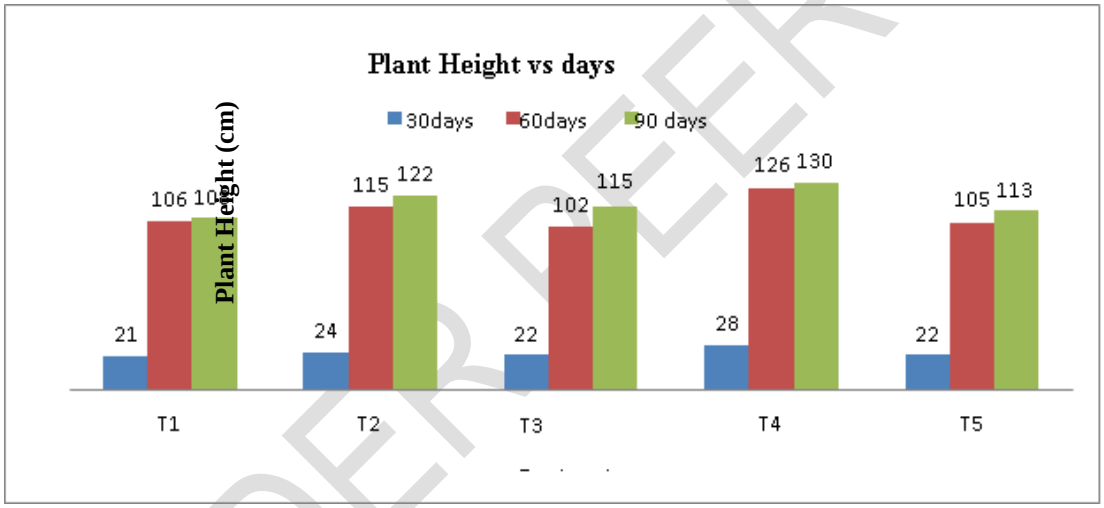

Fig. 1: Plant height at 30, 60 & 90 days

Table 4: Combined effect of vermicompost and inorganic fertilizers on growth attributes on Sesame plant

Treatments	Plant Height (cm)	No. of Branch/plant	No. of leaves/plant	Pod Length (cm)
T_1=Native soil fertility	107.39 c	3.22	63	2.39
T_2=100% CF	118.40 b	3.22	72	2.37
T_3=5 t ha^{-1}VC	112.11 bc	3.44	69	2.63
T4=50% CF + 2.5 t ha^{-}VC	129.06 a	3.83	78	2.43
T_5=70%CF + 1.5 t ha^{-1}VC	110.11 c	3.06	80	2.33
CV (%)	3.65	9.08	1.95	5.92
Level of significance	*	NS	NS	NS

In a column, the values having same letter do not differ significantly at 5% level by DMRT NS= Non significant, CV= Co-efficient of variation, CF= Chemical Fertilizer, VC= Vermicompost

Table 5: Combined effect of vermicompost and inorganic fertilizers on yield attributes on Sesame plant

Treatments	No. of Pod/plant	No. of Seed/Pod	1000 seed weight (gm)	Yield (t/ha)
T_1=Native soil fertility	62.33	56.00 b	3.42	0.93 b
T_2=100% CF	58.89	57.00 b	2.90	1.03 b
T_3=5 t ha^{-1}VC	65.22	55.00 b	3.98	0.97 b
T_4=50% CF + 2.5 t ha^{-}VC	74.11	62.00 a	4.02	1.47 a
T_5=70%CF + 1.5 t ha^{-1}VC	53.45	55.00 b	4.00	0.97 b
CV (%)	21.69	3.22	6.04	5.89
Level of significance	NS	*	NS	*

In a column, the values having same letter do not differ significantly at 5% level by DMRT NS= Non significant, CV= Co-efficient of variation, CF= Chemical Fertilizer, VC= Vermicompost

4. CONCLUSION

The study demonstrates the effect of vermicompost with combination of inorganic fertilizers on the growth and yield components of the plant (*Sesamum indicum* L). The results conclude that the proper mixture of vermicompost with other chemical fertilizers enhances the growth and yield parameters of the plant significantly. 50% chemical fertilizer (CF) + 2.5 t ha^{-1} Vermicompost (VC) produces the highest yield of sesame plant.

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