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Effect of foliar application of vermiwash, compost tea and panchagavya on yield and quality of soybean in inceptisol

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Abstract

An experiment was conducted on "Effect of Foliar Application of Vermiwash, Compost tea and Panchagavya on Growth, Yield and Quality of Soybean in Inceptisol," during 2018-2019 at Farm, Department of Soil Science and Agricultural Chemistry, College of Agriculture, Latur. The experiment was laid out in RBD with eight treatments and three replications. The result revealed that the yield and quality of soybean were significantly increased with the foliar application of vermiwash, compost tea and panchagavya. The maximum yield and quality were recorded in treatment T₅- RDF + Panchagavya @ 3% foliar spray followed by T₆ – RDF + Compost tea @ 75% foliar spray and which was superior over rest of the treatments.

Keywords: Panchagavya, vermiwash, compost tea, yield, quality, RDF

Introduction

Soybean (*Glycine max* (L) Merrill) belongs to family Leguminaceae with sub family papilionaceae. It is basically a pulse crop and gained the importance as an oilseed crop as it contains 20 percent cholesterol free oil, 40 percent protein, 30 percent carbohydrates, 4 percent saponin and 5 percent fibre. The oil contains about 0.5-1.0 percent lecithin which is essential for building up of human nerve tissue. In Maharashtra, soybean occupied an area of 5 lakh ha. With production of 6 lakh tones. Due to the high protein content, soybean is known as "poor man's meat". In vermicomposting process, earthworms feed on the organic waste and their gut act as a bioreactor such that vermicasts are expelled. These vermicasts are rich in the macro and micronutrients. Furthermore, vermiwash, a brownish leachate is produced during the vermicomposting process and used as a foliar spray.

Compost tea is a liquid extract made by steeping compost in water using a variety of preparation methods (Scheuerell and Mahaffee 2002) [8]. Compost tea a term used interchangeably with "watery fermented compost extract", "compost seepage", "organic tea" and "compost leachate" to define water based compost preparations. The term does not distinguish between the production method (Scheuerell and Mahaffee 2002) [8]. Historically, home-made brews were prepared by suspending a bag of compost in a container of water for 14 days to extract nutrients that when applied to plant promotes health and vitality. More recently, compost tea has been brewed in large scale mechanized systems for shorter periods of time and often supplemental with oxygen, nutrients, and microbial starter cultures to enhance the biological activity of the tea (Scheuerell and Mahaffee 2004; Ingam, 2003) [9]. This type of brewing technique is referred to as Aerated Compost Tea (ACT).

Material Methods

An experiment was conducted on response of "Effect of Foliar Application of Vermiwash, Compost tea and Panchagavya on Growth, Yield and Quality of Soybean in Inceptisol." 2018-2019 at Farm, Department of Soil Science and Agricultural Chemistry, College of Agriculture, Latur. Which is situated at 18° 24' 90" N latitude and 76° 36' 66" E longitude at an evaluation 540 MSL. The experiment was under soybean (MAUS-158) with various treatment T₁ (RDF + control), T₂ (100% RDF + Water foliar spray), T₃ (RDF + Compost tea @ 50% foliar spray), T₄ (RDF + Vermiwash @ 10% foliar spray), T₅ (RDF + Panchagavya 3% foliar spray), T₆ (RDF + Compost tea @ 75% foliar spray), T₇ (RDF + Vermiwash @ 25% foliar spray), T₈ (RDF+ Panchagavya @ 4% foliar spray). The experiment was laid out in RBD with eight treatments and three replications, application of fertilizer through urea, SSP and MOP.

Result and Discussion

Yield Attributes

Number of pods plant- 1

The data regarding number of pod recorded at pod development and harvesting stage of crop are presented in table 1. The maximum number of pods plant-1 were observed with the treatment T5 - RDF + Panchagavya @ 3% foliar spray recorded at pod formation (34.18) which was at par with treatment T6 - RDF + Compost tea @ 75% foliar spray, T4 and harvesting (37.65) Which was at par with T6 - RDF + Compost tea @ 75% foliar spray, T4, T7 and T8. Whereas the minimum number of pods per plant was observed with treatment T1 - control at pod formation (26.40) and harvesting

stage (29.10) of soybean. This increase of number of pods might be due to foliar application panchagavya which helped in acceleration of various metabolic processes in plants resulting increase in number of pod plant-1.

Similar observation reported by Loganathan and Wahab (2014) [6] and Vimalendran and Wahab (2013) [10] that application of recommended dose of fertilizer and panchagavya foliar spray at different stage of crop lead to better photosynthesis activity of the plant and more extensive root system and thus, enabled the plant to extract nutrient from soil there by resulting in better development of yield component.

Table 1: Effect of foliar application of vermiwash, compost tea and panchagavya on number of pods of soybean

Treatments	Number of pods	
	At pod formation stage	At harvest stage
T1 – RDF (Absolute Control) (30:60:30)	26.40	29.10
T2-100% RDF + Water spray	28.23	31.69
T3 - RDF + Compost tea @ 50% foliar spray	29.81	32.47
T4 - RDF + Vermiwash @ 10% foliar Spray	31.64	33.72
T5-RDF + Panchagavya @ 3% foliar spray	34.18	37.65
T6 - RDF + Compost tea @ 75% foliar spray	32.43	35.90
T7 - RDF + Vermiwash @ 25% foliar spray	30.19	34.66
T8 - RDF + Panchagavya @ 4% foliar spray	29.96	33.90
General mean	30.36	33.64
SE(m) ±	1.262	1.401
CD at 5%	3.827	4.250

Straw and Grain yield kg ha-1

The data regarding straw yield, grain yield and total dry matter recorded at harvest stage are presented in Table 2. It was observed from the results that the treatment T5 - RDF + Panchagavya @ 3% foliar spray recorded significantly higher straw yield (2685.18 kg ha-1) which was at par with treatment T6 - RDF + Compost tea @ 75% foliar spray T4, T7 and T8, grain yield (1591.35 kg ha-1) which was significant over the rest of Treatments and total dry matter (4276.53 kg ha-1)

which was at par with the treatment T6 - RDF + Compost tea @ 75% foliar spray.

The lowest grain yield was recorded by treatment T1 - control (straw yield 1404.30 kg ha-1, grain yield 998.19 kg ha-1 and total dry matter 2402.49 kg ha-1 of soybean). These results are also in compliance with the findings of Gore and Sreenivasa (2011) [3], Patel *et al.* (2013) [7] and Yadhav *et al.* (2017) [11].

Table 2: Effect of foliar application of vermiwash, compost tea and panchagavya on straw yield, grain yield and total dry matter yield of soybean (kg ha-1)

Treatments	At Harvest Stage		
	Straw yield (Kg ha-1)	Grain yield (Kg ha-1)	Total dry matter (Kg ha-1)
T1 - Control (RDF 100%)	1404.30	998.19	2402.49
T2-100% RDF + Water spray	2129.62	1172.84	3302.46
T3 - RDF + Compost tea @ 50% foliar spray	2314.81	1190.12	3504.93
T4 - RDF + Vermiwash @ 10% foliar spray	2546.29	1269.64	3815.93
T5-RDF + Panchagavya @ 3% foliar spray	2685.18	1591.35	4276.53
T6 - RDF + Compost tea @ 75% foliar spray	2654.32	1280.21	3934.53
T7 - RDF + Vermiwash @ 25% foliar spray	2530.86	1258.02	3788.88
T8 - RDF + Panchagavya @ 4% foliar spray	2469.13	1203.70	3672.83
General mean	3507.33	1245.51	3588.57
SE(m) ±	96.274	48.532	144.806
CD at 5%	292.002	147.199	439.201

Quality

Protein content and protein yield

The data regarding protein content in seed and protein yield are presented in table 3. Higher protein content (40.91) was observed with treatment T5 - RDF + Panchagavya @ 3% foliar spray and it was at par with the rest of the treatments.

The lower protein content (38.01%) in seed was observed with treatment T1. The maximum protein yield was recorded in the treatment T5 - Panchagavya @ 3% foliar spray (651.10 kg ha-1) and which was significantly superior to the rest of

treatment. The minimum protein yield was noticed in treatment T1 (379.48 kg ha-1).

Above result are in line with Lende *et al.* (2007) [5]. Data revealed that foliar application of 200 ppm vermiwash significantly increased seed protein and oil content. The increase in protein content with combined application of recommended dose of fertilizer with organic formulations confirmed the results recorded by Choudhary *et al.* (2017) [11].

Oil content and oil yield

Table 3: Effect of foliar application of vermiwash, compost tea and panchagavya on oil content (%), oil yield (kg ha⁻¹), protein content (%) and protein yield (kg ha⁻¹).

Treatment	Oil content (%)	Oil yield -1 (kg ha).	Protein content (%)	Protein yield (kg ha-1).
T1 - Control (RDF 100%)	19.12	190.78	38.01	379.48
T2-100% RDF + Water spray	19.20	224.97	39.28	460.76
T3 - RDF + Compost tea @ 50% foliar spray	19.28	229.37	39.61	471.53
T4 - RDF + Vermiwash @ 10% foliar spray	19.43	246.70	40.48	512.84
T5-RDF + Panchagavya @ 3% foliar spray	19.55	311.15	40.91	651.10
T6 - RDF + Compost tea @ 75% foliar spray	19.48	249.44	40.69	520.49
T7 - RDF + Vermiwash @ 25% foliar spray	19.42	244.25	40.33	507.62
T8 - RDF + Panchagavya @ 4% foliar spray	19.41	233.66	39.64	478.21
General mean	19.36	241.29	39.87	497.75
SE(m) ±	0.671	9.172	1.312	55.155
CD at 5%	2.035	27.818	3.979	67.197

Data on oil content of soybean as influenced by various treatments presented in Table 3. The maximum oil content (19.55%) was found in treatment T5- RDF + Panchagavya @ 3% foliar spray and which was found at par with all other rest of treatments while, the lowest oil content was recorded in treatment T1-control (19.12%).

The oil yield maximum (311.15 kg ha⁻¹) at treatment T5 - RDF + Panchagavya @ 3% foliar spray and which was found significantly superior to the rest of the treatments while, the lowest oil content was recorded in treatment T1-control (190.78 kg ha⁻¹).

Lende *et al.* (2007) ^[5] reported that foliar application of 200 ppm vermiwash which contain sulphur, it involved in the synthesis of fatty acids and also increased protein quality through the synthesis of certain amino acids such as cystine and methionine this might be a reason for increases the oil content. Fayed (2010) ^[2] found that compost tea as foliar application gave a significant increase in total sugars in fruits on Manfalouty pomegranate trees. Lende *et al.* (2007) ^[5] found that oil percent in seed was maximum in treatment receiving foliar sprays of vermiwash. It is because VW is having sulphur and sulphur requirement of oilseed crops is quite high as compared to other crop.

Conclusion

From the above result however, concluded that application of RDF (30:60:30 kg ha⁻¹ N: P₂O₅: K₂O) with the foliar application of panchagavya @ 3 percent at (30, 45, 60 DAS) and followed by application of RDF with foliar application of compost tea @ 75 per cent at (30, 45, 60 DAS) was found beneficial for increase yield and quality of soybean.

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