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Effect of foliar application of liquid organic manures on growth and yield of maize (*Zea mays* L.)

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Abstract

A field experiment entitled “Effect of Liquid Organic Manures Spray on Growth and Yield of Maize (*Zea mays* L.)” was carried out during *Kharif* season of 2023 at Agriculture Farm, Nalanda College of Agriculture, M.R. Palayam, Tiruchirappalli (District), Tamil Nadu. The experiment consisting of ten treatments *viz.* Control (T₀), Panchagavya @ 3% (T₁), Jeevamurtha @ 3% (T₂), Fish amino acid @ 3% (T₃), Panchagavya @ 5% (T₄), Jeevamurtha @ 5% (T₅), Fish amino acid @ 5% (T₆), Panchagavya @ 8% (T₇), Jeevamurtha @ 8% (T₈) and Fish amino acid @ 8% (T₉) was laid out in Randomized block design with three replications. Maize variety, Pioneer 30B07 was used as a test crop.

The results of one- year study clearly showed that organic foliar spray treatments brought significant effect in increasing growth, yield and economics of maize. Maximum plant height, dry matter accumulation, chlorophyll content, number of kernels per cob, grain yield, stover yield, harvest index, nitrogen, phosphorus and potassium content and their uptake by seed and stover, net returns and B:C ratio of maize was obtained by application of Fish amino acid @ 5% (T₆) which was closely followed by Jeevamurtha @ 8% (T₈). The plant height and dry matter accumulation at 30 DAS, test weight and harvest index of maize remained unchanged due to different treatments. Thus, for increasing productivity and profitability of maize, application of Fish amino acid @ 5% (T₆) or Jeevamurtha @ 8% (T₈) were found equally effective.

Keywords: Maize, liquid organic manures, growth, yield

Introduction

Maize (*Zea mays*) is an important and versatile cereal grown over diverse environment and geographical ranges for human food, feed and fodder for livestock. It also serves as a basic raw materials as an ingredient to thousands of industrial products that includes starch, oil, protein, alcoholic beverages, food sweeteners, pharmaceuticals, cosmetic, film, textile, gum, package and paper industries *etc.* In terms of global production, maize is largest grown cereals in the world and comes third in terms of consumption after rice and wheat. Maize, popularly known as “Queen of cereals” is a miracle crop grown in more than 130 countries of different continents (Preetha and stalin, 2014) [2]. In India, maize occupies an area of 9.43 million hectares with a production of 24.35 million tonnes and the productivity of 2.54 t ha⁻¹. In Tamil Nadu, it is cultivated in an area of 0.22 million hectares with production of 0.81 million tonnes and a productivity of 3.7 t ha⁻¹. The current global scenario firmly emphasizes the need to adopt eco-friendly agriculture practices for sustainable food production.

The use of liquid organic manures such as panchagavya, Jeevamurtha and Fish Amino Acids result in higher growth, yield and quality of crops. Panchagavya is an organic formulation made from cow goods. The usage of fermented organic formulation with supportive beneficial microorganisms as foliar nourishment has come into the picture of modern agriculture for giving rise to good quality non-residue protected food (Galindo *et al.*, 2007) [7]. Consequences of panchagavya application are superior growth, yield and quality of crops. Jeevamurtha and Fish Amino Acids contains macro nutrients, essentials micro nutrients, many vitamins, essential amino acids, growth promoting factors like IAA, GA and beneficial microorganisms (Gadewar *et al.*, 2013) [4]. The Fish Amino Acids is liquid organic manures made from fish waste. Fish Amino Acids is of great value to both plant and microorganisms in their growth. Several

strategies were initiated to boost the productivity of maize. One among them being the efficient way is foliar applications of liquid organic manures for exploiting the maximum genetic potential of the crop. Foliar application of fish emulsion promoted seedlings growth of tomato (Murray *et al.*, 2004) [8] and increased the microbial action in the soil (El-Tarabily *et al.*, 2003) [4]. Recently, many studies have reported that panchagavya, jeevamurtha and Fish Amino Acids as foliar spray is effective. But research studies on different doses of afore said liquid manures on maize crop were meagre. Therefore, the present study was undertaken to find out the response of different concentration of Panchagavya, Jeevamurtha, and Fish Amino Acids on growth and grain yield of maize in Tamil Nadu.

Materials and Methods

Field experiment was conducted at the experimental Farm, Nalanda College of Agriculture and Tamil Nadu to study the influence of different organic growth substance on growth, yield and quality of performance in maize. The experiment was conducted during *Kharif* 2023 at Agricultural Farm, Nalanda College of Agriculture, M.R. Palayam, Tiruchirappalli (District), Tamil Nadu. Geographically, the study area is located at 11.00 °C North latitude and 78.5 °C East Longitudes with an altitude of 85 m MSL. The mean maximum temperature around 37.2 °C and mean minimum is 27.3 °C. The Taluk (Manachanallur) receives a total annual rainfall of 526.4mm. The experiment comprising of ten treatments *viz.*, T₁ - Control (water spray), T₂ - Foliar spray of Panchagavya 3% on 20, 40 and 60 DAS, T₃ - Foliar spray of Jeevamurtha 3% on 20, 40 and 60 DAS, T₄ - Foliar spray of Fish Amino Acid 3% on 20, 40 and 60 DAS, T₅ - Foliar spray of Panchagavya 5% on 20, 40 and 60 DAS, T₆ - Foliar spray of Jeevamurtha 5% on 20, 40 and 60 DAS, T₇ - Foliar spray of Fish Amino Acid 5% on 20, 40 and 60 DAS, T₈ - Foliar spray of Panchagavya 8% on 20, 40 and 60 DAS, T₉ - Foliar spray of Jeevamurtha 8% on 20, 40 and 60 DAS, T₁₀ - Foliar spray of Fish Amino Acid 8% on 20, 40 and 60 DAS.

The experiment was laid out in a randomized block design with three replications. The maize hybrid pioneer 30B07 was chosen for study. The recommended seed rate of 20 kg ha⁻¹ was used for the experiment. The seed were sown by dibbling with a spacing of 60 x 20 cm. As per treatment schedule liquid organic manures were applied. All necessary management practices were carried out as per standard recommendation for maize crop. The growth and yield attributing characters such as plant population, plant height, Dry Matter Accumulations, Leaf Area Index, Number of kernels per cob, Cob of cob per plant, cob length, cob weight, Row per cob were recorded from 5 randomly selected plants. Grain and stover yield were also recorded from each plots. The crop was harvested manually at fully maturity. The harvested crop of the plot was bundled separately, tagged properly and

bring to the clean threshing floor. The data on various studies recorded during the investigation were subjected to statistical scrutiny suggested by Gomez and Gomez (1984) [6].

Results and Discussion

Effect of growth attributes: The application of different liquid organic manures has a considerable impact on the growth parameters of maize as demonstrated by clear data, the application of Fish Amino Acid 5% significantly increased the plant height at 60 DAS and at harvest, dry matter accumulation 60 DAS and at harvest, leaf area index and chlorophyll content over control (Table 1). This might be due to the quick absorption and assimilation of micro and macro nutrients present in the FAA, improved the metabolic activity and cell division resulted in higher plant height, dry matter accumulation, Leaf area index and chlorophyll content. These results accordance in finding of vasmathi (2001) [14] and Sujatha *et al.* (2008) [10]. Among the dose of Fish amino acid @ 5% produced significantly taller plants (186.07) cm at 60 DAS and (200.90) cm at Harvest, and higher Dry matter accumulation (99.87) g at 60 DAS and (122.35) g at harvest, higher LAI (3.13) at 45 DAS and chlorophyll content to tune of 4.40 (Table 1) respectively over control. Foliar spray of Fish amino acid @ 8% registers lesser values of growth promoters than Fish amino acid @ 5% spray. Foliar application Fish amino acid @ 8% affected the plant growth as compared to lower doses. This may be due to higher concentration of FAA would have disturbed the stomatal opening gas exchange and ultimately of growth of the plant. However, it requires further through investigation on the negative effect of higher doses of FAA.

Effect of yield and yield attributes: Yield and yield attributes of maize varied due to foliar application of Panchagavya, Jeevamurtha and Fish amino acid. Significantly, Fish amino acid @ 5%, higher cob length (18.86) cm, cob girth (14.07) cm, Number of kernels per cob (509.10) and test weight (289.3) (Table 2). This was followed by Fish amino acid @ 5% higher grain yield (5207) kg ha⁻¹, Stover yield (7415) kg ha⁻¹, biological yield (12622) kg ha⁻¹ and harvest index (47.70) (Table 3) over control. This might due to that supply of macro and micro nutrients and growth hormones present in the FAA improved the growth characters such as cob length, cob girth, grain yield and biological yield. These results are in accordance with the finding of Abbasi *et al.*, (2003) [1] who reported that foliar spray of fish emulsion increased the total yield of tomato and pepper. Similarly, foliar application of 1% FAA increased the rice yield to tune of 15.5 per cent over control (Priyanka *et al.*, 2019) [9]. Higher dose of FAA reduced the maize yield.

Table 1: Effect of Liquid Organic Manures on growth attributes of Maize

Treatments	Plant height (cm) 60 DAS At harvest	Dry matter accumulations(g) 60 DAS At harvest	Leaf Area Index	Chlorophyll Content
Control	138.65 152.60	76.87 94.82	1.98	3.23
Panchagavya @ 3%	147.70 160.90	82.00 99.25	2.06	3.27
Jeevamurtha @ 3%	165.36 185.90	92.80 115.43	2.50	3.73
Fish Amino Acid @ 3%	169.37 191.70	95.50 118.03	2.51	4.10
Panchagavya @ 5%	154.30 178.80	87.10 108.03	2.20	3.53
Jeevamurtha @ 5%	164.10 180.27	88.80 113.10	2.25	3.60
Fish Amino Acid @ 5%	186.70 200.90	99.87 122.35	2.61	4.40
Panchagavya @ 8%	152.40 177.10	85.00 105.54	2.15	3.50
Jeevamurtha @ 8%	171.80 196.30	97.90 118.77	2.56	4.23
Fish Amino Acid @ 8%	153.30 171.40	83.40 102.18	2.11	3.50
S.Em ±	6.69 8.87	3.87 5.97	0.11	0.16
CD (p = 0.05)	19.87 26.35	11.49 17.75	0.33	0.47

Table 2: Effect of Liquid Organic Manures on Yield attributes of Maize

S. No	Treatments	Cob Length (cm)	Cob Girth (cm)	No. of. kernels per cob	Test weight (g)
T ₀	Control	12.70	8.73	264.67	226.2
T ₁	Panchagavya @ 3%	14.20	10.45	334.80	254.9
T ₂	Jeevamurtha @ 3%	17.67	12.58	465.30	276.8
T ₃	Fish Amino Acid @ 3%	18.10	13.05	478.40	280.9
T ₄	Panchagavya @ 5%	16.20	12.06	435.07	271.1
T ₅	Jeevamurtha @ 5%	17.50	12.30	459.37	274.4
T ₆	Fish Amino Acid @ 5%	18.86	14.07	509.10	289.3
T ₇	Panchagavya @ 8%	15.10	11.24	431.97	269.3
T ₈	Jeevamurtha @ 8%	18.40	13.75	490.10	286.2
T ₉	Fish Amino Acid @ 8%	15.10	11.40	362.43	264.2
S.Em(±)		0.94	0.52	28.97	7.25
CD (p=0.05)		2.79	1.54	86.07	3.72

Table 3: Effect of Liquid Organic Manures on Yield of Maize.

S. No	Treatments	Grain yield (kg ha ⁻¹)	Stover yield (kg ha ⁻¹)	Biological yield (kg ha ⁻¹)	Harvest index (kg ha ⁻¹)
T ₀	Control	3212	5339	8552	34.74
T ₁	Panchagavya @ 3%	3593	5777	9370	38.40
T ₂	Jeevamurtha @ 3%	4395	6915	11310	42.90
T ₃	Fish Amino Acid @ 3%	4546	7080	11626	44.80
T ₄	Panchagavya @ 5%	4127	6494	10620	39.19
T ₅	Jeevamurtha @ 5%	4230	6605	10835	39.30
T ₆	Fish Amino Acid @ 5%	5207	7415	12622	47.40
T ₇	Panchagavya @ 8%	3878	5973	9851	38.86
T ₈	Jeevamurtha @ 8%	4680	7225	11905	46.85
T ₉	Fish Amino Acid @ 8%	3791	5903	9694	38.85
S.Em(±)		181	292	649	2.49
CD (p=0.05)		538	867	1927	7.39

Conclusion

Based on the one year experiment, it may be concluded that application of Fish Amino Acid @ 5% produced significantly higher growth, seed, straw and biological yield as compared to other treatments. Therefore the application of Fish Amino Acid @ 5% may be recommended for higher production and profitability of maize under semi- Arid Tropics of Tamil Nadu.

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